



# INTER-COUNTY ENERGY COOPERATIVE CORPORATION

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Request for Proposals – Advanced Metering Infrastructure Services

RFP No. 2021-001

Due Date: February 4, 2022

Contact: Tim Hatfield, Area Sales Manager

Tim.Hatfield@landisgyr.com • (979) 203-0096

January 30, 2022

David Phelps  
Inter-County Energy Cooperative Corporation  
1009 Hustonville Road  
Danville, KY 40422

Re: Request for Proposal (RFP) Advanced Metering Infrastructure (AMI)

Dear Mr. Phelps:

Landis+Gyr Technology, Inc. sincerely appreciates the opportunity to respond to the Request for Proposal (RFP) for a new Advanced Metering Infrastructure (AMI) system for Inter-County Energy Cooperative.

Landis+Gyr's proposed Gridstream RF network is the latest generation of smart grid technology. Our Gridstream network is based on proven technology and deployment experience gained over the past two decades. Landis+Gyr has the vision, resources, and industry maturity to leverage our combined technologies, experiences, partnerships and capabilities. This unique collaboration allows us to take utilities beyond the smart grid to the enablement of smart communities.

Our electric, water and gas AMI solutions and feature sets have evolved based on our active involvement in the smart grid community as well as the knowledge gained through the deployment of tens of millions of endpoints operating today. We take great pride in providing our customers with a migration path that allows you to move forward with the constantly evolving standards and feature sets that help facilitate your business needs. Using proven program management and execution methodologies, Landis+Gyr has successfully deployed our Gridstream technology to over 300 customers in North America.

We are confident that our experience and large base of installed meters will give you and your members assurance that Landis+Gyr will be here to support your smart grid investment today and for many years to come.

Landis + Gyr looks forward to renewing our long and successful partnership with Inter-County Energy. Please do not hesitate to contact me at (979) 203-0096 or [Tim.hatfield@landisgyr.com](mailto:Tim.hatfield@landisgyr.com) if you have any additional questions.

Sincerely,



Tim Hatfield  
Account Executive  
Landis+Gyr

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## Executive Summary

Landis+Gyr is pleased to respond to Inter-County Energy's Request for Proposal regarding Advanced Metering Infrastructure (AMI).

This is a comprehensive Landis+Gyr solution which incorporates smart grid capabilities from the broad Landis+Gyr portfolio. The solution proposed will position Inter-County Energy to achieve its vision of providing reliable and low-cost utility services to its entire customer base.



### **Landis+Gyr Means Proven Experience from People Who Understand Inter-County Energy's Goals and Are Committed to Excellence**

Decisions about smart grid implementations are decisions about relationships and partnerships as much as they are about technology solutions. The partner you select must be able to craft the right solution for your organization, deliver and implement that solution, and provide support throughout its service life and beyond.

Landis+Gyr takes pride in our history of working exclusively in the utility industry. We know the importance of delivering on time and on budget to a high-profile and highly regulated industry. That is why we bring the proven project management and deployment experience necessary for a successful project. Landis+Gyr brings robust, detailed, standardized documentation and audited processes for AMI implementation as well as operation and maintenance services to your project. This claim is backed by our enterprise-wide ISO certification. No other company has more experience or a better track record of success regarding AMI installation and high-quality managed services. Today we host close to 300 AMI customers and provide full turnkey managed services for over 20 major utilities with a total of 20+ million devices deployed in the field. We can provide any level of support that your team may require at any time during the project.



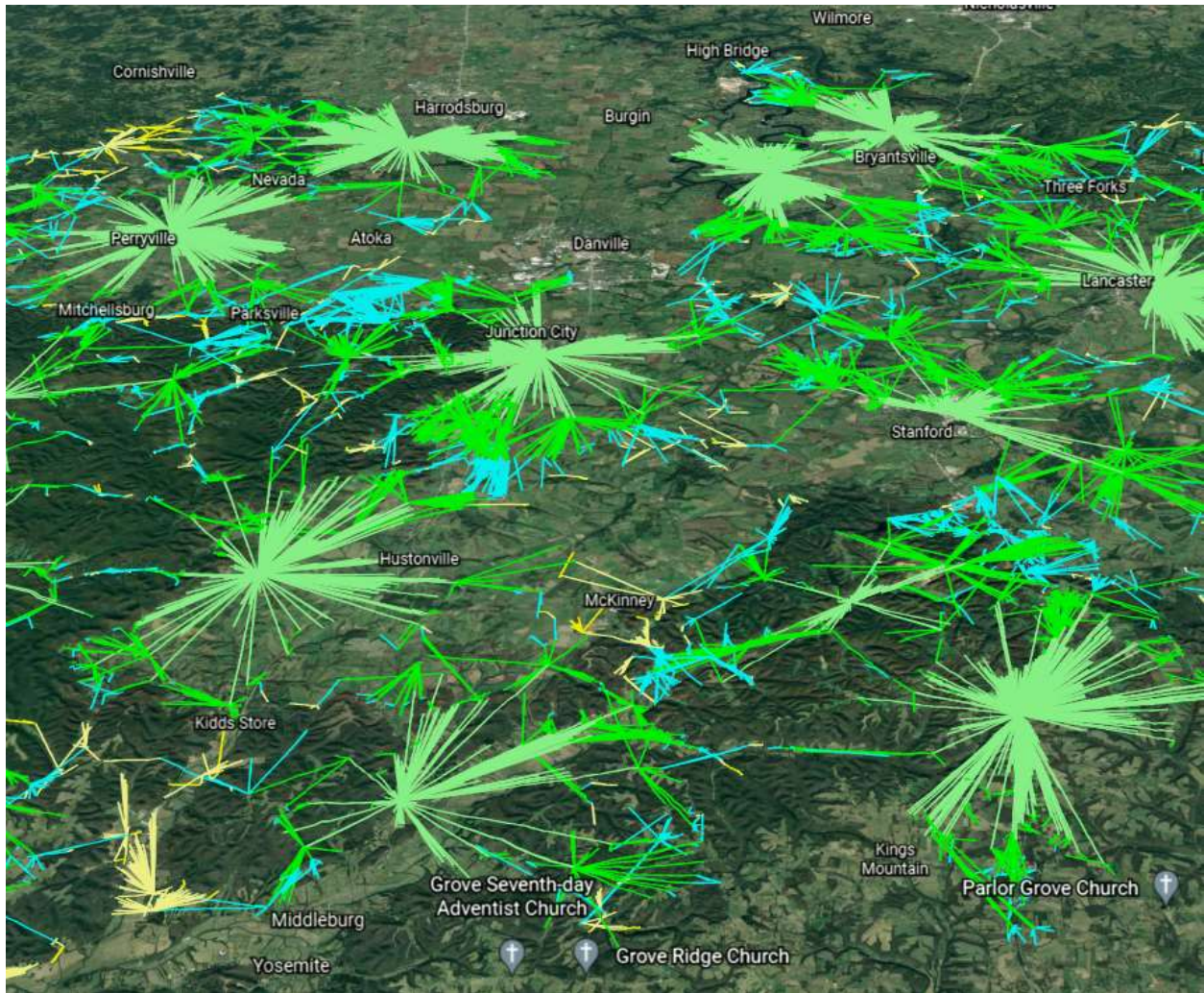
## **+ Landis+Gyr Provides the Lowest Risk for AMI, DA and DR**

Landis+Gyr is proposing our next generation Gridstream platform for Inter-County Energy. The network devices and meters operate at up to 1 Watt the fastest speed and maximum power allowed by the Federal Communications Commission (FCC). The solution is based on a modular architecture, designed with a state-of-the-art processor and 24MB of device level memory allowing for easy flexibility to expanded functionality and performance with future applications.

- + Gridstream radios are intelligent devices that are dynamically adaptive. This means that they continuously determine the best speed and path of operation to optimize the range and performance of the network.
- + Landis+Gyr has rigorous project management processes. The Landis+Gyr project management team and their processes will always assure an efficient, low cost, and low risk deployment for Inter-County.
- + The Landis+Gyr head-end software (Command Center) which is currently operating at over 400 utilities, is very intuitive and its seamless integration capabilities will insure that the wealth of data collected from your system is quickly parsed and transferred to the other critical applications that you are currently operating (CIS, GIS, MDM, etc....).
- + The network communications that will be established over the Inter-County Energy service territory with the Landis+Gyr Gridstream AMI network will ensure that there is no single point of failure allowing the system to quickly self-heal when unexpected outages or system damages occur.
- + Landis+Gyr has more experience than any other AMI provider in distribution automation applications operating over the same AMI network. In addition, the Gridstream network is being used at over 200 utilities for Demand Response communications

## + Landis+Gyr Gridstream Communication Network

To ensure that the proposed solution will provide Inter-County Energy with 100% coverage with no single point of failure while operating at a high-performance level... Landis+Gyr performed an initial design for the electric system. This initial design is based upon the location data provided to us and is highlighted below:



## **+ Landis+Gyr Gridstream goes beyond the Electric meter**

Landis+Gyr has also established an active partnership program, including Master Meter water meters, to extend the portfolio of solutions available throughout the Gridstream platform. Today, we partner with over 150 manufacturers in device or application-level integration and interoperability. This will ensure that the Meter Data and other information that is gathered from the system can be integrated seamlessly into your current back-office software systems to ensure that everything is operating as you desire.

Landis+Gyr is a partner who can help you maximize the benefits of the AMI, DA and DR quickly and cost effectively. Landis+Gyr has developed the expertise and the best practices for operating AMI systems for over 25+ years. Landis+Gyr has flexible business models for managed services and can tailor a model to meet the specific business needs for Inter-County. Our proven people, processes and technology provide reduced risk and cost, enabling Inter-County to stay focused on your core business.







## **Conclusion: Landis+Gyr Is the Right Choice for the Inter-County**

The most critical aspect of selecting a vendor to design and implement your smart grid solution is finding a long-term partner worthy of trust. We hope that you will allow us the opportunity to continue proving that we are the kind of partner that Inter-County can trust that we will honor our commitments and that we will deliver as promised. Please feel free to reach out to some of our other customers in your area such as Blue Grass Energy, Grayson Electric, or Meade County for confirmation.

In any solution for our customers — from AMI to Smart Community solutions — we have a deep commitment to making sure that our solution is as robust and as flexible as possible to meet the business case of today yet accommodate the innovations of tomorrow.

This proven experience and the ability to extend AMI to additional applications will provide the Inter-County with a solution that will exceed your expectations while providing a platform that will evolve to meet your future needs.

The Landis+Gyr Gridstream AMI system is truly the choice for the most discriminating of utilities.

## A. Company Information and Experience

Provide company background and history, including the number of years' experience in providing the proposed products/services.

### Landis+Gyr Response:

Landis+Gyr has a rich history and proudly reflects on 125 years of excellence. From the production of the first electricity meters at a time when the use of electricity was in its beginnings, to the events that impacted the way the Company operates and Landis+Gyr's social commitment and focus on sustainability, which has been part of the DNA since 1896.

With the proliferation of IoT connectivity today, the role of AMI and Smart Grid solutions requires a future-ready network solution that is open and secure, flexible, and scalable to help fulfill the business needs of today and offer the agility to address the challenges of the future. Gridstream® Connect from Landis+Gyr is backed by over 25 years of proven utility IoT interoperability experience with one of the largest partner ecosystems.

Gridstream® Connect, our multipurpose utility IoT platform, has a long history of supporting electric, water, and gas. From the networked Gridstream RF AMI solution comes the ability to leverage the investment in a network to support various smart grid applications, such as meter data management, distribution automation, home automation, load control, micro grids, smart street lighting, PV and EV charging capabilities, prepayment, consumer portal, advanced grid analytics, and voltage conservation solutions.

In the summer of 2017, Landis+Gyr became publicly traded company on the Swiss SIX Exchange (LAND) with its global headquarters in Cham, Switzerland.

The Landis+Gyr North America headquarters is in Alpharetta, GA. In the US, Landis+Gyr maintains R&D Centers in Alpharetta, GA; Bloomington, MN; Minneapolis, MN; Lafayette, IN; Pequot Lakes, MN and Raleigh, NC. Additionally, Landis+Gyr operates numerous regional customer operations program offices to provide deployment services and ongoing AMI managed services in various locations in the US.

Landis+Gyr has domestic teams located in Atlanta, Minneapolis, Pequot Lakes, Lenexa and Lafayette to support all time zones of North America. In addition, we have international-based teams in India to complement our 24x7 support model. Development and support resources have been co-located within our Atlanta and India offices for more than 10 years.

Today, Landis+Gyr proudly serves utilities around the globe as a critical infrastructure provider. With more than 300 million installed devices, of which 125 million are connected intelligent devices, the Company is a leading provider of integrated energy management solutions. Over the past 125 years, the Company has shaped the energy industry through constant change. Through continuous commitment to R&D, M&A, strategic partnerships and investments, the Company is transforming once again to meet the changing needs of its customers, provide stability to its employees and create shareholder value. Rooted in its shared values of Customer Intimacy, Innovative Technology, Uncompromising Performance, Entrepreneurial Spirit and Sustainable Impact, Landis+Gyr's first priority remains to manage energy better for utilities, energy consumers and entire communities.

Include the following information for up to three (3) projects where this product/service has been deployed and is an operating AMI System serving electric utilities within the last two (2) years:

- Brief description of the project
- Project organization, including use of sub-contractors, utility provided services, etc.
- Total number of residential, commercial & industrial meters in each project
- Start and finish dates for the contract.
- A description of the specific services provided to the utility including service level agreement (SLA's) associated with each service.
- Provide relevant references within the utility that are familiar with the work performed. Include name, current phone number and current email address.

## Landis+Gyr Response:

### Reference 1 – Blue Grass Energy

**Customer Name:** Blue Grass Energy  
Nicholasville, KY



<b>Applications:</b>	Gridstream RF AMI Gridstream DA Gridstream ALM
<b>Deployment Period:</b>	2016 – 2022 Deployed Gridstream RF Mesh System
<b>Contact Information:</b>	Blue Grass Energy 1201 Lexington Road Nicholasville, KY 40356 Main Headquarter Phone: 888-546-4243 Web Site: <a href="https://bgenergy.com/">https://bgenergy.com/</a>  Name: Sean Hurd Title: Manager, Engineering Technology Office Phone Number: 859-885-2120 Cell Phone Number: 270-484-5199 Email Address: seanh@bgenergy.com

### Project Overview

Blue Grass Energy began deployment of Landis+Gyr's Gridstream RF system in 2016. Blue Grass Energy serves over 61,000 members in 23 central and north-central Kentucky counties stretching from Berea to the Ohio River. Blue Grass has also deployed Distribution Automation and Advanced Load Management utilizing their Gridstream AMI network.

## Reference 2 – Grayson Rural Electric

**Customer Name:** Grayson Rural Electric  
Grayson, KY



<b>Applications:</b>	Gridstream RF AMI
<b>Deployment Period:</b>	2018 Deployed Gridstream RF Mesh System
<b>Contact Information:</b>	<p>Grayson Electric 109 Bagby Park St. Grayson, KY 41143 Main Headquarter Phone: 606-474-5136 Web Site: <a href="https://graysonrecc.com/">https://graysonrecc.com/</a></p> <p>Name: Brian Poling Title: Manager of Technical Service Office Phone Number: 606-474-5136 Cell Phone Number: 606-474-2122 Email Address: brian.poling@graysonrecc.com</p>

### Project Overview

Grayson RECC began their Gridstream RF deployment in 2018. Grayson serves over 16,000 meters covering 6 counties in Eastern Kentucky. Gridstream RF works well in their rugged terrain using 16 collector sites and they enjoy a better than 99.8% daily read rate.

## Reference 3 – Meade County RECC

**Customer Name:** Meade County RECC  
Brandenburg, KY



<b>Applications:</b>	Gridstream RF AMI Advanced Grid Analytics
<b>Deployment Period:</b>	2020 – Deployed Pilot Gridstream RF Mesh System 2021 – KY PSC approval to fully deploy remaining system
<b>Contact Information:</b>	<p>Meade County RECC 1351 Hwy 79 Brandenburg, KY 40108 Main Headquarter Phone: 270-422-2162 Web Site: <a href="https://www.mcrecc.com/">https://www.mcrecc.com/</a></p> <p>Name: Mike French Title: Director of System Engineering Office Phone Number: 270-422-2162 ext. 3169 Cell Phone Number: 270-422-2162 Email Address: mfrench@mcrecc.com</p>

## *Project Overview*

Meade County RECC began their Pilot Gridstream RF deployment in 2020 with approx. 6,400 meters. Meade County RECC serves approx. 30,000 meters total in North Central Kentucky. The KY PSC approved Meade County RECC to fully deploy their remaining 24,000 meters in 2021. Meade County RECC also utilizes the Landis+Gyr Advanced Grid Analytics software.

## B. AMI System

### 3 DESIGN AND INSTALLATION OF AN ADVANCED METERING INFRASTRUCTURE SYSTEM UTILIZING RF TECHNOLOGY, INCLUDING ALL HARDWARE AND SOFTWARE

#### 3.1 SPECIFICATIONS

System is a RF AMI solution (RF Mesh, Point to Multipoint RF, etc.) with two-way communication.

#### Landis+Gyr Response:

Landis+Gyr's mesh solution is based on a powerful yet simple network design with complete plug-and-play and self-healing qualities. Once installed, Gridstream endpoints self-register, identify multiple communication paths, and begin transmitting data to and from Command Center. Using industry standard APIs and web services such as MultiSpeak and CIM 61968, the metering data and network events can be passed to utility applications or directly to multiple third-party applications.

Key features and functionality:

- **Future-ready** – Landis+Gyr incorporates industry standards at each layer of the solution to ensure that networks deployed today will remain operational, effective, and interoperable as smart grid functionality evolves. Industry standards, as well as smart grid functionality, are constantly evolving.
- **Auto-Registration** – Endpoints automatically self-discover and self-register on the network, which makes installation simple and efficient.
- **Self-Healing and Dynamic Routing** – The self-healing and dynamic routing features of the RF Mesh network automatically adjust for addition or subtraction of endpoints and the introduction of any obstructions, such as foliage and new construction.
- **Multi-Purpose Network** – The RF network supports multiple smart grid applications including AMI, Distribution Automation, and Load Control with no additional network infrastructure.
- **Bandwidth and Scalability** – The RF solution is architected with the reserve capacity to not only maximize your AMI investment but also ensure that your utility can adapt to the changing requirements and opportunities of the smart grid.
- **High Speed, High Availability** – RF utilizes the 902-928MHz unlicensed spectrum with standard data rates up to 200 kbps.
- **Flexibility** – Remote re-configuration and firmware upgrades.
- **Open Standards** – Gridstream is an industry standard solution utilizing ANSI/DLMS meter table communication, 802.145.4g/e, RPL and IPv6 standards
- **Unlicensed Frequency** – The RF solution does not require any FCC licenses, reducing the risk and cost associated with acquiring and maintaining them.
- **Multi-Utility Solution** – The RF AMI solution supports electric, water, and gas.

Completion of a propagation study using data contained in the shop files provided and delivery of a detailed report that includes the following: The quantity and type of equipment required to achieve: 100% Coverage (all deployed meters are active on RF mesh network) 99.9% delivery of billing determinants every 72 hours. 95% of all meters must report back following an on-demand request. The system design results in an average of 2 hops per meter, no more than 6 hops per meter and allows each meter's "last gasp" to be delivered to an OMS system. Installation & maintenance specifications and requirements for collection devices and repeater devices.

#### **Landis+Gyr Response:**

Please refer to the provided "[Solution Design Specification](#)" provided with this proposal.

Detailed pricing for the above referenced system. Pricing must include: One-time costs Recurring costs itemized by year (and any other appropriate time period) for a period of 10 years. (10-year cost of ownership). For System Guarantees/Maintenance Agreements, include initial coverage details and future year's coverage details. Also include the maximum length of a Maintenance Agreement available and the corresponding cost. The additional cost for disconnect/reconnect switches for 100% of all applicable meters, by meter type.

#### **Landis+Gyr Response:**

Please refer to the provided "[Landis+Gyr's Pricing Proposal and Clarifications](#)" within the proposal.

Provides integration to SEDC's CIS/MDM system. Provides integration to Futura's GIS/OMS system. Provides integration to NISC CIS and MDM. Provides integration to Milsoft GIS/OMS. Provides integration to Survalent SCADA. Provides integration to OSI SCADA.

#### **Landis+Gyr Response:**

Via MultiSpeak and CIM standard interface options available, the sharing of event data, device status, and on-demand commands can be supported. Systems which have been interfaced with in past include but are not limited to SEDC, Futura, NISC, and Milsoft.

Capable of sending and receiving DNP3 communication to control downline devices.

#### **Landis+Gyr Response:**

The RF solution is interoperable with and can communicate with any distribution automation (DA) electric or water distribution device that supports standard protocols such as RS-232, RS-485, DNP3 Serial, Modbus, and IP. Each Gridstream communication module is an intelligent device featuring a processor and memory with capability to run user defined programs locally.

During deployment through Inter-County Energy acceptance, a single point of contact with 24/7 accessibility will be provided.

#### **Landis+Gyr Response:**

A project manager will be assigned to run the Landis+Gyr project for the solution proposed. Availability will be during normal business hours, and support by Landis+Gyr support desk outside of business hours.

Any meter equipped with a disconnect/reconnect switch must be able to display the open/closed status of the switch on the meter display.

**Landis+Gyr Response:**

Comply. Meter's LCD display can be configured to display whether the meter's switch is in open or closed status.

Meters must have the ability to collect and report kWh, kW and voltage. Poly phase meters must additionally have the ability to collect and report Power Factor at peak kW.

**Landis+Gyr Response:**

The Landis+Gyr FOCUS AXe, FOCUS AXe-SD, and S4x meters proposed are full bi-directional, reactive capable, TOU and load profile demand meters that meet all current ANSI standards and stated requirements where applicable. Please see the specification sheets supplied with this proposal for each meter type.

**FOCUS AXe-SD Residential Smart Meter**

The FOCUS AXe and FOCUS AXe-SD advanced function residential meters surpass other meters in their class to deliver options you need for a highly functional and affordable metering solution. The FOCUS AXe provides more than just reliability and accurate billing data; it is designed to be a building block for a complete metering system. The result: a single solution to manage demand, time of use, load profile and reactive—with no costly upgrades.



Reactive energy and power quality measurement functions deliver empowering data to run advanced applications, such as voltage monitoring, VAR control and load curtailment. The combination of the FOCUS AXe Service Disconnect (FOCUS AXe-SD) base module and powerful FOCUS AXe register supports a variety of connect/disconnect and service-limiting applications. The FOCUS AXe-SD incorporates a 200A or 320A, motor-driven, cam action disconnect/connect switch under the meter cover. This advanced market-leading switch, coupled with the field-proven reliability of the FOCUS AXe-SD, delivers Landis+Gyr's third-generation design answer to today's evolving utility requirements.

Features:

- Most advanced cam-driven switch designed to withstand 10K cycles at 200A and 4K cycles at 320A



- Durable switch that continues operation, even under low voltage conditions
- Power quality data (sag/swell)
- Magnetic/DC presence detection (based on leading current)
- Tilt and vibration detection
- 8 channels of load profile
- Second recorder for 8 extra load profile channels (optional)
- Surpasses ANSI requirements for surge protection (10KV) and meter accuracy
- Full 320A disconnect rating
- Advanced over-the-air flash-able firmware upgrade avoids loss of utility billing
- ZigBee 2.4 GHz communication included and ready for Home Area Network applications (SEP 1.X)
- RF Mesh (Wi-SUN ready) NIC
- The RF solution provides a means for collecting internal meter temperature data from the FOCUS AXe and S4x meters. This data can be used to aid the in identification of meters suspected of overheating due to poor connections in the meter socket or tampering.

## **S4x Commercial and Industrial Smart Meter**

The commercial metering begins with the S4x. The S4x sets a new standard for versatility right out of the box, with four quadrant measurements of active and reactive energy, load profile and TOU without a battery, when used on the RF Mesh network. The S4x also provides the metrics utilities need at a higher resolution than most competitive meters to take full advantage of advanced grid management technologies. It comes with significantly more RAM, ROM, and non-volatile memory for load profile, self-reads, and event logs. The meter is available with multiple hardware options that further expand its capabilities, raising the bar on security and tamper detection. It provides both tilt and vibration sensing, and a dedicated Hall Effect sensor can detect strong magnetic field presence. The S4x brings value and features together to provide industry-leading capabilities for metering critical accounts.



### Features:

- 16 CH 256K standard, 1MB option
- 2nd 16 CH recorder optional
- 32-bit data storage
- Four-quadrant measurement
- Delivered and received kW, kVA and kVAR demands
- Two alternate methods of VAR and VA calculation
- Milli-unit energy and demand resolution
- Micro-unit instrumentation resolution
- Magnetic tamper detection
- Cover removal switch
- Tilt and vibration sensor
- RF Mesh (Wi-SUN ready) NIC
- I/O board
- “Power from any Phase” metrology power supply (optional)

**Poly phase meters shall be auto-ranging in voltage (120-480V).**

**Landis+Gyr Response:**

Comply. All Landis+Gyr polyphase meters are auto-ranging (have auto ranging power supplies for 120 - 480 v).

**Methodology for deployment, including proposed process maps and deployment schedules for the products/services proposed in order to meet Inter-County Energy’s desired acceptance date of December 2025 for full installation.**

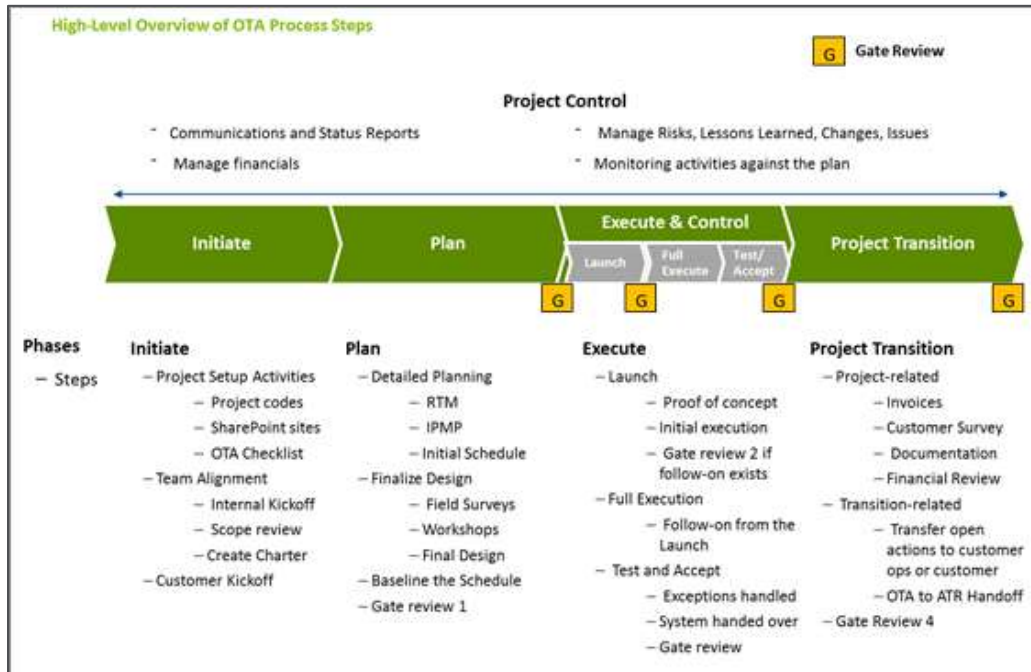
**Landis+Gyr Response:**

Order to Acceptance (OTA), the project implementation methodology described herein, is informed by Landis+Gyr’s long history and strong reputation for solution execution over two (2) decades. The OTA process is rooted in the principles of the internationally recognized Project Management Institute’s Project Management Body of Knowledge (commonly called PMI’s PMBOK). All of Landis+Gyr’s Project and Program Managers are certified by the Project Management Institute (PMI) as Project Management Professionals (PMPs), meaning each project leader has been trained in project management best practices and certified as a project management expert. Landis+Gyr’s methodology functions in accordance with the Landis+Gyr Integrated Management System (IMS), with rigorous and disciplined ISO 9001 (Quality Management), 14001 (Environmental Management) and 18001 (Health and Safety Management) registered processes.

OTA is a gated process that has been applied and refined in over hundreds of deployments of all sizes. The OTA process is composed of four main implementation phases:

1. Initiate
2. Plan
3. Execute & Control
4. Project Transition

A high-level overview of OTA process steps is shown below.



During initial workshops, a detailed schedule for project delivery services to support the solution will be mutually agreed upon. Network Coverage maps will be updated after site surveys are completed and delivered to the client. The goal of our services is to make clients self-sufficient to deploy the system at their own pace successfully.

For a complete view of Landis+Gyr's methodology, please refer to "**Landis+Gyr Project Delivery Order to Acceptance Methodology**" and "**Sample Statement of Work**" provided within the response.

**Any cost associated with the training outlined in Section 6 of this RFP.**

**Landis+Gyr Response:**

Landis+Gyr has included a "**Training Plan**" in the Project Delivery Services and Training section of the RFP. Training is priced in Landis+Gyr's pricing.

**Describe, in detail, cyber security measures/methods intended for use with your proposed AMI solution.**

**Landis+Gyr Response:**

The Landis+Gyr security solution addresses cyber security holistically. This means that security extends beyond securing communications links. Beyond a communication vendor perspective, the security encompasses the head end, the network communications, the field tools, the network devices, the meters and the secure development of these products and systems. Security is built-in to the AMI solution and designed to meet the operational needs of the utility. The Landis+Gyr security philosophy is to use a standards-based solution that uses validated security components, an open security architecture and non-proprietary cryptography.

The solution provides Application Layer security for messaging. Secure messaging is based on encryption, integrity, and message signing (AES 256 unique key encryption, SHA256HMAC integrity check, Elliptic Curve Digital Signature Algorithm (ECDSA) message signing). The solutions use NIST approved and FIPS validated cryptographic libraries built by cryptographers. As the messaging is secured at the application layer, the security solution does not rely on any specific backhaul security between the collectors and the head end. These application layer protections can build upon any TLS or VPN connectivity options that are deployed.

The head end security features include role-based access control with password complexity rules. For enterprise level password rules, user access management, and single sign on the head end supports Active Directory integration. The browser-based user interface supports TLS. Enterprise integration using web services requires web service authentication and the web service user must be authorized in the system. The integrations also supports TLS. All commands, configuration changes, and entries are logged in the database for auditing purposes. The head end also hosts a security dashboard that provides a single page view on security events. The security events can be integrated with a third party SIEM or the security administrator can subscribe to security event email alarms.

The field tools follow the similar procedure with the head end. The user must authenticate with their credentials. The authorization check confirms the user has sufficient privileges to access the field tool features. Should either authentication or authorization fail, the field tool exits.

The device security mitigates the attack vectors at the individual device level. Only signed firmware is accepted by the devices to prevent an installation of rogue firmware. Devices are configured to be secure by default. Software and hardware debug and diagnostics features are disabled to prevent exposure of capabilities that are not required in production. Tampering and security events are detected at the device level and reported back to the head end.

Landis+Gyr's product development employs a Secure Development Life Cycle. This ensures security is considered from the start. Security architects review requirements and ensure security is factored into any new feature and device. During design, threat and misuse analysis are done, and design reviews are performed to ensure security is considered in the design from the start. The developers are trained for secure coding principles and code reviews are used to verify the principles are followed. Internal security testing is done continually and on an annual basis. Landis+Gyr contracts with a third-party company to run penetration tests for our system.

**If the proposed system allows for retrofitting of existing solid-state meters, please specify meter brand and type and the cost of the module.**

#### **Landis+Gyr Response:**

Retrofit is not an option.

Methodology of system design including propagation assumptions described in detail (including built in redundancy of the network).

## Landis+Gyr Response:

### Network Design Overview

Network Design Process incorporates all aspects of system ability and performance. Before design activities begin, the customer's territory is assessed and categorized based on the morphology or environmental aspects, urban/rural, flat/hilly, trees/treeless, etc. Additionally, the customer's data requirements are assessed, and a capacity model developed based on the amount of traffic to transverse the network.

The network design process is:

1. Initial Design
2. Site Surveys
3. Final Design
4. Infrastructure Installation
5. Endpoint Installation
6. Network Validation
7. Network Optimization

### Initial Network Design

The initial design is started by plotting the endpoints. As the initial design continues, the customer's assets—substations, towers, poles—are evaluated. Network Gateways and Routers are placed based on connectivity and utilization. The initial design includes:

- Gather Data – Request meter locations as well as substation and pole locations. Additionally, need to understand customer data requirements for the network.
- Model Data Requirements – Based on customer data requirements, determine designed number of meters/endpoints per Network Gateway.
- Density Analysis – Analysis of meters per square mile; used as an estimate of network infrastructure.
- Buffer Analysis – Analysis of meter-to-meter communication and meter to module communication.
- Obtain Terrain and Clutter Data – Both terrain and clutter data (land usage) are an integral part of understanding device propagation.
- Site Model Building – Includes radio characteristics such as power output, sensitivity, signal-to-noise ratio, antenna gain, and deployment height. These sites are used to analyze coverage using the clutter and terrain data.

- Place Network Gateway – Add Network Gateways to reduce latency/hops within the network taking into consideration the data requirements from the customer.
- Place Routers – Add Router to the network to build communication where gaps occur between meters and/or modules ensure network is robust and provides connectivity to 100% of devices.
- Capacity Analysis – Analysis to ensure Network Gateways are placed so that they are not overloaded capacity-wise.
- Validate Connectivity – Review design to ensure that all endpoints have a path back to the Network Gateways or evaluate for Cellular connectivity.

Once the initial design is completed, the site surveys evaluate the field availability of the customer's equipment for placing the Gridstream infrastructure.

## Site Survey Field Validation

This section outlines the basic procedures for the selection of Network Gateway, RF Router, or RF Mesh Extender sites. It applies to large-scale Landis+Gyr RF network deployments throughout utility areas of operation. The majority of these sites are on wood utility poles or streetlight poles. For all other potential install sites (i.e., buildings, pad-mount transformers, etc.), similar information should be recorded on the Installation Sheet. The Landis+Gyr RF field technician or utility personnel performing the surveys should be knowledgeable about overhead power pole line identification, laptop use, software tools, Landis+Gyr equipment, and GPS, along with being able to navigate the territory to be surveyed. Obtain a list of all utility-owned sites. This list should include Latitude and Longitude coordinates, existing infrastructure (such as poles and towers, including structure height), and available backhaul. The Network Gateway requires Ethernet to a central location if the utility provides backhaul.

## General Guidelines

- The higher, the better. Watch closely for valleys and dips where relocating a node a span will gain better height.
- Never move from the design more than a one pole span in either direction. Install a transformer, or mark survey HOLD for review with Landis+Gyr.
- The fewer obstructions, the better. Watch out for buildings and trees. Move up to one pole span from the design if necessary to get away from a specific obstruction.
- Streetlight mounts are preferred over all others.
- Poles that can be accessed by bucket truck are preferred. (No climbers if possible).
- Avoid any locations on private property.
- Avoid installing Routers on poles that do not have good clearance from foliage.
- Whenever possible, place the streetlight arm addition with router out over the street.
- In a subdivision with underground utilities, do your best to surround the area with routers.

## Final Network Design

Once the surveys are completed, they are provided back to the network design engineer. The network design engineer verifies that all the locations will work (or requests additional surveys) and releases a final design. This final design is used for network deployment. We typically recommend that a utility go through our Landis+Gyr installation training and certification. Upon completion, the network equipment is deployed.

## **Infrastructure and Meter Deployment**

The Network Gateways are deployed first, followed by the Routers. The meters for a particular pocket may be deployed once the Gateway is deployed and ideally once the routers supporting mesh are already installed.

## **Network Validation and Optimization**

The next two steps are optional. The network validation includes communicating to all the Routers and Network Gateways in the network, validating that all network equipment is programmed correctly. Also included is an assessment of health of communication links and ability to move data.

The optimization includes activities specifically around the meters. Items assessed are:

- Register Read Success: midnight CUM read is pushed by all meters - % received
- Interval Read Success: transmitted periodically through the day - % received
- Two-way Endpoint Communication: successful Endpoint ping
- Maximum Latencies: maximum turn-around time based on number of hops or layers in a network.
- Maximum Layers: maximum number of layers

To assess these items, normal register and interval data success is reviewed and mapped. Group pings are sent out to every meter in the network and the success of responses and time to respond to the pings. After these first assessments, additional Routers and occasionally Network Gateways are added to support network success and SLA. Lastly, layer (hops) are reviewed. If there are layer (hop) requirements, additional Network Gateways may be added.

**Any additional required testing equipment with estimated cost.**

### **Landis+Gyr Response:**

None required at this stage.

**List all standard report options through the management portal.**

### **Landis+Gyr Response:**

Command Center provides a variety of data extracts that can be scheduled (with reoccurring options) or run ad hoc. Command Center includes web services built on the HTTP protocol and using SOAP/XML. These web services include CIS/billing systems, outage management system, GIS, and engineering analysis applications. Command Center also provides file integration using interfaces that provide for the import and export of data via files. File formats supported include CSV, XML, fixed length, batch file,

and HTML. All Command Center user interface pre-packaged reports allow for extraction to Microsoft Excel. The utility also has the option of creating custom reports through a report writing tool, such as Crystal Reports, and may include them in the menu structure under Custom Reports.

**Specs on the batteries of all devices that have them (such as routers and collectors) which should include but not limited to expected life, replacement process and if notifications are sent when the battery fails.**

**Landis+Gyr Response:**

**Network Gateway:** Maintenance-free Lithium Iron Phosphate battery (rechargeable); Backup time up to 14 hours after power outage; 15 years expected lifetime.

**Routers:** Maintenance-free Lithium Iron Phosphate Battery backup time up to 14 hours after power outage. Expected lifetime up to 15 years.

The Network Gateway and Router infrastructure devices' Lithium Iron Phosphate battery is monitored by the device. When the battery recharge capability diminishes below an acceptable threshold, an event is sent to the Command Center (head end system) and is visible on the Administrator Dashboard.

**Identify any exceptions to Inter-County Energy’s specifications.**

**Landis+Gyr Response:**

Please refer to Landis+Gyr's Pricing Clarifications in **“Landis+Gyr’s Pricing Proposal and Clarifications”** and **“Landis+Gyr’s Exceptions to Terms and Conditions”** provided within this section for exceptions.

**System Design must be able to run side by side with existing AMI Infrastructure until the existing PLC system is phased out.**

**Landis+Gyr Response:**

Comply. RF communication only applies in the field to endpoints fitted with RF radios. PLC endpoints continue to operate using the infrastructure already available for them. Head End System is agnostic to the underlying endpoint communication technology.

**3.2 FEATURES/FUNCTIONALITY CHECKLIST**

<i>3.2.1 General System Requirements</i>	Yes	No
The AMI System can be deployed using an in house non-hosted model.	X	
The AMI System can be deployed using Microsoft SQL.	X	
The AMI System can be deployed using Oracle.	X	
The AMI System can be used by multiple browsers.	X	
The AMI System supports the use of iPad’s for in field viewing of system.	X	



<i>3.2.1 General System Requirements</i>	Yes	No
Currently provides Pre-Pay functionality.	X	
Currently provides distribution automation functionality.	X	
The AMI System provides/allows for member load control.	X	
The AMI System fully supports Multispeak 3.	X	
The AMI System fully supports Multispeak 4.		X

<i>3.2.2 All Electric Meters</i>	Yes	No
Meter has nonvolatile data storage capable of storing up to 30 days of 15-minute interval data.	X	
Support for ANSI Reading and Programming Standards C12.18.	X	
Support for ANSI Reading and Programming Standards C12.19.	X	
Support for ANSI Reading and Programming Standards C12.22.	X	
Approval of Underwriters Laboratories (UL).	X	
Compliant to UL 2735 Standard for Safety, Electric Utility Meters.	X	
Meter has ability to report auto detection of zero use.	X	
Meter has ability to be programmed to meter bi-directional energy. The meter has two registers (delivered and received) for this operation and the registers are synced to a clock.	X	
The meter display has an alphanumeric display and a watt disk emulator that provides both direction and magnitude of energy registration.	X	
Meter has the ability to report tamper detection including reverse consumption, tilt, and unexpected consumption/diversion.	X	
Meter has backup battery.		X
Meter has optional super capacitor as alternative to the backup battery.	X	

<i>3.2.2 All Electric Meters</i>	Yes	No
The meter's voltage reporting/ monitoring capability is guaranteed by the manufacturer to have +/- .5 volts accuracy of applied voltage as compared to a standard verified against NIST.	X	
The meter is built to function according to ANSI C12.1 Meter Temperature Requirements with a range of -40°F to +185°F.	X	
Meter has the ability to capture a log of up to 200 events (alerts, diagnostics, cautions, communication and meter operations).	X	
Meter & Module have documented mfg. lifecycle of at least 10 years.	X	
Meter has built in functionality to communicate with other equipment to allow member load control.	X	
Meter has current limiting functionality.	X	
Meter has the ability to detect and report voltage fluctuations and send alarm notifications within 3 minutes.	X	
The meter's voltage monitoring supports measurements of instantaneous voltage data (line-to-line and line-to-neutral) up to three phases depending on meter form.	X	

<i>3.2.3 Single Phase Electric Meters</i>	Yes	No
Meter Includes safety button/switch for reconnects.	X	
Meter has ability to collect and report TOU metering measures, Critical Peak, Peak Rebate & Real-Time Usage.	X	
The meter is capable of rolling demand with the minimal capability to roll 5 into 15-minute demand intervals.	X	

<i>3.2.4 Poly Phase Electric Meters</i>	Yes	No
Meters proposed to meet specification also report KVA with no additional cost.	X	
Meter has ability to report TOU metering measures, Critical Peak, Peak Rebate & Real-Time Usage.	X	

<i>3.2.4 Poly Phase Electric Meters</i>	Yes	No
The meter is capable of rolling demand with the minimal capability to roll 5 into 15-minute demand intervals.	X	
Meter has capability of showing instantaneous demand measurement on display.	X	
Meter is capable of providing Power Factor at peak KW	X	

<i>3.2.5 General Network &amp; Meter Data Requirements</i>	Yes	No
AMI System included is capable of capturing all meter errors and events aligned with IEC 61698-9 and can forward these to the integration platform allowing external systems to subscribe to required data in near real-time.	X	
The AMI System supports measurement of other power quality data including RMS voltage/current, over/under voltage, sag/swell, voltage imbalance, and under frequency alerts.	X	
The AMI System provides aggregate daily meter reads to the integration bus to provide scheduled Revenue Residential Electric Meter Reads and is capable of providing 15-minute interval data, delivered at minimum every 4 hours.	X	
The AMI System provides aggregate daily meter reads to the integration bus to provide scheduled commercial electric meter reads and is capable of providing 15-minute interval data, delivered at minimum every 4 hours.	X	
The AMI System provides aggregate daily meter reads to the integration bus in kWh, KW, kvar, TOU, KVA, Power Factor and Demand Data.	X	
Within a selected meter type, Inter-County Energy may desire to utilize different interval durations for endpoints. The AMI solution provides capabilities that allow different groups of meters to be configured at 5, 15 & 30 minute or other intervals.	X	
The AMI System can perform “Gap-filling” to ensure the maximum number of reads are received from the field to minimize the use of VEE in filling meter data gaps by the MDMS.	X	
The AMI System provides an on request (real-time) reading service that allows for retrieval of available meter reading data across the entire population of meters, including the most recent data stored. The following data is available on an “On-Request Meter Reading” query: a. Date and time of reading b. Meter number c. Cumulative kWh read d. Voltage e. Power Factor at peak KW (where available on meter) f. KW Demand (must be programmable up to a total of six digits) g. Remote disconnect status	X	

<i>3.2.5 General Network &amp; Meter Data Requirements</i>	Yes	No
On-Request (Real Time) Meter Reading – meters respond within 15 seconds.	X	
System is capable of generating temperature alert.	X	

<i>3.2.6 General Billing Data</i>	Yes	No
System has ability to provide billing determinants supporting batch scheduled meter read delivery based on a configurable billing cycle schedule, off-cycle bills, and a final bill process.	X	
Peak demand reset can be performed to coincide with the billing determinant delivery.	X	
The AMI System utilizes a web-based utility portal allowing Inter-County Energy to access each included sub-system using a single sign-on methodology integrated to Inter-County Energy’s Active Directory authentication system.	X	
Service Oriented Architecture (SOA) integration adheres to NERC/CIP security compliance.	X	
System uses secure file-based integration utilizing file transfer over https, sFTP, SCP, or FTPs.	X	

<i>3.2.7 AMI System Features</i>	Yes	No
The AMI System does not require a network path that traverses infrastructure that is not reliably backed up. For example, hopping through non-battery backed up end devices.	X	
The AMI System is capable of remote, over-the-air support firmware upgradeability to system devices without affecting the normal operations of system such as regularly scheduled data retrieval.	X	
The AMI System does not require any changes or additional infrastructure in case of consumer “opt out” scenarios.	X	
The AMI System supports accurate time stamping.	X	
The AMI infrastructure supports optional packaging of the Local Area Network radio and Wide-area Network private, wireless data backhaul in a single enclosure, where the AMI backhaul is also capable of supporting near-real time Distribution Automation applications such as Capacitor Bank Control, Reclosers, Fault Detection Isolation and Recovery, etc.	X	

<i>3.2.7 AMI System Features</i>	Yes	No
The AMI System supports the following security attributes: a. Mutual entity authentication of all devices throughout the system b. Message authentication using AES 128 based CMAC or similar. c. Message confidentiality of the application data using at least AES 128-bit encryption d. Message confidentiality of the link layer using 3-key Triple DES or similar e. Limited anonymity by not disclosing the Meter ID over the air f. Verification of authentic firmware upgrade. g. Symmetric key algorithms with no over-the-air key exchange h. SSL encryption for backend IP-infrastructure i. Device keys shall be securely provisioned during manufacturing	X	
Capable of integration with Security Light controls.	X	
Will the system export data to Google Earth?	X	
After the AMI infrastructure is installed, meters within the coverage area are “plug-and-play” and do not require any processes or additional configuration after being powered on.	X	
Does the system perform “self-healing” functions?	X	
The network infrastructure supports two-way communication to multiple types of field device endpoints including electric meters.	X	
The devices on the network avoid connection redundancy by finding primary and alternate AMI infrastructure devices upon installation.	X	
Does the AMI System require licensed frequencies for operation? If yes, does Inter-County Energy have to acquire and own license?		X
All device emissions levels are significantly under FCC OET Bulletin 65 guidelines even if device is stuck in transmitting mode.	X	
Does the system support Phase detection?	X	

<i>3.2.8 Outage Notification and Monitoring Requirements</i>	Yes	No
The system will not false alarm on a momentary outage event. Duration for momentary outage is a parameter that Inter-County Energy can set.	X	
System will provide restoration notice after power has been restored.	X	
The system provides full integration with Futura’s OMS and SEDC’s CIS/MDM systems.	X	

<i>3.2.8 Outage Notification and Monitoring Requirements</i>	Yes	No
Last gasp performance does not degrade in the case of a large grid outage.	X	
Minimum and maximum durations for meter to switch to secondary path if primary signal path is lost.	X	
Restoration performance (i.e. the amount of time that it takes for a restored meter to report restoration) does not degrade in the case of a large grid outage.	X	
The system detects an outage or power loss on monitored meters. When an outage is detected the system will: a. Notify a designated Inter-County Energy representative b. Update GIS map with current status c. Update status on a map d. Log outage information in the system.	X	
Inter-County Energy will have the ability to obtain status of meters within the electrical network (ping); response will be received in 15 seconds or less.	X	
During power restoration the AMI head-end receives and forwards all power up notifications.	X	
Does the system provide a real time status map?	X	
The system provides trouble shooting capabilities such as: a. Current Meter route b. Real time trace c. Neighbor listing Log outage information in the system.	X	
Polling accuracy of routers and collectors greater than 99%.	X	

<i>3.2.9 Asset Monitoring Functionality Requirements</i>	Yes	No
The system provides visualization of the wireless communications network during operation.	X	
Head-end System will store GPS and required data to link the meter to SEDC's Meridian.	X	
System can update meter status on Inter-County Energy's monitoring and mapping screen.	X	
Head-end System can display meter problems/communication problems.	X	
Inter-County Energy will have the ability to query each meter from Head-end System for detailed information.	X	

# Solution Design Specification – RF Mesh

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Landis+Gyr's network coverage is based on economical applications and required solution features. The final network design associated with contract award will be a collaborative effort between Inter-County Energy Cooperative Corporation (Inter-County Energy) and Landis+Gyr to enable Inter-County Energy's operational processes, feature requirements, and service support to be economically utilized over the life of the system.

The system response in this proposal is defined using Landis+Gyr's RF Mesh solution. The analysis conducted was based on the data provided with the Request for Proposal requirements. The solution targets Inter-County Energy's stated endpoints quantities in the RFP, covering 100% electric locations defined with the Landis+Gyr RF Mesh AMI solution.

## Design Approach

### Defining the Network Infrastructure Requirements

Inter-County Energy's provided requirements to meet its business needs. The data provided by Inter-County Energy was utilized for site analysis. The locations were evaluated to determine Network Gateway and Router quantities for the Landis+Gyr RF mesh technology.

The following are assumptions related to coverage analysis and network infrastructure estimation:

- Light poles, distribution poles and structures are sufficient, uncluttered and available to support deployment of Landis+Gyr's network infrastructure.
- Poles and structures are evenly distributed throughout the territory.
- Areas of deployment that do not have overhead lines will have adequate poles for Network Gateways and Routers.
- All endpoints are RF accessible.
- Design approach used is a standard Design.
- The following Standard Gridstream RF AMI throughput parameters are utilized:
  - Up to 4 registers of 15-minute interval data transmitted every 4 hours from all residential electric endpoints.
  - Up to 8 registers of 15-minute interval data transmitted every 60 minutes from all commercial and industrial electric endpoints.
  - Daily read from all electric endpoints at midnight, including Register Reads, TOU, and Demand.
  - Power Outage/Restoration Notification from 0.2% of electric population on average per day.
  - On-Demand Reads from 10% of electric endpoint population on average per day (Move In/Move Outs, re-reads, High bill complaints, Voltage validation).
  - Demand Reset Commands for electric commercial advanced meters sent once per month.

- Service Disconnect/Reconnect Commands for 0.5% of residential advanced electric meters population per day (which includes prepay customers).
- Meter configuration for 0.5% of electric population per day.
- Firmware downloads for electric population twice yearly.
- Advanced meter change outs for 0.1% of electric population per day.
- Meter Events pushed for 1.0% of advanced electric endpoint population per day (Tamper Alarms, Quality of Service Alarms).
- Endpoints communicate to other endpoints and Routers at up to 115.2 kbps.
- Routers communicate to other Routers and Network Gateways at up to 115.2 kbps.
- The following are Standard Propagation Parameters:
  - Antenna modeled at 45 ft above ground level for the Network Gateways installed on substations.
  - Antenna modeled at 20 ft above ground level for the Network Gateways installed on poles.
  - Antenna modeled at 20 ft above ground level for the Routers installed on poles.
  - Modeling Parameters
    - Network Gateways: Transmit power: 29.5 dBm, Sensitivity: -113 dBm @ 9,600 bps, +5.5 dBi antenna gain.
    - Routers: Transmit power: 29.5 dBm, Sensitivity: -113 dBm @ 9,600 bps, +5.5 dBi antenna gain.
    - Electric Endpoints: Transmit power: 26.5 dBm, Sensitivity: -114 dBm @ 9,600 bps, 0-2 dBi peak antenna gain.
  - RF radio: Series V
  - Signal to noise ratio: 11 dB

## ***Calculating the RF Network Gateways and Router Network Infrastructure Requirements***

### Full Deployment

- A 1-radio N2400 Network Gateway was estimated to support up to 5,000 electric meters.
- For 1-radio Network Gateway (loading up to 5,000 electric meters) the utilization margin available for future growth of additional endpoints or messages within the contiguous area is 88%.
- The design is based on an average of 2 hop and max of 5 hops.

Please see [Appendix A](#) for the design map completed for Inter-County Energy.

## **Input Data**

The file with the meter locations were provided by Inter-County Energy and delivered in excel format. The file used in initial design contains 23,037 electric endpoints spread across 1,270 Sq Miles.

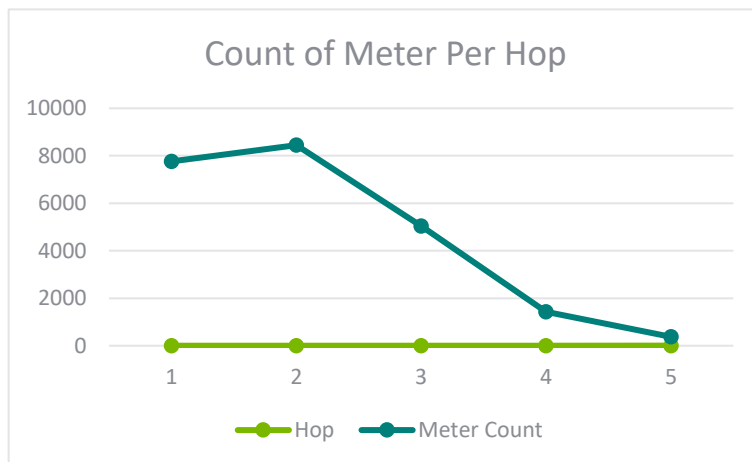


## Network Infrastructure Requirements

- The infrastructure provided is for the stated initial design (Table 1) and based on the data set provided by Inter-County Energy, changes to the data requirements could impact network design quantities. Any erroneous locations might need an additional network device once optimized and corrected.
- Additional Network Gateways/Routers may be required in a particular pocket if all endpoints are not deployed in a contiguous nature. The central part of the territory will require additional infrastructure once meter locations are provided.
- For any water and/or gas areas that are not aligned with existing electric endpoint at same or nearby premise, an additional dedicated network build-out would be required of Routers and possibly Network Gateways to cover a water and/or gas only area. Such coverage is not included in this bid response but can be discussed as the process proceeds.

Inter-County Energy	Initial Design Quantities RF
1-Radio N2400 Network Gateways	31
Routers	460
Electric Endpoints	23,037

TABLE 1: INITIAL DESIGN QUANTITIES FOR **ERROR! NO TEXT OF SPECIFIED STYLE IN DOCUMENT.** INTER-COUNTY ENERGY



Hop	Meter Count
1	7759
2	8446
3	5041
4	1422
5	369

Average of 2 hop and max of 5 hops

## WAN Requirements

- A WAN connection is required at all Network Gateways, which offers internal cellular data modem support and external Ethernet connection.
- The available WAN backhaul options, from the Network Gateway to the data center are 4G Cellular, Satellite, Fiber, WiFi, and Ethernet, utilizing industry standard TCP/IP.
- The minimum backhaul speed is 56 kbps throughput capabilities.

## Initial Design Process

The design included in the RFP response and Solution Design specification is part of the initial design process. The entire network design process includes six steps, of which the initial design is the first step. The network design process is as follows:

1. Initial Design
2. Site Surveys
3. Final Design
4. Deploy Infrastructure
5. Deploy Meters/Modules
6. Optimize Network

## Network Design Overview

The Network Design Process incorporates all aspects of system ability and performance. Before design activities begin, the customer's territory is assessed and categorized based on the morphology or environmental aspects—i.e., urban/rural, flat/hilly, trees/treeless, etc. Additionally, the customer's data requirements are assessed, and a capacity model is developed based on the amount of traffic to transverse the network.

## Initial Network Design

The initial design starts by plotting the endpoints. As the initial design continues, the customer's assets— substations, towers, poles—are evaluated. Network Gateways and Routers are placed based on connectivity and utilization. The initial design includes:

- **Gather Data** – Request meter locations as well as substation and pole locations. Additionally, need to understand customer data requirements for the network.
- **Model Data Requirements** – Based on customer data requirements, determine designed number of meters/endpoints per Network Gateway.
- **Obtain Terrain and Clutter Data** – Both terrain and clutter data (land usage) are an integral part of understanding device propagation.
- **Site Model Building** – Includes radio characteristics such as power output, sensitivity, signal-to-noise ratio, antenna gain, and deployment height. These sites are used to analyze coverage using clutter and terrain data.
- **Place Network Gateway** – Add Network Gateways to reduce latency / hops within the network taking into consideration the data requirements from the customer.
- **Place Routers** – Add Router to the network to build communication where gaps occur between meters and/or modules ensure network is robust and provides connectivity to 100% of devices.

- **Capacity Analysis** – Analysis to ensure Network Gateways are placed so that they are not overloaded capacity-wise.
- **Validate Connectivity** – Review design to ensure that all endpoints have a path back to the Network Gateways.

Once the initial design is completed, field personnel evaluate the field availability of the customer's equipment for placing the network infrastructure.

## Site Survey Field Validation

This section outlines the basic procedures for the selection of Network Gateway or Router sites. It applies to large-scale Landis+Gyr RF network deployments throughout utility areas of operation. The majority of these sites are on wood utility poles or streetlight poles. For all other potential install sites (e.g., buildings, pad-mount transformers, etc.), similar information should be recorded on the Installation Sheet. The Landis+Gyr RF field technician or utility personnel performing the surveys should be knowledgeable of overhead power pole line identification and the Field Deployment System. Personnel should obtain a list of all utility-owned sites. This list should include latitude and longitude coordinates, existing infrastructure (e.g., poles and towers, including structure height), and available backhaul. The Network Gateway requires Ethernet to a central location if the utility provides backhaul.

## General Guidelines

- The higher the deployment on the pole, the better. Watch closely for valleys and dips where relocating a one-pole span will gain better height.
- Never move from the design more than a one-pole span in either direction. Install a transformer, or mark survey HOLD for review with Landis+Gyr.
- The fewer obstructions, the better. (Open is best—i.e., no trees or obstructions and remaining clear of buildings.) Move up to a one-pole span from the design if necessary to get away from a specific obstruction.
- Streetlight mounts are preferred over all others.
- Poles that can be accessed by bucket truck are preferred. (No climbers, if possible).
- Avoid any locations on private property.
- Avoid installing Routers on poles that do not have good clearance from foliage.
- Look for poles that allow devices to extend into the free space above the street.
- Whenever possible, place the streetlight arm addition with Router out over the street.
- In a subdivision with underground utilities, make every attempt to surround the area with Routers.

## Final Network Design

After the surveys are complete, the surveys are provided back to the network design engineer. The network design engineer verifies all locations for connectivity, throughput and accuracy (or requests

additional surveys) and releases a final design. This final design is used for network deployment. Landis+Gyr typically recommends that a utility go through the Landis+Gyr installation training and certification. Upon completion, the network equipment is deployed.

## Infrastructure and Meter Deployment

The Network Gateways are deployed first then followed by the Routers. The meters for a particular pocket may be deployed after the Network Gateway is deployed and ideally after the Routers' supporting mesh is already installed. For the best results, Landis+Gyr recommend starting with the meters that are closest to the Network Gateway and moving outward in a contiguous manner.

Appendix A – Initial Network Design Map

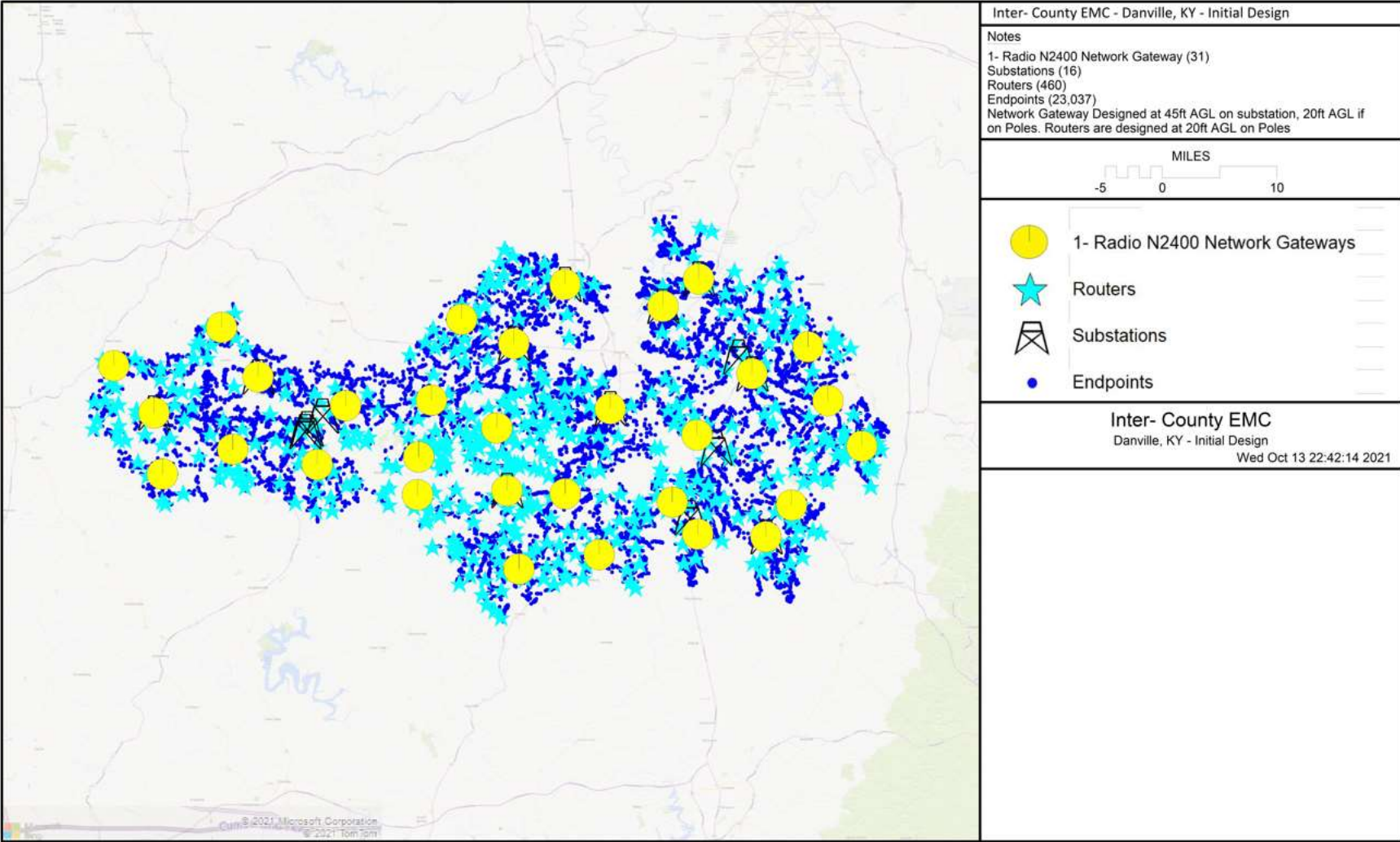


FIGURE 1 – INTER-COUNTY ENERGY COOPERATIVE COPORATION – INITIAL NETWORK DESIGN

# Landis+Gyr Pricing Proposal and Clarifications

## Landis+Gyr Pricing Proposal

Description	Quantity	Unit Price	Extended Price
<b>Electric Meters with Communication Modules</b>			
RF FOCUS AXe-SD (Form 2S) - Assumes 100% Deployment	22,403	\$125.00	\$2,800,375.00
RF S4x (Forms 5S, 6S, 8/9S, 12S, 16S)	5,600	\$285.70	\$1,599,920.00
<b>Network Equipment</b>			
Network Gateway, 10-Foot Default Power Cable, 1 Series 5 Radio, 1 Cellular Modem, Utility Pole Mount	31	\$4,800.00	\$148,800.00
RF Router and Kit with 20-Foot Cable	460	\$1,545.00	\$710,700.00
<b>RF Tools</b>			
Tech Studio Software License (per user)	1	\$1,100.00	\$1,100.00
Tech Studio Annual Maintenance (per license)	10	\$220.00	\$2,200.00
RF Field Toolkit	1	\$1,600.00	\$1,600.00
<b>AMI Software and Support</b>			
Command Center Monthly SaaS Fee (Based on 28,003 Endpoints)	120	\$3,663.11	\$439,572.62
<b>Services and Training</b>			
AMI Project Delivery Services	1	\$69,000.00	\$69,000.00
40 Training Credits (optional for on-line training)	1	\$2,000.00	\$2,000.00
3 Day RF Command Center at Customer Site	1	\$12,500.00	\$12,500.00
3 Day Gridstream Network Deployment Training at Customer Site	1	\$12,500.00	\$12,500.00
<b>Miscellaneous</b>			
Customer Loyalty Discount	1	-\$25,000.00	-\$25,000.00
<b>Total</b>			<b>\$5,775,267.62</b>

Description	Quantity	Unit Price	Extended Price
<b>Optional Pricing</b>			
AGA Project Delivery Services	1	\$50,000.00	\$50,000.00
Advanced Grid Analytics Asset Loading	1	\$800.00	\$800.00
Advanced Grid Analytics Voltage Visualization	1	\$800.00	\$800.00
Advanced Grid Analytics Capacity Contribution	1	\$800.00	\$800.00
Advanced Grid Analytics Revenue Protection	1	\$800.00	\$800.00
AGA Metering Analytics Plus Monthly SaaS Fee	12	\$3,590.07	\$43,080.81
AGA Metering Analytics Plus Annual Subscription Fee	1	\$6,933.33	\$6,933.33
Street Light Controller	100	\$174.00	\$17,400.00
Premium Support Services Year 1	28,003	\$1.20	\$33,603.60
Premium Support Services Year 2	28,003	\$1.30	\$36,403.90
Premium Support Services Year 3	28,003	\$1.40	\$39,204.20

## Ten Year Pricing View

### One-Time Fees

Description	QTY	Price	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Extended Price
RF FOCUS AXe-SD Form 2S)	22,403	\$125.00	\$2,800,375.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2,800,375.00
RF S4x (Forms 5S, 6S, 8/9S, 12S, 16S)	5,600	\$285.70	\$1,599,920.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,599,920.00
Network Gateway, 10-Foot Default Power Cable, 1 Series 5 Radio, 1 Cellular Modem, Utility Pole Mount	31	\$4,800.00	\$148,800.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$148,800.00
RF Router and Kit with 20-Foot Cable	460	\$1,545.00	\$710,700.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$710,700.00
TechStudio Software License (per user)	1	\$1,100.00	\$1,100.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,100.00
RF Field Toolkit	1	\$1,600.00	\$1,600.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,600.00
AMI Project Delivery Services	1	\$69,000.00	\$69,000.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$69,000.00



Description	QTY	Price	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Extended Price
40 Training Credits (optional for on-line training)	1	\$2,000.00	\$2,000.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2,000.00
3 Day RF Command Center at Customer Site	1	\$12,500.00	\$12,500.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$12,500.00
3 Day Gridstream Network Deployment Training at Customer Site	1	\$12,500.00	\$12,500.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$12,500.00
Customer Loyalty Discount	1	(\$25,000.00)	(\$25,000.00)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	(\$25,000.00)
<b>Total One-Time Fees</b>													<b>\$5,333,495.00</b>

Recurring Fees

Description	QTY	Price	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Extended Price
TechStudio Annual Maintenance (per license)	10	\$220.00	\$220.00	\$220.00	\$220.00	\$220.00	\$220.00	\$220.00	\$220.00	\$220.00	\$220.00	\$220.00	\$2,200.00
Command Center Monthly SaaS Fee (Based on 28,003 Endpoints)	120	\$43,957.26	\$43,957.26	\$43,957.26	\$43,957.26	\$43,957.26	\$43,957.26	\$43,957.26	\$43,957.26	\$43,957.26	\$43,957.26	\$43,957.26	\$439,572.62
<b>Total Recurring Fees:</b>												<b>\$441,772.62</b>	

## Optional One-Time Fees

Description	QTY	Price	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
<b>AGA Project Delivery Services</b>	1	\$50,000.00	\$50,000.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<b>Advanced Grid Analytics Asset Loading</b>	1	\$800.00	\$800.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<b>Advanced Grid Analytics Voltage Visualization</b>	1	\$800.00	\$800.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<b>Advanced Grid Analytics Capacity Contribution</b>	1	\$800.00	\$800.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<b>Advanced Grid Analytics Revenue Protection</b>	1	\$800.00	\$800.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<b>Street Light Controller</b>	100	\$174.00	\$17,400.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
<b>Premium Support Services Year 1</b>	28,003	\$1.20	\$33,603.60	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

Description	QTY	Price	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Premium Support Services Year 2	28,003	\$1.30	\$0.00	\$36,403.90	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Premium Support Services Year 3	28,003	\$1.40	\$0.00	\$0.00	\$39,204.20	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

Optional Recurring Fees

Description	QTY	Price	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
AGA Metering Analytics Plus Monthly SaaS Fee	120	\$3,590.07	\$43,080.81	\$43,080.81	\$43,080.81	\$43,080.81	\$43,080.81	\$43,080.81	\$43,080.81	\$43,080.81	\$43,080.81	\$43,080.81
AGA Metering Analytics Plus Annual Subscription Fee	10	\$6,933.33	\$6,933.33	\$6,933.33	\$6,933.33	\$6,933.33	\$6,933.33	\$6,933.33	\$6,933.33	\$6,933.33	\$6,933.33	\$6,933.33

## Pricing Clarifications

### Electric Meters with Communication Modules

1. Pricing assumes the use of RF S4x and FOCUS AXe-SD meters, with 100% of residential meters having service disconnect. Pricing may be adjusted for less than 100% SD.
2. An RF FOCUS AXe (Form 2S) meter is also available for \$89.30 each.
3. Additional electric meter options are as follows:

FOCUS AXe/AXe-SD Residential Meter Options	Price
Battery	\$5.00
Reactive Upgrade (KVA or KVAR)	\$20.00
Reactive Upgrade (KVA or KVAR) 100% Deployment	\$10.00
ANSI C12.18 Opti-Com Magnetic Port Short Cover	\$2.25
ANSI C12.18 Opti-Com Magnetic Port + Reconnect Arming Button Short Cover (FOCUS AXe-SD Only)	\$3.00
ANSI C12.18 Opti-Com Magnetic Port + Demand Reset Tall Cover	\$5.00

S4x Polyphase Meter Options	Price
Battery	\$5.00
1 MB Load Profile	\$50.00
3 Phase Power Supply	\$40.00
4-Output, 2-Input KYZ W/Cables	\$55.00

### Network Equipment

4. Network Equipment quantities are approximations of required quantities and have been developed from the 23,037 electric meter locations provided by Inter-County Energy Cooperative Corporation (Inter-County Energy). Approximately 3,000 endpoint locations were not included in the shape files provided by Inter-County Energy. These meters are not included in the Network Equipment quantities shown. Additional Network Equipment may be required to support the additional meters.
5. Network Equipment quantities are based on Routers being mounted at 20 feet above ground level (AGL). Alternate mounting locations, configurations and heights may require additional brackets, cables or antennas that are not included in this proposal. Actual Network Equipment quantities necessary for proper AMI System functionality may vary based on verification of final meter quantities, system analysis and requirements, approved survey locations, deployment approach, and system optimization needs.
6. Electric endpoints shall be deployed in a contiguous manner to enable adequate meshing.

7. Inter-County Energy will provide WAN backhaul access to each Network Gateway.
8. Inter-County Energy will provide new or existing poles, of an appropriate height, with 120/240V power source for installation of network equipment.
9. The need for external passive antennas, and quantities of such, will be determined during deployment.
10. Optional streetlight controllers function as mesh network routers and dawn to dusk photocells. Additional control functionality can be provided by Smart Community Center software for an additional fee.

## RF Tools

11. TechStudio is a required field tool for the Landis+Gyr RF solution. Pricing includes one (1) license for each user instance of TechStudio.
12. The TechStudio Software License fee is a per-user license fee for the TechStudio software and does not include the cost of a computer or tablet on which to install the software.
13. TechStudio Annual Maintenance includes:
  - Upgrades to TechStudio throughout the year
  - Maintenance upgrades to licensed TechStudio software
  - Support for critical bug fixes
  - New Product Support as they become available
14. A fully executed Software License, and annual Support Agreement, must be in place prior to order processing for TechStudio software.
15. Each user of TechStudio must have a unique username and password of authentication with Command Center to use the tool. Maintenance charges are based on the total number of users set up for authentication.
16. TechStudio training is included in the RF Network Deployment course. A two-hour online TechStudio training course is available for \$200 per login.
17. An enterprise license of TechStudio software is available for an unlimited number of users for a one-time fee of \$53,000.00 and requires an annual maintenance fee of \$10,600.00.
18. An RF Field Tool Kit is also required to enable communications to the endpoint device.

## Software and Support

19. Software-as-a-Service (SaaS) pricing is based on Landis+Gyr hosting the Command Center head-end application in its Network Operations Center (NOC). The SaaS environment for Command Center includes the IT infrastructure and Command Center application. Customer will be responsible for the use and operation of Command Center.
20. SaaS Command Center pricing is based on the actual deployed endpoint quantities at the time of monthly billing, with pricing as noted below. A minimum fee per month applies. Monthly

communication charges may also apply. SaaS pricing requires an annual agreement and a five-year commitment to the service.

- 21. Pricing assumes SaaS hosting in an SQL server environment. Additional fees would apply for SaaS hosting in an Oracle server environment.

Command Center SaaS Pricing (RF Mesh) - SQL	
Minimum Monthly Fee	\$950.00
<i>Number of Deployed Endpoints</i>	<i>Monthly Fee Per Endpoint</i>
First 10,000	\$0.15
Next 10,001-50,000	\$0.12

- 22. Command Center SaaS pricing is for the production environment. Additional environments (e.g., test, development, disaster recovery) require additional fees.
- 23. Command Center SaaS pricing includes 90 days of online data storage, with archive data retained for a minimum of one year. Additional data retention periods require additional fees.
- 24. WAN backhaul is the responsibility of Company unless mutually agreed upon that Landis+Gyr will provide the WAN backhaul as a complement to its SaaS offering. Additional fees will apply for WAN backhaul services.
- 25. As part of its standard solution offering, Landis+Gyr offers a suite of MultiSpeak and CIM-compliant APIs for Command Center. Integration support and/or interface development beyond these standard APIs can be priced based on a defined statement of work. For integration details, reference Landis+Gyr’s Integration Suite Technical Brief.

**MDMS**

- 26. Landis+Gyr included Harris SmartWorks MDMS pricing as a courtesy. Landis+Gyr is not responsible for any information or errors contained within the Harris SmartWorks proposal. Any agreement for the Harris SmartWorks MDMS will be between Inter-County Energy and Harris SmartWorks.

**Optional Metering Analytics Plus AGA**

- 27. Landis+Gyr’s proposal is based on the Metering Analytics Plus AGA solution as a SaaS offering with 26,037 endpoints. Any incremental endpoints may require additional fees.
- 28. All SaaS AGA fees initiate at software installation. SaaS offerings require a five-year initial commitment to the service with annual renewals thereafter. SaaS service fees are subject to annual CPI increases after the initial three-year commitment.
- 29. SaaS pricing includes access to a production environment of Landis+Gyr’s AGA solution for up to two (2) active users.
- 30. The SaaS offering includes 90 days of online storage and up to 60 days of access to an UAT environment annually.

31. Landis+Gyr's AGA Project Delivery Services pricing is based on services being provided for a period of three (3) months beginning at contract execution.
32. All services will be provided remotely.
33. AGA Project Delivery Services are invoiced 50% upon contract signature, with the remaining 50% invoiced at completion of the services.
34. AGA Training is required prior to deployment. Pricing includes one (1), four (4)-hour, classroom format training course for a maximum of 12 participants. Additional seats will be priced upon request.
35. Commercially available functionality for each module selected is included. Enhancements, integrations, custom adapters and/or custom reports require a separate scoping and pricing proposal.
36. Transformer meters and other grid sensors require the measurement of consumption/load in KVA/KW/KVAR (at least two of the three).
37. Integration to Customer's systems may be reutilized for deployment of other modules utilizing the same data in the future.

## Services and Training

38. Initial Deployment Services pricing is based on services being provided by Landis+Gyr for a period of up to nine months, beginning at contract execution and receipt of purchase orders. A sample Deployment Project Statement of Work is attached for your reference. At a high level, these Initial Deployment Services include Project Management, Endpoint Configuration Support, Network Design and Site Surveys, Network Equipment Commissioning, Technical Implementation Support, and Integration Support.
39. Initial Deployment Services are invoiced 50% upon contract signature, with the remaining 50% invoiced at completion of the services.
40. Network equipment (Network Gateway and Router) installation and electric meter installation are not within the scope of Landis+Gyr's offering. It is assumed installation is the responsibility of Inter-County Energy or a third party contracted by Inter-County Energy.
41. RF Training is part of Initial Deployment Services, is required prior to deployment, and includes:
  - 2 online training courses for Security
  - 1 onsite training course for RF Network Deployment
  - 1 onsite training course for Command Center Application
  - 40 online training credits for use with continuing education to be used within 24 months of the contract effective date
42. Pricing for online training is per log-in/registration.
43. RF Training assumes three days of on-site training at an Inter-County Energy facility for up to 12 students. Additional seats are available for \$250.00 per seat.



General Clarifications

44. The following items are available for purchase, as needed:

Item	Unit Price
Remote Antenna Kit	\$730.00
RF Coupling Antenna Kit (includes P/N 40-1705, 45-1221, 28-0350, 19-1742)	\$273.00
IWR 12-24 VDC Input	\$775.00

45. Standard lead time for product shipment can vary, and upon receipt and confirmation of your purchase order, an estimated shipment date will be provided.

46. Licenses sold as part of this solution are for Landis+Gyr products only. Any additional third-party licenses are the responsibility and at the expense of Inter-County Energy.

47. This quote is valid for 90 days.

48. Landis+Gyr’s standard equipment (Network Gateway, Router, electric meter,) warranty for defects in material or workmanship is 60 months from the date of shipment. Landis+Gyr warrants that its software will materially comply with the software documentation provided for a period of thirty (30) days from the date of delivery. Landis+Gyr warrants that Services will be provided in a professional workmanlike manner and the services warranty period is ninety (90) days after performing a service.

49. On-site services and in-person training are subject to COVID-19 travel restrictions.

50. Landis+Gyr’s pricing is subject to change due to any annual increase in CPI.

51. No bonds or letters of credit are included in Landis+Gyr’s pricing.

52. While Landis+Gyr endeavors to make the content of its marketing materials timely and accurate, Landis+Gyr makes no claims or promises about the accuracy, adequacy, or completeness of, and expressly disclaims liability for errors and omissions in, such materials. No warranty of any kind, express, implied, or statutory, including without limitation warranties of non-infringement of third-party rights, title, merchantability, and fitness for a particular purpose, is provided in connection with the content of such marketing materials.

53. This proposal contains confidential and trade secret information of Landis+Gyr. Except as otherwise specified in a non-disclosure agreement regarding Landis+Gyr’s confidential information, Landis+Gyr authorizes use and disclosure of the content of this proposal only as necessary for evaluation of Landis+Gyr’s proposal, or as required by law. No other license rights are intended or implied.

## EXHIBIT D

### INTER-COUNTY ENERGY STANDARD TERMS AND CONDITIONS

#### I. Purchase Terms and Conditions

**1) Agreement** - The following terms and conditions shall apply to the purchase of the service(s) or product(s) identified on a purchase order form by Inter-County Energy from the entity defined herein as "Seller". These terms and conditions, together with specifications contained in this RFP, a submitted response to the RFP or a purchase order form or attached hereto, shall constitute an "Order".

**2) Acknowledgement and Acceptance** - Seller will acknowledge receipt of the Order immediately and advise if shipment cannot be made on or before date specified. Acceptance must be without qualification. Inter-County Energy will not be bound by any different terms and conditions contained in the acceptance, unless agreed to in writing by Inter-County Energy. Seller's action in (a) delivering materials, or (b) performing services called for hereunder shall constitute an acceptance of these terms and conditions. THIS ORDER EXPRESSLY LIMITS ACCEPTANCE TO THE TERMS AND CONDITIONS STATED HEREIN, AND ANY ADDITIONAL OR DIFFERENT TERMS PROPOSED BY THE SELLER ARE REJECTED UNLESS EXPRESSLY ASSENTED TO IN WRITING BY INTER-COUNTY ENERGY. NO CONTRACT SHALL EXIST EXCEPT AS HEREIN PROVIDED.

**3) Cancellation** - Inter-County Energy reserves the right to cancel all or any part of the unperformed portion of the Order at any time. Cancellation will be provided in writing to the Seller. On the date of such cancellation stated in said notice, Seller shall discontinue all work pertaining to the purchase order, shall place no additional orders and shall preserve and protect material on hand purchased for or committed to this purchase order. Upon such cancellation, Seller shall be paid the earned portion of the total cost of all work completed as of the date of cancellation, and this amount shall be Seller's sole remedy for Inter-County Energy's cancellation. Inter-County Energy may, at its option, have those costs, which are reimbursable under this Section, audited by either Inter-County Energy's auditing staff or by independent certified public accountants selected by Inter-County Energy. Inter-County Energy shall not be liable to Seller as a result of cancellation of this Order for any costs, claims, losses, damages or liabilities including, without limitation, loss of anticipated profits, reimbursements for costs associated with the portion of the Order that Seller has not performed as of the date of Buyer's termination notice.

**4) Pricing** - Prices specified on the Order are quoted as firm through delivery, except when escalation is clearly and definitely provided on the face of or attached to the accompanying Purchase Order Form, and a formula for determining such escalation is provided on the face of or attached to the Purchase Order Form. No price escalation shall be effective after the earlier of the specified date or completion date. The Seller, by act of offering a quotation or bid, constitutes an express warranty that the quoted price is not subject to adjustment. Where approval drawings are required, the shipping date specified in the quote shall include a minimum of two weeks for Inter-County Energy's review of drawings, plus one-week transit time.

**5) Invoices and Payment** - Seller shall render invoices upon delivery or completion of the services or, as per specific instructions embodied in the Order. Invoices shall be itemized and contain the Order number that is on the accompanying Purchase Order Form. ~~Freight carrier receipt or parcel post receipt will be provided at the time material is shipped delivered.~~ Payment of invoice will agree to the specified payment terms in this Order. Payments

**Commented [MLH1]:** Parties negotiate. Equipment orders require 16-week cancellation notice.

may be withheld to the extent necessary to make adjustments for shortages, damages and rejections of the product or service, or where in good faith Inter-County Energy challenges the accuracy of such invoice. Inter-County Energy must notify Seller if any invoice adjustment is made. Seller must send an invoice for payment to Inter-County Energy within six months of completion of the project or sale. ~~Any invoices received after this time will be subject to non-payment by Inter-County Energy.~~

Commented [MLH2]: Parties to negotiate

**6) Taxes** - Sales tax, where applicable, is to be remitted by the Seller to the applicable state or locality. The Seller shall show taxes charged to Inter-County Energy as a separate item on the invoice. The Seller shall not charge Inter-County Energy for any tax on the Seller's gross or net income, license tax, or any other tax or governmental fee except sales or similar transaction taxes. ~~Upon request of Seller, Inter-County Energy shall provide certification to Seller for any applicable tax exemptions Seller will charge appropriate sales tax unless provided tax exemption documentation from Inter-County Energy.~~

**7) Shipping and Risk** - All products shipped must be suitably packed for shipping. Each container, shipping cases, and packages shall include the Order number. The Bill of Lading shall include the Order number. The Packing List (in duplicate), must be furnished with each shipment and include the Order number. Unless otherwise stated in the Order, Seller shall pay all shipping costs. All shipments, including return shipments in the event of rejections, shall be made at Seller's risk and expense unless otherwise stated in the Order. Regardless of whether the Order is FOB Origin-Freight Collect or FOB Charges Destination-Freight Allowed, risk of loss shall not pass to Inter-County Energy until delivery to Inter-County Energy.

**8) Scheduled Delivery** - Delivery shall be strictly in accordance with the specified delivery date embodied in the Order. Time is an essential element of this Order unless stated otherwise herein. If no scheduled date is specified, delivery shall be within a reasonable time following the date of the Order. Inter-County Energy has the right to cancel all or part of an Order, without obligation of any kind to Seller, should delivery of any shipment not be made on schedule.

**9) Changes/Substitutions** - Changes to the Order, including but not limited to brand substitutions, shall not be effective until Inter-County Energy issues a revised Order approving the change, or similar document that manifests Inter-County Energy's intent to revise the Order ("Change Order"), and Seller accepts such Change Order in writing. Any request by Seller for a revised Order shall include any proposed price increase or decrease attributable to the change.

**10) Inspection and Receipt** - Inspection and payment by Inter-County Energy prior to shipment does not constitute acceptance and does not relieve Seller from responsibility for furnishing goods and services strictly in accordance with specifications. Inter-County Energy has the right to inspect and fully test all materials and workmanship hereunder. This right shall extend to the inspection of the products during manufacture, at no cost to Inter-County Energy, upon reasonable notice to the Seller. Inter-County Energy has the right to inspect any service operations hereunder, at no cost to Inter-County Energy, upon reasonable notice. Inter-County Energy reserves the right to reject any products or services that it finds to be defective or at variance with the Order specification, regardless of the time or place of discovery of the defect or variance and, in the case of non-apparent defects or variances, regardless of any prior acceptance of the products. Regardless of anything stated herein, the Seller shall bear all costs necessitated by disassembly for inspection and reassembly. For rejected products or services Inter-County Energy shall have the option (1) return the same at Seller's expense, for full credit, including transportation both ways; (2) require the replacement or correction of goods or services at Seller's expense, including transportation both ways; (3) accept the same in the present

condition and either satisfactorily correct it at Seller's expense or use it in its present condition at a renegotiated equitable reduction in price which, if already paid, shall be refunded by Seller forthwith; or (4) cancel this Order in whole or in part.

**11) Warranties** – Seller warrants that the goods furnished and covered hereunder will be ~~of merchantable quality, fit for Inter-County Energy's purposes,~~ free from defects in title, design, material and workmanship and that the goods or services will conform to ~~Inter-County Energy's~~ the good's specifications. Seller further warrants that the goods furnished hereunder shall conform to all representations, affirmations, promises, descriptions, samples or models forming the basis of this Order. Those warranties shall survive acceptance of the goods. Seller further warrants that all services performed for or on behalf of Inter-County Energy will be performed in a competent workmanlike manner and shall be free from faults and defects. These warranties are in addition to any other warranties given by Seller to Inter-County Energy. OTHER THAN THE EXPRESS WARRANTIES SET FORTH HEREIN, SELLER MAKES NO REPRESENTATIONS OR IMPLIED WARRANTIES TO INTER-COUNTY ENERGY WITH RESPECT TO ANY EQUIPMENT, NETWORK EQUIPMENT, FIELD TOOLS, SOFTWARE, FIRMWARE AND/OR SERVICES PROVIDED UNDER THIS AGREEMENT, INCLUDING WITHOUT LIMITATION, ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, INFRINGEMENT OR WARRANTIES THAT MAY BE IMPLIED BY TRADE USAGE OR CUSTOM. NONE OF THE FOREGOING WARRANTIES AND NO OTHER IMPLIED OR EXPRESS WARRANTIES MAY BE DISCLAIMED, OR EXCLUDED, OR MODIFIED EXCEPT BY WRITTEN AGREEMENT SIGNED BY AN AUTHORIZED INTER-COUNTY ENERGY REPRESENTATIVE. Seller agrees to hold Inter-County Energy harmless from any loss, damage or expense whatsoever, including, but not limited to, damage to collateral equipment and attorney's fees, which Inter-County Energy may suffer from breach of these warranties.

**Commented [JS3]:** These warranties are generally disclaimed.

**12) Indemnification** - Whether on ~~Inter-County Energy's~~ the other party's premises or otherwise, ~~Seller~~ each party agrees to indemnify and save ~~Inter-County Energy~~ the other party, its Directors, officers, agents and employees harmless from any and all losses, liabilities, damages, claims, demands, suits, actions, proceedings, subrogation and expense, including court costs and reasonable attorney's fees arising from this contract, or the services performed or goods delivered under this Order, which are claimed or made by any person, firm, association or corporation, including employees, workmen, servants or agents of the ~~Seller~~ party and its subcontractors, ~~whether or not due in whole or in part to conditions, acts or omissions done or permitted by Inter-County Energy.~~ ~~Seller~~ Each party further agrees to promptly assume full responsibility for the defense of any and all such suits, actions, or proceedings which may be brought against ~~Seller~~ the party or against ~~Inter-County Energy~~ the other party for the action of the party. ~~In the event Seller uses Inter-County Energy's machinery or equipment in the performance of any work that might be required under this Order, such machinery or equipment shall be considered as being under the sole custody and control of Seller during this period of such use by Seller.~~

**Commented [JS4]:** This should be mutual. This can be negotiated further if selected.

**13) Insurance** - (1) The Seller shall take out and maintain throughout the period of this Order insurance of the following minimum types and amounts to protect the Seller and Inter-County Energy: (a) Worker's compensation and employer's liability insurance, as required by law, covering all their employees who perform any of the obligations of the contractor, engineer, and architect under the contract. Employers Liability Insurance limits shall be at a minimum of \$500,000 each accident, \$500,000 by disease each employee, and \$500,000 by disease policy limit. If any employer or employee is not subject to worker's compensation laws of the governing State, then insurance shall be obtained voluntarily to extend to the employer and employee

coverage to the same extent as though the employer or employee were subject to the worker's compensation laws; (b) Commercial General Liability insurance covering all operations under the contract shall have a combined single limit of not less than \$1 million each occurrence, including bodily injury or death, property damage, as well as products and completed operations and \$2 million general aggregate limit as well as products and completed operations aggregate limit for accidents during the policy period. This required insurance may be in a policy or policies of insurance, primary and excess including the umbrella or catastrophe form; (c) Automobile liability insurance on all motor vehicles used in connection with the contract, whether owned, non-owned, or hired, shall have a combined single limit of not less than \$1 million per occurrence of bodily injury or death, as well as property damage. This required insurance may be in a policy or policies of insurance, primary and excess including the umbrella or catastrophe form. (2) Inter-County Energy shall have the right, ~~no more than once per year, at any time~~ to require Commercial General Liability insurance and property damage liability insurance greater than those limits required in paragraphs (1)(b) and (1)(c) of this section. In any such event, the additional insurance premium or premiums payable solely as the result of such additional insurance shall be added to the Order price. (3) Inter-County Energy shall be ~~named~~ included as Additional Insured on all policies of insurance required in (1)(b) and (1)(c) of this section and/or any excess or umbrella insurance applicable and given a waiver of subrogation for each requirement stated in 1(a); 1(b); and 1(c). Such insurance shall be primary over any other insurance coverage available to Inter-County Energy. Any other insurance coverage available to the Inter-County Energy, or any insurance maintained by Inter-County Energy, shall be excess and non-contributory to the insurance extended by the seller under this agreement. (4) The policies of insurance shall be in such form and issued by such insurer as shall be satisfactory to Inter-County Energy. The Seller shall furnish Inter-County Energy a certificate evidencing compliance with the foregoing requirements ~~that and~~ shall provide not less than 30 days prior written notice to Inter-County Energy of any cancellation or material change in the insurance.

**14) Remedies** - In addition to any remedies specifically stated herein, Inter-County Energy shall retain any other legal remedies it would have in the event of Seller's breach of the Order.

**15) Patents and Copyrights** - ~~Any good or work developed under this Order shall be deemed a "work made for hire" under the intellectual property and copyright laws of the United States.~~ Seller shall defend any suit or proceeding brought against Inter-County Energy that is based on a claim that any article or apparatus, or any part thereof constituting goods furnished under this order, as well as any device or process necessarily resulting from the use thereof, constitutes an infringement of any patent or copyright of the United States. Seller shall pay all damages and costs awarded therein. In the case use of said article or apparatus, part or device is enjoined, Seller shall, at its own expense and at its option, either procure for Inter-County Energy the right to continue using said article or apparatus, or replace same with a no-infringing equivalent or remove said article or apparatus and refund the purchase price ~~and the transportation and installation costs thereof.~~

Commented [J55]: Not applicable to this relationship.

**16) Compliance** - The Seller agrees that in performing the work under this Order, it will not discriminate against any employee or applicant for employment because of race, color, national origin, sex, religion, handicap or veteran's status. Unless otherwise exempted by rules, regulations or orders of the Secretary of Labor, the Seller shall comply with the Equal Opportunity Clause of the DOL Regulations for Executive Order 11246 section 202; The Affirmative Action Clause of the DOL Regulations under Section 503 of the Rehabilitation Act of 1973; and the Affirmative Action Clause of the DOL Regulations under Section 402 of the Vietnam Era Veterans Readjustment Assistance Act of 1974; and all applicable rules and regulations promulgated under the above. Seller shall comply with any safety regulations and programs of

Inter-County Energy applicable to Inter-County Energy's premises. Seller represents and warrants that all equipment and work practices shall conform to all industrial safety regulations, including, but not limited to The Occupational Safety and Health Act (OSHA), and all applicable federal, state and local laws, rules and regulations.

~~17) Hazardous Substances - Seller must notify Inter-County Energy of any hazardous substances included in the Order and which may not be readily apparent to Inter-County Energy or its personnel. Seller must provide a Safety Data Sheet (SDS) for any item shipped under this order, which may produce hazardous gases, liquids, or solids with each shipment. Seller shall promptly and thoroughly clean up any leaks or spills of any hazardous substance or waste including leaks or spills during shipment. Seller shall not dispose of any hazardous substance or waste on Inter-County Energy's property. Seller shall notify Inter-County Energy immediately of any spill.~~

**Commented [MLH6]:** Not applicable. in accordance with OSHA requirements, SDS are not required for assembled 'articles' - the category our electric meters and network equipment falls into.

~~18) Assignment - Seller shall not assign or subcontract out any of the sums due or to become due, nor shall Seller subcontract any of the work to be performed under this Order, nor shall Seller subcontract for completed or substantially completed material called for by this Order without Inter-County Energy's prior written consent.~~

**Commented [JS7]:** L+G must be able to subcontract out work if required to perform services. L+G is responsible for the actions of its subcontractors.

**19) Title** - Title to products or the product of services, if any, passes upon delivery of such products or product of services, by Seller to Inter-County Energy.

**20) Delivery** - Inter-County Energy shall have the right to defer delivery of product or services under this Order by giving notice of the deferral to Seller. Inter-County Energy shall be responsible for any documented additional costs to Seller directly attributable to such delay. Seller shall make every effort to minimize such costs. Seller shall give Inter-County Energy the benefit of any savings resulting directly from the delay.

**21) Confidentiality** - Seller and Inter-County Energy shall employ all reasonable means to assure that material that is labeled "privileged", "confidential", or "proprietary" or that is labeled with similar wording and that comes into each other's possession in the course of performing this Order ("Confidential Information") shall not be disclosed without authorization from the disclosing party to anyone other than employees of the receiving party with a need to know. At minimum, Seller and Inter-County Energy will employ the same procedures to protect Confidential Information from disclosure as each use for its own privileged, confidential or proprietary materials. Recipient of Confidential Information shall, at the conclusion of the Order, or upon its termination, return or certify the destruction of the Confidential Information to the disclosing party.

**22) Force Majeure** - Neither party, without fault or negligence, shall be in default of its obligations hereunder because of force majeure, which includes ~~only~~ acts of God, acts of the public enemy, riot, civil commotion, expropriation or condemnation of Inter-County Energy's or Seller's facilities, changes in applicable law(s), floods, droughts, fires, explosions, sabotage, terrorism, war, police or hostile action, criminal behavior, or other catastrophes, accidents causing damage to or destruction, in whole or in part, or to the equipment or property necessary to fulfill the Order, or failure or refusal by any regulatory or other agency to act upon or grant permits, ~~or licenses, or other causes beyond its reasonable control~~. Each party shall give notice to the other as soon as possible of any event of force majeure, which potentially affects its performance hereunder. Force majeure shall not operate to excuse, but only to delay the Order's fulfillment.

**23) Waiver** - The failure of Inter-County Energy to insist, in any one or more instances, upon the performance of any of the terms, covenants, or conditions of the Order or to exercise any right hereunder, shall not be construed as a waiver of relinquishment of the future exercise of such right, but the obligation of Seller with respect to such future performance shall continue in full force and effect.

**24) Governing Law** - This Order shall be subject to and governed in all respects, including issues of validity, interpretation, performance and enforcement, by the laws of the State of Kentucky.

**25) Independent Contractor** - Seller shall perform the work as an independent contractor with exclusive control of the manners and means of performing the work, subject only to Inter-County Energy's right to inspect and oversee the work to assure that it is performed in accordance with the specifications and other requirements of the Order.

**26) Entire Agreement** - The Order constitutes the entire agreement between the parties and supersedes all other representations or agreements. Except as specifically provided herein this Order may be amended only in writing signed by both parties. The parties acknowledge and agree that neither of them has made any representation with respect to the subject matter of this agreement or any representations inducing the execution and delivery of this agreement, except such representations as are specifically set forth in this agreement, and each of the parties acknowledges that such party has relied on such party's own judgment in entering into the agreement. However, both parties agree that if any provision of this Order should conflict with any provision of any Contract or Rural Utilities Service Form that may be applicable to the transactions contemplated by this Order, then to the extent of such conflict the pertinent provision of such Contract or Rural Utilities Service Form shall prevail over the conflicting provision of this Order without invalidating or affecting the remaining provisions of this Order in any manner.

## C. Installation, Testing and Removal of Meters

### 4 INSTALLATION OF AMI METERS, END OF LIFE METER TESTING AND STORAGE OF REMOVED METERS

#### 4.1 SPECIFICATIONS

Installer shall submit required CSV file (See Exhibit C for Data requirements) within 48 hours following meter exchange.

**Landis+Gyr Response:**

Does not apply as Landis+Gyr is not bidding Meter Installation/Removal as part of this RFP.

During installation through Inter-County Energy's acceptance, a single point of contact with 24/7 accessibility will be provided.

**Landis+Gyr Response:**

Landis+Gyr is not providing installation services.

End of life testing: Test facility and meter testers shall have certification from the Kentucky Public Service Commission. All meter testing data shall be submitted in a CSV file as specified in Exhibit C. All meters shall be tested, and results returned to Inter-County Energy within fourteen (14) days following removal. All meters shall be tested for accuracy; If meter shows an average meter error that is two (2) percent or greater, fast or slow, or if the meter is stuck or dead, the meter should be returned to Inter-County Energy's Danville Office within 48 hours following testing.

**Landis+Gyr Response:**

Does not apply as Landis+Gyr is not bidding Meter Installation/Removal as part of this RFP.

Methodology for deployment, including proposed process maps and deployment schedules for the products/services proposed in order to meet Inter-County Energy's desired acceptance date of December 2025 for full installation.

**Landis+Gyr Response:**

Does not apply as Landis+Gyr is not bidding Meter Installation/Removal as part of this RFP.

Turnkey solutions and third-party installation services should provide information outlining services they can offer related to communications hardware installation, AMI meter installation and end of life testing for old meters.

**Landis+Gyr Response:**

Does not apply as Landis+Gyr is not bidding Meter Installation/Removal as part of this RFP.

Identify any exceptions to Inter-County Energy's specifications.

**Landis+Gyr Response:**



Does not apply as Landis+Gyr is not bidding Meter Installation/Removal as part of this RFP.

4.2 FEATURES/FUNCTIONALITY CHECKLIST

<i>4.2.1 Meter Installation/ End of Life Testing Requirements</i>	Yes	No
GPS data on installed meter will be provided without additional cost.		
Digital images of the in meter and the out meter are available.		
Naming convention for image files will be by Inter-County Energy meter number.		
Vendor trains all employees in safety, customer relations, hazardous conditions, and identification of meter tampering.		
Meter jaw tension testing		

## D. MDMS

Landis+Gyr included Harris SmartWorks MDMS pricing as a courtesy. Landis+Gyr is not responsible for any information or errors contained within the Harris SmartWorks proposal. Any agreement for the Harris SmartWorks MDMS will be between Inter-County Energy and Harris SmartWorks. Please refer to the Harris SmartWorks MDMS Proposal section.

## E. Warranty Information

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Provide a description of the warranty provided to Inter-County Energy for each component and service contained in your proposal. Include the effective dates, the expiration dates, and the extent of the warranty coverage and any limitations of the warranty.

**Landis+Gyr Response:**

Landis+Gyr's standard equipment (Network Gateway, Router, electric meter,) warranty for defects in material or workmanship is 60 months from the date of shipment. Landis+Gyr warrants that its software will materially comply with the software documentation provided for a period of thirty (30) days from the date of delivery. Landis+Gyr warrants that Services will be provided in a professional workmanlike manner and the services warranty period is ninety (90) days after performing a service.

For a complete view of Landis+Gyr's warranty terms, please refer to section 8 of the provided "Master Purchase License and Service Agreement Template 2021.05.12."

## The Layered Intelligence Approach: Actionable Intelligence When and Where You Need It

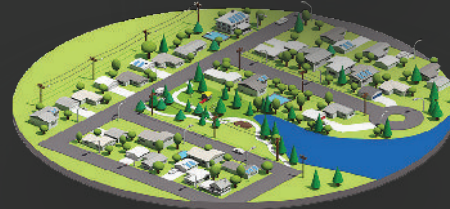
There are currently two distinct approaches to managing intelligence, one that prioritizes centralized intelligence and one that relies solely on edge intelligence. Only Landis+Gyr's Connected Platform enables a third and better way—an approach that combines the best of edge and centralized approaches, while avoiding the pitfalls of each.

Informed by decades of communications and metering experience, Landis+Gyr's Layered Intelligence enables smart devices to provide real-time decision-making at every level of the grid system, from the central system to the grid edge.

**At the grid edge,** individual devices autonomously monitor and manage changing load conditions and power flows to improve efficiency, safety, and customer service.



**In the community,** peer-to-peer communication between intelligent devices improves your reliability by enabling rapid response to changing local conditions.



**And at the system level,** get unprecedented real-time information and management options for more efficient operation.



Let's build a  
brighter future  
together.

To learn more about partnering with Landis+Gyr or Gridstream Connect, visit [landisgyr.com](https://landisgyr.com), email us at [marketing@landisgyr.com](mailto:marketing@landisgyr.com), or call us at 888-390-5733.

# Landis+Gyr

# Gridstream<sup>®</sup> Connect

## The Most Flexible, Future-ready Utility IoT Platform

Introducing Landis+Gyr's Gridstream Connect, the only IoT platform that responds to today's challenges and leverages network intelligence to drive future innovation and growth for your business.

[landisgyr.com](https://landisgyr.com)

# 01

## The Future of Utility Networks

With the advancement of distributed energy resources and the constant pressure for utilities to provide safe and reliable service at an affordable price, the role of AMI and Smart Grid solutions in utilities is rapidly transforming. New business challenges have emerged, requiring a future-ready network solution secure, flexible, and scalable enough to meet each utility's needs.

In an era of rapid change, one thing remains constant for utilities: the need to reduce risk and enhance reliability.

### THE PERFECT STORM FACING UTILITIES TODAY

Our industry is rapidly changing, presenting new challenges to utilities, including:

- Evolving business models requiring new opportunities for revenue growth
- Increased pressure on aging grid infrastructure from distributed energy resources, solar, weather events, and more
- Higher-than-ever customer service and engagement expectations
- Policy shifts resulting in more complex billing, increased security, and new compliance demands
- Efficient and reliable delivery of resources

Gridstream Connect is the only utility IoT networking solution designed to address these issues and to prepare for future business needs. Gridstream Connect is backed by more than 25 years of proven interoperability experience and one of the industry's largest partner ecosystems.

# 02

## Gridstream Connect Benefits

Gridstream Connect is a single network that supports a diverse ecosystem of sensors, from many different vendors, supporting multiple communications technologies. The deployment, operational, and strategic benefits of Gridstream Connect include:



### OPEN & SECURE

Seamlessly and securely integrate new devices with an increasingly connected world. Open limitless potential for new value with application development.



### FLEXIBLE FOR AN EVER-CHANGING FUTURE

Implement cutting-edge technology today with the flexibility to augment in the future. Create the solution that's right for your specific business.



### EXTENDS THE VALUE OF YOUR ASSETS

Optimize existing assets by integrating any device, from any manufacturer, with support for multiple communications technologies.



### RICH ECOSYSTEM FOR GROWTH

Explore new avenues of efficiency and growth through innovation.

# 03

## How Gridstream Connect Works



### STANDARDS-BASED INTEROPERABILITY

Seamless integration for a diverse ecosystem of sensors

Landis+Gyr's Gridstream Connect provides proven interoperability, allowing seamless integration of new and existing devices into a single network. Over our 125 year history, we've developed strong partnerships across the industry. Gridstream Connect leverages these partnerships to better serve each utility's needs.

- 60+ integrated device types from over 20 suppliers
- Wi-SUN leaders
- Support for a broad ecosystem of devices including water, gas, electric, home energy management, smart cities, DER integration, and more



### FLEXIBLE COMMUNICATIONS

Communicate with every mile of your territory

Gridstream Connect allows multiple communications technologies to come together on a single network solution, providing the flexibility to choose the solution that best suits the business need.

- Support for RF Mesh, PLC, and cellular with the ability to integrate new communications technologies as they become relevant
- Make the most of investments while driving efficiency and adding value



### APPLICATION DEVELOPMENT

Harness data for limitless growth potential

Landis+Gyr's Gridstream Connect provides a fully integrated and open application ecosystem that enables the creation of secure, custom solutions tailored to your unique objectives.

- Edge intelligence and processing to support decision making at the most efficient point in the network
- 25 years of experience developing edge computing apps
- App Marketplace and app development program to foster innovation and creativity

# Command Center



## Overview

Command Center™ software is the gateway for all Gridstream® metering technologies and the control point for grid management network sensors. It's the critical link for opening access to valuable data for utility systems and directing actions which occur within the distributed intelligence residing at the network's edge.

Command Center brings data from any communication technology—including RF Mesh, PLC and cellular; and for any commodity such as electricity, natural gas and water—into a single application. Command Center's innovative platform is designed for growth and extensibility to ensure a future ready solution for our customers.

### OPERATIONS SUPPORT COMMAND CENTER INTELLIGENCE PERFORMS FUNCTIONS INCLUDING:

- Remote endpoint programming
- Time-of-use period and rate configuration
- Basic validation and exception management
- Billing extract generation
- Remote disconnect management
- Critical peak usage analysis

### OPERATIONAL PROCESSES SUPPORTED INCLUDES:

- Load control index creation
- Billing support and exception reports
- On-demand device command and control
- System mapping and real-time awareness
- Network management analytics and statistics
- Demand response management of devices
- Voltage monitoring

### FEATURES & BENEFITS: WHY LANDIS+GYR MAKES A DIFFERENCE

- Robust management of the AMI system
- Network management analytics and statistics
- Validation, storage and presentation of collected data
- Seamless integration to other utility applications
- Monitoring and alerting of standard and -user-configurable conditions
- In-depth analysis and reporting monitoring systems

### INNOVATIVE, FLEXIBLE & SECURE

- Modular Software Architecture & deployment
- Market-leading security implementation
- Proven scalability to support the world's largest utilities
- Integration based on Service Oriented Architecture



**ROBUST MANAGEMENT OF THE AMI SYSTEM**



**SEAMLESS INTEGRATION TO OTHER UTILITY APPLICATIONS**



**INNOVATIVE, FLEXIBLE & SECURE**

# Command Center

## PLATFORM INTEGRATION AND STANDARDS LEADERSHIP

As a MultiSpeak® and IEC 61968-9 (CIM) compliant solution, Command Center provides unparalleled integration capabilities.

Command Center's standards-based design, combined with an extensive web service library of more than 100 pre-built interfaces, makes it ready to use right from the start. The fact is Landis+Gyr's proven integration solutions empower hundreds of utilities to integrate their advanced metering and grid management solutions with back-office applications. And with unparalleled industry-leading vendor partnerships and dedicated integration teams, Landis+Gyr provides the key to integration success.

In addition to real-time application interfaces, Command Center delivers pre-built, yet flexible data extracts, in formats readily supported by adjacent systems. Every byte of processed data is available for use.

Fully integrated with Landis+Gyr MDMS, and interoperable with systems including billing, customer service, engineering analysis, outage management, demand response, load management and field service applications, Command Center enhances productivity and delivers unmatched energy resource management and collaboration.

## SYSTEM REQUIREMENT

Command Center is engineered to simultaneously process and validate meter readings for millions of devices quickly and efficiently. It can be configured as a stand-alone solution on a single server platform or scaled to a multiple-server platform. In addition, it can operate in either a Microsoft or Unix environment supporting a Microsoft SQL or Oracle database platform. Command Center hosting and management is also offered as a service with Landis+Gyr Cloud Services.

## LANDIS+GYR SMART GRID SERVICES AND CUSTOMER SUPPORT

When you partner with Landis+Gyr and deploy an AMI system powered by Command Center, you'll have access to support and services expertise unequaled in the industry. You can rely on our technical support 24/7/365 with each Command Center installation. The Landis+Gyr Smart Grid Services team delivers unrivaled expertise and leverages decades of in-the-field experience to maximize the value of your investment and ensure business objectives are met.

## NETWORK MONITORING AND MANAGEMENT FEATURES

- Administrative dashboards
- Exception reporting
- Reading collection statistics
- Mapping
- Network management
  - Message communication statistics
  - Device latency statistics
  - Collector capacity
- Command, error and event tracking and reporting
- Interfaces available for data delivery to industry network monitoring systems

## GET IN TOUCH.

For more information and nationwide warranty terms, visit us at [landisgyr.com](http://landisgyr.com) or call us at 888-390-5733.



## LET'S BUILD A BRIGHTER FUTURE TOGETHER

Since 1896, Landis+Gyr has been a global leader of energy management solutions. We've provided more than 3,500 utility companies all over the world with the broadest portfolio of products and services in the industry. With a worldwide team of 1,300+ engineers and research professionals, as well as an ISO certification for quality and environmental processes, we are committed to improving energy efficiency, streamlining operations, and improving customer service for utility providers.

# Landis+Gyr Integration Suite Technical Brief



## Overview

Utilities today are seeking to integrate their operational software in ways that can capitalize on operational efficiency and improve the customer experience. One key component towards this goal is the integration of their AMI solution into their overall business processes and systems. Utility systems require the sharing of data and functionality with applications such as Meter Data Management (MDM), CIS/Billing, Outage Management (OMS), Engineering Analysis (EA), Work/Service Order Management (WOMS), Demand Management, or DA/SCADA systems. Further extension of this data has grown into the areas of analytics as well. Landis+Gyr's Command Center head-end software provides MultiSpeak v.3.0 and IEC 61968-9 (CIM) standards-based web service methods, as well as customized interfaces to realize these capabilities.

## The Landis+Gyr Solution

At Landis+Gyr, the focus is on maintaining four pillars in our approach to an integration solution for our customers:

### ***Standards In Action***

Other AMI vendors may talk about supporting standards, but don't have them in production-quality solutions. At Landis+Gyr, we have been implementing standards-based solutions for years and have them in daily production at hundreds of utilities every day. We continue to embrace emerging standards in addition to our rich inventory of MultiSpeak interfaces, such as IEC 61968-9 (CIM), with implementations at some of the largest utilities in North America. By focusing on implementing standards for our industry that are subjected to industry interoperability testing, we **ensure success** for our customer installations.

### ***Out of the Box Solutions***

With over 600 installations of our Landis+Gyr solution, our partner ecosystem includes over 75 partnerships with utility vendor solutions. We test our integration solutions in our vendor interoperability lab and focus on out-of-the-box solutions with our partners. By focusing on ensuring successful integration points, we are **lowering the total cost of implementation** of the Landis+Gyr solution for our customers.

### ***Experience***

Unprecedented experience is provided by Landis+Gyr, through successful partnerships, hundreds of installations, and a dedicated integration implementation team ensuring that Landis+Gyr will be your **trusted partner**.

### ***Future Proof***

By focusing on Standards, Interoperability testing and maintaining a sustainable solution we **lower the total cost of ownership** for our customer's integration solutions.

## Integration Architecture

There are several approaches to the use of the available integration offerings based on the architecture of the systems in place at utilities.

Landis+Gyr provides a wide range of data integration options:

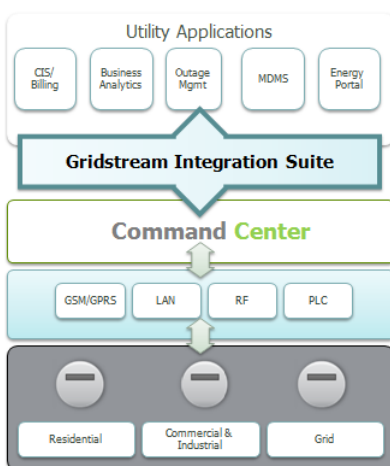
- File based
  - Predefined Imports and Extracts are available for provisioning, readings, customer information, processing, endpoint information updates.
  - Customized Extracts can be created to support various billing system formats.
- Web Service/APIs

There are several approaches to the use of the available integration offerings based on the architecture of the systems in place at utilities.

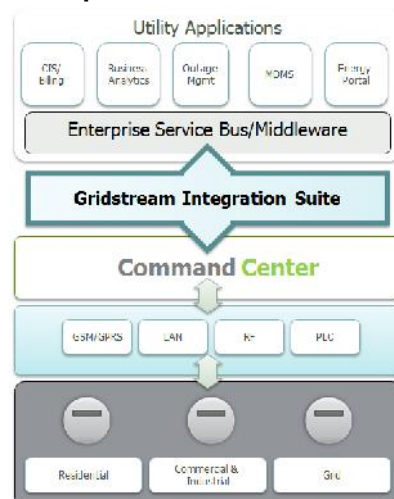
- Direct approach with web services going direct to utility systems from the Command Center Head-end System
- Integration utilizing a Meter Data Management system (MDMS), an Enterprise Service Bus (ESB) or some form of Middleware to route the information to potential utility systems

In either of the architectural cases, these available integration points can be used across these implementations.

**Figure 1: Direct APIs or Files To Utility Systems**



**Figure 2: APIs/File Solution using Meter Data Management System or Enterprise Service Bus**



## Integration Types

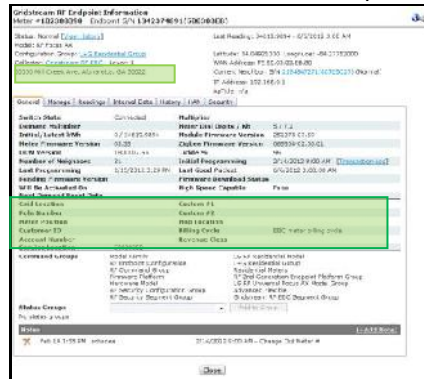
Based on the type of data or the timeliness of the information, the following types of integration may be used.

### Data Exchange

- Purpose: Update Command Center data from an external application or display in real time.

The external application is considered the owner of the data (system of record), and it may be beneficial to have this data in Command Center for on-screen viewing and/or inclusion in reports. For a customer billing system, examples of this data include meter parameters (customer ID, account number, address information, service location, seal numbers, meter nameplate data and custom fields.)

An example of areas where this information may appear on the Command Center endpoint information screen (real-time data noted in shaded area):



- Purpose: Retrieve data from Command Center where Command Center is the system of record for certain data.

Example of this information include meter readings, outage data or connection switch status.

## Business Process Function/Operations Implementation

- Purpose: Initiate commands or actions by Command Center to meters.

Examples include requesting from a CIS/Billing or MDM to connect or disconnect residential power using the PLX or RF FOCUS AX-SD products.



- Purpose: Managing the meter deployment process in which meters are added, replaced, or removed from Command Center.

This capability reduces or eliminates redundant data entry and keeps software system data synchronized. Web service methods exist to allow external systems to assign meters to a Command Center configuration group, as well as add or remove meters to/from command addressing groups.

### Real-time Event Alerts

- Events generated by devices, such as outage/restorations, voltage sags/swells, registration confirmation, connect/disconnect switch state changes, or delivery of hundreds of the Landis+Gyr RF network and meter events.

### Common Integration Approaches

Interfaces are at hundreds of customer sites, as well as with our hosted environment site. The successful and common approaches taken to date include, but are not limited to, the following:

### Web Services with Software Vendor or Third-Party Integrator



## Data Bridge to Legacy System

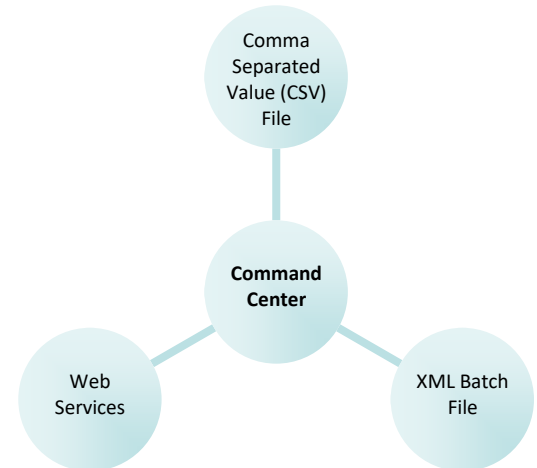
One approach, illustrated below, shows that an application could be written to act as a data bridge between the two applications which would limit the impact on the legacy system. It could be used in cases where a customer information system (CIS) or other legacy system wants to update the Command Center with useful account information, as well as assigning billing cycles to meters but does not have the capability to support web services.



## Integration Design

Data exchange techniques vary based on the capabilities, tools, and technologies available to the software developer or integrator. The following types of data exchange automation are available with the Command Center software.

- File-based Comma Separated Value (CSV) import
- eXtensible Markup Language (XML) file import
- Web Services - MultiSpeak 3-compliant, IEC 61968-9 (CIM), or custom-written



## Standards Based Approach

Landis+Gyr is actively involved in both the CIM (IEC 61968-9) and MultiSpeak initiatives and will continue to work toward compliance in both these areas to serve our customers and their selected vendor's needs. We have global representation on the CIM user's group (WG14), as well as active communication with our vendor partners that are supporting the CIM-based models to ensure we provide the seamless integration sought by our customers.

Landis+Gyr participated in the CIM IEC 61968-9 Interoperability testing in both January 2010 and November 2011. For a report on the January 2010 testing, please contact Landis+Gyr for more information.

Landis+Gyr has also long been involved in the NRECA sanctioned efforts of the MultiSpeak initiative - whose goal is to define a common data exchange between vendor applications or utility customer-built software systems.

Our APIs provide support utilizing the following standards:

1. IEC 61968-9 (CIM) – File and API support utilizing a CIM-based event model for specific events processing and Home Area Network device provisioning, load control, pricing messages, and text messaging.
2. MultiSpeak – Current support includes version 3.0.
3. Custom-written - For specific applications, utilities, or vendors. While not specific to CIM or MultiSpeak, Landis+Gyr realizes there are some interfaces or business processes that are further enhanced with real-time interfaces. For those requirements, we also support custom-written interfaces as well. These are based on a scope of work agreement and time-and-materials based pricing.

Customers will have the option of using one or a combination of these solutions depending on their business needs.

## Design Features

Command Center software interfaces have been designed with the following features in mind to meet the challenge of providing useful, accessible, and programmatic, as well as file-based, solutions that are scalable to meet the needs of our customers.

**Web Services** are the preferred method of integration, providing real-time interaction between applications. Command Center uses ASP.Net web services technology, which is interoperable with many existing 3<sup>rd</sup> party software tools and applications. Microsoft, as well as other major software providers, offer tools such as Microsoft's Express Editions of C# and Visual Basic, to create interfaces with Command Center web service methods.

**Scalability** considerations include implementation of paging where multiple calls are made to web service methods that typically return large amounts of data. Between modules that may be installed on separate servers, Command Center utilizes SOA/Web Service protocols. For example, when the user interface needs to send a command to a meter, it will call a Web Service on the application server.

**Security** is addressed by using authentication of each web method, as well as implementation of SSL for encryption. A SOAP Header for each method call carries the authentication credentials. The APIs are stateless, with authentication information and other data being passed on each Web Service call.

**Flexibility** in the integration approach is addressed by supporting file import and export of data fields requested by our customers and integration partners. File formats supported include CSV, XML, fixed-length, batch file and HTML. The data is open and accessible, and middleware can be created for integration.

**Audit tracking** for each call is available to ensure successful tracking of the web service methods should the need arise to troubleshoot the integration activities or provide audit reports.

MultiSpeak Audit History			
Destination Application: Meter Reading		Vendor: HUNT	
Search Type:	All	Meter Number:	
From Date/Time:		To Date:	
		Reset Search	
Message Date	MS Method	MS Object ID	Error Message
02/09/2012 08:21:19	InitiateUsageMonitoring	... 69801	Meter Not Found or Not Added To Group
02/08/2012 13:55:57	InitiateMeterReadByMeterNumber	... 47573	Meter 47573 does not exist or does not support on demand reads.
02/08/2012 09:22:45	MeterAddNotification	... 63865	Meter Not Added
02/08/2012 08:49:41	InitiateMeterReadByMeterNumber	... 98054	Meter 98054 does not exist or does not support on demand reads.
02/08/2012 08:49:24	InitiateMeterReadByMeterNumber	... 98176	Meter 98176 does not exist or does not support on demand reads.
02/08/2012 08:49:08	InitiateMeterReadByMeterNumber	... 98192	Meter 98192 does not exist or does not support on demand reads.
02/08/2012 08:48:53	InitiateMeterReadByMeterNumber	... 98168	Meter 98168 does not exist or does not support on demand reads.
02/06/2012 08:56:14	InitiateMeterReadByMeterNumber	... 98194	Meter 98194 does not exist or does not support on demand reads.
02/06/2012 08:42:53	InitiateMeterReadByMeterNumber	... 98013	Meter 98013 does not exist or does not support on demand reads.
02/06/2012 08:41:24	InitiateMeterReadByMeterNumber	... 98243	Meter 98243 does not exist or does not support on demand reads.
02/06/2012 08:40:25	InitiateMeterReadByMeterNumber	... 98014	Meter 98014 does not exist or does not support on demand reads.
02/06/2012 08:39:26	InitiateMeterReadByMeterNumber	... 98015	Meter 98015 does not exist or does not support on demand reads.
02/03/2012 08:47:03	InitiateMeterReadByMeterNumber	... 98244	Meter 98244 does not exist or does not support on demand reads.
02/03/2012 08:40:57	InitiateMeterReadByMeterNumber	... 98242	Meter 98242 does not exist or does not support on demand reads.
02/03/2012 08:40:53	InitiateMeterReadByMeterNumber	... 98242	Meter 98242 does not exist or does not support on demand reads.
02/02/2012 12:12:52	InitiateUsageMonitoring	... 47565	Meter Not Found or Not Added To Group
02/02/2012 08:45:04	InitiateMeterReadByMeterNumber	... 98079	Meter 98079 does not exist or does not support on demand reads.

Figure 3: Sample Audit History

## Integration Support Available

### Web Services

To aid utilities in the creation of Web Services, the following are available:

- Experience + Support
  - **400+ Customers**
  - Integration with CIS, MDMS, OMS, GIS, WOMS, Consumer Portal, Prepaid Metering, Business Intelligence, Data Warehousing, and Meter Data Analytics
  - Our incentive is to enhance the existing customer systems
  - Dedicated Integration Implementation Team for more extensive efforts
  - Dedicated Tech Support for integration
- Extensive Web Service Library
  - MultiSpeak-compliant with added extensions, CIM-compliant, and custom specifications
  - WSDL files are available
  - Security and auditing on each method call
- Detailed Integration Guides (Integration Toolkit/SDK)
  - Sample WSDL files and sample code
  - Data Import and Extract Formats
  - Detailed information on each available integration point – web service, imports, extracts
- Testing Site
  - Established test site with scenarios and test scripts available to allow for ease of development
  - Vendor-specific accounts assigned along with instructions
- Examples of pre-built interfaces
  - **Over 135 current APIs implemented in production environments**
  - On-demand read
  - Demand reset
  - Meter query for status/states
  - Remote connect/remote disconnect
  - Move-in/Move-out
  - Meter change-out
  - Meter Installation/Deployment
  - Customer Information
  - Outage/Restoration Events and Files
  - Meter Remove from Service
  - Status Group membership add/remove/modify
  - Usage Monitoring
  - History Logs
  - Meter, Router, Collector Events
  - Home Area Network support based on SEP 1.0



## Data Exchange File Formats

To provide ease of use in integration if batch processing is necessary, several pre-defined formats have been created. In addition, an intuitive, easy-to-use interface allows for customization of readings data formatting and scheduling based on the needs of the utility. The following pre-established formats and types are available:

- Daily Reading/Interval Data Files
- Multiple Billing File Formats
- Custom Data Files
- Customer Information
- Installation Information
- Meter Manufacturer
- Endpoint Data Export

## Examples of System Interfaces

- **Meter Data Management Systems**
  - System provisioning
  - Readings processing
  - On demand reads
  - Demand reset
  - Event notifications
- **Customer Information Systems/Billing**
  - Consumption readings
  - Interval readings
  - On demand readings
  - Demand reset
  - Remote disconnect
- **Outage Management Systems**
  - Current power status
  - Outage/Restoration events
  - Event filtering and throttling
- **Network Management/Monitoring Systems**
  - Event monitoring
  - Network and meter level
  - System administration via utility network operations center

## Landis+Gyr MDMS SmartData Exchange Integration Suite

Landis+Gyr MDMS offers a rich catalog of standards-based interfaces to enable easy integration with utility systems including CIS, AMI Head-end Systems (especially Landis+Gyr Command Center), Outage Management Systems, Work Order Management Systems, or Customer Presentment applications. The philosophy of integration with MDMS is to develop adapters to/from an integration layer called SmartData Exchange. These adapters can be added or modified outside of the bi-yearly releases and allow for flexibility and ease the time of integration with utility systems.

The most common methods for achieving synchronization/integration between the MDMS and adjacent systems include Web Services, JMS Queues, and direct file transfer. The method used in each case is determined by the needs of the specific utility; and strive to adhere to industry standards. The frequency of synchronization between the MDMS and other systems is typically dictated by the utility, based on its business processes. The MDMS can accept as much data as necessary and at whatever frequency is available from integrated systems.

The MDMS makes extensive use of XML, JMS, SOAP, HTTP, and HTTPS. In addition, traditional FTP file exchange methods are available to interact with legacy systems that are unable to communicate with real-time interfaces. The clear majority of integrations with AMI head-end and utility back office systems involve one or more of the following technologies: IP (v4 today and v6 in future), TCP/IP, HTTP, HTTPS, Web Services, XML, JMS, SOAP, FTP, and sFTP (secure FTP).

Most high-volume data transfers between MDMS and other systems still use batch-oriented, fixed format file transfers. This is not a design choice of Landis+Gyr, but rather a reflection of the maturity of many of the AMI and legacy systems. With the Landis+Gyr Command Center AMI Head-end System, reading data flows to the MDMS through-out the course of the day, thus allowing for more efficient readings processing. Additionally, data synchronization and deployment support use pre-established interfaces.

For low volume interfaces (smaller data payloads), especially those that are time sensitive and/or associated with event triggers, command and control functions, on-demand reading and the like, there is already significant progress in utilizing more advanced technologies such as Web Services, ESBs, JMS queues and the like that achieve the more real-time, event driven behavior that is desired. The Landis+Gyr MDMS and Command Center AMI Head-end System are pre-integrated with out-of-the-box interoperability for command and control functions such as on-demand reading, connect/disconnect, and outage/restoration event management.

The MDMS supports all of these messaging and data transfer paradigms and we are firmly committed to advancing the state-of-the-art in compliance with existing and emerging industry standards. Landis+Gyr is also firmly committed to compliance with industry standards, including IEC 61968 (IEC/CIM) and MultiSpeak. Landis+Gyr is an active member of the IEC working group responsible for the IEC 61968 standards and is represented in that organization by two Landis+Gyr representatives. Landis+Gyr is also an active member of the MultiSpeak initiative, with representation on both the MultiSpeak Advisory Board and the MultiSpeak Technical Committee.

With Landis+Gyr, you can be assured that the MDMS and the AMI Command Center Head-end System will support your critical business processes with out-of-the-box interoperability.

## Landis+Gyr Integration Suite - Vendor Partnership Availability

The Landis+Gyr Integration Suite has direct out-of-the-box interfaces and experience maintaining and supporting our interfaces with the following partner solutions:

\* CIS – ATS, CSA/PCS, Daffron, Harris (enQuesta, Advanced Utility Systems, NorthStar), InteData, NISC, Oracle CC&B, SEDC

\* Meter Data Management Systems – Landis+Gyr MDM, Siemens EnergyIP, Harris MeterSense, Oracle C2M, Daffron, NISC, SEDC, ElectSolve, EnergyICT, Primestone

\* Business Intelligence/Analytics - Landis+Gyr Advanced Grid Analytics, Gridmaven (SKTA), Verdeeco, mPower Innovations;

\* Outage Management Systems - ABB, Advanced Control Systems, C3-ilex, Central Response Center, DataVoice, Futura, GE Poweron, Milsoft, NISC, Partner Software, Schneider (formerly Telvent), Trimble, DataCapable, RVW

\* GIS/Engineering Analysis – 4DataLink, Milsoft, mPower Innovations, Schneider, OSISoft

\* DA/SCADA – Landis+Gyr Power Center, CSE, Dominion (DVI), GridPoint, OSI, Survalent, Siemens

\* Prepayment – Daffron, Excleron, NISC, MYMETER, PayGo, SEDC, SmartGridCIS

\* Consumer Portal - Various CIS/Prepayment/MDMS providers mentioned offer consumer portals that are supported, plus solutions from MyMeter, Infosys, and Tendril

\* Demand Response – Landis+Gyr Power Center, GridPoint, OSI, Siemens, Survalent, Tendril

## Integration Partners

Landis+Gyr is committed to providing the most extensive software interfacing of any AMI technology provider. The value of Landis+Gyr's AMI systems is greatly enhanced by the ease with which utilities can share AMI data with other vital software applications. Below is more detailed information on some of our software integration partners.

## Meter Data Management Systems

### Landis+Gyr MDMS

The Landis+Gyr MDMS is a product within the Landis+Gyr portfolio and features strong integration with Command Center. The Landis+Gyr MDMS is designed to optimize billing operations, enable integration with utility systems, and automate business processes within the utility. The implementation of Command Center with Landis+Gyr MDMS will provide a seamless integration experience for Command Center customers. The integration features a strong use of industry standards – particularly IEC-CIM Second Edition and MultiSpeak.

#### **Web Interface**

Real-time on-demand functionality including on-demand readings, connect/disconnect functionality, and demand reset. MDMS also features the capability to schedule and orchestrate of such commands (via composite transaction capabilities) to enable automation of standard utility business processes.

Integration of provisioning / commissioning data from Command Center– and including a sharing of customer information emanating from CIS systems to the MDMS and ultimately to Command Center.

Support for all Command Center events – featuring an event handling capability within the Network Performance Manager module of the MDMS to better inform and manage incoming AMI events. Readings are shared with MDMS give the utility a strong VEE and billing operations capability.

Support for Home Area Networking Smart Energy Profile to support in-home display functionality.

Outage event notifications are handled and processed via the Landis+Gyr MDMS SmartData for Outage Management.

## Siemens – EnergyIP MDM

<b>Web Interfaces</b>	Scheduled meter reads Provisioning as Meter Add, Modify and Delete Operations Real time and scheduled event processing On Demand Reads Connect/Disconnect operations Power status checks
<b>Requires</b>	EnergyIP version 6.3 minimum

## Oracle MDMS

<b>Web Interface</b>	On-demand reading, outage event notification, and connect/disconnect functionality in real-time. Integration of provisioning/commissioning, customer information, and readings processing.
<b>Requires</b>	Oracle MDM and Smart Grid Gateway Adapter for Landis+Gyr

## NISC MDM

<b>Web Interface</b>	In addition to readings processing, provisioning/commissioning/archiving meters, customer information updates, on-demand reading, outage event notification, and connect/disconnect functionality is available in real-time MultiSpeak interfaces.
<b>Requires</b>	Command Center / NISC MDM

## SEDC MDM

<b>Web Interface</b>	In addition to readings processing, provisioning/commissioning/archiving meters, customer information updates, on-demand reading, outage event notification, and connect/disconnect functionality is available in real-time MultiSpeak interfaces.
<b>Requires</b>	Command Center / SEDC MDM

## CIS/Billing Systems

### NISC

<b>Web Interface</b>	Sends customer, meter and location data changes from iVue to Command Center in real time. Upon request from iVue, specific data items from Command Center can update iVue.
<b>Requires</b>	Command Center/NISC: iVUE version 1.8
<b>AMR Daily Reads Requires</b>	Allows daily readings to be imported into NISC's iVUE CIS. Command Center / NISC: iVUE

## SEDC

**CIS Interface** The UPN/Command Center Interface was developed in order to provide users a seamless way to utilize the functionality of both systems and eliminate manual processes. Highlights include: synchronized databases, ping for current readings, dynamic logical grouping of meters, connect/disconnect, and functional real-time connectivity. Business processes in SEDC's CIS model call the appropriate transactions in Command Center that keep the systems synchronized.

## Central Service Association

**CIS Interface** The CSA Orbit & Legacy systems utilizes MultiSpeak interfaces for customer information updates for synchronization of data, acquiring billing data, supporting connect/disconnect features, and additional prepayment functionality.

**Requires** Command Center / CSA Orbit & Legacy Systems

## Daffron

**Billing Interfaces** The implementation of the Multispeak v3.0 specification for ToolboxIXp will provide instant data synchronization and prevent end users from duplicate entry or manually building and transferring integration files.

**Requires** Command Center / Daffron Toolbox and CIS iXp 4.0 or above

## Professional Computer Systems Co.

**CIS interfaces** The PCS CIS system utilizes MultiSpeak interfaces for customer information updates for synchronization of data, acquiring billing data, and for batch synchronization of data.

## ATS

**CIS interfaces** ATS OpenOne utilizes MultiSpeak interfaces for customer information updates to acquire billing data, support connect/disconnect features, provide usage data and prepaid meter functionality as well as full support for meter reading processing.

**Requires** Command Center/ATS version 5.9

## GIS/Outage Management Systems

### 4DataLink

4DataLink offers a one-way standard integration channel between Command Center and 4DataLink's solution suite, providing browser-based query and visualization capabilities to 4DL's Network Information Manager (NIM) core product. By means of user-defined graphical identification of meters on screen, information pulled from Command Center will be readily available to 4DL users on every company employee desktop screen.

### Milsoft Utility Solutions

<b>Engineering data</b>	The Landis+Gyr AMI system records kW demand on all meters within specified time period. Engineering Analysis utilizes provided data such as Phase Identification, kW Demand, kW Peak Demand Time, Signal Strength and Interruption Counts.
<b>Requires</b>	Command Center / Milsoft: Version 7.0 of WindMil
<b>Outage interface</b>	AMI notifies DisSPatch OMS of each meter without power. OMS uses power out notification to predict outage and confirm outage restoration and automatically predicts secondary outages on AMR meters that fail to confirm restoration. AMI meters display Outage, Restoration, Blink Counts, Sustained Outages, and Signal Strength, and can request connectivity information from Command Center.
<b>Requires</b>	Command Center / Milsoft: Version 3.0 of DisSPatch

## Partner Software

The first Partner-TS2 interface focused on outages only. Partner Software now has the capability to query endpoints in any status. Queried endpoints are then displayed on your system maps as various icons that reflect the meter status. Specific meters can be queried to display detailed status information. This interface can be used to increase the efficiency of your Landis+Gyr AMI rollout or to provide a graphical view of the status of your endpoints on your system maps.

<b>Outage interface</b>	Automatic notification from AMR system to Partner Map Integration Toolkit of meters without power. Outages are displayed as icons with status information or as a report in the Partner Web.
<b>Requires</b>	Command Center Partner Software: Partner Map Integration Toolkit and Hunt Map Integration Toolkit Module

## Cooperative Response Center, Inc.

CRC seeks to provide its member cooperatives thorough and comprehensive after-hours crew dispatch, and to enhance that function by utilizing data from outage reporting systems integrated with CRCLink.

## Consumer Portal and Prepayment Systems

### Exceleron Prepaid Account Management System (PAMS)

<b>Web Interface</b>	Connect/disconnect functionality and customer information in real-time.
<b>Requires</b>	Command Center / Exceleron PAMS 2.0

### PayGo

<b>Web Interface</b>	Connect/disconnect functionality, customer usage information in real-time as well as historical data, customer outage information, and meter status.
<b>Requires</b>	Command Center / PayGo V1.1.4.7

### Accelerated Innovations - MYMETER™

<b>Web Interface</b>	Connect/disconnect functionality and customer information in real-time.
<b>Requires</b>	Command Center / MYMETER™



## DA/SCADA

### Open Systems International, Inc. (OSI)

The Open Systems International, Inc. (OSI) OpenDMA product is the MultiSpeak-compliant interface for the OSI SCADA (Supervisory Control and Data Acquisition) system. OpenDMA is responsible for providing SOAP Web Service access to select SCADA status and analog points as well as notifying subscribers of point changes within SCADA.

Some significant features include:

- Provide access to SCADA data through a MultiSpeak 3.0x compliant interface, which will work with other services in the 3.0 series and some 4.0 services
- Provides user-friendly graphical and tabular displays for easy configuration and maintenance for common tasks, such as creating subscriptions and adjusting point values
- Supports redundant paths for requests and publications

<b>Web Interface</b>	Initiates Load Control schedules setup in Command Center
<b>Requires</b>	Command Center 4.0/ OpenDMA v1.1.3

# Available Web Services

MultiSpeak ver. 3.0 Web Service APIs
CancelDisconnectedStatus
CancelPlannedOutage
CancelUsageMonitoring
CDStateChangedNotification
CustomerChangedNotification
CustomersAffectedByOutageNotification
FormattedBlockNotification
GetAllMeters
GetAllOutageDetectionDevices
GetAMRSupportedMeters
GetCDMeterState
GetCDSupportedMeters
GetDomainMembers
GetDomainNames
GetHistoryLogByMeterNo
GetHistoryLogsByDate
GetHistoryLogsByDateAndEventCode
GetHistoryLogsByMeterNoAndEventCode
GetLatestReadingByMeterNo
GetLatestReadings
GetMethods
GetOutageDetectionDevicesByMeterNo
GetOutageDetectionDevicesByStatus
GetOutageDetectionDevicesByType
GetOutagedODDevices
GetReadingByMeterNumberFormattedBlock
GetReadingsByBillingCycle
GetReadingsByDate
GetReadingsByDateFormattedBlock
GetReadingsByMeterNo
InitiateConnectDisconnect
InitiateDisconnectedStatus
InitiateMeterReadByMeterNumber
InitiateOutageDetectionEventRequest
InitiatePlannedOutage
InitiateUsageMonitoring
IsAMRMeter
MeterAddNotification
MeterChangedNotification
MeterConnectivityNotification
MeterExchangeNotification
MeterRemoveNotification
MeterRetireNotification
ODEventNotification
PingURL
ServiceLocationChangedNotification

Custom APIs - MultiSpeak ver. 3.0 Format
AddAmrNote
AddMetersToCommandAddressGroup
AddMetersToConfigurationGroup
AddMetersToStatusGroup
AddMeterToInventory
DeleteAmrNote
DeployElectricMeter
DeployGasAndElectricMeter
DeployGasMeter
GetAllUsers
GetAmrNotes
GetAncillaryMetersByRelatedElectricMeterNo
GetCompletedWorkOrders
GetEndPointInfoByMeterNo
GetEndPointInfoBySPU
GetHistoryLogsBySPU
GetLatestReadingsBySPU
GetInfoByDevice
GetMeterExchanges
GetMetersAdded
GetMetersBySPU
GetMetersByStatus
GetMetersConfigBySPU
GetMetersNotLogging
GetMetersRemoved
GetMetersWithNokWhUsage
GetMUEndpointByAncillaryMeterNo
GetMURReadingByMeterNoWithLookback
GetOutageMeters
GetReadingByMeterNoWithLookback
GetReadingsBySPU
GetSPUByMeterNo
MeterDataCSVFileURLNotification
RemoveMetersFromCommandAddressGroup
RemoveMetersFromGroup
ScheduleDemandReset

MultiSpeak v3.0 Web Calls From Landis+Gyr HES
GetCustomerByMeterNo
GetServiceLocationByServLoc
GetServiceLocationByMeterNo
GetAllCustomers
GetAllServiceLocations

# Available Web Services

IEC (CIM) 61968-9 1st Edition Web Service Functionality Device/Endpoint
Get Device Information
Get Device Configuration
Get Routers by Collector
On-Demand Read - Register and Load Profile
Connect/Disconnect
Event Messaging

HAN (CIM-Based on 1st Edition format)
De-provision (Delete) HAN Device
Get HAN Device Info
Get IHD Pairing Details
HAN Load Control
HAN Load Control Cancel
HAN Load Control Cancel All
Commission HAN Network
Decommission HAN Network
List HAN Devices
Remove All HAN Devices
HAN Pricing
HAN Text Message Route
HAN Text Message Cancel
HAN Cancel All Messages

IEC (CIM) 61968-9 2nd Edition Web Service Functionality Device/Endpoint
On-Demand Read - Register and Load Profile
On-Demand Meter Comm Ping
Connect/Disconnect
On-Demand Demand Reset
Event Messaging
<b>Prepay Support</b>
· Customer configuration
· Customer account configuration
· Prepay Data Reset
· Prepay Mode Switch to Prepay
· Prepay Mode Switch to Credit
· On-demand Non-Disconnect
· Emergency Disconnect
· Cancel Emergency Disconnect
· Assign/remove meters to billing cycles
<b>Load Control - ANZ only</b>
· Start/Stop Load Control
· Get Load Control Relay Status
· Set Under Frequency Load Control Relay
· Set Supply Capacity Control Mode
· Set Ripple Control
<b>Cabinet Meters Support - Brazil only</b>
· Reactivate Cabinet
· Set Door Monitoring Configuration – Enable
· Set Door Monitoring Configuration – Disable
· Set Door Monitoring Configuration – Temporary Disable

As of: 6/12/2017

# Command Center™

## Release Notes

Version: 8.2

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## Purpose of This Release

Command Center 8.2 is a system release for all Landis+Gyr customers.

## Supported Software, Devices, and Firmware

### Software

The following software is supported in the Command Center 8.2 release:

Command Center	8.2.0.153
Integration Suite	8.2.0.103
Data Streaming	8.2.0.38
Key Manager	8.2.0.153
LG NMS Module (Tunnel Manager)	8.2.0.8
ABNT Adapter (ABNT Meters) (Brazil)	8.2.0.51
CM Adapter (Brazil)	8.2.0.103
M2M/Cellular Adapter	8.2.0.147
RF Mesh IP Adapter	8.2.0.21
ANSI Adapter	8.2.0.37
IP Gateway (DA Network Manager)	8.2.0.10
Device Hub	8.2.0.18
LEEP Meter Adapter	8.2.0.142
LEEP Network Adapter	8.2.0.141
Platform GND Converter	8.2.0.142



Kafka	6.0.0.6
MMF Import Service	1.35.0
COSEM (APAC)	2.28.1
DLMS Adapter (APAC)	8.2.0.142
DLMS Device Driver – E360 (APAC)	1.34.0
DLMS Device Driver – E650 (APAC)	1.23.0
DLMS Device Driver – E850 (APAC)	1.13.0
DLMS Device Driver Service (APAC)	2.24.0
Gulf Converter (APAC)	8.2.0.2
Gulf Import Service (APAC)	2.32.0
NMM Changes (APAC)	1.0.0.19
DAS Migration Tool	8.2.0.17
PSTN Adapter (APAC)	8.2.0.10
LTE Adapter (APAC)	8.2.0.11
Store and Forward Service	8.2.0.30
SBSCR Mgmt Protocol Processor	8.2.0.13
Endpoint Administration Software (EAS) (PLC/PLX)	8.2.0.53

## Packages

As part of the Command Center 8.2 release and packaging of the released components, the following release packages allow you to simplify the download and request process. You may submit a request for or download the packages by the names in bold, or individual components, or a la carte.

### Centralized Installer (CIN)

IAS	5.0.0.36
IAS Linux	5.0.0.34
ICMS	5.0.0.52
UI	5.0.0.37
Windows Prerequisites	5.0.0.6
Linux Prerequisites	5.0.0.15
CreateKafkaTopics	8.2.0.2

### CC 8.2 HES

Command Center	8.2.0.153
Data Streaming	8.2.0.38
Integration Suite	8.2.0.103
Key Manager	8.2.0.153

### CC 8.2 Cellular

M2M Adapter	8.2.0.147
Store and Forward Service	8.2.0.30
ZigBee Firmware EM357/EM358	02.04.19
Enhanced Cellular Firmware	Module/DCW – 16.59/16.64
	S4x LTE-M – 8.14 FOCUS AXe – 5.70

### CC 8.2 RF Mesh

ANSI Adapter	8.2.0.37
Device Hub	8.2.0.18
DAS Migration Tool	8.2.0.17
IP Gateway (DA Network Manager)	8.2.0.10
Kafka/Zookeeper	6.0.0.6
LEEP Meter Adapter	8.2.0.142
LEEP Network Adapter	8.2.0.141
MMF Import Service	1.35.0

**CC 8.2 RF Mesh FW**

Module Firmware w/ COMMS Adapter	21.51
DCW	21.50
Collector	C Series – NA
	N-Series (2150) – 6.2.15
	Network Bridge (2250) – 6.2.15
	Network Gateway (2450) – 6.2.15
ZigBee Firmware	EM250 – 02.00.07
	EM357/358 – 02.04.19
	EFR32 – 03.01.08
Metrology Firmware	FOCUS AX – 5.39
	FOCUS AXe – 5.72
	S4x – 8.15
	REXU Series 4 – 1.8
	REXU Series 5 – 4.3
Water Firmware	kV2c – 4.11
	Series 3 – 2.07
Gas Firmware	Gridstream LE – 11.51
	Legacy – 7.59
	Next Generation – 9.53

**CC 8.2 RF Mesh IP**

ABNT Adapter (ABNT Meters)	8.2.0.51
ANSI Adapter	8.2.0.37
CM Adapter	8.2.0.103
DAS Migration Tool	8.2.0.17
Device Hub	8.2.0.18
DLMS Adapter	8.2.0.142
IP Gateway (DA Network Manager)	8.2.0.10
Kafka/Zookeeper	6.0.0.6
LEEP Meter Adapter	8.2.0.142
LEEP Network Adapter	8.2.0.141
MMF Import Service	1.35.0
NMM Changes	1.0.0.19
Platform GND Converter	8.2.0.142
RF Mesh IP Adapter	8.2.0.21
SBSCR Mgmt Protocol Processor	8.2.0.13
Store and Forward Service	8.2.0.30
Tunnel Manager (LG NMS Module)	8.2.0.8

**CC 8.2 RF Mesh IP Firmware**

Module/DCW Firmware	22.50/22.50
Collector	LG Linux – NA
	N-Series (2150) – 6.2.15
	Network Bridge (2250) – 6.2.15
	Network Gateway (2450) – 6.2.15
ZigBee Firmware	EM357/EM358 – 02.04.19
	EFR32 - 03.01.08
Metrology Firmware	FOCUS AXe –5.72
	S4x – 8.15
	REXU – 4.3
Gas Firmware	Legacy - 8.59
	Next Generation – 10.53
Water Firmware	Gridstream LE – 11.51

**CC 8.2 End to End DLMS**

COSEM	2.28.1
DLMS Device Driver - E360	1.34.0
DLMS Device Driver - E650	1.23.0
DLMS Device Driver - E850	1.13.0
DLMS Device Driver Service	2.41.0
Gulf Converter	8.2.0.2
Gulf Import Service	2.32.0
Kafka / Zookeeper	6.0.0.6
LTE Adapter	8.2.0.11
PSTN Adapter	8.2.0.10

**CC 8.2 PLC**

EAS	8.2.0.53
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**CC 8.2 Security**

PANA	8.2.0.2
GemaltoLunaClient	10.1.1.2

# Devices

## Supported Residential Electric Endpoints

- Landis+Gyr FOCUS AX Modular
- Landis+Gyr FOCUS AX Integrated
- Landis+Gyr FOCUS AL
- Landis+Gyr FOCUS AL 2G
- Landis+Gyr Enhanced FOCUS AX Modular (includes the new 4MB and 8MB flash versions)
- Landis+Gyr Enhanced FOCUS AX Integrated
- Landis+Gyr Enhanced FOCUS AXe
- Landis+Gyr Integrated G5 FOCUS AXe
- Landis+Gyr G5 FOCUS AXe
- Landis+Gyr G5i FOCUS AXe
- Elster REX Universal
- Enhanced Cellular FOCUS AXe
- Enhanced Cellular U1200
- Enhanced Cellular U1300
- Enhanced Cellular U3350
- Enhanced Cellular U3400
- Series V U1200 RF SBS
- Series V U1200 RF SBS
- Series V U3400 RF SBS
- Series V U3350 RF SBS
- E350 SM-110: 1 PSM WCM
- E350 SM-310: 3 PSM WCM
- G5i-Varuna-1PSM WCM
- 4G LTE-M Cellular AXe
- Aclara I210+C
- Landis+Gyr G6 REVELO
- Landis+Gyr G6i REVELO

## Supported C&I Electric Endpoints

- Landis+Gyr S4e
- Landis+Gyr S4x
- Landis+Gyr G5 S4x
- Landis+Gyr G5i S4x
- Landis+Gyr FOCUS AX Polyphase
- Landis+Gyr Enhanced FOCUS AX Polyphase
- Landis+Gyr Enhanced S4e
- Elster A3
- Enhanced Elster A3
- GE kV2c
- Enhanced GE kV2c

- G5i E650 G2
- E670 SM-405: 3 PSM LTCT
- Landis+Gyr G6i OFDM S4x
- 4G LTE-M Cellular S4x

### Supported Water Endpoints

- Two-Way Water
  - Pit module
  - Wall module
  - Interpreter

### Supported Gas Endpoints

- RF Mesh
  - Two-Way Gas Residential M120
  - Two-Way Gas C&I M220
  - Two-Way Pressure and Temperature Gas Module M250
  - M125 Residential Gas
- RF Mesh IP
  - Two-Way Gas Residential M120i
  - Two-Way Gas C&I M220i
  - Two-Way Pressure and Temperature Gas Module M250i
  - M125 Residential Gas

### Supported Network Equipment

- Series 3 Router
- Series 4 Router
- Series 5 Router
- Universal Mesh Extender (UME)
- Series 3 Collector
- Collector C6400 Series
- Collector C6500 Series
- Collector C7400 Series
- Collector C7500 Series
- Series 3 Concentrator
- Series 4 Concentrator
- Series 3 IWR
- Series 4 IWR
- Series 5 IWR
- DA Devices
- Network Node
- Network Bridge
- Network Gateway
- Enhanced Router/Network Router

# Firmware

## RF Mesh Products

### Endpoints

Hardware Type	Firmware Version	DCW Identification	DCW Filename	Metrology	ZigBee
FOCUS AX Modular	21.51	1B0D.21.50	FAXG.21.50.hex	5.39	2.00.07
Enhanced FOCUS AX Modular (Series 4) (includes the new 4MB and 8MB flash versions)	21.51	1F0D.21.50	FAXG.21.50.hex	5.39	2.04.19
Enhanced FOCUS AXe (Series 4)	21.51	1F0D.21.50.0014	FAXG.21.50.hex	5.72	2.04.19
G5 FOCUS AXe (Series 5)	21.51	240D.21.50.0014	FAXG.21.50.hex	5.72	2.04.19
G5 Integrated FOCUS AXe (Series 5)	21.51	2D0D.21.50.0014	FAXG.21.50.hex	5.72	2.04.19
Integrated FOCUS AX	21.51	1A01.21.50	FAXG.21.50.hex	5.47	2.00.07
Enhanced Integrated FOCUS AX (Series 4)	21.51	2001.21.50	FAXP.21.50.hex	5.47	2.04.19
FOCUS AL	21.51	1B0C.21.50	FALG.21.50.hex	3.34 <sup>1</sup>	NA
FOCUS AL 2G	21.51	1603.21.50	FAL2.21.50.hex	3.34 <sup>1</sup>	NA
Enhanced REX Universal (Series 4)	21.51	2301.21.50	REXU.21.50.hex	1.8	2.04.19
REX Universal (Series 5)	21.51	3301.21.50	REXU.21.50.hex	4.03	2.04.19
Honeywell A3	21.51	1801.21.50	EA3G.21.50.hex	5.30	NA
Enhanced Honeywell A3 (Series 4)	21.51	1F01.21.50	EA3G.21.50.hex	5.30	2.04.19

<sup>1</sup> The 3.34 is a decimal interpretation of the 3.22 hexadecimal values, which is tracked in the FOCUS AL metrology.

Hardware Type	Firmware Version	DCW Identification	DCW Filename	Metrology	ZigBee
Aclara kV2c	21.51	1802.21.50	kV2G.21.50.hex	4.0	NA
Aclara kV2c (v1.0.1)	21.51	1806.21.50	kV2G.21.50.hex	4.0	NA
Enhanced Aclara kV2c (Series 4)	21.51	1F02.21.50	kV2G.21.50.hex	4.11 <sup>2</sup> 4.12	2.04.19
Aclara I+210+c (Series 5)	NA	NA	NA	NA	NA
S4e	21.51	1804.21.50	S4eG.21.50.hex	6.34 <sup>3</sup>	NA
Enhanced S4e (Series 4) (includes the 4MB and 8MB flash versions)	21.51	1F04.21.50	S4eG.21.50.hex	6.34 <sup>3</sup>	2.04.19
Enhanced S4x (Series 4)	21.51	1F0D.21.50.0008	S4xG.21.50.hex	8.15	2.04.19
G5 S4x (Series 5)	21.51	240D.21.50.0008	S4xG.21.50.hex	8.15	2.04.19
5252B AMPY Prepay	10.07	SRP 5252B 0 V01.13	5252B.01.14.hex	V00_09u18	NA

## Cellular

Hardware Type	Firmware/DCW RF Mesh Bundle	Metrology	ZigBee
LTE-M Cellular FOCUS AXe	16.59/16.64	5.70	2.04.19
LTE-M Cellular S4x	16.59/16.64	8.14	2.04.19

<sup>2</sup> 4.11 kV2c EPS metrology firmware cannot be upgraded to 4.12.

<sup>3</sup> The 6.34 metrology firmware for the S4e is not available Over-the-Air (OTA).



## Network Equipment

The following products are qualified and available for upgrades with use in Command Center version 8.2:

Hardware Type	Firmware Version	DCW Identification	DCW Filename	Collector Application
Series 4 Router (R640)	21.51	1D01.21.50.0010	Rout.21.50.hex	NA
Series 5 Router (R650)	21.51	2101.21.50.0010	Rout.21.50.hex	NA
Series 5 Network Router (R651)	21.51	N/A	N/A	NA
C7400 Collector	21.51	1D7F.21.50.0011	Coll.21.50.hex	4.8.37
C7500 Collector	21.51	217F.21.50.0011	Coll.21.50.hex	4.8.37
C6400 Collector	21.51	1D7F.21.50.0011	Coll.21.50.hex	4.8.37
C6500 Collector	21.51	217F.21.50.0011	Coll.21.50.hex	4.8.37
Series 4 IWR	21.51	NA	NA	NA
Series 5 IWR	21.51	NA	NA	NA
Series 3 Concentrator	21.51	1501.21.50.0012	Conc.21.50.hex	NA
Series 4 Concentrator	21.51	1D01.21.50.0012	Conc.21.50.hex	NA
Network Node (N500)	21.51	N/A	N/A	NA
G5 Streetlight	21.51	2D0B.21.50.012B	DAGW.21.50.hex	NA
Comms Adapter	17.50	2614.17.50.001A	CADP.17.50.hex	NA
Gridstream Mobile Radio	NA	NA	NA	NA
N2200 Network Bridge (Series 5)	21.51	2D7F.21.50.0010	Coll.21.50.hex	6.2.15 <sup>4</sup>

<sup>4</sup> If you want to upgrade from a release earlier than 6.X, you must perform an intermediate upgrade. Please follow the instructions in the RF Mesh/RF Mesh IP Gateway Application N-Series 6.2.15 Release Notes, publication number 98-2691.

Hardware Type	Firmware Version	DCW Identification	DCW Filename	Collector Application
N2400 Network Gateway (Series 5)	21.51	2D7F.21.50.0011	Coll.21.50.hex	6.2.15 <sup>4</sup>

## RF Mesh IP (SBS) Products

The following products are qualified and available for upgrades with use in Command Center version 8.2:

### Electric

Hardware Type	Module Firmware	Firmware/DCW RF Mesh IP Bundle	Metrology	ZigBee
G5i FOCUS AXe (Series 5)	NA	22.50/22.50	5.72	2.04.19
G5i Integrated FOCUS AXe (Series 5)	NA	22.50/22.50	5.72	2.04.19
G5i Honeywell REX Universal	NA	22.50/22.50	4.03	2.04.19
Aclara I+210+c (Series 5)	NA	NA	NA	NA
G5i S4x (Series 5)	NA	22.50/22.50	8.15	2.04.19
G5i S4x (Series 6)	NA	22.50/22.50	8.15	2.04.19
G6i Revelo	NA	NA	NA	NA

## SOUTH AMERICA

Hardware Type	Module Firmware	Firmware/DCW RF Mesh IP Bundle	Metrology	ZigBee
G5i SGP+M IWR	NA	22.50/22.50	NA	NA
G5i Cabinet Meter SGP+M	NA	22.50/22.50	3.18 <sup>5</sup> 3.14	NA
G5i 3 <sup>rd</sup> party meters IWR	NA	22.50/22.50	NA	NA
G5i Power Vault IWR	NA	22.50/22.50	NA	NA
G5i Recloser IWR	NA	22.50/22.50	NA	NA
G5i E430 ABNT	NA	22.50/22.50	01.52 <sup>1</sup>	NA
G5i E450 ABNT	NA	22.50/22.50	01.52 <sup>1</sup>	NA
G5i E650 G2 ABNT	NA	22.50/22.50	01.64 <sup>1</sup> 51.14 <sup>6</sup>	NA
G5i E750 G2 ABNT	NA	22.50/22.50	01.64 <sup>1</sup>	NA
G5i Cabinet Meter E13 SGP+M	NA	22.50/22.50	60K 60L	NA
NSX 112i P314i 113i P213i	NA	22.50/22.50	1.09	NA

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<sup>5</sup> INMETRO Version

<sup>6</sup> Energy Balance

ASIA- PACIFIC				
Hardware Type	Module Firmware	Firmware/DCW RF Mesh IP Bundle	Metrology	ZigBee
Series V U1200 RF SBS	NA	22.50/22.50	05.05.R50	NA
Series V U1300 RF SBS	NA	22.50/22.50	07.00.006	NA
Series V U3350 RF SBS	NA	22.50/22.50	05.05.R50	NA
Series V U3400 RF SBS	NA	22.50/22.50	07.00.006	NA
Series V S1100 RF SBS	NA	22.50/22.50	1.03.028	NA
Series V R1100 RF SBS	NA	22.50/22.50	05.05.R12	NA
LY SM100	NA	22.50/22.50	44	NA
LY SM300	NA	22.50/22.50	28	NA
E35C-RF Series U	NA	22.50/22.50	NA	NA
E420-RF Integrated Meter	NA	22.50/22.50	NA	NA
E320 SM-100	NA	22.50/22.50	44	NA
E320 SM-300	NA	22.50/22.50	28	NA
E350 SM-110: 1 PSM	NA	NA	01.802.02	NA
E350 SM-310: 3 PSM WCM	NA	NA	01.502.14	NA
E670 SM-405: 3 PSM LTCT	NA	NA	01.202.14	NA
E350 SM-100 LC 1PSM	NA	22.50/22.50	01.805.10	NA
E350 SM110E	NA	NA	LGZ0-V04 <sup>7</sup>	NA
E350 SM310E	NA	NA	LGZ3-V04 <sup>3</sup>	NA
HPL LTCT	NA	NA	800.59	NA
1P HPL	NA	NA	900.58	NA
1P L&T	NA	NA	RS04.00.12	NA
Mk7B Single Phase	NA	22.50/22.50	v2_381.01	NA
Mk10D Three Phase	NA	22.50/22.50	v2_381.01	NA

<sup>7</sup> Meter manufacturer needs to enhance meter firmware to make metrology more robust.

## Network Equipment

Hardware Type	Module Firmware	Firmware/DCW RF Mesh IP Bundle	Collector Application
G5i Router R650 (Series 5)	NA	22.50/22.50	NA
G5i Collector (C6500)	NA	22.50/22.50	4.8.37
G5i IWR (Series 5)	NA	22.50/22.50	NA
Network Router R651 (Series 5)	NA	22.50/NA	NA
Behind the Meter Collector (N2150)	NA	22.50/22.50	6.2.15
Network Node (N550)	NA	22.50/NA	NA
Network Node (N551)	NA	22.50/NA	NA
Network Bridge N2250 (Series 5)	NA	22.50/22.50	6.2.15 <sup>8</sup>
Network Bridge N2250 (Series 6)	NA	22.50/22.50	6.2.15 <sup>4</sup>
Network Gateway N2450 (Series 5)	NA	22.50/22.50	6.2.15 <sup>4</sup>
Network Gateway N2450 (Series 6)	NA	22.50/22.50	6.2.15 <sup>4</sup>
G5i Streetlight	NA	22.50/22.50	NA
Comms Adapter	NA	18.57/18.52	NA
Gridstream Mobile Radio	NA	NA	NA

<sup>8</sup> If you want to upgrade from a release earlier than 6.X, you must perform an intermediate upgrade. Please follow the instructions in the RF Mesh IP/RF Mesh IP Gateway Application 6.2.15 N-Series Release Notes, publication number 98-2691.

## Cellular

### ASIA- PACIFIC

Hardware Type	Module Firmware	Firmware/DCW RF Mesh IP Bundle	Metrology	ZigBee
S1100	NA	22.50/22.50	1.03.028	NA
R1100	NA	22.50/22.50	05.05.R12	NA
U1200	NA	22.50/22.50	05.05.R50	NA
U1300	NA	22.50/22.50	07.00.006	NA
U3350	NA	22.50/22.50	06.00.005	NA
U3400	NA	22.50/22.50	07.00.006	NA

### NORTH AMERICA

Hardware Type	Module Firmware	Firmware/DCW RF Mesh IP Bundle	Metrology	ZigBee
LTE-M Cellular FOCUS AXe	NA	16.59/16.64	5.70	2.04.19
LTE-M Cellular S4x	NA	16.59/16.64	8.14	2.04.19

## Wi-SUN

Hardware Type	Module Firmware	Firmware/DCW RF Mesh IP Bundle	Metrology	ZigBee
G6 Revelo	NA	NA	NA	NA

## Gridstream PLX

Hardware Type	Firmware Version	Metrology
Collector 3000	6.2.0.430/ 3.01.19.3000 / 3.01.21.3000 6.3.0.507 / 3.01.19.3000	NA
FOCUS AL	9.20	3.34
FOCUS AX, AX-SD	9.20	5.35, 5.37
FOCUS AXe	10.15	5.70
S4e	9.20	6.32
S4x	10.14	8.13

## Gridstream PLC (TS2)

Hardware Type	Firmware Version	Metrology
SPU 2000 – VxWorks	2.15.0.60 / 2.12.35	NA
SPU 2000 – Linux	4.3.2.32/ 2.12.33	NA
Collector 3000 – VxWorks	2.15.0.60 / 2.3.14.3000	NA
Collector 3000 – Linux – Old Hardware	4.3.2.31 / 2.03.14.3000	NA
Collector 3000 – Linux – New Hardware	6.2.0.430/ 2.03.14.3000 6.3.0.507 / 2.03.14.3000	NA
Remote Service Switch (RSS)	9	NA
Load Control Switch (LCS)	13	NA
GE KV2c	40	4.0 or later
Itron Centron	30	NA

Hardware Type	Firmware Version	Metrology
Standard AMR	22	NA
FOCUS AL	25	2.32
FOCUS AX, AX-SD/ZigBee	21/10	5.34 only
S4e	49	7.18

## TS1

Hardware Type	Firmware Version	Metrology
SPU 1000 – VxWorks	2.15.0.60/1.10.3	NA
SPU 1000 – VxWorks	2.15.0.60/1.10.3	NA
SPU 1000 – Linux	4.3.2.31 1.10.03	NA
Collector 3000 – VxWorks	2.15.0.60/1.7.9.3000	NA
Collector 3000 – Linux – Old Hardware	4.3.2.31/1.07.09.3000	NA
Collector 3000 – Linux – New Hardware	6.1.1.313/ 1.07.09.3000	NA
TS1 S4e	7	7.12
TS1 DRR GE Kv2C	19	4.0
TS1 Mechanical	4	NA

## PLC Tool

Hardware Type	Firmware Version	Metrology
OptoWand+	21	NA



# 1132 Compatibility

1132 Compatibility Matrix for Command Center 8.2					
Latest Firmware Version Supported for Over-The Air (OTA) Programming					
Command Center	Maximum 1132 Version for Config File Import	FOCUS AX (5.28 - 5.44)	FOCUS AXi (5.45 - 5.59)	FOCUS AXe (5.60+)	E650 (S4x) (8.01+)
7.6	5.13: GA, MR1 and MR2	5.39	5.47	5.70 5.72	8.15
8.0					
8.1					
8.2					

## Installation Instructions

### Centralized Installer

Command Center 8.1 and all components require installation be performed using the Centralized Installer (CIN).

For more information on the installation procedures using the Centralized Installer, please refer to the *Command Center Installation Using the Centralized Installer and ICMS Framework*, publication number 98-2230 Rev AK.

Please refer to all Centralized Installer documentation for the Command Center 8.1 under the “Related Documentation” section of this document.

### Platform Migration Tool

RF Mesh IP customers that have deployed the G5i FOCUS AXe, S4x, LYSM 100, LYSM 300-meter platforms and/or RF Mesh and RF Mesh IP Series 5 Two-Way water products prior to the installation of Command Center 8.1 and have not yet executed the Landis+Gyr Platform Migration Tool post installation either Command Center 7.4, 7.5, 7.6 or 8.0, must execute the tool post installation of Command Center 8.1.

The DAS (EDPL) and DAS LYSM (EDPL) migration are required to migrate device information to the Network Hub (NAS) platform component.

Please refer to the *Landis+Gyr Platform Data Migration Tool User Guide v8.1, V7.6, 7.5 and 7.4*, publication number 98-2528 Rev AC, for more information.

## Capability Service & Network Hub Removal Migration

As an effort to improve overall system performance and resource utilization, it was determined that the Capability Service and Network Hub could be eliminated. The Capability Service functionality was merged into Command Center and the Network Hub functionality was merged into Device Hub. Anyone with Command Center 8.1 or later will not need these components.

**Note:** Customers using SQL Server and were utilizing the Network Hub component prior to Command Center 8.1, need to upgrade their SQL-to-SQL 2016 or greater prior to the upgrade of Command Center 8.1 for the removal of the Network Hub migration.

## Luna Client

When upgrading any Command Center deployment using Advanced Security to Command Center 8.2, please carefully read *ICMS Installation Add-On: Gemalto Luna Client Package Specifics*, publication number 98-2570 Rev AB (or more recent), section 5.1.1. This document contains critical information about the orchestration of the upgrade of the Luna client during the maintenance window.

When upgrading any Command Center deployment using Advanced Security to Command Center 8.2, special care will be taken to:

- If using **lunaSAclient** component older than 10.1.1.2, create a new profile containing **lunaSAcomponent 10.1.1.2**
- Navigate to **Misc** tab in **CIN UI** to set **Luna Client** architecture setting to **64bit** ; save settings.
- When Command Center is quiesced (no more data coming in and backlog of queued messages processing is completed):
  - if existing Command Center is already deployed using **lunaSAcomponent 10.1.1.2**, re-install same **lunaSAcomponent** profile to all Command Center application servers (Primary and Auxiliary).
  - if existing Command Center is deployed using **lunaSAcomponent 10.1.1.1** or older, upgrade existing **lunaSAcomponent** profile to newly created **lunaSAcomponent 10.1.1.2** profile to all Command Center application servers (Primary and Auxiliary).

**Note:** LunaSAclient 10.1.1.2 is not supported with HSM software 5.X versions. Customers using HSM Luna SA5 with HSM Software 5.2.6 or other 5.X versions will need to upgrade the HSM Software to a 6.X versions prior to installing Command Center 8.2. HSM software upgrade is **not** required for HSM Luna SA6 and HSM Luna 7. Please contact Landis+Gyr for help and instructions on upgrading the HSM software.

# New Enhancements and Functionality

## System Support for RF Mesh IP & Wi-SUN E360 Residential Revelo

Command Center 8.2 introduces core AMI support for the Series 6 RF Mesh IP and Wi-SUN E360 Residential Revelo metering platform. Revelo is the industry-first IoT grid sensing electric meter. The real-time edge intelligence enabled by Revelo's metering technology provides real-time visibility to unprecedented data and active behind and in-front of the meter.

Revelo metering platform features include:

- IoT sensing that leverages high resolution Waveform data sampling (15 kHz)
- High resolution current and voltage streaming to an integrated Edge Intelligence Card
- Gridstream Connect App OS enabled sensor
- Communications flexibility
- Grid Apps: Grid Location Awareness, Anomaly Detection, and Intelligent Voltage Monitoring
- Consumer Apps: Home Analytics, Real-time High Energy Usage Alerts, and Meter Safety Alerts
- Open application ecosystem with third-party and utility partner application creation potential
- Enhanced power quality
- Richer harmonics measurement
- High-resolution billing system (ready for the future of transactive energy)
- 200A and 320A remote disconnect
- Millisecond accuracy network time
- Micro arc sensing at the meter blades
- Wi-Fi and internet enabled



**Note:** Full solution support of the Series 6 RF Mesh IP and Wi-SUN Revelo metering platform will be in Command Center 8.3 with the general availability of the E360 Revelo Residential meter.

For more information, please reference the *Landis+Gyr Gridstream G6 Wi-SUN and G61 RF Mesh IP Revelo User Guide for E360 Revelo*, publication number 98-2749, which will be provided at a later date. Please contact your sales representative for details regarding product availability.

## System Support for RF Mesh/Mesh IP FOCUS AXei E332/E352

Command Center 8.2 supports the enhanced RF Mesh and RF Mesh IP FOCUS AXei E332/E352 meter platform.

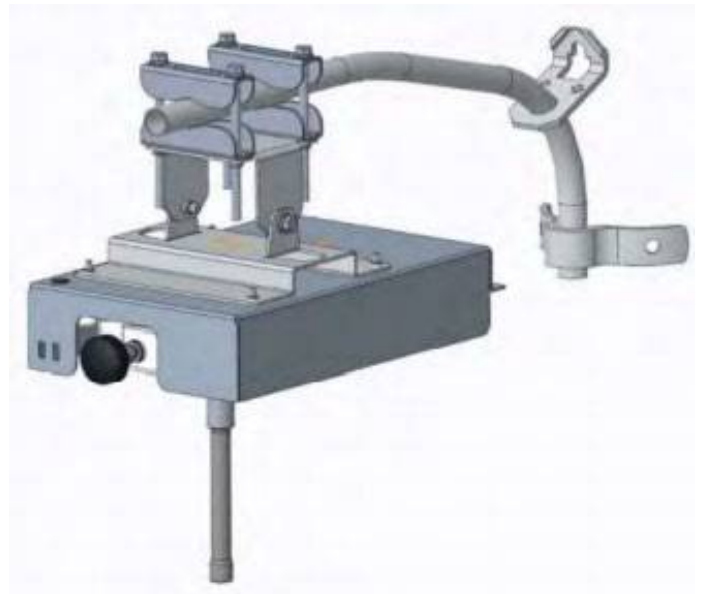
Please contact your sales representative for details regarding product availability.

## System Support for OFDM Series 6 Network Router

Command Center 8.2 introduces support for the Series 6 OFDM RF Mesh IP Network Router. The Network Router supports RS-232/485 serial interface for Transparent Packet Protocol (TPP) and RS-232 serial interface for LAN Packet Protocol (LPP). The LAN Packet Protocol line is used to communicate to devices which use LPP, such as a PC with configuration or diagnostic software, or an end device which has implemented LPP. The TPP provides a general data port and is used to transport byte-oriented data, such as that generated by industry standard protocols.

In an AMI system, routers are used to create a robust communications path to a collector or for SmartGrid applications. In a Distribution Automation (DA) application, it is commonly interfaced with such devices as Remote Terminal Units (RTUs), Programmable Logic Controllers (PLCs), and other Intelligent End Devices (IEDs) and communicates via RS-232/485 TPP to end devices.

This next generation router provides for superior battery life and flexible communications. The Enhanced Mesh Router is battery backed with up to 15 hours of battery retention. It is Global Positioning System (GPS) enabled for location services and time synchronization accuracy improvements.



For more information, please reference the *Network Router (R651 & R661) Installation and User Guide*, publication number 98-2427, and the *Network Router Data Sheet*, publication number 98-2678. Please contact your sales representative for details regarding product availability.

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**NOTE:** With the support of the Network Router, an updated event mask was required. This updated event mask affects all network devices (Collectors, Routers, Bridges and Gateways). It is expected that newly deployed network devices will initially go through a reconfiguration upon installation to update to the new default configuration group.

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## System Support for Version 2 Streetlight Controller

Command Center 8.2 introduces enhanced support for our existing and next generation RF Mesh/Mesh IP Streetlight Controllers. Controllers included are:

- G5 Streetlight Gateway
- G5 Streetlight V1
- G5 Streetlight V2
- G5 Streetlight V2 Gateway
- G5i Streetlight Gateway
- G5i Streetlight V1
- G5i Streetlight V2
- G5i Streetlight V2 Gateway

Please contact your sales representative for details regarding product availability.

## Two-Way Water Interval Consumption Readings

The RF Mesh and RF Mesh IP Series 5 Two-Way Water modules send the register read as received from the water meter for each interval to Command Center. In Command Center 8.2, customers can choose to have interval consumption, the delta between two consecutive interval register reads, calculated by Command Center.

A new Organization Information, Reading Setting, has been added to enable the Calculate Water Interval consumption feature for Series 5 water modules. This setting is disabled by default.

Readings Settings		
Validation Group	Default Validation Group	Indicates which group will be used to hold the default processing rules for all meters that are not assigned to another Validation Group.
Calculate Water Interval Consumption	<input type="checkbox"/>	When enabled, Command Center will calculate interval consumption for Series 5 Water meters.
Enable Gas Meters Raw Pulse Counts Recording	<input type="checkbox"/>	Enable to record gas meter raw pulse counts.
RF Gas Meter Default Billing Start Time	10:00 AM	This is the Billing Start Time / Self Read Time for Residential and Commercial Gas modules assigned to default Endpoint Configuration Groups. Changing this setting will be applicable for all Gas modules registering in Command Center going forward; Gas modules in Normal state will NOT be automatically reconfigured. The value also defines the default of the Billing Start Time field on the Residential and Commercial Configuration Groups screen when a new custom Endpoint Configuration Group is created. The value can be modified when creating the custom group.
RF Water Meter Default Billing Start Time	10:00 AM	This is the Billing Start Time for Water modules assigned to default Endpoint Configuration Groups. Changing this setting will be applicable for all Water modules registering in Command Center going forward; Water modules in Normal state will NOT be automatically reconfigured. The value also defines the default of the Billing Start Time field on the Water Configuration Groups screen when a new custom Endpoint Configuration Group is created. The value can be modified when creating the custom group.
Max Interval Data Range Request Minutes	1440	The maximum number of minutes allowed when issuing 'Get Load Profile' command.
Water Meter Right Sizing Duration	7 Days	Number of days for Right Sizing to collect data from the water meter.

Once enabled, the calculation is done on both read pushes from the module, as well as responses to the Get Endpoint Read Data command to manually fill reading gaps. The data is stored in Command Center in addition to the register read intervals, and both can be viewed on the Endpoint Information page and extracted in the Interval extracts.

**Gridstream RF Endpoint Information** 🌐 🔄 ?

Meter #**40A81BFD** Endpoint S/N **1084759037(40A81BFD)**

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Status: Normal [\[View History\]](#) Last Reading: 5829122.0000 - 6/28/2021 6:00:00 AM

Model: Water M520 Mi.Node IP

Configuration Group: [LG RF Water Configuration D](#) Latitude: 46.603048 Longitude: -94.267982

Collector: [BEP Farm Mesh IP\\_WH](#) - Layer: 2 Current Neighbor: S/N [2423288324\(90707204\)](#) (Normal)

---

General | Manage | Readings | **Interval Data** | History | Security

GAL  Consumption GAL  Right Sizing Data

**Interval Data**     1  3  7 Day(s) 🗨️ 🔄

Others

Info	Interval Date	Gap(+)	GAL	Interval	Consumption GAL	Consumption Interval	Status	UTC Offset
Published	6/28/2021 12:00:00 AM		5820397	60 Minute Full Register Read	1747	60 Minute	OK	-240
Published	6/28/2021 1:00:00 AM		5822140	60 Minute Full Register Read	1743	60 Minute	OK	-240
Published	6/28/2021 2:00:00 AM		5823887	60 Minute Full Register Read	1747	60 Minute	OK	-240
Published	6/28/2021 3:00:00 AM		5825634	60 Minute Full Register Read	1747	60 Minute	OK	-240
Published	6/28/2021 4:00:00 AM		5827381	60 Minute Full Register Read	1747	60 Minute	OK	-240
Published	6/28/2021 5:00:00 AM		5829122	60 Minute Full Register Read	1741	60 Minute	OK	-240
Published	6/28/2021 6:00:00 AM		5830858	60 Minute Full Register Read	1736	60 Minute	OK	-240

**NOTE:** Command Center will not estimate any interval consumption values if interval register reads are missing or set to zero if the radio firmware cannot get the interval read from the meter. The consumption calculation algorithm only calculates the delta between two consecutive available register read intervals.

## Gas Gap Reconciliation

Utilities now have the option to enable the Readings Gap Reconciliation process for gas modules. Command Center provides a series of settings to configure this feature.

### Organization Information

Under Organization Information you will see a new section, Low Energy Endpoint Reading Gap Reconciliation Settings:

Low Energy Endpoint Readings Gap Reconciliation Settings		
<b>Low Energy Endpoint Settings</b>		
Enable Gas Readings Gap Reconciliation	<input type="radio"/> All <input checked="" type="radio"/> Enrolled via Status Group	Specifies whether Gas endpoints must be actively enrolled via Status Group to be enabled for Readings Gap Reconciliation, or whether all endpoints are enrolled per default. Readings Gap Reconciliation is only performed if the Low Energy Endpoint Readings Gap Reconciliation/Retry processes are enabled.
Default Gas Gap Reconciliation Status Group	Select Status Group	If 'All' is selected in Enable Gas Readings Gap Reconciliation, this setting specifies the Status Group that defines the Low Energy Endpoint Readings Gap Reconciliation parameters for all Gas endpoints by default. A group must be selected for Readings Gap Reconciliation to take effect.
<b>Gap Collection Settings</b>		
Batching Algorithm	Sequential Collector Based	Algorithm to be used to process Low Energy Endpoint Gap reconciliation requests.
Batching Collector Max Number of Parallel Threads	10	Maximum number of parallel threads for Low Energy Endpoint Readings Gap collection, if the Collector Based batching algorithm is chosen.
Blackout Begin Time	12:00 AM	Begin time to stop the Low Energy Endpoint Readings Gap collection from issuing gap request commands to collect the data.
Blackout End Time	4:00 AM	End time of the time window for the Low Energy Endpoint Readings Gap collection not issuing gap request commands to collect the data.
Commands Batch Size	1000	Number of commands that will be collected in each batch for a Low Energy Endpoint Readings Gap collection run.
End Time Lookback Buffer Minutes	5	Number of buffer minutes subtracted from the current UTC time to create the look back end time for the Low Energy Endpoint Readings Gap Reconciliation process.
Initial Lookback Hours	4	Time interval the Low Energy Endpoint Readings Gap Reconciliation process should look back to determine reading gaps on first run.
Max Commands Per Run	10000	Maximum number of commands per Low Energy Endpoint Readings Gap collection run.
Max Commands Per Run Per Collector (RF)	100	Maximum commands per Low Energy Endpoint Readings Gap collection run per Collector for the RF network.
Request Batch Size in Minutes	5	Time in minutes each Low Energy Endpoint Readings Gap batch uses to query the database looking for gaps.
<b>Gap Retry Settings</b>		
Command Response Time Delay Minutes (RF)	60	Time in minutes to wait for a Low Energy Endpoint command response before issuing a Readings Gap retry command in the RF network.
End Time Lookback Buffer Minutes	5	Number of buffer minutes subtracted from the current UTC time to create the look back end time for the Low Energy Endpoint Readings Gap Reconciliation Retry process.
Initial Lookback Hours	6	Time interval the Low Energy Endpoint Readings Gap Reconciliation Retry process should look back to determine reading gaps on first run.

These setting specify whether gas endpoints must be actively enrolled in readings gap reconciliation via Status Group, or whether all endpoints are enrolled per default when the Low Energy Endpoint Readings Gap Reconciliation processes are running. The setting defaults to **Enrolled via Status Group**.

If **All** is selected, the Status Group with the default settings for readings gap reconciliation must be selected via the next setting.

**Default Gas Gap Reconciliation Status Group:** If the Enable Gas Readings Gap Reconciliation setting is set to **All**, this setting specifies the Status Group that defines the readings gap reconciliation parameters for all gas endpoints by default. A group must be selected for readings gap reconciliation to take effect.

The following Gap Collection Settings define how the RF Low Energy Endpoint Gap Reconciliation Process handles and processes reading gaps. Before changing the defaults of these settings, customers should consult with Landis+Gyr first to ensure that the settings are suitable for their mesh network and number of endpoints.

**Batching Algorithm:** This setting specifies the algorithm to be used to process gap reconciliation requests. The options are **Sequential** and **Sequential Collector Based**. Per default **Sequential** is selected, which is also the recommended option.

**Batching Collector Max Number of Parallel Threads:** If the Batching Algorithm setting is set to **Sequential Collector Based**, this setting specifies the maximum number of parallel threads for Low Energy Endpoint Readings Gap collection. The default setting is **10**, with allowed values from **1** to **50**.

**Blackout Begin Time – Blackout End Time:** These two settings define the start and end of a blackout window during which no gap request commands are sent to gas modules. Sending queued up commands will be halted during this time and resumes after the blackout window.

**Commands Batch Size:** This setting specifies the number of commands submitted within each batch of the Low Energy Endpoint Readings Gap collection run. The default value is **1000**, with allowed values from **50** to **5000**.

**End Time Lookback Buffer Minutes:** The setting specifies the number of minutes subtracted from the current time (in UTC) to create the lookback end time for the Low Energy Endpoint Readings Gap Reconciliation process. The default is **5** minutes, with the option to select **1** to **10**. (See also next setting.)

**Initial Lookback Hours:** The setting specifies how far back into the past the Low Energy Endpoint Readings Gap Reconciliation process should look back to determine reading gaps on the first run of the process. The default is **4** hours, with the option to select **1** to **24**.

**Max Commands Per Run:** The setting specifies the maximum number of commands submitted per Low Energy Endpoint Readings Gap collection run. The default is **10000**, with valid values between **1** and **300000**.

**Max Commands Per Run Per Collector (RF):** The setting specifies the maximum number of commands submitted per Low Energy Endpoint Readings Gap collection run per Collector. The default is **100**, with valid values between **1** and **1000**.

**Request Batch Size in Minutes:** The setting specifies the time each Low Energy Endpoint Readings Gap batch uses to query the database looking for gaps. The default is **5** minutes, with the option of **5** to **60**.

The following Gap Retry Settings are applicable for the RF Low Energy Endpoint Gap Reconciliation Retry Process. Same as for the settings above, before changing the defaults of these settings, customers should consult with Landis+Gyr first.

**Command Response Time Delay Minutes (RF):** This setting specifies the time in minutes how long Command Center will wait for a command response before re-issuing the gap collection command. The default is **60** minutes, with the option of **30** to **240**.

**(Retry) End Time Lookback Buffer Minutes:** The setting specifies the number of minutes subtracted from the current time (in UTC) to create the lookback end time for the Low Energy Endpoint Readings Gap Reconciliation Retry process. The default is **5** minutes, with the option to select **1** to **10**. (See also next setting.)



**(Retry) Initial Lookback Hours:** The setting specifies how far back into the past the Low Energy Endpoint Readings Gap Reconciliation Retry process should look back to determine reading gaps on the first run of the process. The default is **6** hours, with the option to select **1** to **24**.

## Process Settings

**RF Low Energy Endpoint Gap Reconciliation Process:** This process is responsible for sending reading gap fill requests to gas endpoints for which readings processing has detected gaps of interval data. The process can be customized via various Organization Information settings (and settings of Status Groups to which the modules are assigned).

The process is disabled by default and must be manually enabled by customers. The default frequency is hourly, with options to run it every x hours, from hourly to max 24 hours.

**RF Low Energy Endpoint Gap Reconciliation Retry Process:** This process works in conjunction with the RF Low Energy Endpoint Gap Reconciliation process. If no response is received within a configured amount of time for a readings gap fill request sent from Command Center to a gas module, this process resends the request to fill the gap. The process can be customized via various Organization Information settings and settings of Status Groups to which the modules are assigned

The process is disabled by default and must be manually enabled by customers. The default frequency is hourly, with options to run it every x hours, from hourly to max 24 hours.

<input type="checkbox"/>	RF Low Energy Endpoint Readings Gap Reconciliation	Every	1 hour ▼
<input type="checkbox"/>	RF Low Energy Endpoint Readings Gap Reconciliation Retry	Every	1 hour ▼

## Status Groups

### All or Selected Endpoints Included in Gap Reconciliation

The Enable Gas Readings Gap Reconciliation Organization Information setting defines whether all gas modules should be included in readings gap reconciliation or only specific modules that are assigned to a Readings Gap Reconciliation status group.

Per default, this setting is set to **Enrolled via Status Group**, which means that only gas modules that are manually moved to one of the Readings Gap Reconciliation status groups will be included in the process. If the setting is set to **All**, customers must select a default status group via the Default Gas Gap Reconciliation Status Group Organization Information setting. This enables all gas endpoints to be included in readings gap reconciliation with the settings specified via that selected default group, except for endpoints that are manually assigned to another readings gap reconciliation status group. However, none of the gas modules can be excluded in this scenario.

**Note:** Unlike manual assignment of modules to status groups, the selected default status group in the **All** endpoints scenario does not display the list of all gas modules when the group is viewed, and the group does not show on the gas modules' Endpoint Information page. The assignment is behind the scenes via the Organization Information setting only.

### Readings Gap Reconciliation Status Group Settings

Customers can create their own custom Readings Gap Reconciliation status groups to customize the process. All of the settings can be modified; however, some settings should be carefully selected, and customers should get Landis+Gyr advice before changing default values.

**Low Energy Endpoint Readings Gap Reconciliation Group** ?

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Group Name  [\[Edit Description\]](#)

Active  Start Date  End Date

Low Energy Endpoint Type

Gap Reconciliation Period in Days	<input type="text" value="30"/>	Period in days within which the Maximum Number of Gap Reconciliation request commands should not be exceeded.
Max Gap Reconciliation Requests per Period	<input type="text" value="5"/>	Maximum number of Gap Reconciliation request commands to be sent to an endpoint within the Gap Reconciliation Period.
Max Gap Reconciliation Requests per Parent	<input type="text" value="10"/>	Maximum number of Gap Reconciliation request commands to be sent to all endpoints associated with the same parent within the Passive Sync period.
Gap Scattering Window in Minutes	<input type="text" value="240"/>	Period in minutes within which Command Center will spread out sending Gap Reconciliation requests to ensure that not all requests are sent at the same time.
Large Gap Threshold in Hours	<input type="text" value="24"/>	Large gap threshold in hours beyond which Command Center will break a gap into multiple Gap Reconciliation command requests to avoid too large response packets from the endpoint. Note that this setting is only applicable for next generation Gas modules and should depend on the interval length, which results in the varying number of intervals included in one response.
Max Gap Reconciliation Retries	<input type="text" value="3"/>	Maximum number of Gap Reconciliation retries per gap per endpoint.
Gap Reconciliation Retry After Hours	<input type="text" value="24"/>	Minimum number of hours after which a failed or incomplete Gap Reconciliation request will be retried.

Setting	Description	Default	Min Value	Max Value
Gap Reconciliation Period in Days	Period in days within which the Maximum Number of Gap Reconciliation request commands should not be exceeded.	30 days	5	90
Max Gap Reconciliation Requests per Period	Maximum number of Gap Reconciliation request commands to be sent to an endpoint within the Gap Reconciliation Period. If the number of specified requests is exceeded, the RF Gas Max Readings Gap Reconciliation Requests Exceeded event is raised for the gas endpoint.	5	1	15
Max Gap Reconciliation Requests per Parent	Maximum number of Gap Reconciliation request commands to be sent to all endpoints associated with the same parent within the Passive Sync period.	10	1	1000
Gap Scattering Window in Minutes	Period in minutes within which Command Center will spread out sending Gap Reconciliation requests to ensure that not all requests are sent at the same time.	240 min	60	1200
Large Gap Threshold in Hours	Large gap threshold in hours beyond which Command Center will break a gap into multiple Gap Reconciliation command requests to avoid too large response packets from the endpoint. Note that this setting is only applicable for next generation Gas modules and should depend on the interval length, which results in the varying number of intervals included in one response.	24 hrs	3	96
Max Gap Reconciliation Retries	Maximum number of Gap Reconciliation retries per gap per endpoint. If the number of specified retries is exceeded, the RF Gas Max Readings Gap Reconciliation Retries Exceeded event is raised for the gas endpoint.	3	1	3
Gap Reconciliation Retry After Hours	Minimum number of hours after which a failed or incomplete Gap Reconciliation request will be retried.	24 hrs	6	48










## Default Readings Gap Reconciliation Status Groups

Command Center provides three seeded default status groups that can be used by customers. These default status groups cannot be changed or deleted, but they can be copied to create custom groups.

### Status Groups

Endpoint Group Type	Description
<input checked="" type="checkbox"/> Disconnected	Endpoints where service has been disconnected.
<input checked="" type="checkbox"/> Low Energy Endpoint Readings Gap Reconciliation	Low Energy Endpoints that should be included in Readings Gap Reconciliation.

Name	Meters	Start Date	End Date	Actions
✓ High Impact Gas Readings Gap Reconciliation (Default)	0	7/22/2021	1/1/3000	  
✓ Low Impact Gas Readings Gap Reconciliation (Default)	0	7/22/2021	1/1/3000	  
✓ Medium Impact Gas Readings Gap Reconciliation (Default)	0	7/22/2021	1/1/3000	  

The default groups provide the following settings:

Default Status Group Setting	Low Impact Gas Readings Gap Reconciliation Status Group	Medium Impact Gas Readings Gap Reconciliation Status Group	High Impact Gas Readings Gap Reconciliation Status Group
Gap Reconciliation Period in Days	60	45	30
Max Gap Reconciliation Requests per Period	5	10	15
Max Gap Reconciliation Requests per Parent	4	10	15
Gap Scattering Window in Minutes	240	240	240
Large Gap Threshold in Hours	24	24	24
Max Gap Reconciliation Retries	2	2	2
Gap Reconciliation Retry After Hours	24	242	24

## Meter Configuration History Report

A new report has been added to view the historical over-the-air meter reprogramming, using the Meter Program Download command, to a new meter configuration. The Meter Configuration History report can be found under the Reporting menu. Upon Command Center 8.2 upgrade and as over-the-air meter reprogramming is being performed, Command Center will track and report on meter program history for each meter with a start and end date. The report will include full or partial meter reprogramming and is supported for RF Mesh, RF Mesh IP, Cellular and Wi-SUN technologies. This report is for meter models that support the Meter Program Download command.

**Meter Configuration History** T All ?

Export to Excel Export to PDF

Drag a column header and drop it here to group by that column

Meter #	Meter Program Name	Meter Program ID	End Device Model	Status	Effective Start Date
<a href="#">92009062</a>	<a href="#">N/A (64040)</a>	0001	G5 Integrated AXei E332/E352	Normal	9/21/2021 1:44:18 PM
<a href="#">F0AF15E8</a>	<a href="#">5RatesRF</a>	000111	FOCUS Universal AX	Normal	9/13/2021 8:59:00 PM
<a href="#">90617C54</a>	<a href="#">5Rates</a>	0020	G5i Integrated FOCUS AXe	Normal	9/16/2021 10:16:27 AM
<a href="#">F0C10284</a>	<a href="#">5Rates</a>	0020	FOCUS Universal AX	Normal	8/5/2021 11:08:00 PM
<a href="#">9082C03E</a>	<a href="#">30Min</a>	0030	FOCUS AXe	Normal	9/24/2021 10:31:00 AM
<a href="#">910888D4</a>	<a href="#">30Min</a>	0030	FOCUS AXe	Normal	9/20/2021 2:37:49 PM
<a href="#">507585D5</a>	<a href="#">NewSummations</a>	0123	FOCUS AXe	Normal	9/7/2021 3:58:00 PM
<a href="#">90707647</a>	<a href="#">NeFAXScale10TOU</a>	20220	G5i Integrated FOCUS AXe	Normal	9/14/2021 10:26:15 PM
<a href="#">50BA070D</a>	<a href="#">S4XComplexTOU</a>	2030	RF G5i S4x	Normal	9/3/2021 12:23:01 PM
<a href="#">50C73149</a>	<a href="#">S4XComplexTOU</a>	2030	Enhanced S4x	Normal	9/3/2021 11:50:52 AM
<a href="#">50C73165</a>	<a href="#">S4XComplexTOU</a>	2030	RF G5i S4x	Normal	9/16/2021 10:46:44 AM
<a href="#">91088877</a>	<a href="#">Q1andQ4kVARTOU</a>	2040	Enhanced S4x	Normal	9/14/2021 2:17:26 PM
<a href="#">810D5337</a>	<a href="#">N/A (54752)</a>	33034	kV2c	Normal	4/16/2021 9:21:00 PM
<a href="#">810D5338</a>	<a href="#">N/A (32024)</a>	33034	kV2c	Normal	2/11/2021 1:38:00 PM
<a href="#">920088F1</a>	<a href="#">DailyMoTariff</a>	33050	G5 Aclara I210+c	Normal	9/23/2021 2:49:43 PM
<a href="#">92008A98</a>	<a href="#">Fm2SEd50002</a>	50008	G5i Aclara I210+c	Normal	9/14/2021 3:17:03 PM
<a href="#">50C7314F</a>	<a href="#">pac2v2NS1LP</a>	PAC1LP	Enhanced S4x	Normal	9/24/2021 3:34:20 PM
<a href="#">91088556</a>	<a href="#">N/A (10624)</a>	PAC1LP	Enhanced S4x	Inventory	7/22/2020 9:47:58 AM

1 - 18 of 18 items

The meter number on this report will hyperlink to a new page with the historical programming data for that meter.

**Meter Program History**



**Meter # 90617C54**

**Export to Excel** **Export to PDF**

*Drag a column header and drop it here to group by that column*

<a href="#">Meter Program Name</a>	<a href="#">Meter Program ID</a>	<a href="#">Effective Start Date</a>	<a href="#">Effective End Date</a>
<a href="#">SRates</a>	0020	9/16/2021 10:16:27 AM	
<a href="#">Z003 KWH DT</a>	0031	9/14/2021 3:16:58 PM	9/16/2021 10:16:26 AM
<a href="#">NewComplexTOU</a>	20210	9/2/2021 12:10:06 PM	9/14/2021 3:16:57 PM
<a href="#">30Min</a>	0030	9/1/2021 4:07:42 PM	9/2/2021 12:10:05 PM
<a href="#">SRates</a>	0020	8/31/2021 5:05:00 PM	9/1/2021 4:07:41 PM

1 - 5 of 5 items

Season and Rate changes have been added to the Device Configuration properties (Meter Program Name hyperlink). Calendar, TOU, DST and Multiplier information has also been added to the Device Configuration properties page when defined in the meter program and the meter program xml is imported into Command Center.

Device Configuration Properties



Meter Type

Model Type I210C

Program Details

Meter Program ID 33050  
 Meter Program Name DailyMoTariff  
 Meter Program CRC 11104

Summations

Summation 0 kWh

Demands

Demand 0 Present Demand Max Del Only Fund + Harmonics

Load Profile Configuration Set 1

Load Profile Interval 15  
 Number Of Channels 6

Load Profile Metrics Set 1

- 0. kWh
- 1. kWh Rcvd
- 2. Reactive KVARh Net
- 3. RMS Volts End (Phase A) (LP)
- 4. Temperature C Min (LP)
- 5. RMS Current End (Phase A) (LP)

General

Multiplier  
 DST

Season Schedule

	Start Date	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Holiday 1
Season 1									

Rate Schedule

	12 AM	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM
Rate A																								
Rate B																								
Rate C																								
Rate D																								
Rate E																								

■ Rate A 
 ■ Rate B 
 ■ Rate C 
 ■ Rate D 
 ■ Rate E

The Meter Configuration History role permission has been added under Screen and Menu permissions. This report defaults to the System Administrator Role. All other roles must be edited to add the permission if so required.

**Note:** Meter programs updated in the field using 1132 or TechStudio are supported on the Meter Configuration History Report. Once the events are received by Command Center by the device, the data will be available on the report.

## CIM 2nd Edition for PLX

With the Command Center 8.2 Release, the following CIM 2<sup>nd</sup> Edition features are supported for PLX:

- Power Outage Events
- On-Demand Read
- Read Switch Status
- Connect/Disconnect Status

For more information on these features, please refer to Landis+Gyr publication 98-1639, *Gridstream Integration Suite Software Implementation Based on IEC CIM 61968-9-2* (CIM 2nd Edition).

## Active Directory Support for External Integration User

Command Center now has the ability to authenticate web services using the External Integration role using Active Directory (LDAP). Authentication of using Active Directory user credentials as External Integration user is supported in Command Center for CIM 1<sup>st</sup> Edition, CIM 2<sup>nd</sup> Edition and MultiSpeak integration methods.

User authentication parameters format require Domain\Username, and password for that domain user.

### System Setting

A new system setting was added under the General category:

**Active Directory Authentication Retries for External User:** This setting sets the number of retries to authenticate to the external integration system. The default value is **3** and acceptable ranges are **0** to **5**.

Active Directory Authentication Retries for External Integration

The number of retries to authenticate an external integration user's credentials with Active Directory.



## Configurable Lookback on Connect and Disconnect Commands

When there is a loss of communication to collectors, or collectors are powered off, commands can build up in the Command Center queue. A new feature has been added in Command Center 8.2 for connect/disconnect commands, to allow the user to specify a configurable lookback on how long the system will allow older commands to be executed.

There are two new System Settings were added under the General category:

**Command Lookback setting:** When enabled, this setting allows user to set time threshold for not issuing queued command(s) when collector communication is restored.

**Command Lookback Duration:** This setting provides a time threshold for not issuing queued command(s) when collector communication is restored

Command Lookback Duration can be set to a minimum of **15** minutes and a maximum of **1440** minutes. The Command Lookback is **disabled** by default.



When the collector's communications or power are restored and commands will begin sending to the collector, any connect/disconnect command that is older than Command Lookback Duration threshold, set in the System Settings, is deleted for RF Mesh Endpoints (FOCUS AX, AXe).

## Data Extract Spring DST

A new Organization Information setting has been added to allow users to choose whether to include or exclude the 2:00-3:00 AM data during Sprint Daylight Saving Time (DST). Currently in the extract files, the file includes null entries in the data extract file. When the **Remove Spring DST null intervals** is enabled, the data extract process will remove the null entries in the extract file, completely removing the 2:00-3:00 AM hour from the file.



## Data Definition Updates

Several data definitions have had updated name changes in Command Center 8.2. Please refer to the following documentation in the Command Center 8.2 package for a complete list of changes:

Document Title	Publication Number
Dynamic Data Definition Mapping for Command Center 8.2 <i>These are the new Data Definitions that were added in this release.</i>	98-2784 Rev AA
Dynamic Data Definition Mapping for Endpoint Models for Command Center 8.2 <i>These are the Data Definitions mapped to specific models in this release.</i>	98-2785 Rev AA
Dynamic Data Definition Name Changes for Command Center 8.2 <i>Data Definition Names and Short Names that were modified in this release.</i>	98-2786 Rev AA
Dynamic Data Definition Mapping for Endpoint Models for Command Center 8.2 <i>Data Definition Mappings removed from specific models in this release.</i>	98-2787 Rev AA

## Integration Suite

### WSDL and XSD Updates

There are documents that outline information related to each release of the WSDL package within the WSDL packages for CIM (IEC 61968-9) and MultiSpeak.

### MultiSpeak Updates

1. metering.wsdl
  - A. New complex type under MeterManufacturingData string type
    - a. EdgeSerialNumber
  - B. Added following new enumerations under EndPointsModel simple type
    - a. G5iWiSunEnhancedRouter
    - b. G5StreetLightV1
    - c. G5StreetLightV2
    - d. G5iStreetLightV1
    - e. G5iStreetLightV2
    - f. EdgeIntelligenceCard
    - g. G5StreetLightV2DA
    - h. N1501Series5RFMeshHeadEnd
    - i. N1551Series5RFMeshIPHeadEnd
    - j. N1651Series6RFMeshIPHeadEnd

**CIM 1st Edition – CIM 1.0 – Standard:**

1. CIMService.wsdl in CIM1.0APIService:
  - a. Soap location is how https.
  - b. sp: Https token RequiredClientcertificate is false
  - c. TransportBinding <http://schemas.xmlsoap.org/ws/2005/07/securitypolicy> added under CIMServiceEndpoint\_policy
2. CIMService.wsdl in CIM1.0APIServiceSingleWsdl:
  - a. Soap location is how https.
  - b. sp:Https token RequiredClientcertificate is false
  - c. TransportBinding <http://schemas.xmlsoap.org/ws/2005/07/securitypolicy> added under CIMServiceEndpoint\_policy

**CIM 1st Edition – CIM 2.0 – Standard:**

1. CIMService.wsdl in CIM2.0APIService:
  - a. Soap location is how https.
  - b. sp: Https token RequiredClientcertificate is false
  - c. TransportBinding <http://schemas.xmlsoap.org/ws/2005/07/securitypolicy> added under CIMServiceEndpoint\_policy
2. CIMService.wsdl in CIM2.0APIServiceSingleWsdl:
  - a. Soap location is how https.
  - b. sp: Https token RequiredClientcertificate is false
  - c. TransportBinding <http://schemas.xmlsoap.org/ws/2005/07/securitypolicy> added under CIMServiceEndpoint\_policy

**CIM 1st Edition – CIM 1.0 – Strict:**

1. CIMService.wsdl in CIM1.0APIService:
  - a. Soap location is how https.
  - b. sp: Https token RequiredClientcertificate is false
  - c. TransportBinding <http://schemas.xmlsoap.org/ws/2005/07/securitypolicy> added under CIMServiceEndpoint\_policy
2. CIMService.wsdl in CIM1.0APIServiceSingleWsdl:
  - a. Soap location is how https.
  - b. sp: Https token RequiredClientcertificate is false
  - c. TransportBinding <http://schemas.xmlsoap.org/ws/2005/07/securitypolicy> added under CIMServiceEndpoint\_policy

**CIM 1st Edition – CIM 2.0 – Strict:**

1. CIMService.wsdl in CIM2.0APIService:
  - a. Soap location is how https.
  - b. sp: Https token RequiredClientcertificate is false
  - c. TransportBinding http://schemas.xmlsoap.org/ws/2005/07/securitypolicy added under CIMServiceEndpoint\_policy
  
2. CIMService.wsdl in CIM2.0APIServiceSingleWsd:
  - a. Soap location is how https.
  - b. sp: Https token RequiredClientcertificate is false
  - c. TransportBinding http://schemas.xmlsoap.org/ws/2005/07/securitypolicy added under CIMServiceEndpoint\_policy

**CIM 2nd Edition – Service:**

1. No Change

**CIM 2nd Edition - xsd:**

1. No Change

**CIM Client Callback Service:**

1. No Change

**CIM (IEC 61968) 1st and 2nd Edition - Reading Types**

Please refer to the CIM 1<sup>st</sup> and 2<sup>nd</sup> Edition SDK documentation for a complete list of supported reading types.

**Meter Events**

The Event Type changed from 'S4x Specific' to 'Landis+Gyr Specific' for the following pre-existing events.

Event Type ID	Event	Default Alarm Setting	CIM 1st Edition ID	CIM 2nd Edition ID
4485	Enter/Exit Real Time Rate	Advisory	3.34.16.201	3.20.94.13
4486	Cold Start	Alarm	3.21.18.31	3.21.0.31
4489	Line Frequency Range Adjust Error	Alarm	3.12.17.79	3.26.4.79
4490	New Firmware Received	Advisory	3.11.17.3	3.11.17.3

Event Type ID	Event	Default Alarm Setting	CIM 1st Edition ID	CIM 2nd Edition ID
4492	Meter FW Image Verification	Log Only	3.11.18.90	3.11.17.37
4493	Meter Upgrade	Advisory	3.20.7.9	3.7.17.24
4494	Meter Programming Started	Alarm	3.21.7.242	3.7.83.24
4496	VHoldUp Low	Alarm	3.38.10.150	3.26.38.139
4497	Flash Pointer Corruption	Advisory	3.18.17.154	3.18.17.79
4499	Meter ROM Verification	Alarm	3.18.18.90	3.18.17.37
4500	Enter Factory Mode	Alarm	3.22.11.76	3.7.11.76
4501	Exit Factory Mode	Alarm	3.22.11.66	3.7.11.66
4503	Expected Sequence Number	Disabled	3.18.5.80	3.18.17.225
4504	Actual Sequence Number	Disabled	3.18.5.65	3.18.42.24
4505	Alert Occurred	Disabled	3.21.17.79	3.21.17.79
4508	L5/AMR Security Is Disabled By Programming	Disabled	3.24.16.66	3.12.24.66
4509	L5/AMR Security Is Re-enabled By Under-cover Switch Sequence	Disabled	3.24.16.76	3.12.24.76
4510	Disable OPT port LOCKOUT via MFG procedure 19	Advisory	3.20.17.66	3.0.17.66
4511	Disable OPT port demotion via MFG procedure 22	Disabled	3.20.17.76	3.0.17.76
4513	Power Down Cover	Alarm	3.26.1.44	3.26.29.212
4514	Power Down Magnet	Alarm	3.26.1.152	3.26.66.47
4515	Power Down Unknown	Disabled	3.26.18.185	3.26.0.47
4518	Authentication Enabled	Disabled	3.32.7.76	3.12.1.58
4523	Config ID not updated	Advisory*	3.21.7.193	3.7.83.79
4524	Voltage Phase Error	Advisory	3.38.14.79	3.26.25.79
4525	Teridian PIC Startup Sync Error	Advisory	3.20.17.252	3.7.17.79
4526	Power Fail Data Restored	Advisory	3.26.18.216	3.26.18.216
4527	Valid Service Detected	Advisory	3.20.17.3	3.21.17.3
4528	Status STD Table 23	Advisory	3.21.17.209	3.21.89.79
4529	RTOS Event	Advisory	3.11.17.79	3.11.17.79
4530	Firmware Failure Logged	Advisory*	3.11.17.86	3.11.17.85

<b>Event Type ID</b>	<b>Event</b>	<b>Default Alarm Setting</b>	<b>CIM 1st Edition ID</b>	<b>CIM 2nd Edition ID</b>
4531	Demand Overload Error 0	Advisory*	3.8.17.178	3.8.261.79
4532	Demand Overload Error 1	Advisory*	3.8.17.178	3.8.261.79
4533	Demand Overload Error 2	Advisory*	3.8.17.178	3.8.261.79
4534	Demand Overload Error 3	Advisory*	3.8.17.178	3.8.261.79
4535	Demand Overload Error 4	Advisory*	3.8.17.178	3.8.261.79
4536	Demand Overload Error 5	Advisory*	3.8.17.178	3.8.261.79
4537	Demand Overload Error 6	Advisory*	3.8.17.178	3.8.261.79
4538	Demand Overload Error 7	Advisory*	3.8.17.178	3.8.261.79
4539	Demand Overload Error 8	Advisory*	3.8.17.178	3.8.261.79
4540	Demand Overload Error 9	Advisory*	3.8.17.178	3.8.261.79
4541	Demand Overload Error 10	Advisory*	3.8.17.178	3.8.261.79
4542	Demand Overload Error 11	Advisory*	3.8.17.178	3.8.261.79
4543	Demand Overload Error 12	Advisory*	3.8.17.178	3.8.261.79
4544	Demand Overload Error 13	Advisory*	3.8.17.178	3.8.261.79
4545	Demand Overload Error 14	Advisory*	3.8.17.178	3.8.261.79
4546	Demand Overload Error 15	Advisory*	3.8.17.178	3.8.261.79
4547	Gyrbox D1 Diagnostic Set	Advisory*	3.25.17.76	3.26.25.76
4548	Gyrbox D2 Diagnostic Set	Advisory*	3.38.17.65	3.26.38.91
4549	Gyrbox D3 Diagnostic Set	Advisory*	3.25.17.100	3.26.25.100
4550	Gyrbox D4 Diagnostic Set	Advisory*	3.25.17.183	3.26.25.216
4551	Voltage Magnitude Imbalance Error	Advisory*	3.38.17.98	3.26.67.79
4552	Gyrbox D6 Diagnostic Set	Advisory*	3.6.17.98	3.26.17.98
4553	Gyrbox D7 Diagnostic Set	Advisory*	3.25.17.3	3.26.17.3
4554	Bottom Feed Active	Advisory*	3.20.7.4	3.7.46.4
4555	Audit Trail Log is Full	Advisory*	3.17.17.146	3.17.44.32
4556	Alert 1 Set	Advisory*	3.21.18.261	3.21.17.93
4557	Alert 2 Set	Advisory*	3.21.18.261	3.21.17.93
4558	Alert 3 Set	Advisory*	3.21.18.261	3.21.17.93
4559	Alert 4 Set	Advisory*	3.21.18.261	3.21.17.93
4560	Alert 5 Set	Advisory*	3.21.18.261	3.21.17.93
4561	Alert 6 Set	Advisory*	3.21.18.261	3.21.17.93

Event Type ID	Event	Default Alarm Setting	CIM 1st Edition ID	CIM 2nd Edition ID
4562	Alert 7 Set	Advisory*	3.21.18.261	3.21.17.93
4563	Alert 8 Set	Advisory*	3.21.18.261	3.21.17.93
4565	Default Sys Config Calibration	Advisory*	3.21.4.58	3.21.18.37
4566	Default Phase to Phase Cal Constants	Advisory*	3.25.17.58	3.26.25.37
4567	Measurement Over Run Error Detected	Advisory*	3.21.7.139	3.21.67.139
4568	Measurement Time Out Error Detected	Advisory*	3.21.17.125	3.21.67.35
4569	Measurement Bad CRC Error Detected	Advisory*	3.21.17.127	3.21.17.35
4570	Measurement Lock Out Error Detected	Advisory*	3.21.17.106	3.21.67.85
4571	Incorrect CRC System Config Write Detected	Advisory*	3.21.7.127	3.21.7.35
4572	Incorrect CRC Calibration Data Write Detected	Advisory*	3.21.4.127	3.21.18.35
4575	Audit Trail Log is not Full	Advisory*	3.17.17.28	3.17.44.28
5000	M63 CRC Mismatch	Host generated	3.21.14.159	3.12.30.159
5001	M64 CRC Mismatch	Host generated	3.21.17.159	3.12.30.159
5457	Table Read Request	Disabled		
5458	Sync time to line frequency time adjustment	Disabled		

### Collector Events

Event Type ID	Event	Default Alarm Setting	CIM 1st Edition ID	CIM 2nd Edition ID
6574	CPU Exchanged			3.39.82.24
6640	CPU Temperature Normal		10.35.3.214	10.35.43.37

**Gas Events**

<b>Event Type ID</b>	<b>Event</b>	<b>Default Alarm Setting</b>	<b>CIM 1st Edition ID</b>	<b>CIM 2nd Edition ID</b>
6691	RF Gas Gap Reconciliation Requests Per Parent Exceeded	Host Generated	4.21.16.139	4.21.261.286
6598	RF Gas Readings Gap Reconciliation Requests Exceeded	Host Generated	4.21.5.139	4.21.87.139
6597	RF Gas Readings Gap Reconciliation Retries Exceeded	Host Generated	4.21.15.160	4.21.87.285

**Command Center Events**

<b>Event Type ID</b>	<b>Event</b>	<b>Default Alarm Setting</b>	<b>CIM 1st Edition ID</b>	<b>CIM 2nd Edition ID</b>
6566	Alarm Register Cleared	Advisory		3.21.285.28
6689	Device IPV4 Address Changed	Alarm		3.23.75.24

**Brazil Specific Communication Module**

<b>Event Type ID</b>	<b>Event</b>	<b>Default Alarm Setting</b>	<b>CIM 1st Edition ID</b>	<b>CIM 2nd Edition ID</b>
6687	RF Electric Communication Lost	Alarm		3.1.17.47
6687	RF Electric Communication Restored			3.1.17.216

**Meter – North America – REVELO**

<b>Event Type ID</b>	<b>Event</b>	<b>Default Alarm Setting</b>	<b>CIM 1st Edition ID</b>	<b>CIM 2nd Edition ID</b>
6591	Accelerometer Communication Error	Advisory		3.1.144.79
6592	Digest Event Started	Alarm		3.21.14.242
6593	Digest Event Stopped	Information		3.21.14.243
6590	EIC Data Link Status Change	Information		3.21.31.216
6596	Orientation change	Alarm		3.6.0.24
6595	Power Down Cover Installed	Alarm		3.26.29.105
6594	Warm Start	Disabled		3.11.0.278



**Meter – APAC**

<b>Event Type ID</b>	<b>Event</b>	<b>Default Alarm Setting</b>	<b>CIM 1st Edition ID</b>	<b>CIM 2nd Edition ID</b>
6638	Checksum Error - Measurement system	Alarm		3.41.284.79
6612	Clock error cleared	Advisory		3.36.114.279
6654	Digital output 3 switched OFF	Advisory		3.39.1.66
6655	Digital output 3 switched ON	Advisory		3.39.1.76
6650	Error Register Detected	Advisory		3.7.89.4
6675	GSM registration failure	Alarm		3.19.90.85
6671	HLS Password changed	Alarm		3.12.24.4
6670	LLS Password changed	Alarm		3.12.24.13
6644	Load Control boost request received	Advisory		3.1.82.225
6659	Load Control Boost Start	Advisory		3.26.74.242
6660	Load Control Boost Stop	Advisory		3.26.74.243
6679	Load Control Command Accepted	Advisory		3.15.55.29
6681	Load Control Command Processing Start	Advisory		3.15.55.44
6686	Load Control Command rejected	Advisory		3.15.55.59
6643	Load Control power restore request received	Advisory		3.1.88.216
6645	Load Control priority override request received	Advisory		3.1.82.42
6680	Load Control State Changed	Advisory		3.15.55.24
6684	Load Control Timetable passive emergency script executed	Advisory		3.15.95.30
6668	Load Control Timetable passive table activated	Advisory		3.7.121.4
6667	Load Control Timetable passive table activation failed	Advisory		3.7.121.85
6666	Load Control Timetable passive table programmed	Advisory		3.7.121.44
6682	Load Control Timetable passive table verification failed	Advisory		3.15.95.85
6683	Load Control Timetable passive table verification passed	Advisory		3.15.95.58
6642	Load Control timetable request received	Advisory		3.1.82.242
6685	Load Control Timetable season changed	Advisory		3.15.95.24
6464	Meter Cover Closed	Alarm		3.12.29.16
6463	Meter Cover Opened	Alarm		3.12.29.39

Event Type ID	Event	Default Alarm Setting	CIM 1st Edition ID	CIM 2nd Edition ID
6635	Meter Switch Status Changed	Alarm		3.31.17.24
6676	PDP context established	Alarm		3.1.33.24
6677	PDP context failure	Advisory		3.1.33.85
6641	Power Restores after long outage	Advisory		3.26.74.216
6656	PredicTemp Monitor A L1 breach	Alarm		3.35.144.93
6661	PredicTemp Monitor A L1 Normal	Alarm		3.35.144.150
6657	PredicTemp Monitor A L2 breach	Alarm		3.35.144.93
6662	PredicTemp Monitor A L2 Normal	Alarm		3.35.144.150
6658	PredicTemp Monitor A L3 breach	Alarm		3.35.144.93
6663	PredicTemp Monitor A L3 Normal	Alarm		3.35.144.150
6587	P-time/Time threshold for Missing Potential	Advisory*		3.7.114.24
6678	Push Data Failure	Alarm		3.7.31.85
6652	Security policy changed	Alarm		3.12.95.24
6651	Self test failed	Advisory		3.7.100.85
6649	Self test passed	Advisory		3.7.100.28
6648	Self tests initiated	Advisory		3.7.100.225
6588	Threshold for Missing Potential	Advisory*		3.7.261.24
6669	Unexpected Meter Restart	Alarm		3.21.148.53
6639	Voltage Monitoring: Voltage Returned to Normal (PhB)	Advisory		3.21.132.71
6664	Waveform disabled	Advisory		3.41.40.66
6665	Waveform enabled	Advisory		3.41.40.76

### Meter – Brazil

Event Type ID	Event	Default Alarm Setting	CIM 1st Edition ID	CIM 2nd Edition ID
6569	Data link error	Advisory		3.12.31.79
6573	Feature state update	Information		3.9.46.24
6571	Metrological fraud detected	Alarm		3.21.17.35
6572	RDM Lan ID update	Information		3.12.143.24
6570	Session layer error	Warning		3.12.129.79
6567	Temporarily Disable Door Monitoring Event End	Alarm		3.12.128.288
6568	Temporarily Disable Door Monitoring Event End Failure	Alarm		3.12.128.85

## Asia Specific Enhancements

### U1300, U3400 Ripple Control Improvements

The RF Mesh IP U3400/Enhanced Cellular U3400 with metrology firmware version S00261-99.00.381 and later supports up to four independent load control relays. The EMPWin version 0.0.26 is a software application where users can hook to the RF Mesh IP U3400/Enhanced Cellular U3400 meter for configuring load control relays (outputs 1, 2, 3 and 4).

## India Specific Enhancements

### LY 1P and 3P Changes

Starting with Command Center 8.2, Linyang meters running firmware version 22.50 or later, implemented additional tamper-evidence features. All new registered E350 1P/3P devices (SM110E and SM310E) will be created with the new configuration group as “LG DLMS Residential Configuration Group F” for more device detection and tamper event counts.

# Firmware

## RF Mesh

### Gridstream RF Firmware 21.51

The following information describes what is new, changed and resolved in Gridstream RF Communication firmware from version 19.50 to version 21.51.

#### New Features

The following new features appear in this release.

- Support for the new RF Mesh and RF Mesh IP FOCUS E352 meter platform.
- Support for Series 5 Aclara I-210+c endpoint.

#### Changed Features

There are no changed features in this release.

#### Resolved Issues

There are no resolved issues in this release.

### Device Control Word (DCW) 21.50

The following information describes what resolved in the DCW from version 19.50 to 21.50.

#### New Features

There are no new features in this release.

#### Changed Features

There are no changed features in this release.

#### Resolved Issues

The following issues have been resolved in this release:

- Resolved an issue where an unexpected reboot occurred 900 times a day. 5252B Prepay meters rebooted 400 times a day which caused unexpected data schedule loss. (TFS 1185688)

- Resolved an issue where after meters are upgraded to version 15.04/15.05, reverse rotation alarms do not display on the Command Center dashboard. A message “Event generated when a new meter configuration has been detected. The meter configuration has not previously existed in Command Center” appears. (TFS 1162671)

## ZigBee Firmware 02.04.19

The following information describes what is new, changed and resolved in ZigBee 02.04.19.

### New Features

There are no new features in this release.

### Changed Features

There are no changes features in this release.

### Resolved Issues

There are no resolved issues in this release.

## RF Mesh IP (SBS)

### RF Mesh IP Firmware 22.50

The following describes what is new, changed and resolved in RF Mesh IP firmware from version 20.53 to 22.50.

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**NOTE:** The new features and functionality in this release are only available to systems enabled for RF Mesh IP (SBS).

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### New Features

The following new feature appears in this release:

- Starting with Command Center 8.2, LingYang meters running firmware version 22.50 or later, implemented additional tamper-evidence features. All new registered E350 1P/3P (SM110E and SM310E) devices will be created with the new configuration group as “LG DLMS Residential Configuration Group F” for more device detection and tamper event counts.
- Support for the new RF Mesh and RF Mesh IP FOCUS E352 meter platform.
- Support for Series 6 RF Mesh IP and Wi-SUN E360 Residential Revelo metering platform.
- Support for Series 5 RF Mesh and RF Mesh IP I-210+c endpoint.
- Support for Series 6 Network Router R661.

## Changed Features

There are no changed features in this release:

## Resolved Issues

The following issue is resolved in this release:

- Resolved an issue where router moves to configure state after it gets to discovered state while executing an auto-registration. (TFS 1147469)

## Device Control Word (DCW) 22.50

The following information describes what is new, changed and resolved in the DCW from version 20.51 to 22.50.

## New Features

There are no new features in this release.

## Changed Features

There are no changed features in this release.

## Resolved Issues

There are no resolved issues in this release.

## ZigBee Firmware 02.04.19

The following information describes what is new, changed and resolved in ZigBee 02.04.19.

## New Features

There are no new features in this release.

## Changed Features

There are no changes features in this release.

## Resolved Issues

There are no resolved issues in this release.

## N-Series

The information in this release note applies to Gateway application for:

- N-Series

These release notes officially announce the firmware versions, features, and issues resolved in Command Center release 8.1 for RF Mesh IP (SBS) capable (G5i) hardware products. This release supports both RF Mesh and RF Mesh IP for N-Series.

The following products are qualified and available for upgrades compatible with Command Center version 7.3 MR1 and later:

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**NOTE:** If you are upgrading from any version earlier than firmware 6.X, you must update to an intermediate firmware version.

- If you are currently on firmware 5.4.X, you must upgrade to firmware 5.4.18.
- If running firmware 5.6.X, you must upgrade to firmware 5.6.5 before upgrading to firmware 6.2.15.

A direct upgrade to firmware 6.2.15 respectively is not supported.

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The following information describes what is new, changed and resolved from Gateway N-Series versions:

- **5.4.18 to 6.2.15**
- **5.6.4 to 6.2.15**

Landis+Gyr recommends upgrading in the following order:

1. Firmware
2. DCW
3. Collector Application

### Supported Devices

- N2200/N2400
- N2250/N2450

## New Features

The following are new features and functionality that were added in this release:

- Added Flip from RF Mesh IP to Wi-SUN dispatcher IP address and port number support for Border Router Application.
- Support SSH credential management enhancements – Linux User Account Management. The previous ‘far’ login account is no longer available.
- Added support for Wi-SUN collector application.
- Support for new rpltopographyWithMac file for devices with non-SLAAC-based IP addresses.
- Implementation of Topology notification for devices using Wi-SUN-based IP addresses.
- Added ability to retain RPL Topology through an application restart.
- Added new SNMPv3 implementation for RF Mesh and RF Mesh IP N-Series.

## Enhanced Features

The following enhancements and improvements were made in this release:

- Reduced local radio ping time from +100ms to sub 20ms to improve throughput. (TFS 1052634)
- Changed to allow Series 5 N2450 Get Collector Settings (Get Comms profile). (TFS 1003107, 1003109)
- Implementation SNMP v3 for RF Mesh and RF Mesh IP. (TFS 984068)
- Changed to allow RF Mesh and RF Mesh IP SNMP Server configuration in Gateway application. (TFS 825045, TFS 825044)
- Changed to allow N2450 collector radio support. (TFS 966479)
- Improvement made to the SNMP settings for Gateway application from Config UI so that traps can be sent, and data retrieved back from the Gateway application for RF Mesh and RF Mesh IP devices. (TFS 841362)
- Changed to allow external DHCPv6. (TFS 960393, 946947 and 946963)
  - WiSUN1.x-Phase 2- External DHCPv6: Implement parameters in config.ini for DHCPV6\_RELAY\_ADDR.
  - WiSUN1.x-Phase 2- External DHCPv6: Disable ISC-DHCPv6 Server based on DHCPV6\_RELAY\_ADDR in config.ini.
- Changed to allow firmware LG-Linux Kernel upgrade. (TFS 926166)



## Resolved Issues

The following issues were resolved in this release:

- Resolved an issue where timekeeper gets dropped after restart. (TFS 1220521)
- Resolved an issue where the Default route for the active interface is removed. (TFS 1202169)
- Watchdog starts RplBridge instead of ReceiverForm on RF Mesh Network Gateway with version 5.4.18. (TFS 1197517)
- Network Gateway keeps dropping connection to Command Center even when the connected modem has internet. (TFS 1190679)
- Identified an issue where a list of boot mode options was available. Firmware was modified to remove boot mode options. (TFS 1155832)
- Resolved an issue where the Mesh IP collector is not properly handling cellular modem failures. (TFS 1142817)
- RF Mesh IP transport mode device registers DANM as the same IPv6 address of DANM. (TFS 1184888)
- Fixed an issue where collector code occasionally loses the default route and cannot recover. (TFS 1182015)
- Implemented a fix where RadioDetect fails to update event\_state.ini file on startup. (TFS 1138502)
- Resolved an issue where collector status shows radio(s) are NOT communicating sometimes when radios are running RF Mesh code. (TFS 1114419)
- Fixed an issue where Network Configuration WEBUI, enabling DAPR, does not populate the base device settings table. (TFS 1112639)
- Resolved an issue where RF Mesh IP collector resource monitor not computing HighWaterModule correctly. (TFS 1037022)
- Resolved an issue where RF Mesh IP collector is not averaging the CPU usage value as defined in the config.ini file. (TFS 1037029)
- Fixed issue where RF Mesh Network Bridge loses communication to Command Center. (TFS 1093063)
- Resolved an issue where RF Mesh IP radio is getting rebooted. (TFS 1098428)
- Implemented fix where RF Mesh IP is unable to SSH into Verizon Gateways. (TFS 1044820)
- Running SlotIdentifier.sh during RplRoot causing an issue. (TFS 1053970)
- Cannot ping or connect to DA device in ETH1. (TFS 1092598)
- Resolved an issue causing Upstream UDP packet loss on N-Series ETH0 @ 1000 Mbps. (TFS 1057548)
- RF Mesh resolved buffer overflow in RemoteAccess GET\_SETTINGS for Bridge and Gateway. (TFS 1023267)
- DAPR: bad memory location writes in GSIS/RF-MESH mode. (TFS 1084699)
- Resolved a collector issue where WEBUI is showing default data on network/serial, which is not saved. (TFS 1081523)
- Fixed a collector application issue where the collector pings from Command Center fails after initial bootup from firmware upgrade. (TFS 1078678)
- Fixed a collector issue where radios "Link\_Ipv6Addr" information went unavailable in rpl\_link\_info.ini file under RF\_MESH\_IP profile. (TFS 1077711)

- Resolved an issue where WebUI/Network/Serial menu should be hidden on gateway hardware. (TFS 1073907)
- Implemented a fix for N-Series reboot where collector causes logging configuration to be wiped out. (TFS 971178)
- Implemented a fix for N2450 where a Cellular modem error would occur on running status command on the collector application. (TFS 1073680)
- Implemented a fix for RF Mesh collector application where MONO logger config settings are not persisting across reboots. (TFS 1067552)
- Resolved an issue where RF Mesh Network Gateway 5.4.10/5.4.12 is unable to assign a static IP address. (TFS 998579)
- Implemented a fix for DAPR/LGSERIALD eth0 alias conflict. (TFS 1072926)
- Resolved an issue where Ethernet rate limiting caused DHCP failure in some networks. (TFS 1068511)
- Implemented a fix where Modify Setting command is failing to check community string case sensitivity. (TFS 1048246)
- Resolved an issue where memory leak occurring during "Icmp6 Snd Fail" seen in collector application logs. (TFS 1055840)
- Resolved an issue where RF Mesh Network Gateway Command Center address list does not show connected status in RadioShop. (TFS 1064474)
- Miss-leveled logging in RplBridge code. (TFS 1053081)
- Observed RTU Adapter running in Bridge mode for N2200. (TFS 1052513)
- Resolved collector application issue where duplicate firmware activated events to Command Center. (TFS 1037045)
- SNMP Firewall configuration controlled by Trap Enable instead of SNMP Enable. (TFS 1058284)
- RplRoot invalid error filling log. (TFS 1051983)
- Implemented a fix where RF Mesh Bridge does not fail back to primary after falling too secondary. (TFS 956298)
- WiSUN1.x- RplRoot not closing the /opt/iprf/tmp/NetIF.txt properly. (TFS 1058370)
- Comm links specified incorrectly in rpl\_link\_info.txt when 1 or more GW radios are disabled in factory.ini. (TFS 1035333)
- Fixed an DA Bridge 5.6.4 issue where DCW bits set incorrectly. (TFS 1049622)
- Implemented a fix for ConfigUI/SNMP where if the second field is selected without changes, the Unsaved Changes alert activates. (TFS 1037167)
- Fixed an N-Series issue where DAPR WAN 0 Tunnel overwritten with DA base address. (TFS 1050134)
- Fixed an issue where the default Gateway reported No Route Available. (TFS 1044082)
- Wi-SUN 1.X excessive logs in RemoteAccess.log. (TFS 1051657)
- Resolved an issue where Wi-SUN unnecessary files present on N-Series. (TFS 981383)
- Resolved an issue where ICMP pings that require fragmentation returns inconsistent response. (TFS 926260)
- Topology graph empty after running collector for more than five days. (TFS 1035789)
- Resolved a RemoteAccess upgrade issue where the upgrade.log appended two logs instead of the latest log file. (TFS 1031553)

- Resolved a Collector application (N-Series) issue where firmware upgrade process fails due to timeout. (TFS 1030847)
- Resolved an issue where Low Battery Object Identifier (OID) returns invalid value. (TFS 1020712)
- Resolved a problem in the Start script that prevented the new firmware activation event from being sent to Command Center. (TFS 1015475)
- Resolved an issue where INIPARSER rejects/returns-fail requests on empty or non-existent files. (TFS 1010196)
- Resolved an issue where RF Mesh IP collector application download status fails (TFS 963242)
- Resolved N2400 and N2200 5.6 TestURL key error. (TFS 967937)
- Resolved issue where ethconfig.sh: failed to set hostname when DHCP selected for autoconfigure. (TFS 971155)
- Implemented a fix for N24XX router where the battery test and WiFi fail to initialize in Setup mode. (TFS 973396)

## Standard Radio Configuration

Customers migrating from Gridstream RF Mesh protocol stack to the RF Mesh IP (previously known as SBS) protocol will require specific infrastructure and deployment efforts to enable PANA security on existing deployed RF radios for network devices and meters. Detailed steps are outlined in the specific hardware guides and Deployment playbook documentation available from Landis+Gyr Deployment Services.

Please contact your Program/Project Management team for assistance.

## Related Documentation

Use this document to find documentation for specific versions and edits of this release.

Document Title	Publication Number	Revision
<b>Release Notes</b>		
Command Center Release Notes Release 8.2	98-2795	AA
RF Mesh/RF Mesh IP Gateway Application 6.2.15 N-Series Release Notes	98-2691	AB
RF Mesh Firmware, DCW and ZigBee Release Notes Version: Firmware <b>21.51</b> Device Control Word <b>21.50</b> and ZigBee <b>02.04.19</b>	98-2791	AA
RF Mesh IP Firmware, DCW and ZigBee Release Notes Version: Firmware <b>22.50</b> Device Control Word <b>22.50</b> and ZigBee <b>02.04.19</b>	98-2793	AA
Two-Way Water RF Mesh and RF Mesh IP Firmware Release Notes Version: <b>11.51/12.51</b>	98-2798	AA
<b>Customer Communications Letter</b>		
RadioShop End-of-Life Customer Service Alert	98-2543	AA

<b>Document Title</b>	<b>Publication Number</b>	<b>Revision</b>
CIL: Instantaneous Current Incorrectly Allowing Resolution Settings in Package – PLX FOCUS AXe and S4x	98-2714	AA
<b>Licenses</b>		
Command Center and Third-Party Open-Source Software Licensing Technical Reference Guide	98-1918	AB
<b>Compatibility Matrix for Releases</b>		
RF Mesh Compatibility Matrix for Command Center 8.2	98-2792	AA
RF Mesh IP Compatibility Matrix for Command Center 8.2	98-2794	AA
1132 Compatibility Matrix for Command Center 8.2	98-2789	AA
<b>User Guide</b>		
RF Mesh IP Command Center User Guide Command Center 8.2	98-1460	AM
RF Mesh Command Center User Guide Command Center 8.2	98-9108	BC
PLC Command Center User Guide Command Center 8.2	PUBS-0679-0001	S
<b>Reports</b>		
Command Center Reports	98-2399	AC
<b>Security</b>		
Landis+Gyr Security Administrator's Guide Command Center 8.2	98-1035	BB
<b>Two-Way Gas</b>		
Gridstream M120-1 Two-Way Gas Module Installation Guide for American Residential Gas Meters	98-1123	AK
Gridstream M120-2 Two-Way Gas Module Installation Guide for Sprague Residential Gas Meters	98-1134	AL
GPR Installation Guide	98-1135	AL
Gridstream M120-4 National Two-Way Gas Endpoint Installation Guide	98-1253	AE
Gridstream M120-3 Sensus 2-Way Gas Endpoint Installation Guide	98-1254	AI
Implementing Two-Way Gas Modules in the Gridstream Solution	98-1993	AF
Gridstream M125A/M125B Two-Way Gas Module for American Residential Gas Meters Installation Guide	98-2680	AA
Gridstream M125C Two-Way Gas Module for Sprague Residential Gas Meters Installation Guide	98-2693	AA
Gridstream M125D/M125E Two-Way Gas Module for Sensus Gas Meters Installation Guide	98-2694	AA
<b>Two-Way Water</b>		
Implementing Two-Way Water Modules in the RF Mesh System	98-1277	AI
Two-Way Water Compatibility Guide	98-1906	AB
Series 5 Water M510 Pit Mount Module Data Sheet	98-2488	AE
Series 5 Water M511 Wall Mount Module Data Sheet	98-2489	AE
Series 5 Water M512 Interpreter Module Data Sheet	98-2657	AA
Series 5 Water M512 Interpreter Installation and User Guide	98-2659	AA

<b>Document Title</b>	<b>Publication Number</b>	<b>Revision</b>
Series 5 Water M511 Wall Mount Module Installation and User Guide	98-2660	AA
Series 5 Water M510 Pit Module Installation and User Guide	98-2661	AA
<b>Enhanced Cellular</b>		
Gridstream Connect LTE-M Cellular FOCUS AXe/S4x Endpoint Data Sheet	98-1722	AI
LTE-M Cellular Command Center Implementation Guide	98-1736	AI
LTE-M Pocket Reference Manual: Field Troubleshooting Starting at the Meter	98-2605	AA
<b>Multi-Tenancy</b>		
Implementing Multi-Tenancy Support in Command Center	98-2067	AB
<b>Endpoints</b>		
Gridstream RF Enhanced Modular FOCUS AX Quick Start Guide	98-0072	AB
Gridstream RF Enhanced Integrated FOCUS AX Quick Start Guide	98-1033	AD
Landis+Gyr Gridstream RF Integrated FOCUS AX/AX-SD Endpoint User Guide	98-1034	AH
Landis+Gyr Gridstream RF Modular FOCUS AX/AX-SD Endpoint User Guide	98-1048	AI
Gridstream RF Enhanced FOCUX AXe Endpoint User Guide	98-1309	AF
Gridstream RF Enhanced FOCUS AXe Endpoint Data Sheet	98-1310	AB
Landis+Gyr Gridstream RF kV2c+ Endpoint Quick Start Guide	98-1385	AA
Gridstream RF Generation 5 (G5) FOCUS AXe Endpoint User Guide	98-1481	AE
Gridstream RF Generation 5 (G5) FOCUS AXe Endpoint Quick Start Guide	98-1482	AB
Landis+Gyr Gridstream RF Enhanced S4x Endpoint User Guide	98-1483	AD
Landis+Gyr Gridstream RF Enhanced S4x Endpoint Data Sheet	98-1484	AB
Gridstream RF Enhanced Elster A3 Endpoint User Guide	98-1671	AA
Gridstream RF Enhanced Series IV Elster A3 Endpoint Data Sheet	98-1672	AA
Gridstream RF Generation 5i (G5i) FOCUS AXe Endpoint User Guide	98-1726	AC
Landis+Gyr E650 S4x Technical Manual	98-1830	AC
RF Mesh Honeywell REXU Series 5 Endpoint Data Sheet	98-1949	AB
Landis+Gyr Gridstream G5i S4x User Guide	98-2252	AC
Gridstream RF Generation 5 (G5) Integrated FOCUS AXe Endpoint User Guide	98-2411	AB
Gridstream RF Generation 5 (G5) Integrated FOCUS AXe Endpoint Quick Start Guide	98-2412	AB
<b>Network Devices</b>		
Gridstream Series IV IWR Radio Data Sheet	98-0064	AD
Landis+Gyr Gridstream RF C7400-Series Collector Data Sheet	98-0094	AF
Landis+Gyr Series IV Gridstream RF Router Data Sheet	98-1049	AE
C6400-Series (GAP) Collector Data Sheet	98-1096	AF

<b>Document Title</b>	<b>Publication Number</b>	<b>Revision</b>
Landis+Gyr Series V Gridstream RF Router Data Sheet	98-1204	AD
C6500-Series (GAP) Collector Data Sheet	98-1211	AG
Landis+Gyr Gridstream RF Series V IWR Radio Data Sheet	98-1215	AF
C7500-Series Gridstream RF Collector Data Sheet	98-1393	AD
Landis+Gyr Gridstream RF Collector Installation and User Guide	98-1814	AJ
Landis+Gyr Gridstream Router Installation and User Guide	98-1815	AD
Landis+Gyr Network Bridge N2200/N2250 Installation and User Guide	98-1817	AB
Landis+Gyr Network Gateway N2150 Installation and User Guide	98-1818	AE
Landis+Gyr Series 5 Network Bridge N2200/N2250 Data Sheet	98-1822	AE
Network Node Data Sheet	98-1837	AI
Network Node Developer's Guide	98-1838	AH
Landis+Gyr Network Gateway N2150 Data Sheet	98-1881	AC
/Landis+Gyr Series 5 Network Gateway N2400/N2450 Data Sheet	98-1882	AD
Landis+Gyr Series 5/Series 6 Network Gateway N2400/N2450 Installation and User Guide	98-1988	AE
Landis+Gyr mSBR Developers Guide	98-2108	AA
Series 6 Network Node N651 Data Sheet	98-2109	AA
Landis+Gyr Series 6 Network Gateway N2450 Data Sheet	98-2204	AB
Landis+Gyr Series 6 Network Bridge N2250 Data Sheet	98-2369	AC
Series 5 Network Node N501 & N551 Data Sheet	98-2386	AB
Network Router R651 Installation and User Guide	98-2427	AB
Sector Antenna Kit Data Sheet	98-2588	AA
Network Router Data Sheet	98-2678	AA
<b>Streetlight</b>		
Streetlight Management Solution User Guide	98-1935	AC
Streetlight Community Center User Guide	98-2337	AB
<b>Data Migration</b>		
Landis+Gyr Platform Data Migration Tool User Guide v8.2	98-2528	AC
<b>Transitioning</b>		
Network Device Upgrade Guide	98-1290	AL
Command Center 8.2 System Recommendations	98-1480	AN
RF Mesh Command Center Load Balancing Recommendations	98-1329	AG
<b>Best Practices</b>		
Command Center Oracle Partitioning Best Practices	98-1327	AL
M2M Oracle Partitioning Best Practices	98-1448	AA
RF Mesh IP (SBS) Oracle Partitioning Best Practices	98-1449	AE
M2M SQL Partitioning Best Practices	98-1999	AA
Command Center SQL Partitioning Best Practices	98-2003	AE
RF Mesh IP (SBS) SQL Partitioning Best Practices	98-2004	AB

<b>Document Title</b>	<b>Publication Number</b>	<b>Revision</b>
Command Center (Data Warehouse) SQL Partitioning Best Practices	98-2005	AA
<b>PLC-PLX</b>		
TCU Startup Safety Checklist	98-1281	AC
S4e PLX High Voltage Data Sheet	98-1813	AA
TS2/PLX Dual Platform User Guide	98-1834	AC
Dual Platform TCU Retrofit Guide	98-1835	AA
Gridstream PLX Landis+Gyr FOCUS AXe Endpoint User Guide	98-1981	AC
Gridstream Connect PLX S4x Endpoint User Guide	98-2320	AE
PLX FOCUS AXe Endpoint Migration to Command Center 8.x	98-2742	AB
PLX Substation Hardware Installation Manual	98-5141	AB
PLX Substation Commissioning Procedure	98-5142	AB
PLX Endpoint Administration Software (EAS) User Guide	98-5143	AD
Landis+Gyr Gridstream PLX S4e Endpoint User Guide	98-5146	AH
PLX Command Center User's Guide Command Center 8.2	98-5147	AN
PLX Feeder Study Kit Manual	98-5151	AC
Landis+Gyr PLC 3000 Collector Installation and User Guide	98-5152	AD
PLC 3000 Stop Now Installation Notice	98-5153	AD
Gridstream PLX Landis+Gyr FOCUS AL Endpoint User Guide	98-5154	AD
Gridstream PLX Landis+Gyr FOCUS AX/AX-SD Endpoint User Guide	98-5155	AG
Landis+Gyr OptoWand+ Data Sheet	98-5254	AF
Programming Station (120V)	PUBS-0347-0001	B
<b>PLC-TS2</b>		
Endpoint Administration Software Installation and User Manual	PUBS-0670-0001	G
<b>Events</b>		
Gridstream GA Release 8.2 NAM Events (PDF)	N/A	N/A
Gridstream GA Release 8.2 NAM Events (Excel)	N/A	N/A
Gridstream GA Release 8.2 BRZ Events (PDF)	N/A	N/A
Gridstream GA Release 8.2 BRZ Events (Excel)	N/A	N/A
Gridstream GA Release 8.2 ANZ (Asia Pacific) Events (PDF)	N/A	N/A
Gridstream GA Release 8.2 ANZ Events (Excel)	N/A	N/A
<b>Data Definitions</b>		
Dynamic Data Definition Mapping Command Center 8.2	98-2784	AA
Dynamic Data Definition Mapping for Endpoint Models Command Center 8.2	98-2785	AA
Dynamic Data Definition Name Changes Command Center 8.2	98-2786	AA
Dynamic Data Definition Mapping for Endpoint Models Removed Command Center 8.2	98-2787	AA

## What's New in Landis+Gyr Product Documentation

This release contains the following new documents.

Document Title	Publication Number	Revision
Landis+Gyr E650 S4x Technical Manual	98-1830	AC
Command Center and Third-Party Open-Source Software Licensing Technical Reference Guide	98-1918	AB
Network Router R651 Installation and User Guide	98-2427	AB
PLX FOCUS AXe Endpoint Migration to Command Center 8.x	98-2742	AB
Network Router Data Sheet	98-2678	AA
Gridstream M125A/M125B Two-Way Gas Module for American Residential Gas Meters Installation Guide	98-2680	AA
Gridstream M125C Two-Way Gas Module for Sprague Residential Gas Meters Installation Guide	98-2693	AA
Gridstream M125D/M125E Two-Way Gas Module for Sensus Gas Meters Installation Guide	98-2694	AA

## Obsolete Documents

The following documents are obsolete; no longer being used.

Document Title	Publication Number	Revision
RadioShop Getting Started Guide v7.5 Please refer to the <i>RadioShop End-of-Life Customer Service Alert, 98-2543</i> , for details about the tool that replaces RadioShop.	98-1054	AH

## Centralized Installer

Centralized Installer add-on documentation is included in the Centralized Installer software package.

Document Title	Publication Number	Revision
<b>Centralized Installer</b>		
Command Center Installation Using Centralized Installer and ICMS Framework	98-2230	AK
ICMS Installation Add-On: ANSI Adapter Package Specifics	98-2270	AG
ICMS Installation Add-On: Command Center Package Specifics	98-2272	AG
ICMS Installation Add-On: Integration Suite Package Specifics	98-2273	AH
ICMS Installation Add-On: Key Manager Package Specifics	98-2274	AG
ICMS Installation Add-On: RF Mesh IP Adapter Package Specifics	98-2275	AH
ICMS Installation Add-On: Low Energy Network Adapter Package Specifics	98-2287	AF



<b>Document Title</b>	<b>Publication Number</b>	<b>Revision</b>
ICMS Installation Add-On: Low Energy Meter Adapter Package Specifics	98-2288	AF
ICMS Installation Add-On: Platform GND Converter Package Specifics	98-2289	AF
ICMS Installation Add-On: Device Hub Installation Package Specifics	98-2291	AF
ICMS Installation Add-On: KAFKA/Zookeeper Adapter Installation Package Specifics	98-2305	AG
ICMS Installation Add-On: MMF Import Service Package Specifics	98-2306	AE
ICMS Installation Add-On: M2M Adapter Package Specifics	98-2307	AG
ICMS Installation Add-On: Tunnel Manager Package Specifics	98-2353	AD
ICMS Installation Add-On: PANA Package Specifics	98-2491	AE
ICMS Installation Add-On: Platform DLMS Device Service Package Specifics	98-2515	AD
ICMS Installation Add-On: COSEM Service Package Specifics	98-2516	AD
ICMS Installation Add-On: Gulf Import Service Package Specifics	98-2517	AD
ICMS Installation Add-On: LTE Adapter Package Specifics	98-2518	AD
ICMS Installation Add-On: PSTN Adapter Service Package Specifics	98-2519	AD
ICMS Installation Add-On: Store and Forward Service Package Specifics	98-2548	AC
ICMS Installation Add-On: Gemalto Luna Client Package Specifics	98-2570	AB
ICMS Installation Add-On: Data Streaming Package Specifics	98-2622	AC

## Contacting Landis+Gyr Support

Contact the Landis+Gyr Customer Support Team at 888-390-5733 for questions or assistance.

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Covered by both issued and pending patents.

For further patent information see: <https://www.landisgyr.com/about/patent-notice/>

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than)	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed)	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
A new FAN Encryption Key was derived and activated	The endpoint derived and activated a new FAN (Field Area Network) encryption key.	Security	Communication Module	Communication Module	Log Only*	FAN Encryption Configuration Updated	5126							3.12.32.29 10.12.32.29 20.12.32.29
A new Master FAN Key Derivation Key was Activated	The Endpoint activated a new Master FAN key derivation key.	Security	Communication Module	Communication Module	Log Only*	FAN Encryption Configuration Updated	5125							3.12.32.4 10.12.32.4 20.12.32.4
A new Master FAN Key Derivation Key was received	The Endpoint received a new Master FAN Key Derivation key.	Security	Communication Module	Communication Module	Log Only*	FAN Encryption Configuration Updated	5124							3.12.32.25 10.12.32.25 20.12.32.25
Accelerometer Communication Error	Excessive meter orientation sensor errors detected	Diagnostic	Landis+Gyr Specific	Meter:Metrology	Advisory		6591						3.21.1.104	3.1.144.79
Access Error - Backup Memory	Indicates that the backup memory could not be accessed several times	Diagnostic	Meter	Meter:Metrology	Advisory		6403							3.18.1.79
Access Error - Communication Unit	Indicates a failure to access the communication unit	Diagnostic	Meter	Meter:Metrology	Advisory		6407							3.1.3.39
Access Error - Display Board	Indicates display failure	Diagnostic	Meter	Meter:Metrology	Advisory		6408							3.13.3.39
Access Error - Load Profile Data	Indicates memory access failures	Diagnostic	Meter	Meter:Metrology	Advisory		6406							3.16.3.39
Access Error - Measurement system	Indicates measuring system access failures	Diagnostic	Meter	Meter:Metrology	Advisory		6404							3.12.3.39
Access Error - Time Device	Indicates a failure to access the time base device	Diagnostic	Meter	Meter:Metrology	Advisory		6405							3.36.3.39
Active Control Input 1	Indicates that the state of control input 1 has changed to active	Informational	Meter	Meter:Metrology	Advisory		6387							3.1.55.4
Active Power Cleared	Active Power disappears when it is too high.	Diagnostic	Meter	Meter:Metrology	Advisory		6380							3.26.67.139
Active Power Detected	Indicates that the active power is above the set threshold	Diagnostic	Meter	Meter:Metrology	Advisory		6418							3.26.67.93
Active Power Detected-Phase A	Indicates that the active power on L1 exceeds a parameterised threshold	Diagnostic	Meter	Meter:Metrology	Advisory		6415							3.26.126.139
Active Power Detected-Phase B	Indicates that the active power on L2 exceeds a parameterised threshold	Diagnostic	Meter	Meter:Metrology	Advisory		6416							3.26.134.139
Active Power Detected-Phase C	Indicates that the active power on L3 exceeds a parameterised threshold	Diagnostic	Meter	Meter:Metrology	Advisory		6417							3.26.135.139
Actual Sequence Number	This event contains the actual sequence number from the restored backup.	Informational	Landis+Gyr Specific	Meter:Metrology	Disabled		4504						3.18.5.65	3.18.42.24
Adapter Usage Changed	Event indicating that Network Gateway/Bridge backhaul adapter usage has changed.	Diagnostic	Collector	Collector	Advisory		6259						10.23.7.24	10.1.123.24

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Added Endpoint into Team	Device is added into team by the user	Team	Command Center Generated	Command Center	Host generated		6200						3.23.7.24 11.23.7.24 30.7.390.370	3.7.390.370 11.7.390.370 30.7.390.370
Additional Power Supply - Missing	Indicates the additional power supply is missing.	Diagnostic	Meter	Meter:Metrology	Advisory		6367							3.26.138.285
AES Key Import	Utility key has been imported on Import System Key page.	Security	Command Center Generated	Command Center	Host generated		1507						7.32.17.4	0.12.32.4
Alert 1 Set	Event confirming that the self check of the meter has found that Alert 1 is set.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4556						3.21.18.261	3.21.17.93
Alert 2 Set	Event confirming that the self check of the meter has found that Alert 2 is set.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4557						3.21.18.261	3.21.17.93
Alert 3 Set	Event confirming that the self check of the meter has found that Alert 3 is set.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4558						3.21.18.261	3.21.17.93
Alert 4 Set	Event confirming that the self check of the meter has found that Alert 4 is set.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4559						3.21.18.261	3.21.17.93
Alert 5 Set	Event confirming that the self check of the meter has found that Alert 5 is set.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4560						3.21.18.261	3.21.17.93
Alert 6 Set	Event confirming that the self check of the meter has found that Alert 6 is set.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4561						3.21.18.261	3.21.17.93
Alert 7 Set	Event confirming that the self check of the meter has found that Alert 7 is set.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4562						3.21.18.261	3.21.17.93
Alert 8 Set	Event confirming that the self check of the meter has found that Alert 8 is set.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4563						3.21.18.261	3.21.17.93
Alert Occurred	This event is generated when a demand threshold alert, voltage threshold alert, or any of the other types of alerts occur.	Informational	Landis+Gyr Specific	Meter:Metrology	Disabled		4505						3.21.17.79	3.21.17.79
ANSI Security Fail	Incorrect Password used over the C12.18 port(s)	Security	Centron II Specific	Meter:Metrology	Disabled*	Centron II Group 02	3545						3.32.17.85	3.12.17.35
ANSI Security Success	Correct Password used over the C12.18 port(s)	Security	Centron II Specific	Meter:Metrology	Disabled*	Centron II Group 02	3544						3.32.17.244	3.12.17.44
Apparent Power Detected	Indicates that the apparent power is above the set threshold	Diagnostic	Meter	Meter:Metrology	Advisory		6426							3.26.290.139

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Apparent Power Detected- Phase A	Indicates that the apparent power on L1 exceeds a parameterised threshold	Diagnostic	Meter	Meter:Metrology	Advisory		6423							3.26.291.139
Apparent Power Detected- Phase B	Indicates that the apparent power on L2 exceeds a parameterised threshold	Diagnostic	Meter	Meter:Metrology	Advisory		6424							3.26.292.139
Apparent Power Detected- Phase C	Indicates that the apparent power on L3 exceeds a parameterised threshold	Diagnostic	Meter	Meter:Metrology	Advisory		6425							3.26.293.139
Arm Rejected: Switch Not Open	Arm command rejected because the switch can only be armed when the switch is open	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm	Service Disconnect Error	6009							3.31.66.16
ASIC Data Overrun	Meter detected an application specific integrated circuit data overrun.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3231						3.4.14.52	3.21.286.79
ASIC Not Initialized	The application specific integrated circuit was not initialized.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3229						3.4.7.171	3.7.0.79
Audit Trail Log is Full	Event confirming that the self check of the meter has found that Audit Trail Log is Full.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4555						3.17.17.146	3.17.44.32
Audit Trail Log is not Full	Event confirming that the self check of the meter has found that Audit Trail Log is not Full.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4575						3.17.17.28	3.17.44.28
Authenticate Service Failure	Event indicating an authenticate service failure occurred.	Security	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 05	4450						3.1.1.147	3.12.1.38
Authentication Enabled	Event generated when C12.21 two-way session-level authentication is enabled.	Security	Landis+Gyr Specific	Meter:Metrology	Disabled		4518						3.32.7.76	3.12.1.58
Auxiliary Relay Closed	Event indicating the auxiliary relay has closed.	Informational	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 05	4444						3.15.18.42	3.15.17.42
Auxiliary Relay Opened	Event indicating the auxiliary relay has opened.	Informational	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 05	4443						3.15.18.68	3.15.17.68
Average voltage high	Average voltage higher than set threshold.	Diagnostic	Meter	Meter:Metrology	Advisory		6429							3.26.38.286
Average voltage low	Average voltage lower than set threshold.	Diagnostic	Meter	Meter:Metrology	Advisory		6430							3.26.38.57
Bad Password	Event indicating a bad password has been detected.	Security	KV2c Specific	Meter:Metrology	Disabled		2567						3.24.1.106	3.12.24.35
Bad Password Threshold	Meter has received more than specified invalid passwords, in a single session, Manufacturing Event Group 07	Security	Aclara I210+c	Meter:Metrology	Alarm		6494						3.24.1.93	3.12.24.93
Bad Password Threshold Alert Cleared	Manufacturing Event Group 07	Security	Aclara I210+c	Meter:Metrology	Alarm		6502						3.6.1.28	3.12.24.279
Battery - Low level Condition Cleared	Battery - Low level Condition Cleared	Diagnostic	ABNT	Meter:Metrology	Alarm*	Battery - Low level	5333							3.2.22.37

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Battery low	Indicates that the battery voltage has fallen below 5.2 V.	Diagnostic	Meter	Meter:Metrology	Advisory		6369							3.2.43.212
Battery Status Bad	Event indicating that Battery is Bad.	Diagnostic	Collector	Collector	Alarm		6195						10.2.18.17	10.2.17.85
Battery Status Good	Event indicating that Battery is Good.	Diagnostic	Collector	Collector	Alarm		6196						10.2.18.16	10.2.17.37
Bottom Feed Active	Event confirming that the self check of the meter has found a Bottom Feed Active.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4554						3.20.7.4	3.7.46.4
Button Press Clear Data Occurred	Event indicating button press clear data occurred.	Revenue Integrity	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4474						3.8.18.195	3.8.17.28
Button Press Demand Reset Occurred	Event indicating button press Demand Reset occurred.	Revenue Integrity	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4473						3.8.17.195	3.8.17.215
Bypass Feeder Operation Mode Detected	Indicates that the meter is in the bypass feeder operation mode.	Informational	Meter	Meter:Metrology	Advisory		6366							3.7.12.4
Calendar Initiated Demand Reset Occurred	Meter Calendar Initiated Demand Reset Occurred On The Meter.	Revenue Integrity	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4468						3.8.17.61	3.8.17.33
Calibration Mode Activated	A Calibration Mode Activated event is logged when Calibration Mode is activated. There is no equivalent Calibration Mode Deactivated event since the meter does not advance time while in Calibration Mode.	Diagnostic	kV2c Specific	Meter:Metrology	Advisory		2310							
Canadian Locked	Billing relevant configuration tables cannot be written and billing relevant procedures cannot be executed	Diagnostic	Elster REXU Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4609						3.21.1.40	3.7.9.79
Caution 000400 Under Voltage	The Low Potential caution indicates that the voltage for one or more phases fell below the reference voltage minus the tolerance (uses Diagnostic 6 threshold). All active phases are tested every 5 seconds using the phase voltages from the previous second. The meter sets the Low Potential caution when the test fails 3 consecutive times.	Diagnostic	kV2c Specific	Meter:Metrology	Alarm		2300							

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than)	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed)	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Caution 000400 Under Voltage Condition Cleared	<p>A Caution 000400 Under Voltage Condition Cleared event is logged when the Caution 000400 Under Voltage is cleared.</p> <p>The meter automatically clears the Low Potential caution when all active phases exceed the minimum threshold for 2 consecutive tests.</p>	Informational	kv2c Specific	Meter:Metrology	Alarm		2301							
Caution 000400 Demand Overload	<p>The Demand Overload caution indicates that the load demand of the user-selected quantity exceeded the programmed threshold. The meter compares the value of the user-selected "instantaneous" demand quantity to the programmed threshold every 5 seconds using the demand from the previous second. The meter sets the Demand Overload caution when the user-selected demand exceeds its threshold for 3 consecutive tests.</p>	Diagnostic	kv2c Specific	Meter:Metrology	Alarm		2302							
Caution 000400 Demand Overload Condition Cleared	<p>A Caution 000400 Demand Overload Condition Cleared event is logged when the Caution 000400 Demand Overload is cleared.</p> <p>The meter does not automatically clear the Demand Overload caution. The Demand Overload caution is cleared by a demand reset.</p>	Informational	kv2c Specific	Meter:Metrology	Alarm		2303							

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Caution 040000 Leading kvarh	The Leading kvarh caution indicates that the current leads the voltage instead of lagging it. The meter tests the direction of the quadergy every 5 seconds using the kvarh from the previous second. The meter sets the Leading kvarh caution when the direction of the quadergy is leading for 3 consecutive tests.	Diagnostic	KV2c Specific	Meter:Metrology	Log Only		2306							
Caution 040000 Leading kvarh Condition Cleared	A Caution 040000 Leading kvarh Condition Cleared event is logged when the Caution 400000 Received kWh is cleared.  The meter does not automatically clear the Leading kvarh caution. The Leading kvarh caution is cleared by a demand reset.	Informational	KV2c Specific	Meter:Metrology	Log Only		2307							
Caution 400000 Received kWh	The Received kWh caution indicates that active energy was received from the load. The meter tests the direction of the active energy every 5 seconds using the kWh from the previous second. The meter sets the Received kWh caution when the direction of the active energy is received for 3 consecutive tests.	Diagnostic	KV2c Specific	Meter:Metrology	Alarm		2304							
Caution 400000 Received kWh Condition Cleared	A Caution 000400 Received kWh Cleared event is logged when the Caution 000400 Received kWh is cleared.  The meter does not automatically clear the Received kWh caution. The Received kWh caution is cleared by a demand reset.	Informational	KV2c Specific	Meter:Metrology	Alarm		2305							
Changed Prepay Block Mode	The meter has changed to Prepay Block pricing.	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm*	Payment Mode	5491							3.7.0.358
Changed Prepay TOU Mode	The meter has changed to Prepay TOU pricing.	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm*	Payment Mode	5490							3.7.121.358

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Changed to Credit Mode	The meter has changed from Prepay Mode to Credit Mode.	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm*	Payment Mode	5489							3.7.0.359
Checksum Error - Backup Data	Indicates a backup data checksum failure	Diagnostic	Meter	Meter:Metrology	Advisory		6409							3.18.284.39
Checksum Error - Event Log	Indicates a checksum error in the event log	Diagnostic	Meter	Meter:Metrology	Advisory		6413							3.17.284.39
Checksum Error - Internal Profile	Indicates a checksum failure in the stored values profile	Diagnostic	Meter	Meter:Metrology	Advisory		6412							3.2.284.39
Checksum Error - Load Profile	Indicates a load profile data checksum failure	Diagnostic	Meter	Meter:Metrology	Advisory		6411							3.16.284.39
Checksum Error - Load Profile 2	Indicates a load profile 2 data checksum failure	Diagnostic	Meter	Meter:Metrology	Advisory		6414							3.16.284.39
Checksum Error - Parameter	Indicates a parameter data checksum failure	Diagnostic	Meter	Meter:Metrology	Advisory		6410							3.7.284.39
Checksum Error In Flash Memory	Meter detected a checksum error in the data section of flash memory.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3226						3.18.5.52	3.18.42.43
Child Dropped	The parent endpoint has automatically emancipated a Low Energy Endpoint due to too many sync periods without contact.	Communication Application	Battery Endpoint Parent	Communication Module	Advisory		5452						3.23.5.252 11.23.5.252 30.23.5.252	26.10.68.85
Clear Billing Data	Billing Data was Cleared	Revenue Integrity	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 01	3535						3.34.5.28	3.21.140.28
Clock error detected	Event informing that a self check of the meter has found a Clock Error in the metrology.  This occurs when the meter enters stand-by, meaning an outage longer than the supercap could hold occurred. This clears when time is set by the AMI module.	Diagnostic	ANSI C12.19 DLMS	Meter:Metrology	Alarm Advisory*	S03 Meter Table Changed	2042			Clock error detected	42		3.36.1.29	3.36.114.85
Clock Reset Backwards Flag Detected	Event to flag that the meter recorded a clock reset backwards event.	Revenue Integrity	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4478						3.36.1.123	3.36.114.214
Cmnds: Report Hard iMODULE Reset(21)	Event generated when the radio is asked to reboot.	Diagnostic	Communication Module	Communication Module	Advisory		1031							3.12.0.53
Cold Start	Event generated when Cold Start occurs. Note: Not yet supported by the meter Metrology.	Informational	Landis+Gyr Specific	Meter:Metrology	Alarm		4486						3.21.18.31	3.21.0.31
Collector Battery Error	Sent when Collector is not able to read its battery status.	Informational	Collector	Collector	Advisory*	Battery Error	4390						10.2.1.79	10.2.0.85



Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than)	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed)	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Collector Communication Delay	Event indicating a Collector is not communicating with Command Center.	Outage	Collector	Command Center	Host generated		100			*Verify WAN Service provider is active with no known outages.  *Issue Ping command to Collector.			10.23.1.217	10.1.0.22
Collector Decryption Errors	Collector dropped a message due to decryption failure.	Security	Collector	Collector	Advisory		5406							10.12.36.85
Collector Endpoint Key Derivation Key Update Failed	Encryption key update for Route A from head end to Collector failed.	Security	Collector	Collector	Advisory		5159							10.12.32.85
Collector Firmware Activation Status	Firmware is waiting for activation OR Firmware is successfully activated.	Informational	Collector	Collector			5461							10.11.17.4
Collector Firmware Awaiting Activation Date	The Date that Firmware is waiting for activation.	Informational	Collector	Collector			5462							10.11.17.225
Collector Firmware Download Cancelled	Download of firmware file is cancelled.	Informational	Collector	Collector			5479							
Collector Firmware Download Complete	Firmware file download completed and Installation is in progress.	Informational	Collector	Collector			5460							10.11.0.25
Collector Firmware Download Started	Download of firmware file is started.	Informational	Collector	Collector			5459							10.11.17.14
Collector Location Changed	Event indicating that collector location has changed beyond a threshold value.	Security	Collector	Collector			6109						10.1.1.212	10.12.261.212
Collector Radio ChangeOut	Event indicating that collector have noticed a changeout.	Security	Router	Collector			6089							10.12.136.27
Collector Security Token Received	A Collector has received a Security Configuration Token.	Security	Collector	Collector	Advisory*	Crypto Token Received	2578						10.32.7.3	10.32.7.3
Collector Security Token Received Failure	A Collector has received a Security Configuration Token and failed to process it.	Security	Collector	Collector	Advisory		5405							10.12.103.85
Collector Security Token Received Success	A Collector has received a Security Configuration Token and successfully processed it.	Security	Collector	Collector	Advisory		5403							10.12.103.58
Collector Signature Errors	Collector dropped a message due to signature errors.	Security	Collector	Collector	Advisory		5404							10.12.103.79
Collector System Reset	Event indicating a Collector system reset has occurred. The event is sent after the Collector has reset due to a watchdog failure.	Informational	Collector	Collector	Advisory*	Watchdog	6						10.0.0.214	10.0.0.214
Collector Windows Update Applied	Sent when a Windows update is applied on the Collector.	Informational	Collector	Collector	Advisory*	Windows Update Applied	4391						10.11.17.24	10.11.17.24

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Command Processor Halted	The velocity threshold value has been exceeded and the commands processor has been halted.	Informational	Command Center Generated	Command Center	Host generated		5055						1.23.1.243	0.23.82.243
Command Processor Restarted	The commands processor has been restarted after velocity threshold value has been exceeded.	Informational	Command Center Generated	Command Center	Host generated		5056						1.23.1.242	0.23.82.53
Commercial Demand Max	Command Center Commercial demand threshold has been exceeded.	Revenue Integrity	Command Center Generated	Command Center	Host generated		2324							
Commercial Demand Min	Command Center Commercial demand threshold to 'allow no less than x kW' has been met.	Revenue Integrity	Command Center Generated	Command Center	Host generated		2326							
Commercial Energy Threshold Exceeded	Evaluation done of data delivered against preset commercial thresholds in Command Center.	Revenue Integrity	Command Center Generated	Command Center	Host generated		2327							
Commercial Interval kWh per hour exceeded	Event is generated when interval data is received for a Commercial meter and an interval kWh value is greater than the calculated threshold amount.	Revenue Integrity	Command Center Generated	Command Center	Host generated		3002							
Communication lockout	Triggered once the communication is locked out from RF or optical port.	Security	U Series Meter	Meter:Metrology	Log Only		3287						3.1.1.32	3.1.1.88
Communication Terminated Abnormally	The ANSI session established with the metrology was closed before a logout was received.	Diagnostic	ANSI C12.19	Meter:Metrology	Disabled		2013				Communication Terminated Abnormally	13	1.23.17.32	3.1.17.85
Communication Terminated Normally	The ANSI session established with the metrology was closed normally using Logout.	Diagnostic	ANSI C12.19	Meter:Metrology	Disabled		2012				Communication Terminated Normally	12	1.23.17.34	3.1.17.59
Communications Firmware Changed	Event indicating the communications firmware has changed.	Communication Application	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 03	4435						3.11.5.30	3.11.17.24
Compensation Values Updated	Indicates that either a transformer correction or a customer magnitude adjustment has been made.	Diagnostic	Meter	Meter:Metrology	Advisory		6379							3.39.16.24
Config ID not updated	Event confirming that the Config ID not updated during previous programming.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	503 Meter Table Changed	4523						3.21.7.193	3.7.83.79

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Configuration error detected	Event triggered when a self check of the meter determines the current configuration is not supported.  This might be caused by outside factors that are not necessarily hard errors requiring the meter to be replaced.	Diagnostic	ANSI C12.19	Meter:Metrology	Alarm Advisory*	503 Meter Table Changed	4448				Configuration error detected	37	3.21.7.40	3.7.0.79
Configuration error detected	Event indicating a configuration error has been detected on an Elster meter.	Diagnostic	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 05	2037						3.21.7.79	3.7.17.79
Configuration group created	A meter configuration group has been auto-generated.	Informational	Command Center Generated	Command Center	Host generated		3094							
Configuration group not created	A new meter configuration group has been detected but Command Center is unable to auto-generate.	Informational	Command Center Generated	Command Center	Host generated		3095							
Configuration Table Write	Event indicating configuration table write has occurred.	Informational	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 03	4438						3.21.7.256	3.9.110.24
Configuration Token Invalid Length	Endpoint received a Security Configuration Token with an invalid length.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2804						3.32.7.116 10.32.7.116 11.32.7.116 30.32.7.116 24.32.7.116 4.32.7.116	3.12.119.35 10.12.119.35 11.12.119.35 30.12.119.35 24.12.119.35 4.12.119.35
Configuration Token Invalid Network ID	Endpoint received a Security Configuration Token with an invalid network id.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2803						3.32.7.127 10.32.7.127 11.32.7.127 30.32.7.127 24.32.7.127 4.32.7.127	3.12.71.35 10.12.71.35 11.12.71.35 30.12.71.35 24.12.71.35 4.12.71.35
Configuration Token Invalid Options	Endpoint received a Security Configuration Token with invalid options.	Security	Communication Module	Communication Module	Advisory* Alarm	Token Received	2805						3.32.7.107 7.32.7.107 10.32.7.107 11.32.7.107 30.32.7.107 24.32.7.107 4.32.7.107	3.12.32.35 10.12.32.35 11.12.32.35 30.12.32.35 24.12.32.35 4.12.32.35
Configuration Token Invalid Version	Endpoint received a Security Configuration Token with an invalid version.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2802						3.32.7.128 10.32.7.128 11.32.7.128 30.32.7.128 24.32.7.128 4.32.7.128	3.12.120.35 10.12.120.35 11.12.120.35 30.12.120.35 24.12.120.35 4.12.120.35
Configuration Token Message Generation Error	Endpoint received a Security Configuration Token with a message generation error.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2806						3.32.7.79 10.32.7.79 11.32.7.79 30.32.7.79 24.32.7.79 4.32.7.79	3.12.32.79 10.12.32.79 11.12.32.79 30.12.32.79 24.12.32.79 4.12.32.79
Configuration Token Processed	Endpoint accepted and processed the Security Configuration Token.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2801						3.32.7.244 10.32.7.244 11.32.7.244 30.32.7.244 24.32.7.244 4.32.7.244	3.12.32.44 10.12.32.44 11.12.32.44 30.12.32.44 24.12.32.44 4.12.32.44

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Control Input OFF	Indicates that the states of the input control signals have changed	Informational	Meter	Meter:Metrology	Advisory		6389							3.7.55.19
Control Input ON	Indicates that the states of the input control signals have changed	Informational	Meter	Meter:Metrology	Advisory		6390							3.7.55.4
Conventional Readings Extract Completed	Event indicating the conventional readings (self read) data extract file has completed.	Revenue Integrity	Command Center Generated	Command Center	Host generated		200						3.7.15.135	3.21.231.3
Count registers cleared	All general count registers were cleared.	Informational	Meter	Meter:Metrology	Advisory		6373							3.38.89.28
Cover Was Installed	Event generated when the meter cover is installed.	Informational	Landis+Gyr Specific DLMS	Meter:Metrology	Alarm		4506						3.1.5.105	3.12.29.105
Cover Was Removed	Event generated when the meter cover is removed.	Informational	Landis+Gyr Specific DLMS	Meter:Metrology	Alarm		4507						3.1.5.44	3.12.29.212
CPU Exchanged	Meter detected an exchange of the CPU it is connected.	Informational	Collector	Collector			6574							3.39.82.24
CPU Temperature Normal	Event indicating that current CPU temperature is Normal.	Informational	Collector	Collector			6640						10.35.3.214	10.35.43.37
CRC Error	Set if a CRC error is detected on a configuration table	Metrology Configuration	Elster REXU Specific	Meter:Metrology	Advisory*	503 Meter Table Changed	4600						3.21.7.116	3.12.30.79
Created New Team	New team is created by the user	Team	Command Center Generated	Command Center	Host generated		6198						3.23.3.4	3.7.390.83
Credit adjustment accepted	Event indicating credit adjustment has been accepted.	Prepay	Landis+Gyr Specific	Meter:Metrology	Disabled* Alarm*	Payment Code Applied Payment Code Applied with Details	5498							3.20.8.24
Critical Peak Pricing	CPP Event with status	Revenue Integrity	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 25	3724						3.34.6.201	3.20.140.24
Crypto Init Failure	Endpoint fails the Security Configuration process.	Security	Command Center Generated	Command Center	Host generated		1500						3.32.7.85 10.32.7.85 11.32.7.85 20.12.298.85 30.32.7.85 24.12.298.85 4.32.7.85	3.12.298.85 10.12.298.85 20.12.298.85 30.12.298.85 24.12.298.85 4.12.298.85
Current Imbalance Alert Cleared	current imbalance (diagnostic 4) in 10th degrees cleared	Revenue Integrity	Aclara I210+c	Meter:Metrology	Alarm		6503						3.6.1.9	3.6.6.28
Current Magnitude Imbalance Error	Current imbalance GyrBox call in event.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	503 Meter Table Changed	3248						3.25.17.98	3.6.38.98
Current Phase Angle Error	Current phase angle GyrBox call in event.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	503 Meter Table Changed	3247						3.25.17.183	3.26.130.216
Current without voltage Detected - Phase A	Current without voltage Detected - Phase A	Diagnostic	ABNT	Meter:Metrology	Alarm*	Current without voltage	5329							3.26.131.257
Current without voltage Detected - Phase B	Current without voltage Detected - Phase B	Diagnostic	ABNT	Meter:Metrology	Alarm	Current without voltage	5388							3.26.132.257
Current without voltage Detected - Phase C	Current without voltage Detected - Phase C	Diagnostic	ABNT	Meter:Metrology	Alarm	Current without voltage	5390							3.26.133.257
Customer Payment Transaction Initiated	The customer payment transaction has been initiated. The request will be sent to the meter	Prepay	Landis+Gyr Specific	Command Center	Host generated		6087							3.20.81.242

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DASCADA Event	Event generated when any unsolicited data sent from a DA Device to Command Center.	DA Device	DA Device	DADevice	N/A		4427						30.19.18.3	30.112.17.4
Date Invalid	Set if the meter's date is invalid	Time	Elster REXU Specific	Meter:Metrology	Advisory*	503 Meter Table Changed	4608						3.36.1.110	3.36.34.35
DC Current Detected	DC Current has been detected.	Informational	Elster REXU Specific	Meter:Metrology	Alarm*	Elster REXU Group 10	4461						3.6.17.3	3.17.6.4
DCW firmware change complete	Event confirming that the DCW change has completed.	Communication Application	Communication Module	Communication Module	Advisory		2279						3.11.7.244	3.11.83.213
DCW firmware change started	Event confirming that the DCW change has started.	Communication Application	Command Center Generated	Command Center	Host generated		2278							
DCW Module Tamper Event	DCW Module Tamper Event	Communication Application	U Series Meter	Communication Module	Advisory*	503 Meter Table Changed	5438							3.9.0.257
DCW pre-empted or removed	Event indicating that a DCW has been removed or replaced.	Communication Application	Communication Module	Communication Module	Advisory		2134						3.11.7.212 11.11.7.212	3.11.124.212 11.11.124.212
DCW raised its access level	Event indicating that a DCW has raised its access level.	Communication Application	Communication Module	Communication Module	Log Only		2139							11.11.1.102 3.11.282.102
Decryption Error General	Endpoint dropped a message due to decryption failure.	Security	Communication Module	Communication Module	Log Only*	Decryption Errors	2603						3.19.14.85 10.19.14.85 11.19.14.85 30.19.14.85 24.19.14.85 4.19.14.85	3.12.36.79 10.12.36.79 11.12.36.79 30.12.36.79 24.12.36.79 4.12.36.79
Decryption Error HMAC Failure	Endpoint dropped a message because the HMAC validation failed.	Security	Communication Module	Communication Module	Log Only*	Decryption Errors	2602						3.19.14.1 10.19.14.1 11.19.14.1 30.19.14.1 24.19.14.1 4.19.14.1	3.12.54.85 10.12.54.85 11.12.54.85 30.12.54.85 24.12.54.85 4.12.54.85
Decryption Error Plain Text	Endpoint dropped a message because it was in plain text and should have been encrypted.	Security	Communication Module	Communication Module	Log Only*	Decryption Errors	2601						3.19.14.79 10.19.14.79 11.19.14.79 30.19.14.79 24.19.14.79 4.19.14.79	3.12.31.63 10.12.31.63 20.12.31.63 30.12.31.63 24.12.31.63 4.12.31.63
Decryption Errors	Endpoint dropped a message due to decryption failure.	Security	Communication Module	Communication Module	Log Only		2600							3.12.36.85
Decryption Errors Flag	Endpoint dropped a message due to decryption failure.	Security	Communication Module	Communication Module	Log Only		6340						24.19.17.79 4.19.17.79	24.12.36.85 4.12.36.85
Decryption Failure	Event generated by Command Center if a message fails to decrypt.	Security	Command Center Generated	Command Center	Host generated		1501						3.19.14.230 10.19.14.230 11.19.14.230 30.19.14.230 24.19.14.230 4.19.14.230	3.12.36.85 10.12.36.85 20.12.36.85 30.12.36.85 24.12.36.85 4.12.36.85
Default Phase to Phase Cal Constants	Event confirming that the self check of the meter has found that Default Phase to Phase Cal Constants is in Use.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	503 Meter Table Changed	4566						3.25.17.58	3.26.25.37
Default Sys Config Calibration	Event confirming that the self check of the meter has found that Default SysConfig and Calibration is in use.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	503 Meter Table Changed	4565						3.21.4.58	3.21.18.37
Deleted Team	Team is deleted by the user	Team	Command Center Generated	Command Center	Host generated		6199						3.23.3.66	3.7.390.19

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Demand Detected - Level 1	Indicates that the demand is above a set limit	Diagnostic	Meter	Meter:Metrology	Advisory		6393							3.8.67.40
Demand Detected - Level 2	Indicates that the demand is above a set limit	Diagnostic	Meter	Meter:Metrology	Advisory		6394							3.8.67.40
Demand Detected - Level 3	Indicates that the demand is above a set limit	Diagnostic	Meter	Meter:Metrology	Advisory		6395							3.8.67.40
Demand Detected - Level 4	Indicates that the demand is above a set limit	Diagnostic	Meter	Meter:Metrology	Advisory		6396							3.8.67.40
Demand Detected - Level 5	Indicates that the demand is above a set limit	Diagnostic	Meter	Meter:Metrology	Advisory		6397							3.8.67.40
Demand Detected - Level 6	Indicates that the demand is above a set limit	Diagnostic	Meter	Meter:Metrology	Advisory		6398							3.8.67.40
Demand Detected - Level 7	Indicates that the demand is above a set limit	Diagnostic	Meter	Meter:Metrology	Advisory		6399							3.8.67.40
Demand Detected - Level 8	Indicates that the demand is above a set limit	Diagnostic	Meter	Meter:Metrology	Advisory		6400							3.8.67.40
Demand Limit Lockout	The number of demand limiting occurrences exceeded the threshold	Diagnostic	Elster REXU Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4605						3.31.17.284	3.8.261.40
Demand overload detected	Event informing that a self check of the meter has found the load on a particular phase of the meter is above the maximum threshold.	Diagnostic	ANSI C12.19	Meter:Metrology	Alarm Advisory*	S03 Meter Table Changed	2046			Demand overload detected	46		3.8.1.178	3.8.261.139
Demand Overload Error 0	Event confirming that the self check of the meter has found a demand overload error 0.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4531						3.8.17.178	3.8.261.79
Demand Overload Error 1	Event confirming that the self check of the meter has found a demand overload error 1.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4532						3.8.17.178	3.8.261.79
Demand Overload Error 10	Event confirming that the self check of the meter has found a demand overload error 10.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4541						3.8.17.178	3.8.261.79
Demand Overload Error 11	Event confirming that the self check of the meter has found a demand overload error 11.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4542						3.8.17.178	3.8.261.79
Demand Overload Error 12	Event confirming that the self check of the meter has found a demand overload error 12.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4543						3.8.17.178	3.8.261.79
Demand Overload Error 13	Event confirming that the self check of the meter has found a demand overload error 13.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4544						3.8.17.178	3.8.261.79
Demand Overload Error 14	Event confirming that the self check of the meter has found a demand overload error 14.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4545						3.8.17.178	3.8.261.79

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Demand Overload Error 15	Event confirming that the self check of the meter has found a demand overload error 15.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4546						3.8.17.178	3.8.261.79
Demand Overload Error 2	Event confirming that the self check of the meter has found a demand overload error 2.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4533						3.8.17.178	3.8.261.79
Demand Overload Error 3	Event confirming that the self check of the meter has found a demand overload error 3.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4534						3.8.17.178	3.8.261.79
Demand Overload Error 4	Event confirming that the self check of the meter has found a demand overload error 4.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4535						3.8.17.178	3.8.261.79
Demand Overload Error 5	Event confirming that the self check of the meter has found a demand overload error 5.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4536						3.8.17.178	3.8.261.79
Demand Overload Error 6	Event confirming that the self check of the meter has found a demand overload error 6.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4537						3.8.17.178	3.8.261.79
Demand Overload Error 7	Event confirming that the self check of the meter has found a demand overload error 7.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4538						3.8.17.178	3.8.261.79
Demand Overload Error 8	Event confirming that the self check of the meter has found a demand overload error 8.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4539						3.8.17.178	3.8.261.79
Demand Overload Error 9	Event confirming that the self check of the meter has found a demand overload error 9.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4540						3.8.17.178	3.8.261.79
Demand Reset Occurred	Confirmation that a demand reset executed successfully.	Revenue Integrity	ANSI C12.19 ABNT DLMS	Meter:Metrology	Alarm		2255			Demand Reset Occurred	20		3.8.1.61	3.8.0.215
Demand Threshold Exceeded	Min/Max demand threshold exceeded for recorded energy	Revenue Integrity	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 01	3539						3.8.14.93	3.8.261.286
Demand Threshold Restored	Now falling within the boundaries of the Min/Max demand thresholds	Revenue Integrity	Centron II Specific	Meter:Metrology	Disabled*	Centron II Group 02	3540						3.8.14.216	3.8.261.216
Device IPV6 Address Changed	The device's IP version 6 address has changed.	SBS	Command Center Generated	Command Center	Host generated		5400						3.23.3.26 10.23.3.26 11.23.3.26 30.23.3.26	3.23.127.24 10.23.127.24 11.23.127.24 38.23.127.24
Diagnostic 1 Condition Cleared	A Diagnostic 1 Condition Cleared event is logged when the Diagnostic 1 Polarity, Cross Phase, Reverse Energy Flow is cleared.	Informational	kV2c Specific	Meter:Metrology	Alarm		2285						3.38.1.218	3.26.38.28

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than)	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed)	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Diagnostic 1 Polarity, Cross Phase, Rv Energy Flow	This diagnostic verifies that all meter elements are sensing the correct voltage and current for the electrical service. This is accomplished by comparing each voltage and current phase angle with expected values. Voltage phase angles must be within $\pm 10^\circ$ of the expected value and current phase angles must be within $\pm 120^\circ$ of the expected value to prevent a diagnostic 1 error.  Typical problems detected: Cross-phasing of a voltage or current circuit, incorrect polarity of voltage or current circuit, reverse	Diagnostic	KV2c Specific	Meter:Metrology	Alarm		2284						3.38.1.139	3.26.130.45
Diagnostic 2 Condition Cleared	A Diagnostic 2 Condition Cleared event is logged when the Diagnostic 2 Voltage Imbalance is cleared.	Informational	KV2c Specific	Meter:Metrology	Alarm		2287							
Diagnostic 2 Voltage Imbalance	This diagnostic verifies that the voltage at each phase is maintained at an acceptable level with respect to the other phases. For diagnostic 2 tests, the A phase voltage is combined with the user programmed percentage tolerance to determine the acceptable range for the B and C phase voltages as appropriate for the ANSI form and service type. For the 4 wire delta services, the meter scales Vc before comparing it to Va. Pass Conditions for diagnostic 2: $V_a(100\% - T\%) < [V_B]$ $< V_a(100\% + T\%)$ and $V_a(100\% - T\%) < [V_C]$ $< V_a(100\% + T\%)$	Diagnostic	KV2c Specific	Meter:Metrology	Alarm		2286							
Diagnostic 3 Condition Cleared	A Diagnostic 3 Condition Cleared event is logged when the Diagnostic 3 Inactive Phase Current is cleared.	Informational	KV2c Specific	Meter:Metrology	Alarm		2289							



Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Diagnostic 3 Inactive Phase Current	This diagnostic verifies that the current of each phase is maintained at an acceptable level. A diagnostic 3 error condition is triggered if the current of one or more phases, as appropriate for the ANSI form and service type, falls below a user programmed low current value and at least one phase current remains above this value.  Typical problems detected: Shorted current transformer, wiring error, tampering or current diversion, or shorting bar or by-pass closed	Diagnostic	kV2c Specific	Meter:Metrology	Alarm		2288							
Diagnostic 4 Condition Cleared	A Diagnostic 4 Condition Cleared event is logged when the Diagnostic 4 Phase Angle Alert is cleared.	Informational	kV2c Specific	Meter:Metrology	Alarm		2291							
Diagnostic 4 Phase Angle Alert	This diagnostic verifies that the current phase angles fall within a user specified range around expected values. Diagnostic 4 can be enabled only if diagnostic 1 is enabled and is checked only if diagnostic 1 passes. The user programmed current phase angle tolerance value for diagnostic 4 has a range of 0° to 120° in increments of 1°. Typical problems detected: Poor power factor, or imbalanced load.	Diagnostic	kV2c Specific	Meter:Metrology	Alarm		2290							
Diagnostic 5 Condition Cleared	A Diagnostic 5 Condition Cleared event is logged when the Diagnostic 5 High Distortion is cleared.	Informational	kV2c Specific	Meter:Metrology	Alarm		2293							

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than)	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed)	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Diagnostic 5 High Distortion	This diagnostic verifies that the user-selected form of distortion measured on each individual element and, in the case of DPF, across all elements, is not excessive.  Diagnostic 5 shall be selectable to monitor one of the following distortion measures: <ul style="list-style-type: none"> <li>- Distortion Power Factor (DPF), per element and summed.</li> <li>- Total Demand Distortion (TDD), per element only.</li> <li>- Total Harmonic Current Distortion (ITHD), per element only.</li> <li>- Total Harmonic Voltage Distortion (VTHD), per element</li> </ul>	Diagnostic	KV2c Specific	Meter:Metrology	Alarm		2292							
Diagnostic 6 Condition Cleared	A Diagnostic 6 Condition Cleared event is logged when the Diagnostic 6 UnderVoltage, Phase A is cleared.	Informational	Endpoint	Meter:Metrology	Alarm		2295							
Diagnostic 6 UnderVoltage, Phase A	This diagnostic verifies that the phase A voltage is maintained above an acceptable level. The user programs an undervoltage percentage tolerance for diagnostic 6 that has a range of 0 to 100 % in increments of 1%. A diagnostic 6 error condition is triggered if the voltage at phase A falls below the reference voltage (Vref) minus the undervoltage percentage tolerance (T).  The threshold used for diagnostic 6 is also used for the potential annunciators and the low potential	Diagnostic	Endpoint	Meter:Metrology	Alarm		2294						3.38.17.223	3.26.38.223
Diagnostic 7 Condition Cleared	A Diagnostic 7 Condition Cleared event is logged when the Diagnostic 7 Over Voltage, Phase A is cleared.	Informational	Endpoint	Meter:Metrology	Alarm		2297						3.38.17.249	3.26.38.249

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than)	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed)	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Diagnostic 7 Over Voltage, Phase A	This diagnostic verifies that the phase A voltage is maintained below an acceptable level. The user programs an overvoltage percentage tolerance for diagnostic 7 that has a range of 0 to 100 % in increments of 1%. A diagnostic 7 error condition is triggered if the voltage at phase A rises above the reference voltage (Vref) plus the overvoltage percentage tolerance (T).  Typical problems detected: Capacitor banks, voltage regulation, blown fuse, or wrong VT ratio.	Diagnostic	Endpoint	Meter:Metrology	Alarm		2296						3.38.17.248	3.26.38.223
Diagnostic 8 Condition Cleared	A Diagnostic 8 Condition Cleared event is logged when the Diagnostic 8 High Neutral Current is cleared.	Informational	kV2c Specific	Meter:Metrology	Alarm		2299							
Diagnostic 8 High Neutral Current	This diagnostic verifies that the imputed neutral current is maintained below an acceptable level. A diagnostic 8 error condition is triggered if the imputed neutral current exceeds a user-programmed threshold. Form 45 and 56 as 4WD or 4WY applications are not valid services for calculating the imputed neutral values. In these cases the imputed neutral will be zeroed after the service type has been determined.  Typical problems detected: Third harmonic distortion adding in neutral,	Diagnostic	kV2c Specific	Meter:Metrology	Alarm		2298							
Digest Event Started	Excessive meter event logging started	Diagnostic	Landis+Gyr Specific	Meter:Metrology	Alarm		6592						3.17.18.242	3.21.14.242
Digest Event Stopped	Excessive meter event logging stopped	Diagnostic	Landis+Gyr Specific	Meter:Metrology	Information		6593						3.17.18.243	3.21.14.243
Disable OPT port demotion via MFG procedure 22	Disable OPT port demotion via MFG procedure 22	Informational	Landis+Gyr Specific	Meter:Metrology	Disabled		4511						3.20.17.76	3.0.17.76

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Disable OPT port LOCKOUT via MFG procedure 19	Disable OPT port LOCKOUT via MFG procedure 19	Informational	Landis+Gyr Specific	Meter:Metrology	Advisory		4510						3.20.17.66	3.0.17.66
Disconnect Relay Open	Set if the disconnect switch is installed and in the open position	Service Switch	Elster REXU Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4602						3.31.5.68	3.31.0.68
Disconnect Switch Closed	Event indicating the disconnect switch has closed.	Service Switch	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 04	4442						3.31.18.42	3.31.0.42
Disconnect Switch Closed -No LSV	Event indicating disconnect switch closed. There is no load side voltage (LSV).	Service Switch	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 05	4446						3.31.18.144	3.31.0.16
Disconnect Switch Opened	Event indicating the disconnect switch has opened.	Service Switch	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 04	4441						3.31.18.68	3.31.0.39
Download Failure	Event indicating a firmware download failure has occurred.	Communication Application	Communication Module	Communication Module	Advisory		99							3.11.0.85 20.11.0.85
Download Image Command Received	Event confirming the download image command has been received.	Communication Application	Communication Module	Communication Module	Advisory Disabled - SBS and Cellular		2140							3.11.282.25
DSP Comm Timeout	Meter detected a digital signal processing communication timeout.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3234						3.21.14.34	3.21.129.125
DSP error	Meter detected a digital signal processing error.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3219						3.21.1.73	3.23.17.79
DSP Initialization Error	There was a digital signal processing initialization error.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3230						3.21.7.73	3.23.17.217
DST Flag Mismatch	Daylight savings time flags between the radio, meter and system did not match.  This event's default alarm setting is controlled by the 'Time Sync Alert' event unless 'Time Sync Alert' is set to disabled. If 'Time Sync Alert' is disabled, default alarm setting will be set to Alarm.	Time	Communication Module	Communication Module	Alarm S4x-Advisory Japan - Advisory	Time Sync Alert	3202						3.36.18.56	3.36.56.159
DTA Exceeded	Demand threshold alert call in event.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3242						3.8.17.261	3.8.17.139
EIC Data Link Status Change	Waveform and periodic data streaming to the EIC has halted or restored	Diagnostic	Landis+Gyr Specific	Meter:Metrology	Information		6590						3.21.7.216	3.21.31.216
Emergency Code activated	Event indicating Global Emergency Code or Customer Specific Emergency code has been activated.	Prepay	Landis+Gyr Specific	Meter:Metrology	Disabled* Alarm*	Payment Code Applied Payment Code Applied with Details	5499							3.20.40.4

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than)	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed)	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Emergency Code deactivated	Event indicating Global Emergency Code or Customer Specific Emergency code has been deactivated.	Prepay	Landis+Gyr Specific	Meter:Metrolgy	Disabled* Alarm*	Payment Code Applied Payment Code Applied with Details	5500							3.20.40.19
Emergency Credit	Event indicating a change in Emergency Credit.	Prepay	Landis+Gyr Specific	Meter:Metrolgy	Advisory		5492							
Emergency Credit Activated	Emergency Credit Activated.	Prepay	Landis+Gyr Specific	Meter:Metrolgy	Advisory	Emergency Credit	5493							3.20.81.40
Emergency Credit Failed: Credit Meter	Emergency Credit failed to activate due to meter in Credit Mode.	Prepay	Landis+Gyr Specific	Meter:Metrolgy	Advisory	Emergency Credit	5496							3.20.81.4
Emergency Credit Failed: EC Not Available	Emergency Credit Failed to activate due to Emergency Credit not available.	Prepay	Landis+Gyr Specific	Meter:Metrolgy	Advisory	Emergency Credit	5494							3.20.81.160
Emergency Credit Failed: Insufficient EC Balance	Emergency Credit failed to activate due to insufficient Emergency Credit balance.	Prepay	Landis+Gyr Specific	Meter:Metrolgy	Advisory	Emergency Credit	5495							3.20.81.85
Encryption Implicit Acknowledgement	Event generated when Command Center updated encryption status of a device implicitly.	Security	Command Center Generated	Command Center	Host generated		3005						3.32.16.4 10.32.16.4 11.32.16.4 30.32.16.4 24.32.16.4 4.32.16.4	26.12.32.76 24.12.32.76 4.12.32.76
Encryption key update failure	Encryption key update for Route A from head end to router (repeater) failed.	Security	Router	Router			5158							20.12.282.85
Encryption Reverted	Encryption was reverted back to AES with default key.	Security	Communication Module	Communication Module	Advisory*	Gridstream RF Encryption Configuration Updated	3108						3.32.14.24 10.32.14.24 11.32.14.24	3.12.32.219 10.12.32.219 11.12.32.219
End Device Accessed for Read	An AMI device or Optical Probe accessed the ANSI tables to Read a particular table or part of a table.	Diagnostic	ANSI C12.19	Meter:Metrolgy	Disabled		2007				End Device Accessed for Read	07	7.1.17.202	3.12.202.58
End Device Accessed for Write	An AMI device or Optical Probe accessed the ANSI tables to Write a particular table or part of a table.	Diagnostic	ANSI C12.19	Meter:Metrolgy	Disabled		2008				End Device Accessed for Write	08	7.1.17.282	3.12.282.58
End Device Programmed	Event confirming the meters associated endpoint was reconfigured using the AMI module or the optical probe.	Metrolgy Configuration	ANSI C12.19	Meter:Metrolgy	Advisory		2011				End Device Programmed	11	3.21.7.24	3.11.0.213
End Device Remote Program Error	Event indicating End Device Remote Program Error.	Security	Elster A3 Specific	Meter:Metrolgy	Advisory		5042						3.20.17.193	3.31.83.79
End Device Sealed	Event indicating the end device sealed.	Informational	ANSI C12.19	Meter:Metrolgy	Alarm		4516				End Device Sealed	56	3.20.7.227	3.23.17.227
End Device Unsealed	Event indicating the end device unsealed.	Informational	ANSI C12.19	Meter:Metrolgy	Alarm		4517				End Device Unsealed	57	3.20.7.269	3.23.17.269
End of Calendar Detected	End of calendar has been detected.	Informational	Elster REXU Specific	Meter:Metrolgy	Alarm*	Elster REXU Group 10	4463						3.36.1.115	3.36.34.40

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
End of Interval - External	Indicates that the profile entry was made due to an externally generated regular EOI	Informational	Meter	Meter:Metrolgy	Advisory		6392							3.16.87.55
End of Interval - Internal	Indicates that the profile entry was made due to an internally generated regular EOI	Informational	Meter	Meter:Metrolgy	Advisory		6391							3.16.59.55
Endpoint Collector Association Changed	Event indicating endpoint has changed Collectors.	Informational	Command Center Generated	Command Center	Host generated		1367						3.14.3.24 4.14.3.24 10.14.3.24 11.14.3.24 24.14.3.24 30.14.3.24	3.39.0.284 11.39.0.284
Endpoint Configuration Changed	Event indicating an endpoints configuration has changed.	Informational	Command Center Generated	Command Center	Host generated		2338							
Endpoint Key Derivation Key Received	An Endpoint Key Derivation Key update was received.	Security	Communication Module	Communication Module	Log Only		5138							3.12.282.25
Endpoint Key Derivation Key Update Failed	An Endpoint Key Derivation Key update attempt failed.	Security	Communication Module	Communication Module	Log Only*	Endpoint Key Derivation Key Received	5156							3.12.282.85 20.12.282.85
Endpoint Key Derivation Key Update Processed Successfully	An Endpoint Key Derivation Key update was processed successfully.	Security	Communication Module	Communication Module	Log Only*	Endpoint Key Derivation Key Received	5401							11.12.32.24
Endpoint Key Roll Started	Event generated by Command Center when it starts to roll the keys of an endpoint when they expire.	Security	Command Center Generated	Command Center	Host generated		4599						3.32.1.23 10.32.1.23 11.32.1.23 30.32.1.23 24.32.1.23 4.32.1.23	26.12.32.242 24.12.32.242 4.12.32.242
Endpoint PANA Authentication Agent Failed to Authenticate a Client	The Endpoint PANA (Protocol for carrying Authentication for Network Access) Authentication Agent failed to authenticate a Tools client or a Route B client.	Security	Communication Module	Communication Module	Log Only	PANA Authentication Failed	5129							3.12.211.85 10.12.211.85 20.12.211.85
Endpoint PANA Authentication Client Authentication Failed	The Endpoint PANA (Protocol for carrying Authentication for Network Access) Authentication Client was unable to authenticate to the PANA Authentication Agent.	Security	Communication Module	Communication Module	Log Only	PANA Authentication Failed	5130							3.12.76.85 10.12.76.85 20.12.76.85

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Endpoint Power Outage	Alarm indicating the communication module has suffered a power outage (last gasp) with a duration greater than the sustained outage duration, which is defaulted to 30 seconds.	Outage	Communication Module	Communication Module	Alarm		3			*Ping Meter to determine restoration  *L+G does not recommend pinging a router or Collector, instead determine if there is a localized or mass outage to determine scale or work orders			3.26.9.185 11.26.9.185 30.26.9.185	3.26.0.85 11.26.0.85 30.26.0.85
Endpoint Power Restore	Event confirming that the communication module has had power restored.	Outage	Communication Module s4e - ANSI C12.19	Communication Module s4e-Meter: Metrology	Alarm Advisory*	S03 Meter Table Changed	4			*No user action			3.26.9.216 11.26.9.216 30.26.9.216	3.26.0.216 11.26.0.216 30.26.0.216 10.26.0.216
Endpoint Removed from Quarantine Status Group	The endpoint has been removed from Quarantine Status Group due to an import of installation data.	Informational	Command Center Generated	Command Center	Host generated		6084						3.20.10.25 4.20.10.25 11.20.10.25 24.20.10.25 30.20.10.25	3.20.17.212 4.20.17.212 11.20.17.212 24.20.17.212 30.20.17.212
Endpoint Time Synchronization	Event indicating the time drift between meter and network was between acceptable values and the meter time was corrected.	Time	Communication Module	Communication Module	N/A		1366						3.36.16.254	3.36.116.58
Energy Polarity Check Error	Energy polarity GyrBox call in event.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3249						3.25.17.3	3.26.25.3
Energy Profile Cleared	Clearing of profile 1 or energy values profile.	Diagnostic	Meter	Meter:Metrology	Advisory		6378							3.16.31.28
Energy register cleared	One or more total energy registers and/or energy rate registers have been cleared.	Diagnostic	Meter	Meter:Metrology	Advisory		6377							3.8.89.28
Energy Registers Modified	The Current Register Data table (STD Table 23) was written, either directly or using the Preload Energy Values option in field tool	Informational	ANSI C12.19	Meter:Metrology	Disabled		6174						3.21.17.256	3.16.31.36
Enter Factory Mode	Event indicating meter has entered factory mode.	Informational	Landis+Gyr Specific	Meter:Metrology	Alarm		4500						3.22.11.76	3.7.11.76
Enter stand-by Mode	Event indicating the meter powered up without network time.	Informational	FOCUS AX Specific	Meter:Metrology	Alarm		2117						3.5.4.79	3.7.108.242
Enter Tier Override	Event indicating enter tier override occurred.	Time	Endpoint	Meter:Metrology	A3 - Advisory REXU - Log Only* Aclara I210+c - Alarm	Elster REXU Group 01	3971						3.34.16.242	3.20.113.76
Enter/Exit Real Time Rate	Event indicating meter has entered or exited Real Time Rate.	Diagnostic	Landis+Gyr Specific	Meter:Metrology	Advisory		4485						3.34.16.201	3.20.94.13
Error In Flash Memory	Meter detected error in the code section of flash memory.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3225						3.18.5.154	3.18.42.79

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Error occurred while assigning a SoftID to the meter	Event generated when an error occurs while assigning a SoftID to the meter.	Diagnostic	Command Center Generated	Command Center	Host generated		4479		Y	* Contact Landis+Gyr			3.1.14.107 10.1.14.107 11.1.14.107	3.7.10.79 11.7.10.35
Error Register Cleared	Indicates that the error register was cleared.	Diagnostic	Meter	Meter:Metrology	Advisory		6365							3.17.89.28
Event Log Cleared	Event confirming that a command to clear the Meter Event Log was executed.  If event log is not planned to be cleared in the field, might indicate tampering.	Security	ANSI C12.19	Meter:Metrology	Alarm		2018				Event Log Cleared	18	3.21.1.81	3.17.44.28
Event Log Overflow	Event indicating event log overflow warning has occurred.	Diagnostic	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	5097							
Event Log Pointers Updated	Event logging that the Event log pointer was updated.	Informational	ANSI C12.19	Meter:Metrology	Log Only		2019				Event Log Pointers Updated	19	3.17.18.82	3.17.44.24
Event mask updated	Event that tracks when a change of the event mask has occurred.	Security	Communication Module	Communication Module	Log Only		2143						3.11.16.24 11.11.16.24 30.11.16.24	3.11.16.24 10.11.16.24 11.11.16.24
Event Tamper Cleared	Tamper event was Cleared	Security	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 18	3673						3.33.5.28	3.12.17.91
Exceeds the maximum allowable layers event	The calculated route exceeds the maximum allowable layers event.	Informational	Command Center Generated	Command Center	Host generated		3789						3.23.14.139 11.23.14.139	3.23.43.139 11.23.43.139
Excessive leading current detection started - Phase A	Excessive leading current detection started - Phase A	Revenue Integrity	Landis+Gyr Specific	Meter:Metrology	Alarm* Advisory*	Excessive leading current detection S03 Meter Table Changed	3783						3.6.5.242	3.21.6.139
Excessive leading current detection started - Phase B	Excessive leading current detection started - Phase B	Revenue Integrity	Landis+Gyr Specific	Meter:Metrology	Alarm* Advisory*	Excessive leading current detection S03 Meter Table Changed	3785						3.6.14.242	3.26.381.242
Excessive leading current detection started - Phase C	Excessive leading current detection started - Phase C	Revenue Integrity	Landis+Gyr Specific	Meter:Metrology	Alarm* Advisory*	Excessive leading current detection S03 Meter Table Changed	3787						3.6.17.242	3.26.382.242
Excessive leading current detection stopped - Phase A	Excessive leading current detection stopped - Phase A	Revenue Integrity	FOCUS AX Specific	Meter:Metrology	Alarm*	Excessive leading current detection	3784						3.6.5.243	3.21.6.37
Excessive leading current detection stopped - Phase B	Excessive leading current detection stopped - Phase B	Revenue Integrity	FOCUS AX Specific	Meter:Metrology	Alarm*	Excessive leading current detection	3786						3.6.14.243	3.26.288.243
Excessive leading current detection stopped - Phase C	Excessive leading current detection stopped - Phase C	Revenue Integrity	FOCUS AX Specific	Meter:Metrology	Alarm*	Excessive leading current detection	3788						3.6.17.243	3.26.289.243
Exit Factory Mode	Event indicating meter has exited factory mode.	Informational	Landis+Gyr Specific	Meter:Metrology	Alarm		4501						3.22.11.66	3.7.11.66
Exit stand-by mode	Event indicating the end of stand by mode which is meter powered up without network time. The meter received network time.	Informational	Landis+Gyr Specific	Meter:Metrology	FOCUS AX - Disabled S4x - Log Only		2116						3.22.9.243	3.7.108.66
Exit Tier Override	Event indicating exit tier override occurred.	Time	Endpoint	Meter:Metrology	A3 - Advisory Aclara i210+c - Alarm REXU - Log Only*	Elster REXU Group 01	3970						3.34.16.243	3.20.113.66



Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Expected Sequence Number	This event contains the expected sequence number of the restored backup on power up.	Informational	Landis+Gyr Specific	Meter:Metrology	Disabled		4503						3.18.5.80	3.18.17.225
External Event	Event caused by use of Manufacture Procedure 19	Informational	Centron II Specific	Meter:Metrology	Disabled*	Centron II Group 04	3558						3.1.5.3	3.1.17.3
External Input	External input call in event.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3239						3.19.17.104	3.1.55.42
External Input Error	Event confirming that the self check of the meter has found an external input error.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4564						3.21.17.232	3.21.55.79
Failed to Cancel Scheduled Demand Reset	Failed to Cancel Scheduled Demand Reset	Informational	Command Center Generated	Command Center	Host generated		6108						3.8.18.36	3.8.95.86
Failed to Send Scheduled Demand Reset	Failed to Send Scheduled Demand Reset	Informational	Command Center Generated	Command Center	Host generated		6107						3.8.17.36	3.8.95.301
FAN Encryption Configuration Updated	Event generated when FAN Encryption configuration has been updated.	Security	Communication Module	Communication Module	Log Only		5123							
Fatal Error	Logged whenever a Fatal error is detected	Diagnostic	Centron II Specific	Meter:Metrology	Alarm*	Centron II Group 16	3653						3.21.1.52	3.21.0.79
File Transfer Awaiting Activation	Event confirming file transfer is waiting for activation	DADevice	DADevice	DADevice	Advisory		6276						30.21.17.272	30.7.83.14
File Transfer Complete	Event confirming file transfer is completed	DADevice	DADevice	DADevice	Advisory		6279						30.11.18.5	30.11.43.25
File Transfer Delay Is Over	Event confirming file transfer delay is over	DADevice	DADevice	DADevice	Advisory		6277						30.21.17.216	30.7.83.216
File Transfer General Error	Event confirming file transfer general error	DADevice	DADevice	DADevice	Advisory		6281						30.11.7.79	30.11.83.79
File Transfer Image Failed To Start	Event confirming image is failed to start	DADevice	DADevice	DADevice	Advisory		6282						30.11.17.86	30.11.17.1
File Transfer Local Transfer InProgress	Event confirming transferring file to third party device	DADevice	DADevice	DADevice	Advisory		6278						30.21.7.242	30.7.83.34
File Transfer No Response Received	Event confirming file transfer no response is received from device	DADevice	DADevice	DADevice	Advisory		6280						30.19.17.160	30.1.17.160
File Transfer Progress	Event containing file transfer completion percentage	DADevice	DADevice	DADevice	Advisory		6285							
File Transfer Started	Event confirming file transfer has been started	DADevice	DADevice	DADevice	Advisory		6275						30.21.17.242	30.21.83.34
Firmware Debug 1	Event indicating radio has detected a problem. Landis+Gyr should be notified if the event is generated.	Communication Application	Communication Module	Communication Module	Advisory		4424	X		* Contact Landis+Gyr				3.11.33.46
Firmware Debug 2	Event indicating radio has detected a problem. Landis+Gyr should be notified if the event is generated.	Communication Application	Communication Module	Communication Module	Log Only		4425			* Contact Landis+Gyr				3.11.44.46

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Firmware Download Abort	Logged when a CLEAR PENDING TABLE is received before the 1st block of a firmware download is received	Communication Application	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 24	3716						3.11.7.1	3.11.17.1
Firmware Download Status Change	Firmware Download Status Change	Communication Application	Communication Module	Communication Module	Advisory 1:N and Cellular - Alarm		2141							3.11.17.24
Firmware Failure Logged	Event confirming that firmware failure has been logged.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4530						3.11.17.86	3.11.17.85
Firmware Upgrade Attempt Failure	Event indicating a firmware upgrade attempt failed.	Communication Application	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 02	4433						3.11.1.86	3.11.285.85
Flash Pointer Corruption	Event indicating meter has detected flash pointer corruption.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory		4497						3.18.17.154	3.18.17.79
Flat Battery	Flat Battery	Informational	U Series Meter	Meter:Metrology	Advisory*	S03 Meter Table Changed	5439							
Gateway Tamper Tilt	Event indicating that the Collector Body has been tilted beyond a threshold value.	Diagnostic	Collector	Collector			6172						10.33.1.263	10.12.0.263
Global Emergency Codes Changed	The Global Emergency Codes have been added, changed or deleted by a user.	Prepay	Command Center Generated	Command Center	Host generated		6029							18.12.361.24
Global Emergency Codes Viewed	The Global Emergency Codes have been viewed by a user.	Prepay	Command Center Generated	Command Center	Host generated		6054							18.12.361.46
GMT Offset Mismatch	GMT offset in radio did not match system configuration.  This event's default alarm setting is controlled by the 'Time Sync Alert' event unless 'Time Sync Alert' is set to disabled. If 'Time Sync Alert' is disabled, default alarm setting will be set to Alarm.	Time	Communication Module	Communication Module	Alarm S4x-Advisory Japan - Advisory	Time Sync Alert	3204						3.36.18.123	3.36.17.35
Gridstream Collector First Connect	Event indicating the Collector application has restarted.	Informational	Collector	Collector	Alarm		2576						10.1.17.42	10.23.52.42
Gridstream Collector Radio Load DCW	Collector determines a Collector radio DCW is either missing or the DCW version is too old to support the current Collector code. Collector radio DCW will be automatically updated.	Informational	Collector	Collector	Alarm		2571						10.23.17.86	10.11.0.85
Gridstream Collector Radio Registration Data	Collector radio has registered with Command Center.	Informational	Collector	Collector	Alarm		2574						10.23.17.14	26.6.5.50

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Gridstream Collector Radio Set IP List	Collector determines a Collector radio needs Command Center IP address to be changed. Collector radio will be automatically updated.	Informational	Collector	Collector	Alarm		2575						10.23.16.76	10.7.127.24
Gridstream Collector Radio Set Network Settings	Collector determines a Collector radio needs to set the network settings. Collector radio will be automatically updated.	Informational	Collector	Collector	Alarm		2572						10.23.16.24	10.7.0.24
Gridstream Collector Radio Set TimeKeeper	Collector determines a Collector radio needs to set the timekeeper on or off. Collector radio will be automatically updated.	Informational	Collector	Collector	Alarm		2573						10.23.16.264	10.36.114.24
Gridstream RF Collector Door Event	Collector door has been opened or closed.	Security	Collector	Collector	Alarm*	Door Tamper	2518						10.1.1.71	10.12.128.2
Gridstream RF Encryption Configuration Updated	Endpoint's encryption configuration was updated.	Security	Communication Module	Communication Module	Advisory		1320						3.32.7.132 10.32.7.132 11.32.7.132 30.32.7.132	3.7.32.24 10.7.32.24 11.7.32.24 30.7.32.24
HAN Cancel All Messages Failed	HAN Cancel All Messages Failed	HAN	HAN	HAN			6112						3.19.6.156	3.1.112.85
HAN Cancel All Messages Succeeded	HAN Cancel All Messages Succeeded	HAN	HAN	HAN			6111						3.19.6.95	3.1.53.10
HAN Device Pairing Completed	Event informing the host a new HAN device has joined.	HAN	HAN	HAN	Alarm		2270						12.7.16.242	12.10.74.58
HAN In Premise Display Removed	Event indicating the In Premise Display has been removed.	HAN	HAN	Command Center	Host generated		2504						12.43.17.212	15.0.0.212
HAN Load Control All Cancelled	Event indicating all HAN load control has been cancelled.	HAN	HAN	Command Center	Host generated		3100						12.15.17.28	12.15.148.10
HAN Load Control Cancel request	Event indicating Load Control cancel has been requested.	HAN	HAN	Command Center	Host generated		2510						12.15.6.24	12.15.43.8
HAN Load Control CancelAll request	Event indicating HAN Load Control Cancel All request.	HAN	HAN	HAN			2520						12.15.6.28	12.15.148.8
HAN Load Control Cancelled	Event indicating the HAN load control has been cancelled.	HAN	HAN	Command Center	Host generated		3098						12.15.17.24	12.15.43.10
HAN Load Control Device Removed	Event indicating a Load Control device has been removed.	HAN	HAN	HAN			2506						12.45.17.212	16.0.0.212
HAN Load Control request	Event indicating a HAN Load Control has been requested.	HAN	HAN	Command Center	Host generated		2511						12.15.6.236	12.15.0.30
HAN Load Control Scheduled	Event indicating HAN load control has been scheduled.	HAN	HAN	Command Center	Host generated		3101						12.15.17.236	12.15.0.225
HAN Metering Device Removed	Event indicating the HAN Metering device has been removed.	HAN	HAN	HAN			2503						12.42.17.212	17.0.0.212

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
HAN Network Commission request	Event indicating a commission HAN Network has been requested.	HAN	HAN	Command Center	Host generated		2512						12.23.6.42	12.23.17.54
HAN Network Commissioned	Event indicating HAN network has been commissioned.	HAN	HAN	Command Center	Host generated		3102						12.23.17.42	12.23.17.242
HAN Network Decommission request	Event indicating a decommission HAN Network has been requested.	HAN	HAN	Command Center	Host generated		2513						12.23.6.68	12.23.17.55
HAN Network Decommissioned	Event indicating HAN network has been decommissioned.	HAN	HAN	Command Center	Host generated		3103						12.23.17.68	12.23.17.243
HAN PCT Removed	Event indicating the PCT (programmable communicating thermostat) has been removed.	HAN	HAN	HAN			2505						12.44.17.212	19.0.0.212
HAN Ping Device Event	Event indicating a HAN ping device command has completed.	HAN	HAN	HAN	Alarm		2569							
HAN Ping Device Timeout Event	Event indicating a HAN ping device command has timed out.	HAN	HAN	HAN	Alarm		2577							
HAN Pricing Completed	Event indicating HAN pricing has completed.	HAN	HAN	Command Center	Host generated		3104						12.23.17.291	12.20.9.58
HAN Pricing request	Event indicating a HAN pricing request has been issued.	HAN	HAN	Command Center	Host generated		2516						12.23.6.291	12.20.9.30
HAN Text Message Cancel request	Event confirming a HAN Text Message Cancel Request was successfully processed	HAN	HAN	HAN			2521						12.19.6.24	12.1.112.8
HAN Text Message Cancelled	Event indicating HAN text message has been cancelled.	HAN	HAN	Command Center	Host generated		3107						12.19.17.24	12.13.112.10
HAN Text Message Created	Event indicating HAN text message has been created.	HAN	HAN	Command Center	Host generated		3105						12.19.17.290	12.13.112.83
HAN Text Message request	Event confirming a text message has been requested.	HAN	HAN	Command Center	Host generated		2514						12.19.6.290	12.13.112.30
HAN Unknown Removed	Event indicating an unknown HAN device has been removed.	HAN	HAN	HAN			2500						12.39.17.212	7.0.0.212
High Current Caution	High Current Detected	Revenue Integrity	Aclara I210+c	Meter:Metrology	Alarm		6497						3.6.1.177	3.26.6.139
High Current Caution Cleared	High Current Caution Cleared	Revenue Integrity	Aclara I210+c	Meter:Metrology	Alarm		6500						3.6.1.28	3.21.6.28
High Humidity Critical	Event indicating that the humidity is above the extreme humidity threshold.	Diagnostic	Collector	Collector	Alarm		6171						10.35.1.139	10.40.261.40
High Humidity Warning	Event indicating that critical humidity is high.	Diagnostic	Collector	Collector	Advisory		6170						10.35.5.139	10.40.261.139
High Speed Flag Changed	Event indicating that the device high speed flag changed.	Informational	Command Center Generated	Command Center	Host generated		3800						3.23.17.24 10.23.17.24 11.23.17.24 30.23.17.24	3.23.17.24 10.23.17.24 11.23.17.24 30.23.17.24
High Temp Threshold Alert Cleared	High Temp Threshold Alert Cleared	Diagnostic	Aclara I210+c	Meter:Metrology	Alarm		6501						3.35.1.28	3.35.43.28

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
High Temperature	Meter Inversion Detected	Diagnostic	Aclara I210+c	Meter:Metrology	Alarm		6495						3.35.1.93	3.35.43.4
High Temperature Critical	The temperature is above the extreme hot threshold.	Diagnostic	Collector	Collector	Alarm		5144							10.35.0.139
High Temperature Warning	Event indicating critical temperature is high.	Diagnostic	Collector	Collector	Alarm		5143						3.35.1.93	10.35.0.93 3.35.43.4
High Voltage Event	Set if the meter has detected a high voltage event	Revenue Integrity	Elster REXU Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4607						3.38.1.93	3.26.38.93
History Log Cleared	Event confirming that a command to clear the Meter History Log was executed.  If history log is not planned to be cleared in the field, might indicate tampering.	Security	ANSI C12.19	Meter:Metrology	Alarm		2016			History Log Cleared	16		3.21.1.95	3.17.53.28
History Log Overflow	Event indicating history log overflow has occurred.	Diagnostic	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	5105							
History Log Pointers Updated	Event generated when the current pointer has to be changed in the history log.	Informational	ANSI C12.19	Meter:Metrology	Log Only		2017			History Log Pointers Updated	17		3.17.18.96	3.17.53.24
HSM Failure	Event generated from Command Center when any of the HSMs (Hardware Security Modules) are unavailable.	Security	Command Center Generated	Command Center	Host generated		1503						7.32.17.85	0.12.1.85
Inactive Control Input 1	Indicates that the state of control input 1 has changed to inactive	Informational	Meter	Meter:Metrology	Advisory		6388							3.1.55.100
Inactive Phase Current Error	Inactive current phase GyrBox call in event.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3246						3.25.17.100	3.26.287.100
Incorrect CRC Calibration Data Write Detected	Event confirming that the self check of the meter has found an Incorrect CRC Calibration Data Write.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4572						3.21.4.127	3.21.18.35
Incorrect CRC System Config Write Detected	Event confirming that the self check of the meter has found an Incorrect CRC System Config Write.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4571						3.21.7.127	3.21.7.35
Incorrect extension board ID	Indicates that an incorrect board is installed.	Diagnostic	Meter	Meter:Metrology	Advisory		6372							3.39.10.35
Incorrect Flash Installed	Indicates that an incorrect EEPROM/Flash is installed.	Diagnostic	Meter	Meter:Metrology	Advisory		6371							3.18.42.35
Incorrect Measurement Detected	Indicates missing measurement voltage in all phases (complete outage).	Diagnostic	Meter	Meter:Metrology	Advisory		6364							3.21.114.91
Instrumentation Profiling Set 1 Overflow	Instrumentation Profiling Set 1 Overflow warning	Diagnostic	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	5101							

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than)	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed)	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Interruption During Programming	Meter was interrupted during programming. New program was lost.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3224						3.21.6.193	3.21.83.79
Interval Data Gap Reconciliation Retry Expired	Event generated when Gap Reconciliation process has tried to retrieve missing interval data and the retry attempts have been exceeded.	Revenue Integrity	Command Center Generated	Command Center	Host generated		4466							3.21.67.285
Interval Readings Extract Completed	Event indicating the data extract interval file has completed.	Revenue Integrity	Command Center Generated	Command Center	Host generated		201						3.7.15.165	3.21.59.58
Invalid cancel load control event command	Event informing the host the cancel load control event command was invalid.	HAN	HAN	HAN	Disabled		2265						12.15.6.106	12.15.43.35
Invalid cancel load control event command - undefined event	Invalid cancel load control event command - undefined event.	HAN	HAN	HAN	Disabled		2268						12.15.6.109	12.15.43.86
Invalid Length	Endpoint dropped a message because an invalid unsigned data length has been detected.	Security	Communication Module	Communication Module	Log Only*	Signature Errors	2702						3.32.14.107 10.32.14.107 11.32.14.107 30.32.14.107 24.32.14.107 4.32.14.107	3.12.119.35 10.12.119.35 11.12.119.35 30.12.119.35 24.12.119.35 4.12.119.35
Invalid meter program download attempt	The communication module firmware will trigger this event when the pre-programming CRC check fails. If the CRC check fails, the meter programming will abort.	Metrology Configuration	Communication Module	Communication Module	Advisory*	Download Image Command Received	5432						3.11.17.193	3.7.83.35
Invalid Service	Service scan did not find a matching service.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3217						3.25.4.159	3.12.24.159
Invalid Signature Key Specified	Endpoint dropped a message due to invalid signature key specified.	Security	Communication Module	Communication Module	Log Only*	Signature Errors	2706						3.32.14.114 10.32.14.114 11.32.14.114 30.32.14.114 24.32.14.114 4.32.14.114	3.12.32.35 10.12.32.35 11.12.32.35 30.12.32.35 24.12.32.35 4.12.32.35
Invalid Signature Timestamp	Endpoint dropped a message because an invalid signature timestamp has been detected.	Security	Communication Module	Communication Module	Log Only*	Signature Errors	2703						3.32.14.110 10.32.14.110 11.32.14.110 30.32.14.110 24.32.14.110 4.32.14.110	3.12.105.35 10.12.105.35 11.12.105.35 30.12.105.35 24.12.105.35 4.12.105.35
Inversion Tamper Detected	Inversion Tamper detected by the meter	Security	Centron II Specific	Meter:Metrology	Alarm*	Centron II Group 08	3594						3.33.5.257	3.12.17.257
Issue MAT Certificate	A new Mobile Admin Tool Certificate has been issued.	Security	Command Center Generated	Command Center	Host generated		2570						7.32.6.2	0.14.21.82
Key Finger Print Mismatch	If the Command Center calculated key fingerprint does not match the key fingerprint from the endpoint, this event is generated.	Security	Command Center Generated	Command Center	Host generated		3003						3.32.18.159 10.32.18.159 11.32.18.159 30.32.18.159 24.32.18.159 4.32.18.159	26.12.31.63 24.12.31.63 4.12.31.63
kM Subinterval Accumulation Overflow	Meter detected an overflow in a subinterval of kM.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3233						3.6.5.177	3.26.6.177

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
kW Subinterval Accumulation Overflow	Meter detected an overflow in a subinterval of kW.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3232						3.6.14.177	3.26.28.177
L5/AMR Security Is Disabled By Programming	Event indicating L5/AMR security has been disabled by programming.	Security	Landis+Gyr Specific	Meter:Metrology	Disabled		4508						3.24.16.66	3.12.24.66
L5/AMR Security Is Re-enabled By Under-cover Switch Sequence	Event indicating L5/AMR security is re-enabled by under-cover switch sequence.	Security	Landis+Gyr Specific	Meter:Metrology	Disabled		4509						3.24.16.76	3.12.24.76
Large DCW installed	Event indicating that an AMR or large DCW has been downloaded and activated.	Communication Application	Communication Module	Communication Module	Advisory		2135							3.11.47.215 20.11.47.215
Large DCW terminated	Event indicating that an AMR or large DCW has been stopped.	Communication Application	Communication Module	Communication Module	Advisory		2137							3.11.47.65 20.11.47.65
Latched LSV Present	latched copy of the load side voltage present flag	Service Switch	Elster REXU Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4604						3.31.5.143	3.31.17.36
Leading kvarh	Meter detected leading kvarh.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3223						3.6.5.137	3.26.27.40
Line Frequency Range Adjust Error	Event indicating line frequency range adjust error.	Revenue Integrity	Landis+Gyr Specific	Meter:Metrology	Alarm		4489						3.12.17.79	3.26.4.79
Load control event cancelled	Event confirming the load control event cancellation was received at the endpoint.	HAN	HAN	HAN	Log Only		2260						12.15.6.212	12.15.43.10
Load control event completed	Event confirming a load control request has completed.	HAN	HAN	HAN	Log Only		2253						12.15.6.244	12.15.43.58
Load control event complete-no prtctptn-prev optout	Event informing the host that the user has chosen to opt-out of the program.	HAN	HAN	HAN	Log Only		2264						12.15.6.3	12.15.43.300
Load control event complete-partial prtctptn-optin	Event informing the host that the user has chosen to opt-in part way through the program.	HAN	HAN	HAN	Log Only		2263						12.15.6.180	12.15.43.301
Load control event complete-partial prtctptn-optout	Event informing the host that the user has chosen to opt-out part way through the program.	HAN	HAN	HAN	Log Only		2262						12.15.17.3	12.15.43.302
Load control event received	Event confirming a load control request has been issued.	HAN	HAN	HAN	Log Only		2257						12.15.6.202	12.15.43.44
Load control event rejected	Event informing the host Load control was rejected.	HAN	HAN	HAN	Disabled		2269						12.15.6.1	12.15.43.159
Load control event rejected:Event in past	Event informing the host Load Control event was rejected due to event occurring in the past.	HAN	HAN	HAN	Disabled		2267						12.15.6.174	12.15.43.31
Load control event rejected:invalid effective time	Event informing the host Load Control event was rejected due to invalid effective time.	HAN	HAN	HAN	Disabled		2266						12.15.6.123	12.15.43.40
Load control event started	Event confirming a load control event has started.	HAN	HAN	HAN	Log Only		2256						12.15.6.242	12.15.43.242

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Load control event superseded	Event confirming the load control event was not acted upon due to a higher priority at the endpoint.	HAN	HAN	HAN	Disabled		2261						12.15.6.254	12.15.43.41
Load Control User opt-in	Event informing the host that the user has chosen to opt-in to the program.	HAN	HAN	HAN	Alarm		2259						12.7.16.244	12.15.43.80
Load Control User opt-out	Event informing the host that the user has chosen to opt-out of the program.	HAN	HAN	HAN	Alarm		2258						12.7.16.243	12.15.43.81
Load profile 2 cleared	Indicates that the load profile 2 was cleared.	Revenue Integrity	Meter	Meter:Metrology	Advisory		6382							3.15.89.28
Load Profile Cleared	Load Profile cleared as a result of the Standard Procedure 4	Revenue Integrity	Centron II Specific	Meter:Metrology	Disabled*	Centron II Group 02	3546						3.16.5.28	3.16.109.28
Load Profile Parity Error	Meter detected a load profile parity error.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	503 Meter Table Changed	3228						3.16.5.79	3.16.77.79
Load Profile Pointers Updated	Load Profile Pointers Updated as a result of Standard Procedure 5	Revenue Integrity	Centron II Specific	Meter:Metrology	Disabled*	Centron II Group 02	3547						3.16.5.142	3.16.64.24
Load Side Voltage (LSV) Present on Switch Open	Event indicating load side voltage (LSV) is present on switch open.	Service Switch	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 05	4445						3.31.18.143	3.31.26.36
Load Voltage Greater Than Threshold	Load side voltage greater than SD error voltage threshold was detected after the switch was opened	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm	Service Disconnect Error	6007							3.26.38.93
Load voltage greater/equal to threshold: SD Closed	Load side voltage transitioned from 'less than SD error Voltage threshold' to 'greater than or equal to SD error Voltage threshold' while the SD switch is closed.	Prepay	Landis+Gyr Specific	Meter:Metrology			6055							3.31.38.41
Load Voltage Less Than Threshold	Load side voltage less than SD error voltage threshold was detected after the switch was closed	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm	Service Disconnect Error	6006							3.26.38.36
Load voltage less than threshold: SD Open	Load side voltage transitioned from 'greater than or equal to SD error Voltage threshold' to 'less than SD error Voltage threshold' while the SD switch is open.	Prepay	Landis+Gyr Specific	Meter:Metrology			6056							3.31.38.84
Load Voltage Present	Switch-disconnect request failed due to presence of load side voltage	Service Switch	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 29	3762						3.31.17.143	3.31.17.17
Local Download Attempt	A download attempt was initiated by RadioShop or ETM.	Security	Command Center Generated	Command Center	Host generated		1506						3.11.17.72 10.11.17.72 11.11.17.72 30.11.17.72	3.11.17.7 10.11.17.7 11.11.17.7 30.11.17.7
Loss Of Phase Restore	Power has been restored to a phase	Diagnostic	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 06	3575						3.25.5.216	3.26.25.74



Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Low battery detected	Event indicating the battery is low and therefore needs immediate attention. It won't occur on meters using the TOU without a battery feature, but if it occurred a meter's battery needs replacing.	Diagnostic	ANSI C12.19 DLMS	Meter:Metrology	Alarm Advisory*	S03 Meter Table Changed	2044				Low battery detected	44	3.2.1.149	3.2.22.150
Low Credit Threshold	Event indicating Low Credit Threshold has been crossed.	Prepay	Landis+Gyr Specific	Meter:Metrology	Disabled		5517							3.20.8.150
Low loss potential detected	Event informing that a self check of the meter has found a Low Loss situation on one of the legs of the meter.	Informational	ANSI C12.19	Meter:Metrology	Advisory Advisory*	S03 Meter Table Changed	2045			Low loss potential detected	45	3.38.17.276	3.26.38.47	
Low Voltage Event	Set if the meter has detected a low voltage event	Revenue Integrity	Elster REXU Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4606						3.38.1.150	3.26.38.150
M63 CRC Mismatch	Event confirming that mismatch is found for M63 between DCW generated CRC and Command Center generated CRC.	Revenue Integrity	Landis+Gyr Specific	Command Center	Host generated		5000						3.21.14.159	3.12.30.159
M64 CRC Mismatch	Event confirming that mismatch is found for M64 between DCW generated CRC and Command Center generated CRC.	Revenue Integrity	Landis+Gyr Specific	Command Center	Host generated		5001						3.21.17.159	3.12.30.159
Magnetic Tamper alert Cleared	Magnetic Tamper Detected alert cleared	Informational	Aclara I210+c	Meter:Metrology	Alarm		6504						3.33.1.28	3.21.6.28
Magnetic Tamper Detected	Magnetic tamper has been detected.	Revenue Integrity	Elster REXU Specific DLMS	Meter:Metrology	Alarm*	Elster REXU Group 10	4462						3.33.1.152	3.12.66.257
Manufacturing Event Group 01	Not Used Currently	Informational	Aclara I210+c	Meter:Metrology	Log Only		6508							
Manufacturing Event Group 02	Diagnostic 6-Under Voltage,Phase A, Diagnostic 6 Condition Cleared, Diagnostic 7-Over Voltage, Phase A ,Diagnostic 7 Condition Cleared	Informational	Aclara I210+c	Meter:Metrology	Alarm		6509							
Manufacturing Event Group 03	Caution 000400 Condition Cleared ,Caution 000400-Under Voltage,Caution 004000 Condition Cleared2 ,Caution 004000-Demand Overload,Caution 004000 Condition Cleared2 , Caution 004000-Received kWh,Caution 004000 Condition Cleared2 ,Caution 004000-Leading kvarh	Informational	Aclara I210+c	Meter:Metrology	Alarm		6510							

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Manufacturing Event Group 04	Real Time Pricing Deactivation, Real Time Pricing Activation, Calibration Mode Activated	Informational	Aclara I210+c	Meter:Metrology	Alarm		6511							
Manufacturing Event Group 05	Service Disconnect Successful	Informational	Aclara I210+c	Meter:Metrology	Alarm		6512							
Manufacturing Event Group 06	Service Connect Successful ,Tamper Detect (Meter Inversion)	Informational	Aclara I210+c	Meter:Metrology	Alarm		6513							
Manufacturing Event Group 07	High Temp Threshold Alert Set,High Temp Threshold Alert Clear ,Bad Password Threshold Cleared , Bad Password Threshold Set,Communication Terminated Normally,Communication Terminated Abnormally	Informational	Aclara I210+c	Meter:Metrology	Alarm		6514							
Manufacturing Event Group 08	High Line Current Caution Cleared , High Line Current Caution Set,Current Imbalance Cleared , Current Imbalance Detected,Magnetic Tamper Cleared , Magnetic Tamper Detected	Informational	Aclara I210+c	Meter:Metrology	Alarm		6517							
Manufacturing Event Group 09	Not Used Currently	Informational	Aclara I210+c	Meter:Metrology	Log Only		6518							
Manufacturing Event Group 10	Not Used Currently	Informational	Aclara I210+c	Meter:Metrology	Log Only		6519							
Manufacturing Event Group 11	Not Used Currently	Informational	Aclara I210+c	Meter:Metrology	Log Only		6520							
Manufacturing Event Group 12	Not Used Currently	Informational	Aclara I210+c	Meter:Metrology	Log Only		6521							
Manufacturing Event Group 13	Not Used Currently	Informational	Aclara I210+c	Meter:Metrology	Log Only		6522							
Manufacturing Event Group 14	Not Used Currently	Informational	Aclara I210+c	Meter:Metrology	Log Only		6523							
Mass Memory Error	Load Profile halted due to outage or the meter was configured without a battery	Diagnostic	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 06	3574						3.18.5.79	3.18.0.79
MAT Certificate Busy with Insufficient Priority	Endpoint received a MAT Certificate but was busy.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2912						3.32.6.36 10.32.6.36 11.32.6.36 30.32.6.36 24.32.6.36 4.32.6.36	3.14.21.161 10.14.21.161 11.14.21.161 30.14.21.161 24.14.21.161 4.14.21.161
MAT Certificate Expired	Endpoint received an expired MAT Certificate.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2915						3.1.17.23 10.1.17.23 11.1.17.23 30.1.17.23 24.1.17.23 4.1.17.23	3.14.21.31 10.14.21.31 11.14.21.31 30.14.21.31 24.14.21.31 4.14.21.31
MAT Certificate Expired, KeepAliveTimeout Exceeded	Endpoint received an expired MAT Certificate with the keep alive timeout exceeded.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2917						3.1.17.234 10.1.17.234 11.1.17.234 30.1.17.234 24.1.17.234 4.1.17.234	3.14.32.64 10.14.32.64 11.14.32.64 30.14.32.64 24.14.32.64 4.14.32.64

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than)	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed)	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
MAT Certificate Invalid LAN Address Block	Endpoint received a MAT Certificate with an invalid LAN Address Block.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2911						3.1.17.117 10.1.17.117 11.1.17.117 30.1.17.117 24.1.17.117 4.1.17.117	3.14.61.35 10.14.61.35 11.14.61.35 30.14.61.35 24.14.61.35 4.14.61.35
MAT Certificate Invalid Length	Endpoint received a MAT Certificate with an invalid length.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2903						3.1.17.116 10.1.17.116 11.1.17.116 30.1.17.116 24.1.17.116 4.1.17.116	3.14.119.35 10.14.119.35 11.14.119.35 30.14.119.35 24.14.119.35 4.14.119.35
MAT Certificate Invalid Network ID	Endpoint received a MAT Certificate with an invalid version network id.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2902						3.1.17.127 10.1.17.127 11.1.17.127 30.1.17.127 24.1.17.127 4.1.17.127	3.14.71.35 10.14.71.35 11.14.71.35 30.14.71.35 24.14.71.35 4.14.71.35
MAT Certificate Invalid Options	Endpoint received a MAT Certificate with invalid options.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2904						3.1.17.107 10.1.17.107 11.1.17.107 30.1.17.107 24.1.17.107 4.1.17.107	3.14.32.35 10.14.32.35 11.14.32.35 30.14.32.35 24.14.32.35 4.14.32.35
MAT Certificate Invalid Version	Endpoint received a MAT Certificate with an invalid version.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2901						3.1.17.128 10.1.17.128 11.1.17.128 30.1.17.128 24.1.17.128 4.1.17.128	3.14.120.35 10.14.120.35 11.14.120.35 30.14.120.35 24.14.120.35 4.14.120.35
MAT Certificate Message Generation Error	Endpoint received a MAT Certificate with a message generation error.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2905						3.1.17.79 10.1.17.79 11.1.17.79 30.1.17.79 24.1.17.79 4.1.17.79	3.14.32.79 10.14.32.79 11.14.32.79 30.14.32.79 24.14.32.79 4.14.32.79
MAT Certificate pre-empted	Endpoint received a MAT Certificate that was pre-empted by another user.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2916						3.1.17.24 10.1.17.24 11.1.17.24 30.1.17.24 24.1.17.24 4.1.17.24	3.14.32.41 10.14.32.41 11.14.32.41 30.14.32.41 24.14.32.41 4.14.32.41
MAT Certificate Processed	Endpoint accepted and processed a MAT Certificate.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2900						3.1.17.244 10.1.17.244 11.1.17.244 30.1.17.244 24.1.17.244 4.1.17.244	3.14.32.44 10.14.32.44 11.14.32.44 30.14.32.44 24.14.32.44 4.14.32.44
MAT Certificate Random Data or Target LAN Error	Endpoint received a MAT Certificate with random data or target LAN does not match.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2914						3.1.17.159 10.1.17.159 11.1.17.159 30.1.17.159 24.1.17.159 4.1.17.159	3.14.31.79 10.14.31.79 11.14.31.79 30.14.31.79 24.14.31.79 4.14.31.79
MAT Certificate released	Endpoint released a MAT Certificate.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	2918						3.1.17.212 10.1.17.212 11.1.17.212 30.1.17.212 24.1.17.212 4.1.17.212	3.14.32.51 10.14.32.51 11.14.32.51 30.14.32.51 24.14.32.51 4.14.32.51

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Maximum Number of Discovered Collectors Exceeded	Event generated when an attempt is made to exceed the maximum number of discovered collectors. Remove a discovered collector or increase maximum number allowed.	Informational	Collector	Collector	Host generated		4480						1.23.1.93	10.1.17.139
Maximum voltage Condition Cleared - Phase A	Maximum voltage Condition Cleared - Phase A	Diagnostic	ABNT	Meter:Metrology	Advisory*	Maximum Voltage	5250							3.26.131.73
Maximum voltage Condition Cleared - Phase B	Maximum voltage Condition Cleared - Phase B	Diagnostic	ABNT	Meter:Metrology	Advisory*	Maximum Voltage	5252							3.26.132.73
Maximum voltage Condition Cleared - Phase C	Maximum voltage Condition Cleared - Phase C	Diagnostic	ABNT	Meter:Metrology	Advisory*	Maximum Voltage	5253							3.26.133.73
Measurement Bad CRC Error Detected	Event confirming that the self check of the meter has found a Measurement Bad CRC Error.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4569						3.21.17.127	3.21.17.35
Measurement Current Missing	Current on all phases drops below a parameterised threshold within a defined time window.	Diagnostic	Meter	Meter:Metrology	Advisory		6376							3.26.6.150
Measurement error detected	Event informing that a self check of the meter has found a Measurement error in the metrology.	Diagnostic	ANSI C12.19	Meter:Metrology	Alarm Advisory*	s03 Meter Table Changed	2043		Y	*Replace meter	Measurement error detected	43	3.21.1.79	3.21.67.79
Measurement Lock Out Error Detected	Event confirming that the self check of the meter has found a Measurement Lock Out Error.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4570						3.21.17.106	3.21.67.85
Measurement Over Run Error Detected	Event confirming that the self check of the meter has found a Measurement over run error.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4567						3.21.7.139	3.21.67.139
Measurement Time Out Error Detected	Event confirming that the self check of the meter has found a Measurement time out error.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4568						3.21.17.125	3.21.67.35
Message confirmation	Event confirming successful delivery of a message.	HAN	HAN	HAN	Log Only		2254						12.19.17.244	12.1.112.17
Meter Configuration Changed	Event indicating the meter configuration has changed.	Informational	Meter	Meter:Metrology	Alarm Elster - Log Only*	Elster REXU Group 05	4447						3.21.7.49	3.7.0.24
Meter Connect request	Event generated when a meter connect request has been received via API.	Service Switch	Command Center Generated	Command Center	Host generated		1062						3.31.6.42	3.31.0.18
Meter Connected	Event generated when a meter connect request has been received via API and the meter has connected.	Service Switch	Command Center Generated	Command Center	Host generated		1060						3.31.17.42	3.31.0.42

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Meter Disconnect request	Event generated when a meter disconnect request has been received via API.	Service Switch	Command Center Generated	Command Center	Host generated		1063						3.31.6.68	3.31.0.23
Meter Disconnected	Event generated when a meter disconnect request has been received via API and the meter has disconnected.	Service Switch	Command Center Generated	Command Center	Host generated		1061						3.31.17.68	3.31.0.68
Meter Error Call In	Error in meter call in.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3238						3.19.17.22	3.1.0.79
Meter firmware change complete	Event confirming the meter firmware change has completed.	Metrology Configuration	Communication Module	Communication Module	Advisory*	Download Image Command Received	2272						3.11.7.24	3.11.17.58
Meter Flash Attempt	Event indicating an attempt to upgrade meter firmware.	Metrology Configuration	Landis+Gyr Specific DLMS	Meter:Metrology	Alarm		2119						3.18.1.2	3.18.1.2
Meter Flash Event	Event indicating Meter Flash.	Metrology Configuration	Elster A3 Specific	Meter:Metrology	Alarm		5044						3.18.1.3	3.18.1.3
Meter FW Image Verification	Event indicating meter has verified the meter firmware image.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Log Only		4492						3.11.18.90	3.11.17.37
Meter Inversion	Meter Inversion Detected	Diagnostic	Aclara I210+c	Meter:Metrology	Alarm		6496						3.6.3.219	3.21.6.69
Meter Log on failure	Indicates an AMR or Optical logon failure.	Security	Landis+Gyr Specific DLMS	Meter:Metrology	Advisory		2126						3.23.1.147	3.23.85.65
Meter Program Archived	The meter program has been archived.	Metrology Configuration	Command Center Generated	Command Center	Host generated		5450						3.7.10.100	3.7.83.213
Meter Program Awaiting Activation	Event confirming the meter program is awaiting activation.	Metrology Configuration	Communication Module	Communication Module	Advisory*	Download Image Command Received	5453						3.21.7.272	3.7.83.14
Meter program change complete	Event confirming the meter program change has completed.	Metrology Configuration	Communication Module Command Center Generated	Communication Module Command Center	Advisory* Host generated	Download Image Command Received	2273						3.21.7.192	3.7.83.24
Meter program change failed	Event indicating the meter program change has failed.	Metrology Configuration	Communication Module	Communication Module	Advisory*	Download Image Command Received	5431						3.21.7.85	3.21.83.217
Meter program change started	The event indicating meter program download has started.	Metrology Configuration	Communication Module	Communication Module	Advisory*	Download Image Command Received	5430						3.21.17.242	3.21.83.34
Meter Program Changed	Event indicating that Meter Program (Tariff Id) has changed.	Metrology Configuration	Command Center Generated	Command Center	Host generated		4467						3.21.7.30	3.7.83.24
Meter Program Download Progress	The meter program download is currently in progress.	Communication Application	Communication Module	Communication Module	Advisory*	Download Image Command Received	5454						3.21.7.180	3.7.83.34
Meter Program Imported	Meter Program has been imported.	Informational	Command Center Generated	Command Center	Host generated		5392						3.21.6.49	3.21.83.60
Meter Program Reinstated	The meter program has been reinstated.	Metrology Configuration	Command Center Generated	Command Center	Host generated		5451						3.7.10.216	3.7.83.216
Meter Programming Started	Event indicating meter programming has started.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Alarm		4494						3.21.7.242	3.7.83.24
Meter reprogrammed (43)	Event confirming that the meter was reprogrammed successfully.	Metrology Configuration	ANSI C12.19	Meter:Metrology	Alarm		1053			End Device reprogrammed	36		3.21.1.213	3.7.83.24
Meter ROM Verification	Event indicating meter has verified ROM.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Alarm		4499						3.18.18.90	3.18.17.37

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Meter RTC sync interval boundary exceeded(41)	Event is generated when an endpoint synchronizes time with its active neighbor with the best time (based on time age) and the time adjusts more than 20 seconds.	Time	Communication Module	Communication Module	Advisory		1051						3.36.3.254	3.36.116.139
Meter RTC time adjustment.(39)	Radio time changed by a small amount (generally (between -20 and +20 seconds).	Time	Communication Module	Communication Module	Log Only		1049							3.23.136.116
Meter Time Adjustment	Event indicating time adjustment (to the 32 kHz RTC based on line frequency).	Time	FOCUS AX Specific	Meter:Metrology	Alarm		2118						3.36.1.5	3.36.114.13
Meter Time Zone Mismatch	Event confirming that there is mismatch between Meter Timezone and Command Center Import Installation File Timezone.	Time	Communication Module	Communication Module	Advisory		4576						3.36.3.159	3.36.118.159
Meter Upgrade	Event indicating a meter upgrade (load profile, etc) has occurred.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory		4493						3.20.7.9	3.7.17.24
Meter/Radio Drift	An alert condition has been detected by the radio for the meter time.  This event's default alarm setting is controlled by the 'Time Sync Alert' event unless 'Time Sync Alert' is set to disabled. If 'Time Sync Alert' is disabled, default alarm setting will be set to Alarm.	Time	Communication Module	Communication Module	Alarm S4x-Advisory Japan - Advisory	Time Sync Alert	3201						3.36.18.65	3.1.114.79
Metering mode started	Event confirming that the meter has been changed to Metering Mode.	Informational	ANSI C12.19	Meter:Metrology	Alarm		2030		Y		Metering mode started	30	3.22.12.242	3.7.12.242
Metering mode stopped	Event confirming that the Metering Mode option has been disengaged.	Informational	ANSI C12.19	Meter:Metrology	Alarm		2031		Y		Metering mode stopped	31	3.22.12.243	3.7.12.243
Metrology Firmware Changed Version	Event indicating the metrology firmware has changed versions.	Metrology Configuration	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 02	4434						3.11.7.30	3.11.124.24
Missing 50/60 hz	Meter missing expected line frequency	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3227						3.12.5.160	3.21.4.285
Module firmware awaiting activation	Event confirming the module firmware is awaiting activation.	Communication Application	Communication Module	Communication Module	Advisory*	Download Image Command Received	2334							3.11.283.280 20.11.283.280
Module firmware change complete	Event confirming the communication module firmware is complete.	Communication Application	Communication Module	Communication Module	Advisory*	Download Image Command Received	2283						3.11.7.5	3.11.283.4 20.11.283.4

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Module firmware change started	Event confirming the communication module firmware has started.	Communication Application	Communication Module	Communication Module	Advisory*	Download Image Command Received	2282						3.11.6.242	3.9.17.242
Module Low Battery Detected	Event informing the host that the router has a low battery.	Diagnostic	Router	Router	Alarm		2146						11.2.1.149 30.2.1.149	11.2.22.150 30.2.22.150
Module Unable to Read Meter Data	Event generated when the communication module was unable to read data from the meter. The meter was busy at the time.	Diagnostic	Command Center Generated	Command Center	Host generated		4475						3.1.1.202	3.1.87.85
Network Authentication Failed	Network Authentication Failed	Security	Communication Module	Communication Module	Host generated		6334						3.23.16.85 11.23.16.85	11.23.74.85 3.23.74.85
Network Endpoint Communication Delay	Event indicating a network endpoint is not communicating with Command Center.	Outage	Router	Command Center	Host generated		5162						11.23.13.34	11.1.0.22 38.1.0.22
Network Endpoint Communication Restored	Event indicating network endpoint communication has been restored.	Outage	Router	Command Center	Host generated		5163						11.23.13.33	11.1.0.49 38.1.0.49
Network Frequency High Detected	Indicates high network frequency	Diagnostic	Meter	Meter:Metrology	Advisory		6385							3.23.4.139
Network Frequency Low Detected	Indicates low network frequency	Diagnostic	Meter	Meter:Metrology	Advisory		6386							3.23.4.150
Neutral current Condition Cleared	Neutral current Condition Cleared	Diagnostic	ABNT	Meter:Metrology	Log Only*	Neutral current	5271						3.6.1.9	3.6.6.28
Neutral Integrity	Neutral Integrity	Informational	U Series Meter	Meter:Metrology	Advisory*	S03 Meter Table Changed	5441							
New Battery	Battery level has been detected.	Diagnostic	Centron II Specific	Meter:Metrology	Disabled*	Centron II Group 02	3543						3.2.18.27	3.2.0.284
New Firmware Received	Event indicating meter has received new metrology firmware.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory		4490						3.11.17.3	3.11.17.3
New Meter Configuration Created	Event generated when a new meter configuration has been detected. The meter configuration has not previously existed in Command Center.	Metrology Configuration	Command Center Generated	Command Center	Host generated		4477						3.21.7.105	3.7.0.83
New Meter Configuration Detected	Event generated when a new meter configuration has been detected. The meter configuration previously existed in Command Center.	Metrology Configuration	Command Center Generated	Command Center	Host generated		4476						3.21.7.3	3.7.0.17
Next Demand Reset Date Changed	Event to notify external integration next demand reset date has changed.	Revenue Integrity	Command Center Generated	Command Center	Host generated		3799						3.8.17.53	3.8.34.24
Non-Disconnect Date Range Activated	Non-Disconnect date range has been activated in the meter.	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm		5514							3.31.73.4
Non-Disconnect Date Range Activation Pending	Non-Disconnect date range has been sent to the meter and is awaiting activation.	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm		5513							3.31.73.14

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Non-Disconnect Date Range Activity	Non-Disconnect date range has been activated in the meter.	Prepay	Landis+Gyr Specific	Meter:Metrology	Log Only		5511							
Non-Disconnect Date Range Deactivated	Non-Disconnect date range has been deactivated in the meter.	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm		5512							3.31.73.19
Nonvolatile memory failure detected	Event informing that a self check of the meter has found a nonvolatile memory failure in the metrology.	Diagnostic	ANSI C12.19 DLMS	Meter:Metrology	Alarm Advisory*	S03 Meter Table Changed	2041		Y	*Replace meter, if s4e meter. *If Focus AX meter, replace meter only if metrology firmware version is 5.34 or higher.	Nonvolatile memory failure detected	41	3.21.1.173	3.21.72.85
Optical Port Enabled/Disabled	Event indicating optical port has been enabled/disabled.	Informational	Endpoint	Meter:Metrology	Log Only* Alarm	Elster REXU Group 03	4440						3.20.17.24	3.21.46.24
Optical Port Lockout	Set if the optical port is locked	Diagnostic	Elster Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4603						3.20.18.66	3.21.46.66
Optical Port Unlocked	Event indicating Optical Port Unlocked.	Security	Elster A3 Specific	Meter:Metrology	Log Only		5043						3.20.6.76	3.21.46.76
Option 1 Firmware Changed	Event indicating the option 1 firmware has changed.	Informational	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 03	4437						3.11.5.24	3.11.46.24
Orientation change	Excessive meter installation rotation detected	Diagnostic	Landis+Gyr Specific	Meter:Metrology	Alarm		6596						3.21.16.24	3.6.0.24
Out Of Calibration	Meter detected that it was out of calibration.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3235						3.21.4.85	3.21.18.40
Over current Detected - Phase B	Over current Detected - Phase B	Diagnostic	ABNT	Meter:Metrology	Log Only*	Over current	5260							3.26.288.93
Over current Detected - Phase C	Over current Detected - Phase C	Diagnostic	ABNT	Meter:Metrology	Log Only*	Over current	5262							3.26.289.93
Over Heat Alarm	Over Heat Temperature Alarm Detected	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Alarm		6192						3.35.17.139	3.26.25.177
Over Heat Warning	Over Heat Temperature Warning Detected	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Alarm		6193						3.35.17.93	3.35.261.93
Overcurrent neutral	Indicates that an overcurrent in the neutral conductor has occurred.	Diagnostic	Meter	Meter:Metrology	Alarm		6447							3.21.6.177
Overvoltage Detected - Phase A	Overvoltage Detected - Phase A	Diagnostic	ABNT	Meter:Metrology	Log Only*	Overvoltage	5238							3.26.131.40
Overvoltage Detected - Phase B	Overvoltage Detected - Phase B	Diagnostic	ABNT	Meter:Metrology	Log Only*	Overvoltage	5240							3.26.132.40
Overvoltage Detected - Phase C	Overvoltage Detected - Phase C	Diagnostic	ABNT	Meter:Metrology	Log Only*	Overvoltage	5242							3.26.133.40
PANA Authentication Failed	Event indicating PANA (Protocol for carrying Authentication for Network Access) authentication has failed.	Security	Communication Module	Communication Module	Log Only		5127							3.12.52.85 10.12.52.85 20.12.52.85
PANA Server Authentication Failed	The PANA Server failed to authenticate an endpoint device.	Security	Command Center Generated	Command Center	Host generated		5128							26.12.32.85
Parameterization Changed	Parameterization/configuration of meter was changed.	Metrology Configuration	Meter	Meter:Metrology	Advisory		6362							3.7.75.24
Password/Key Changed	Event indicating the password/key has changed.	Security	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 03	4439						3.24.10.24	3.12.24.24



Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Payment Code Applied	Event indicating Payment Code has been applied.	Prepay	Landis+Gyr Specific	Meter:Metrology	Disabled		5497							
Payment Code Applied with Details	Event indicating Payment Code has been applied. Additional information (Connect status, etc) is provided when the event is generated.	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm		6025							
Payment Lockout: Duplicate Payment	Credit adjustment rejected, duplicate Payment, lockout activated	Prepay	Landis+Gyr Specific	Meter:Metrology	Disabled* Alarm*	Payment Code Applied Payment Code Applied with Details	5504							3.20.96.66
Payment Lockout: Invalid Payment	Credit adjustment rejected, invalid Payment, lockout activated	Prepay	Landis+Gyr Specific	Meter:Metrology	Disabled* Alarm*	Payment Code Applied Payment Code Applied with Details	5505							3.20.96.84
Payment Mode	Event indicating payment mode (credit/prepay) changed.	Prepay	Landis+Gyr Specific DLMS	Meter:Metrology	Alarm		5487							3.20.81.24
Payment Rejected: Duplicate Payment	Credit adjustment rejected, duplicate Payment	Prepay	Landis+Gyr Specific	Meter:Metrology	Disabled* Alarm*	Payment Code Applied Payment Code Applied with Details	5501							3.20.96.161
Payment Rejected: Excess Payment	Credit adjustment rejected, exceeds limits of total credit inserted	Prepay	Landis+Gyr Specific	Meter:Metrology	Disabled* Alarm*	Payment Code Applied Payment Code Applied with Details	5503							3.20.96.139
Payment Rejected: Invalid Payment	Credit adjustment rejected, invalid Payment	Prepay	Landis+Gyr Specific	Meter:Metrology	Disabled* Alarm*	Payment Code Applied Payment Code Applied with Details	5502							3.20.96.35
Pending Reconfigure	Reconfigure event started	Informational	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 17	3666						3.21.7.217	3.21.0.213
Pending Table Activate Fail	Pending Table activation failed	Informational	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 21	3693						3.21.5.181	3.21.110.85
Pending Table Activated	Pending Table Activated detected.	Informational	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4471						3.21.17.181	3.21.110.42
Pending Table Activation	Event informing the system of a Table change request that has been made.	Informational	ANSI C12.19	Meter:Metrology	Advisory		2028			Pending Table Activation	28		3.21.18.181	3.21.110.4
Pending Table Clear	Event informing the system of a Table Clear change request that has been made.	Informational	ANSI C12.19	Meter:Metrology	Advisory		2029			Pending Table Clear	29		3.21.18.182	3.21.110.28
Pending Table Clear Failed	Request to clear a specific pending tabled failed	Informational	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 29	3763						3.21.5.182	3.21.110.85
Pending Table Error	Pending table swap failed	Informational	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 32	3782						3.21.5.79	3.21.110.79
Pending Table Full	Unable to add data to a pending table, write failed	Informational	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 30	3764						3.21.5.255	3.21.110.93
PF Mem Error	Set on power restoration if there is a CRC error on the memory saved to EEPROM when a power fail occurs	Outage	Elster REXU Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4601						3.18.14.154	3.18.42.85

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than)	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed)	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
PFTA Exceeded	Power factor threshold alert call in event.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3241						3.27.17.261	3.26.27.139
Phase A mains voltage loss	Event indicating loss of mains voltage has occurred.	Informational	U Series Meter	Meter:Metrology	Log Only		3312						3.38.18.160	3.26.131.47
Phase A Off	Event indicating Phase A Off.	Revenue Integrity	Elster A3 Specific	Meter:Metrology	Log Only		5025						3.38.17.66	3.26.126.45
Phase A On	Event indicating Phase A On.	Revenue Integrity	Elster A3 Specific	Meter:Metrology	Log Only		5026						3.38.17.76	3.26.126.285
Phase A Out	The RMS phase voltage dropped below the configured percentage without a power outage.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3214						3.38.14.57	3.26.131.57
Phase A Voltage Event, Coincidental Value: Demand (PhA)	Phase A Voltage Event, Coincidental Value: Demand (PhA) has been detected.	Informational	Elster REXU Specific	Meter:Metrology	Disabled*	Elster REXU Group 08	4459						3.38.3.79	3.8.131.79
Phase A Voltage Event, Coincidental Value: Demand (PhC)	Phase A Voltage Event, Coincidental Value: Demand (PhC) has been detected.	Informational	Elster REXU Specific	Meter:Metrology	Disabled*	Elster REXU Group 09	4460						3.38.5.79	3.8.133.79
Phase A Voltage Event, Coincidental Value: Voltage (PhC)	Phase A Voltage Event, Coincidental Value: Voltage (PhC) has been detected.	Informational	Elster REXU Specific	Meter:Metrology	Disabled*	Elster REXU Group 08	4458						3.38.17.79	3.26.131.79
Phase B mains voltage loss	Event indicating loss of mains voltage has occurred.	Informational	U Series Meter	Meter:Metrology	Log Only		3332						3.38.2.160	3.26.132.47
Phase B Missing	Phase B Missing warning	Diagnostic	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	5107							
Phase B Off	Event indicating Phase B Off.	Revenue Integrity	Elster A3 Specific	Meter:Metrology	Log Only		5027						3.38.14.66	3.26.134.45
Phase B On	Event indicating Phase B On.	Revenue Integrity	Elster A3 Specific	Meter:Metrology	Log Only		5028						3.38.14.76	3.26.134.285
Phase B Out	The RMS phase voltage dropped below the configured percentage without a power outage.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3215						3.38.14.24	3.26.132.57
Phase C mains voltage loss	Event indicating loss of mains voltage has occurred.	Informational	U Series Meter	Meter:Metrology	Log Only		3337						3.38.16.160	3.26.133.47
Phase C Missing	Phase C Missing warning	Diagnostic	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	5108							
Phase C Off	Event indicating Phase C Off.	Informational	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 02	4431						3.25.17.28	3.26.135.45
Phase C On	Event indicating Phase C On.	Informational	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 02	4432						3.25.17.4	3.26.135.285
Phase C Out	The RMS phase voltage dropped below the configured percentage without a power outage.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3216						3.38.14.261	3.26.133.57
Phase C Voltage Event, Coincidental Value: Voltage (PhA)	Phase C Voltage Event, Coincidental Value: Voltage (PhA) has been detected.	Informational	Elster REXU Specific	Meter:Metrology	Disabled*	Elster REXU Group 08	4457						3.38.18.79	3.26.133.79
Phase Rotation	Phase Rotation	Informational	U Series Meter	Meter:Metrology	Advisory*	S03 Meter Table Changed	5443							
Phase Voltage Unbalance	Phase Voltage Unbalance	Informational	U Series Meter	Meter:Metrology	Advisory*	S03 Meter Table Changed	5442							
Potential Neutral Lost	Voltage potential was lost on neutral line.	Diagnostic	S4e Specific	Meter:Metrology	Alarm*	Potentials Loss/Restored	3270						3.38.14.160	3.21.4.91

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than)	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed)	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Potential Neutral Restored	Voltage potential was restored on neutral.	Diagnostic	S4e Specific	Meter:Metrology	Alarm*	Potentials Loss/Restored	3274						3.38.14.216	3.21.4.216
Potential Phase A Lost	Voltage potential was lost on phase A.	Diagnostic	S4e Specific	Meter:Metrology	Alarm*	Potentials Loss/Restored	3271						3.38.17.160	3.26.126.47
Potential Phase A Restored	Voltage potential was restored on phase A.	Diagnostic	S4e Specific	Meter:Metrology	Alarm*	Potentials Loss/Restored	3275						3.38.17.216	3.21.126.216
Potential Phase B Lost	Voltage potential was lost on phase B.	Diagnostic	S4e Specific	Meter:Metrology	Alarm*	Potentials Loss/Restored	3269						3.38.5.160	3.26.134.47
Potential Phase B Restored	Voltage potential was restored on phase B.	Diagnostic	S4e Specific	Meter:Metrology	Alarm*	Potentials Loss/Restored	3273						3.38.5.216	3.26.134.216
Potential Phase C Lost	Voltage potential was lost on phase C.	Diagnostic	S4e Specific	Meter:Metrology	Alarm*	Potentials Loss/Restored	3268						3.38.1.160	3.26.135.47
Potential Phase C Restored	Voltage potential was restored on phase C.	Diagnostic	S4e Specific	Meter:Metrology	Alarm*	Potentials Loss/Restored	3272						3.38.9.216	3.26.135.216
Power Down Cover	Event indicating meter has detected a power down cover.	Security	Landis+Gyr Specific	Meter:Metrology	Alarm		4513						3.26.1.44	3.26.29.212
Power Down Cover Installed	Meter cover installed while unpowered	Revenue Integrity	Landis+Gyr Specific	Meter:Metrology	Alarm		6595						3.26.1.105	3.26.29.105
Power Down Magnet	Event indicating meter has detected a power down magnet.	Security	Landis+Gyr Specific	Meter:Metrology	Alarm		4514						3.26.1.152	3.26.66.47
Power Down Unknown	Event indicating meter has detected an unknown power down.	Security	Landis+Gyr Specific	Meter:Metrology	Disabled		4515						3.26.18.185	3.26.0.47
Power factor - Low Level 1	Indicates that the power factor is below a set limit	Diagnostic	Meter	Meter:Metrology	Advisory		6427							3.21.27.150
Power factor - Low Level 2	Indicates that the power factor is below a set limit	Diagnostic	Meter	Meter:Metrology	Advisory		6428							3.21.27.150
Power Fail Counter Mismatch	Power Fail Counter Mismatch	Informational	U Series Meter	Meter:Metrology	Advisory*	S03 Meter Table Changed	5440							
Power Fail Data Restored	Event confirming that the self check of the meter has not found a powerfail data on startup.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory	S03 Meter Table Changed	4526						3.26.18.216	3.26.18.216
PQM Failure	PQM Failure occurred	Diagnostic	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	5121							
PQM Log Overflow	PQM Log Overflow warning	Diagnostic	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	5094							
Prepay Command Rejected - Credit Mode	Prepay Command Rejected - Credit Mode.	Prepay	Landis+Gyr Specific	Meter:Metrology	Advisory		5506							
Prepay Configuration Update	Prepay Configuration Update.	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm		5515							3.7.360.24
Prepay Mode Not Changed	Event indicating the Prepay Mode was not changed.	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm*	Payment Mode	5488							3.7.0.356
Prepay Reset	Prepay Reset occurred.	Prepay	Landis+Gyr Specific	Meter:Metrology	Advisory		5510							3.20.140.214
Prepay Transaction	Event generated when 'Get Prepay Transaction Log' command retrieves payment history from meter.	Prepay	Landis+Gyr Specific	Meter:Metrology	Log Only		5480							3.17.360.44

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Prepayment Configuration Already Downloaded	Event confirming a prepayment configuration download has already been downloaded.	Prepay	Command Center Generated	Command Center	Host generated		6028							3.7.360.41
Prepayment configuration change awaiting activation	Event confirming a prepayment configuration download has finished but has not been activated	Prepay	Communication Module	Communication Module	Advisory*	Download Image Command Received	5486							3.7.360.14
Prepayment configuration change complete	Event confirming a prepayment configuration download has completed	Prepay	Communication Module	Communication Module	Advisory*	Download Image Command Received	5484							3.7.360.24
Prepayment configuration change failed	Event indicating a prepayment configuration download failed	Prepay	Communication Module	Communication Module	Advisory*	Download Image Command Received	5485							3.7.360.217
Prepayment configuration change started	Event confirming a prepayment configuration download has initiated	Prepay	Communication Module	Communication Module	Advisory*	Download Image Command Received	5483							3.7.360.242
Prepayment Dwelling Status	Prepayment Dwelling Status	Informational	U Series Meter	Meter:Metrology	Advisory*	S03 Meter Table Changed	5445							
Prepayment Status	Prepayment Status	Informational	U Series Meter	Meter:Metrology	Advisory*	S03 Meter Table Changed	5444							
Previous Key Used	Event generated from Command Center when a message is successfully decrypted with a previous version of a key for an endpoint.	Security	Command Center Generated	Command Center	Host generated		1505						3.19.14.214 10.19.14.214 11.19.14.214 30.19.14.214 24.19.14.214 4.19.14.214	3.19.14.214 10.19.14.214 20.19.14.214 30.19.14.214 24.19.14.214 4.19.14.214
Previous Season Data Available	Event indicating previous season data is available.	Revenue Integrity	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4469						3.21.15.228	3.21.228.24
Primary Power Down	This is an indicator of when the meter metrology was de-energized. This correlates to ANSI Primary Power Down event.	Outage	ANSI C12.19 DLMS	Meter:Metrology	Log Only Advisory*	S03 Meter Table Changed	1010		*No user action	Primary Power Down	01	3.26.17.185	3.26.17.85	
Primary Power Up	This is an indicator of when the meter metrology was energized. This correlates to ANSI Primary Power Up event.	Outage	ANSI C12.19 DLMS	Meter:Metrology	Log Only		1011		*No user action	Primary Power Up	02	3.26.17.216	3.26.17.216	
Procedure Invoked	Each meter has certain procedures which can be called to perform a specific operation. A procedure is a series of table reads and writes. For example, a demand reset occurs using a procedure.	Informational	ANSI C12.19	Meter:Metrology	Disabled		2009			Procedure Invoked	09	3.11.18.191	3.11.42.24	

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Public Key Update Token Invalid Length	Endpoint received a Public Key Update Token with an invalid length.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	5048						3.32.17.107 10.32.17.107 11.32.17.107 30.32.17.107 24.32.17.107 4.32.17.107	3.23.119.35 10.23.119.35 11.23.119.35 30.23.119.35 24.23.119.35 4.23.119.35
Public Key Update Token Invalid Network ID	Endpoint received a Public Key Update Token with an invalid Network ID.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	5047						3.32.14.127 10.32.14.127 11.32.14.127 30.32.14.127 24.32.14.127 4.32.14.127	3.23.71.35 10.23.71.35 11.23.71.35 30.23.71.35 24.23.71.35 4.23.71.35
Public Key Update Token Invalid Options	Endpoint received a Public Key Update Token with invalid options.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	5049						3.32.14.117 10.32.14.117 11.32.14.117 30.32.14.117 24.32.14.117 4.32.14.117	3.23.32.35 10.23.32.35 11.23.32.35 30.23.32.35 24.23.32.35 4.23.32.35
Public Key Update Token Invalid Version	Endpoint received a Public Key Update Token with an invalid version.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	5046						3.32.14.128 10.32.14.128 11.32.14.128 30.32.14.128 24.32.14.128 4.32.14.128	3.23.120.35 10.23.120.35 11.23.120.35 30.23.120.35 24.23.120.35 4.23.120.35
Public Key Update Token Processed	Endpoint received and processed a Public Key Update Token.	Security	Communication Module	Communication Module	Advisory* Water-Alarm Gas-Alarm	Token Received	5045						3.32.7.105 10.32.7.105 11.32.7.105 30.32.7.105 24.32.7.105 4.32.7.105	3.23.32.44 10.23.32.44 11.23.32.44 30.23.32.44 24.23.32.44 4.23.32.44
Pulse Profiling Overflow	Event indicated pulse profiling Overflow warning occurred.	Diagnostic	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	5100							
Qualified Power Fail	Event indicated qualified power fail has occurred.	Diagnostic	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	5093							
Radio detected momentary outage	Communication module detected outage less than the sustained outage duration value.	Outage	Communication Module	Communication Module	Log Only		2130			*No user action			3.26.13.165	3.26.17.72
Radio detected sustained outage	Communication module detected outage greater than or equal to the sustained outage duration value.	Outage	Communication Module	Communication Module	Log Only		2129	X		*No user action				3.1.261.47
Radio first acquired network time after restart	Event which records when the communication module first acquired time from a neighbor.	Informational	Communication Module	Communication Module	Log Only		2131							3.36.114.4
Radio lost power	Event indicating power has been lost.	Outage	Communication Module	Communication Module	Log Only		2128	X		*No user action				3.26.0.85
RAM failure detected	Event informing that the self check of the meter has found a RAM failure in the metrology.	Diagnostic	ANSI C12.19	Meter:Metrology	Alarm Advisory*	S03 Meter Table Changed	2039		Y	*Replace meter	RAM failure detected	39	3.18.1.199	3.18.85.85
Rate Change	Event triggered from the meter when a change occurs to the rates loaded by the initial program.	Revenue Integrity	ANSI C12.19	Meter:Metrology	Advisory		2025				Rate Change	25	3.21.7.201	3.21.86.13

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Reactive Power Cleared	Reactive Power disappears when it is too high.	Diagnostic	Meter	Meter:Metrology	Advisory		6381							3.26.294.139
Reactive Power Detected	Indicates that the reactive power is above the set threshold	Diagnostic	Meter	Meter:Metrology	Advisory		6422							3.26.294.93
Reactive Power Detected- Phase A	Indicates that the reactive power on L1 exceeds a parameterised threshold	Diagnostic	Meter	Meter:Metrology	Advisory		6419							3.26.295.139
Reactive Power Detected- Phase B	Indicates that the reactive power on L2 exceeds a parameterised threshold	Diagnostic	Meter	Meter:Metrology	Advisory		6420							3.26.296.139
Reactive Power Detected- Phase C	Indicates that the reactive power on L3 exceeds a parameterised threshold	Diagnostic	Meter	Meter:Metrology	Advisory		6421							3.26.297.139
Real Time Entry	Real time entry call in event.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3236						3.36.17.76	3.36.114.76
Real Time Exit	Real time exit call in event.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3237						3.36.17.66	3.36.114.66
Real Time Pricing Activation	A Real Time Pricing Activated event is logged when Real Time Pricing is activated (includes the wait time). The Real Time Pricing events can be used to verify the correct operation of the meter during a real time pricing instance.	Revenue Integrity	kv2c Specific	Meter:Metrology	Alarm		2308							
Real Time Pricing Deactivation	A Real Time Pricing Deactivated event is logged when Real Time Pricing is deactivated. The Real Time Pricing events can be used to verify the correct operation of the meter during a real time pricing instance.	Revenue Integrity	kv2c Specific	Meter:Metrology	Alarm		2309							
Received kWh	Meter detected received kWh.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3222						3.6.5.231	3.21.87.3
Register Download Failed	Register Download Failed for the described reasons	Communication Application	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 09	3598						3.11.7.210	3.11.89.85
Register Download Initiated	Register FW download successfully started via MFG Procedure 37	Communication Application	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 22	3701						3.11.7.242	3.11.89.33
Register Download Initiated Failed	Register FW download initiation via MFG Procedure 37 failed	Communication Application	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 22	3704						3.11.7.243	3.11.89.217
Register Download Success	Register Download was successful	Communication Application	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 09	3599						3.11.17.244	3.11.89.58
Registered HAN device failed to join	Event informing the host a HAN device has failed to join.	HAN	HAN	HAN	Log Only		2350						12.7.16.41	12.23.17.67

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Registers and Profiles - Cleared	All registers and profiles were cleared.	Diagnostic	Meter	Meter:Metrology	Advisory		6368							3.21.89.28
Rejected Due to Credit Mode: Apply Token	Token was applied but rejected because meter is in credit mode.	Prepay	Landis+Gyr Specific	Meter:Metrology	Advisory	Prepay Command Rejected - Credit Mode	5508							3.20.32.4
Rejected Due to Credit Mode: Emergency Credit Selected	Emergency credit was selected but rejected because meter is in credit mode.	Prepay	Landis+Gyr Specific	Meter:Metrology	Advisory	Prepay Command Rejected - Credit Mode	5507							3.20.81.7
Rejected Due to Credit Mode: Non-Disconnect Period Set	Non-Disconnect period was set but rejected because meter is in credit mode.	Prepay	Landis+Gyr Specific	Meter:Metrology	Advisory	Prepay Command Rejected - Credit Mode	5509							3.31.73.88
Remote Connect Activated	Logged in the Connect relay was successfully activated and load voltage is present	Service Switch	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 24	3720						3.31.5.4	3.31.17.4
Remote Connect Failed	Remote Connect Failed	Service Switch	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 24	3717						3.31.17.41	3.31.17.85
Remote Connect Initiated	Logged in the meter was successfully armed for connect with user intervention.	Service Switch	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 24	3721						3.31.17.242	3.31.17.242
Remote Disconnect Activated	Logged in if the disconnect relay was successfully activate and the no load voltage is seen.	Service Switch	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 24	3719						3.31.17.4	3.31.17.23
Remote Disconnect Failed	Remote Disconnect Failed	Service Switch	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 24	3718						3.31.17.67	3.31.17.84
Remote Flash Failed	Event indicating Remote Flash Failed.	Metrology Configuration	Elster A3 Specific	Meter:Metrology	Alarm		5029						3.18.1.85	3.18.17.85
Remote Tool Connection Disconnected	Set when TCP/IP WAN connection is lost.	Informational	Collector	Collector	Advisory*	Network Disconnect	1323						10.23.1.32	10.23.211.68
Remote Tool Connection Established	Sent when any connection is newly established between Collector and an Internet partner.	Informational	Collector	Collector	Advisory*	Network Connect	1365						10.23.1.42	10.23.211.29
Removal Tamper Detected	Removal Tamper detected by the meter	Security	Centron II Specific	Meter:Metrology	Alarm*	Centron II Group 08	3595						3.33.5.212	3.12.17.212
Remove Endpoint From Service	Event indicating the endpoint has been removed from service.	Informational	Command Center Generated	Command Center	Host generated		11							
Removed Endpoint from Team	Device is removed from team by the user	Team	Command Center Generated	Command Center	Host generated		6201						3.23.7.212 11.23.7.212 30.23.7.212	3.7.390.212 11.7.390.212 30.7.390.212
Reset List Pointers	Event that indicates the end device attempted to reset list control variables to their initial state.  Load profile cleared – might indicate tamper if this is not planned.	Revenue Integrity	ANSI C12.19	Meter:Metrology	Alarm		2014				Reset List Pointers	14	3.16.1.141	3.16.64.214

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than)	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed)	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Residential Demand Max	Command Center Residential demand threshold has been exceeded.	Revenue Integrity	Command Center Generated	Command Center	Host generated		2318							
Residential Demand Min	Command Center Residential demand threshold to 'allow no less than x kW' has been met.	Revenue Integrity	Command Center Generated	Command Center	Host generated		2320							
Residential Energy Threshold Exceeded	Evaluation done of data delivered against preset residential thresholds in Command Center.	Revenue Integrity	Command Center Generated	Command Center	Host generated		2321						4.21.15.139 24.21.15.139	4.21.231.139 24.21.231.139
Residential Interval kWh per hour exceeded	Event is generated when interval data is received for a Residential meter and an interval kWh value is greater than the calculated threshold amount.	Revenue Integrity	Command Center Generated	Command Center	Host generated		3001							
Response Meter firmware change complete	The event indicating meter firmware download has completed.	Communication Application	Communication Module	Communication Module	Advisory		2341							
Response Module firmware awaiting activation	The event indicating module firmware is awaiting activation.	Communication Application	Communication Module	Communication Module	Advisory		2332							
Response Module firmware change complete	The event indicating communication module firmware download has completed.	Communication Application	Communication Module	Communication Module	Advisory		2331							
Response Module firmware change started	The event indicating communication module firmware download has started.	Communication Application	Communication Module	Communication Module	Advisory		2330							
Response Module firmware download failure	The event indicating communication module firmware download has failed.	Communication Application	Communication Module	Communication Module	Advisory		2333							
Response Zigbee Firmware download complete	Event indicating response Zigbee Firmware download complete.	Communication Application	Communication Module	Communication Module	Advisory		3804						3.11.7.72	3.11.0.72
Response Zigbee Firmware download started	Event indicating response Zigbee Firmware download started.	Communication Application	Communication Module	Communication Module	Advisory		3803						3.11.7.3	3.11.0.242
Revenue Guard Plus Event	A Revenue Guard+ event is logged when the meter switches into or out of 2-½-element operation along with the missing element.	Revenue Integrity	kV2c Specific	Meter:Metrology	Alarm		2311							
Reverse Power Flow Restored	Power is now flowing in the normal direction	Outage	Centron II Specific	Meter:Metrology	Disabled*	Centron II Group 05	3571						3.26.5.216	3.26.48.37



Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Reverse Rotation detected	Event indicating that the meter has had a configurable amount of -kwh during a specified timeframe. The values for this are in the meter program which control its activation.	Revenue Integrity	ANSI C12.19	Meter:Metrology	Alarm Advisory*	S03 Meter Table Changed	2277				Reverse rotation detected	48	3.33.1.219	3.12.93.219
RF Battery Endpoint FW Transfer Completed	Parent transfer new firmware to device has completed.	Communication Application	Battery Endpoint Parent	Communication Module	Advisory*	Download Image Command Received	3158						3.11.18.244 11.11.18.244 30.11.18.244	3.11.17.244 11.11.17.244 30.11.17.244
RF Battery Endpoint FW Transferring to Device	All blocks of the new firmware have been received by parent and the parent is transferring to device.	Communication Application	Battery Endpoint Parent	Communication Module	Advisory*	Download Image Command Received	3157						3.11.18.72 11.11.18.72 30.11.18.72	3.11.17.72 11.11.17.72 30.11.17.72
RF Battery Endpoint Status Changed	The event is generated when the electric meter/router/mesh extender has at least one gas/water meter associated with it. It is also generated if electric meter/router/mesh extender no longer has a gas/water associated.	Informational	Battery Endpoint Parent	Communication Module	Log Only Disabled - Cellular		3010						3.14.17.24 11.14.17.24 30.14.17.24	3.2.17.24 11.2.17.24 30.2.17.24
RF Battery OK	Sent when the power changes from battery power to A/C power (plus any time battery level changes by about 0.2V while in this state).	Outage	Collector	Collector	Alarm*	Power Restore	1316			*No user action			10.26.9.216	10.2.22.37
RF Collector Power Outage	Sent when the power moves from A/C power to battery power (plus any time the battery level changes by about 0.2V while in this state).	Outage	Collector	Collector	Alarm*	Power Failure	1315			*L+G does not recommend pinging a Collector, instead determine if there is a localized or mass outage to determine scale or work orders.			10.26.9.185	10.26.0.85
RF Collector Time Adjustment	Sent when the Collector detects a clock change larger than a configured number of seconds.	Time	Collector	Collector	Advisory*	Clock Change	1306						10.36.1.24	10.36.115.85
RF Gas Active sync	The endpoint has missed several passive syncs, and was forced to perform active network sync.	Diagnostic	RF Gas	Communication Module	Advisory		3135						4.22.5.253	4.23.74.42
RF Gas Active sync flag	The endpoint has missed several passive syncs, and was forced to perform active network sync.	Diagnostic	RF Gas	Communication Module	Advisory		3370						4.22.18.253	4.23.74.42
RF Gas Battery low	The loaded battery voltage is low. The battery needs to be replaced.	Outage	RF Gas	Communication Module	Advisory		3124						4.2.2.149	4.2.38.57

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
RF Gas Battery low flag	The loaded battery voltage is low. The battery needs to be replaced.	Outage	RF Gas	Communication Module	Advisory		3359						4.1.2.149	4.2.38.57
RF Gas Boot Firmware Updated	The endpoint has updated the Boot firmware.	Informational	RF Gas	Communication Module	Advisory		6490						4.11.17.236	4.11.17.24
RF Gas Boot Firmware Updated Flag	The endpoint has updated the Boot firmware.	Informational	RF Gas	Communication Module	Advisory		6491						4.11.5.236	4.11.17.24
RF Gas Channel Configuration Mismatch	The number of channels configured for this meter does not match the number of channels detected by the RF Gas module.	Revenue Integrity	RF Gas	Command Center	Host generated		6359						4.16.7.159	4.16.87.159
RF Gas Communication Lost	The Gas module has not communicated with Command Center within the period set by the Gas Lost Communication Threshold Organization Information setting.	Revenue Integrity	RF Gas	Command Center	Host generated		6575						4.13.1.32	4.1.17.47
RF Gas Communication Restored	The Gas module that previously lost communication is communicating again and has sent a packet.	Informational	RF Gas	Command Center	Host generated		6286						4.13.1.33	4.1.17.216
RF Gas Config change	The configuration of the endpoint has changed.	Informational	RF Gas	Communication Module	Advisory		3130						4.13.7.24	4.7.0.24
RF Gas Config change Flag	The configuration of the endpoint has changed.	Informational	RF Gas	Communication Module	Advisory		3365						4.13.7.4	4.7.0.24
RF Gas Consumption modified	Consumption value was modified.	Revenue Integrity	RF Gas	Communication Module	Alarm		3151						4.33.1.24	4.20.87.24
RF Gas Consumption modified flag	Consumption value was modified.	Revenue Integrity	RF Gas	Communication Module	Alarm		3386						4.33.2.24	4.20.87.24
RF Gas Consumption rollover	The consumption value has rolled from 0xFFFFFFFF to 0x00000000.	Revenue Integrity	RF Gas	Communication Module	Advisory		3147						4.13.16.5	4.21.87.24
RF Gas Consumption rollover flag	The consumption value has rolled from 0xFFFFFFFF to 0x00000000.	Revenue Integrity	RF Gas	Communication Module	Advisory		3382						4.13.14.5	4.21.87.24
RF Gas Consumption Value Rollover Channel 1	The consumption value has rolled from 0xFFFFFFFF to 0x00000000	Diagnostic	RF Gas	Communication Module	Advisory		4583						4.13.15.209	4.21.84.79
RF Gas Consumption Value Rollover Channel 1 Flag	The consumption value has rolled from 0xFFFFFFFF to 0x00000000	Diagnostic	RF Gas	Communication Module	Advisory		4584						4.13.14.209	4.21.84.79
RF Gas Consumption Value Rollover Channel 2	The consumption value has rolled from 0xFFFFFFFF to 0x00000000	Diagnostic	RF Gas	Communication Module	Advisory		4581						4.13.18.209	4.21.89.79
RF Gas Consumption Value Rollover Channel 2 Flag	The consumption value has rolled from 0xFFFFFFFF to 0x00000000	Diagnostic	RF Gas	Communication Module	Advisory		4582						4.13.17.209	4.21.89.79
RF Gas Cover off	The cover has been removed, or the sensor dial wheel has fallen off.	Revenue Integrity	RF Gas	Communication Module	Advisory		3121						4.1.5.44	4.12.29.212

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than)	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed)	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
RF Gas Cover off flag	The cover has been removed, or the sensor dial wheel has fallen off.	Revenue Integrity	RF Gas	Communication Module	Advisory		3356						4.2.5.44	4.12.29.212
RF Gas Download complete	All blocks of the new firmware have been received, and the endpoint is awaiting activation.	Communication Application	RF Gas	Communication Module	Alarm		3112						4.11.7.5	4.11.43.25
RF Gas Download complete flag	All blocks of the new firmware have been received, and the endpoint is awaiting activation.	Communication Application	RF Gas	Communication Module	Alarm		3347						4.11.17.5	4.11.43.25
RF Gas Download error	An error occurred with the download of new firmware.	Communication Application	RF Gas	Communication Module	Alarm		3113						4.11.7.85	4.11.43.85
RF Gas Download error flag	An error occurred with the download of new firmware.	Communication Application	RF Gas	Communication Module	Alarm		3348						4.11.17.85	4.11.43.85
RF Gas Download started	A firmware download was started by the host. The event will be generated for each firmware block received.	Communication Application	RF Gas	Communication Module	Alarm		3152						4.11.7.242	4.11.43.242
RF Gas Download started flag	A firmware download was started by the host. The event will be generated for each firmware block received.	Communication Application	RF Gas	Communication Module	Alarm		3387						4.11.17.242	4.11.43.242
RF Gas Download stopped	A firmware download was stopped by the host. The event will be generated for each firmware block completed.	Communication Application	RF Gas	Communication Module	Alarm		3153						4.11.7.243	4.11.43.243
RF Gas Download stopped flag	A firmware download was stopped by the host. The event will be generated for each firmware block completed.	Communication Application	RF Gas	Communication Module	Alarm		3388						4.11.17.243	4.11.43.243
RF Gas DST change	The parent of the Gas module has indicated a DST change in the passive sync.	Diagnostic	RF Gas	Communication Module	Log Only		3137						4.13.3.93	4.36.56.24
RF Gas DST change flag	The parent of the Gas module has indicated a DST change in the passive sync.	Diagnostic	RF Gas	Communication Module	Log Only		3372						4.13.17.93	4.36.56.24
RF Gas Exceeded energy quota	One of the energy usage quotas has been exceeded.	Diagnostic	RF Gas	Communication Module	Advisory		3133						4.6.2.261	4.26.6.139
RF Gas External Device Alarm	Utility Equipment has reported an Alarm event	Diagnostic	RF Gas	Communication Module	Advisory		4589						4.20.15.24	4.1.87.24
RF Gas External Device Alarm Flag	Utility Equipment has reported an Alarm event	Diagnostic	RF Gas	Communication Module	Advisory		4590						4.20.1.24	4.1.87.24
RF Gas External Device Configuration Error	An external device configuration error has been detected.	Revenue Integrity	RF Gas	Communication Module	Alarm		4520							4.7.17.79

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RF Gas External Device Configuration Error Flag	An external device configuration error has been detected.	Revenue Integrity	RF Gas	Communication Module	Alarm		4521							4.7.17.79
RF Gas External Device Serial Number Changed	The external device configured serial number does not match the value received from the external device.	Informational	RF Gas	Communication Module	Advisory		6474						4.20.7.24	4.7.61.24
RF Gas External Device Serial Number Changed Flag	The external device configured serial number does not match the value received from the external device.	Informational	RF Gas	Communication Module	Advisory		6475						4.20.7.26	4.7.61.24
RF Gas Extreme cold	The temperature is below the extreme cold threshold.	Diagnostic	RF Gas	Communication Module	Advisory		3145						4.35.16.150	4.35.261.150
RF Gas Extreme cold flag	The temperature is below the extreme cold threshold.	Diagnostic	RF Gas	Communication Module	Advisory		3380						4.35.17.150	4.35.261.150
RF Gas Extreme hot	The temperature is above the extreme hot threshold.	Diagnostic	RF Gas	Communication Module	Advisory		3146						4.35.16.93	4.35.261.93
RF Gas Extreme hot flag	The temperature is above the extreme hot threshold.	Diagnostic	RF Gas	Communication Module	Advisory		3381						4.35.17.93	4.35.261.93
RF Gas Extreme temp change	The temperature has changed more than the allowed limit. The 32kHz clock may have excessive error.	Diagnostic	RF Gas	Communication Module	Advisory		3144						4.35.16.261	4.35.261.24
RF Gas Extreme temp change flag	The temperature has changed more than the allowed limit. The 32kHz clock may have excessive error.	Diagnostic	RF Gas	Communication Module	Advisory		3379						4.35.17.261	4.35.261.24
RF Gas Failed Communication Error	Event indicating gas meter failed communication.	Diagnostic	RF Gas	Communication Module	Alarm		3126						4.30.1.85	4.1.111.85
RF Gas Failed Communication Error Flag	Event indicating gas meter failed communication.	Diagnostic	RF Gas	Communication Module	Alarm		3361						4.30.2.85	4.1.111.85
RF Gas Field rf session	A low power field RF programming session was initiated.	Communication Application	RF Gas	Communication Module	Advisory		3141						4.26.12.242	4.26.12.242
RF Gas Field rf session flag	A low power field RF programming session was initiated.	Communication Application	RF Gas	Communication Module	Advisory		3376						4.26.17.242	4.26.12.242
RF Gas Firmware activated	New firmware was successfully activated.	Communication Application	RF Gas	Communication Module	Alarm		3131						4.11.7.4	4.11.43.4
RF Gas Firmware activated flag	New firmware was successfully activated.	Communication Application	RF Gas	Communication Module	Alarm		3366						4.11.17.4	4.11.43.4
RF Gas Gap Reconciliation Requests Per Parent Exceeded	The Low Energy Endpoint Gap Reconciliation process is trying to retrieve missing self read data, but the maximum number of reading gap reconciliation requests Per Parent have been exceeded.	Revenue Integrity	RF Gas	Command Center	Host generated		6691						4.21.16.139	4.21.261.286

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RF Gas High Flow Alarm	The Gas meter's flow has exceeded the High Flow Alarm threshold.	Informational	RF Gas	Communication Module	Alarm		6289						4.13.5.93	4.21.261.139
RF Gas High Flow Alarm flag	The Gas meter's flow has exceeded the High Flow Alarm threshold.	Informational	RF Gas	Communication Module	Alarm		6290						4.13.18.93	4.21.261.139
RF Gas High Flow Warning	The Gas meter's flow has exceeded the High Flow Warning threshold.	Informational	RF Gas	Communication Module	Advisory		6291						4.13.5.139	4.21.261.93
RF Gas High Flow Warning flag	The Gas meter's flow has exceeded the High Flow Warning threshold.	Informational	RF Gas	Communication Module	Advisory		6292						4.13.21.139	4.21.261.93
RF Gas Host busy	Attempts to tickle the host have failed more than the allowed threshold.	Diagnostic	RF Gas	Communication Module	Log Only		3139						4.13.17.139	4.21.17.139
RF Gas Host busy flag	Attempts to tickle the host have failed more than the allowed threshold.	Diagnostic	RF Gas	Communication Module	Log Only		3374						4.13.18.139	4.21.17.139
RF Gas Host psr low	The hosts PSR is below the configured threshold.	Diagnostic	RF Gas	Communication Module	Log Only		3138						4.13.3.150	4.21.76.67
RF Gas Host psr low flag	The hosts PSR is below the configured threshold.	Diagnostic	RF Gas	Communication Module	Log Only		3373						4.13.17.150	4.21.76.67
RF Gas Host rssi low	The host's RSSI level is below the configured threshold.	Diagnostic	RF Gas	Communication Module	Log Only		3136						4.13.3.261	4.21.261.67
RF Gas Host rssi low flag	The host's RSSI level is below the configured threshold.	Diagnostic	RF Gas	Communication Module	Log Only		3371						4.13.17.261	4.21.261.67
RF Gas Initial Time Rcvd	Gas endpoint received initial time from parent endpoint.	Time	RF Gas	Command Center	Host generated		4578						4.36.3.103	4.10.114.46
RF Gas Interval overflow	Interval value overflowed.	Revenue Integrity	RF Gas	Communication Module	Advisory		3156						4.16.16.177	4.16.59.177
RF Gas Interval overflow flag	Interval value overflowed.	Revenue Integrity	RF Gas	Communication Module	Advisory		3391						4.16.17.177	4.16.59.177
RF Gas Interval Processing Delayed	Interval data processing was delayed by higher priority processes in the endpoint.	Informational	RF Gas	Command Center	Host generated		4580						4.16.17.217	4.16.17.14
RF Gas Interval sensor fail	One or more of the intervals in the daily push message is bad because of a sensor error during this interval period.	Revenue Integrity	RF Gas	Communication Module	Advisory		3116						4.16.14.106	4.21.59.85
RF Gas Interval sensor fail flag	One or more of the intervals in the daily push message is bad because of a sensor error during this interval period.	Revenue Integrity	RF Gas	Communication Module	Advisory		3351						4.16.18.106	4.21.59.85
RF Gas Interval Time Realigned	Gas endpoint realigned its time to network time.	Time	RF Gas	Command Center	Host generated		4579						4.16.17.264	4.16.116.24

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RF Gas Large time change	An excessive time change occurred. Some scheduled events were canceled.	Time	RF Gas	Communication Module	Advisory		3143						4.36.2.93	4.36.114.24
RF Gas Large time change flag	An excessive time change occurred. Some scheduled events were canceled.	Time	RF Gas	Communication Module	Advisory		3378						4.36.1.93	4.36.114.24
RF Gas Long Interval	Event generated when long interval detected for gas meter.	Revenue Integrity	RF Gas	Communication Module	Advisory		3148						4.16.14.102	4.16.59.102
RF Gas Long Interval flag	Event generated when long interval detected for gas meter	Revenue Integrity	RF Gas	Communication Module	Advisory		3383						4.17.14.102	4.16.59.102
RF Gas Low voltage	The processor voltage has dropped below the safe limit. Possible state or memory corruption.	Diagnostic	RF Gas	Communication Module	Advisory		3129						4.38.2.276	4.21.72.85
RF Gas Low voltage flag	The processor voltage has dropped below the safe limit. Possible state or memory corruption.	Diagnostic	RF Gas	Communication Module	Advisory		3364						4.38.1.276	4.21.72.85
RF Gas Magnet detected	A magnetic field was detected by the endpoint.	Informational	RF Gas	Communication Module	Advisory		3140						4.7.7.152	4.7.43.3
RF Gas Magnet detected flag	A magnetic field was detected by the endpoint.	Informational	RF Gas	Communication Module	Advisory		3375						4.7.18.152	4.7.43.3
RF Gas Master Reset	A Master Reset has been performed on the Gas module.	Informational	RF Gas	Communication Module	Alarm		6476						4.0.17.214	4.0.0.214
RF Gas Master Reset flag	A Master Reset has been performed on the Gas module.	Informational	RF Gas	Communication Module	Alarm		6477						4.0.18.214	4.0.0.214
RF Gas Meter Magnet Tamper	An external magnetic field has been detected that could result in billing data tamper.	Revenue Integrity	RF Gas	Communication Module	Alarm		6492						4.13.8.257	4.21.9.257
RF Gas Meter Magnet Tamper flag	An external magnetic field has been detected that could result in billing data tamper.	Revenue Integrity	RF Gas	Communication Module	Alarm		6493						4.13.14.257	4.21.9.257
RF Gas Meter Right Sizing Started	The endpoint has started gathering data for the Right Sizing operation.	Informational	RF Gas	Communication Module	Alarm		6486						4.21.17.242	4.21.67.242
RF Gas Meter Right Sizing Started flag	The endpoint has started gathering data for the Right Sizing operation.	Informational	RF Gas	Communication Module	Alarm		6487						4.21.18.242	4.21.67.242
RF Gas Meter Right Sizing Stopped	The endpoint has stopped gathering data for the Right Sizing operation.	Informational	RF Gas	Communication Module	Alarm		6488						4.21.17.243	4.21.67.243
RF Gas Meter Right Sizing Stopped flag	The endpoint has stopped gathering data for the Right Sizing operation.	Informational	RF Gas	Communication Module	Alarm		6489						4.21.18.243	4.21.67.243
RF Gas Missed passive sync	The endpoint missed a passive sync.	Diagnostic	RF Gas	Communication Module	Log Only		3134						4.22.5.160	4.7.17.285

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RF Gas Missed passive sync flag	The endpoint missed a passive sync.	Diagnostic	RF Gas	Communication Module	Log Only		3369						4.22.18.160	4.7.17.285
RF Gas Module Reboot	Gas module was rebooted.	Informational	RF Gas	Command Center	Host generated		4577						4.13.6.214	4.21.83.214
RF Gas New parent	The endpoint has been forced to pick a new host radio or the endpoint has rebooted.	Informational	RF Gas	Communication Module	Alarm		3132						4.5.10.27	4.7.76.24
RF Gas New parent flag	The endpoint has been forced to pick a new host radio or the endpoint has rebooted.	Informational	RF Gas	Communication Module	Alarm		3367						4.5.1.27	4.7.76.24
RF Gas Nvram corrupt	A NVRAM read failed CRC.	Diagnostic	RF Gas	Communication Module	Alarm		3122						4.18.1.85	4.18.72.43
RF Gas Nvram corrupt flag	A NVRAM read failed CRC.	Diagnostic	RF Gas	Communication Module	Alarm		3357						4.18.2.85	4.18.72.43
RF Gas Oscillator stop	The endpoint oscillator stopped.	Diagnostic	RF Gas	Communication Module	Advisory		3128						4.4.17.243	4.21.93.243
RF Gas Oscillator stop flag	The endpoint oscillator stopped.	Diagnostic	RF Gas	Communication Module	Advisory		3363						4.4.18.243	4.21.93.243
RF Gas Power Mode Changed	The RF module has switched to a different power mode.	Informational	RF Gas	Communication Module	Advisory		6484						4.26.17.24	4.26.17.242
RF Gas Power Mode Changed flag	The RF module has switched to a different power mode.	Informational	RF Gas	Communication Module	Advisory		6485						4.26.18.24	4.26.17.242
RF Gas Readings Gap Reconciliation Requests Exceeded	The Low Energy Endpoint Gap Reconciliation process is trying to retrieve missing self read data, but the maximum number of reading gap reconciliation requests have been exceeded for this endpoint within the defined gap reconciliation period.	Revenue Integrity	RF Gas	Command Center	Host generated		6598						4.21.5.139	4.21.87.139
RF Gas Readings Gap Reconciliation Retries Exceeded	The Low Energy Endpoint Gap Reconciliation process has tried to retrieve missing self read data and the retry attempts have been exceeded.	Revenue Integrity	RF Gas	Command Center	Host generated		6597						4.21.15.160	4.21.87.285
RF Gas Real time count	The consumption has incremented by one unit.	Revenue Integrity	RF Gas	Communication Module	Log Only		3149						4.13.16.102	4.21.87.102
RF Gas Real time count flag	The consumption has incremented by one unit.	Revenue Integrity	RF Gas	Communication Module	Log Only		3384						4.13.14.102	4.21.87.102
RF Gas Reboot cmd	A reboot command was issued.	Informational	RF Gas	Communication Module	Advisory		3150						4.26.13.185	4.26.83.24
RF Gas Reboot cmd flag	A reboot command was issued.	Informational	RF Gas	Communication Module	Advisory		3385						4.26.13.214	4.26.83.24
RF Gas Registration Failure	Event generated when gas meter failed to register because the import installation file contains invalid values for this meter type.	Diagnostic	RF Gas	Command Center	Host generated		4573						4.20.18.159	4.6.83.159

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RF Gas Security Configuration Error	Endpoint security configuration resulted in an error.	Security	RF Gas	Communication Module	Alarm		6480						n/a	n/a
RF Gas Security Configuration Error flag	Endpoint security configuration resulted in an error.	Security	RF Gas	Communication Module	Alarm		6481						4.32.14.79	4.7.32.79
RF Gas Security Configuration Success	Endpoint has been successfully configured for security.	Security	RF Gas	Communication Module	Alarm		6478						n/a	n/a
RF Gas Security Configuration Success flag	Endpoint has been successfully configured for security.	Security	RF Gas	Communication Module	Alarm		6479						4.32.14.244	4.7.32.58
RF Gas Sensor Fail Channel 1	Pulse sensor or register has failed. Consumption count is suspect	Revenue Integrity	RF Gas	Communication Module	Alarm		4593						4.20.17.20	4.7.89.85
RF Gas Sensor Fail Channel 1 Flag	Pulse sensor or register has failed. Consumption count is suspect	Revenue Integrity	RF Gas	Communication Module	Alarm		4594						4.20.1.20	4.7.89.85
RF Gas Sensor Fail Channel 2	Pulse sensor or register has failed. Consumption count is suspect	Revenue Integrity	RF Gas	Communication Module	Alarm		4591						4.20.17.85	4.7.17.85
RF Gas Sensor Fail Channel 2 Flag	Pulse sensor or register has failed. Consumption count is suspect	Revenue Integrity	RF Gas	Communication Module	Alarm		4592						4.20.1.85	4.7.17.85
RF Gas Sensor overload	The sensor has produced more counts than is possible in a single minute.	Revenue Integrity	RF Gas	Communication Module	Advisory		3118						4.30.5.178	4.17.43.93
RF Gas Sensor Overload Channel 1	The sensor has produced more counts than is possible in a single minute	Revenue Integrity	RF Gas	Communication Module	Advisory		4595						4.20.17.178	4.50.144.40
RF Gas Sensor Overload Channel 1 Flag	The sensor has produced more counts than is possible in a single minute	Revenue Integrity	RF Gas	Communication Module	Advisory		4596						4.20.1.178	4.50.144.40
RF Gas Sensor Overload Channel 2	The sensor has produced more counts than is possible in a single minute	Revenue Integrity	RF Gas	Communication Module	Advisory		4585						4.20.2.178	4.51.144.40
RF Gas Sensor Overload Channel 2 Flag	The sensor has produced more counts than is possible in a single minute	Revenue Integrity	RF Gas	Communication Module	Advisory		4586						4.20.18.178	4.51.144.40
RF Gas Sensor overload flag	The sensor has produced more counts than is possible in a single minute.	Revenue Integrity	RF Gas	Communication Module	Advisory		3353						4.30.18.178	4.17.43.93
RF Gas Sensor Stuck Channel 1	A sensor switch is stuck	Revenue Integrity	RF Gas	Communication Module	Advisory		4597						4.20.2.88	4.50.144.88
RF Gas Sensor Stuck Channel 1 Flag	A sensor switch is stuck	Revenue Integrity	RF Gas	Communication Module	Advisory		4598						4.20.1.88	4.50.144.88
RF Gas Sensor Stuck Channel 2	A sensor switch is stuck	Revenue Integrity	RF Gas	Communication Module	Advisory		4587						4.20.18.88	4.51.144.88
RF Gas Sensor Stuck Channel 2 Flag	A sensor switch is stuck	Revenue Integrity	RF Gas	Communication Module	Advisory		4588						4.20.17.88	4.51.144.88



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RF Gas Short interval	The current interval was shorter than 5 minutes, due to a reboot, or time error	Revenue Integrity	RF Gas	Communication Module	Advisory		3115						4.16.14.79	4.16.59.79
RF Gas Short interval flag	The current interval was shorter than 5 minutes, due to a reboot, or time error	Revenue Integrity	RF Gas	Communication Module	Advisory		3350						4.16.18.79	4.16.59.79
RF Gas Stack Overflow	A stack overflow has occurred.	Diagnostic	RF Gas	Communication Module	Advisory		3111						4.17.17.79	4.17.17.79
RF Gas Stack Overflow flag	A stack overflow has occurred.	Diagnostic	RF Gas	Communication Module	Advisory		3346						4.17.18.79	4.17.17.79
RF Gas Stale register	The register has not counted a pulse in allotted time.	Revenue Integrity	RF Gas	Communication Module	Advisory		3127						4.36.2.209	4.36.89.79
RF Gas Stale register flag	The register has not counted a pulse in allotted time.	Revenue Integrity	RF Gas	Communication Module	Advisory		3362						4.36.1.209	4.36.89.79
RF Gas Stale time	The endpoint network time has not been updated in within set limits.	Time	RF Gas	Communication Module	Advisory		3142						4.36.17.29	4.36.114.85
RF Gas Stale time flag	The endpoint network time has not been updated in within set limits.	Time	RF Gas	Communication Module	Advisory		3377						4.36.18.29	4.36.114.85
RF Gas Stuck magnet switch	The magnet switch is stuck.	Diagnostic	RF Gas	Communication Module	Advisory		3120						4.7.5.152	4.7.66.2
RF Gas Stuck magnet switch flag	The magnet switch is stuck.	Diagnostic	RF Gas	Communication Module	Advisory		3355						4.7.17.152	4.7.66.2
RF Gas Stuck sensor switch	A sensor switch is stuck.	Revenue Integrity	RF Gas	Communication Module	Advisory		3119						4.30.5.5	4.21.84.270
RF Gas Stuck sensor switch flag	A sensor switch is stuck.	Revenue Integrity	RF Gas	Communication Module	Advisory		3354						4.30.18.5	4.21.84.270
RF Gas Suspect Reading Received	Event generated when current reading is less than prior reading.	Revenue Integrity	RF Gas	Command Center	Host generated		4574						4.13.14.196	4.21.87.159
RF Gas System error	A system error such as task queue overflow or stack overflow has occurred.	Diagnostic	RF Gas	Communication Module	Advisory		3154						4.17.17.177	4.18.0.177
RF Gas System error flag	A system error such as task queue overflow or stack overflow has occurred.	Diagnostic	RF Gas	Communication Module	Advisory		3389						4.17.18.177	4.18.0.177
RF Gas Tilt switch	The endpoint has been tilted beyond 30 deg. Possible tamper.	Revenue Integrity	RF Gas	Communication Module	Advisory		3125						4.33.2.263	4.12.261.257
RF Gas Tilt switch flag	The endpoint has been tilted beyond 30 deg. Possible tamper.	Revenue Integrity	RF Gas	Communication Module	Advisory		3360						4.33.1.263	4.12.261.257
RF Gas Unused interval data	Unused or initialized interval data in the daily push message.	Revenue Integrity	RF Gas	Communication Module	Advisory		3155						4.16.14.160	4.16.59.285
RF Gas Watch dog	A watch dog reset has occurred.	Diagnostic	RF Gas	Communication Module	Advisory		3123						4.11.7.280	4.1.370.215
RF Gas Watch dog flag	A watch dog reset has occurred.	Diagnostic	RF Gas	Communication Module	Advisory		3358						4.11.17.280	4.1.370.215
RF Gas Weak Parent	The endpoint has a weak connection to its parent.	Informational	RF Gas	Communication Module	Advisory		6482						4.5.10.150	4.7.76.270
RF Gas Weak Parent flag	The endpoint has a weak connection to its parent.	Informational	RF Gas	Communication Module	Advisory		6483						4.5.1.150	4.7.76.270

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RF Init Push	Event sent as part of registration to confirm installation. It is also used to deliver communication module and metrology configuration data to Command Center.	Informational	Communication Module SBS - Collector	Communication Module SBS - Collector	Alarm		1002						3.5.7.24 4.5.7.24 24.5.7.24 30.5.7.24	3.6.5.58 11.6.5.58 30.6.5.58 (DA)
RF Low Battery	Event generated by the Collector informing the host a detected battery level lower than the configured threshold has occurred.	Diagnostic	Collector	Collector	Alarm*	Low Battery	1312						10.2.1.149	10.2.22.150
RF No Mesh Comm	Sent when the Collector loses connection with one of its local radios.	Outage	Collector	Collector	Alarm*	Radio Disconnect	1321			*Ping affected Collector Radio. *If no response investigate locally.			10.23.1.68	10.1.68.85
RF Registration Request	Event indicating an endpoint has initially been discovered on the network.	Informational	Communication Module SBS - Collector	Communication Module SBS - Collector	N/A		1000						30.20.18.14	3.6.5.50 10.6.5.50 20.6.5.50
RF Response Battery Endpoint FW to Transfer Complete	Event generated when firmware has completed transferring to the device. Event generated during point to point firmware download.	Communication Application	Battery Endpoint Parent	Communication Module	Advisory		3160						3.11.18.24 11.11.18.24 30.11.18.24	3.11.43.58 11.11.43.58 30.11.43.58
RF Response Battery Endpoint FW to Transferring to Device	Event generated when firmware is transferring to the device. Event generated during point to point firmware download.	Communication Application	Battery Endpoint Parent	Communication Module	Advisory		3159						3.11.18.3 11.11.18.3 30.11.18.3	3.11.43.3 11.11.43.3 30.11.43.3
RF System status updated	Event indicating the system status has been updated.	Informational	Meter	Communication Module	Advisory Disabled - Cellular		2328							3.1.17.46
RF Tranceiver Reset	Sent when the Collector establishes a connection with one of its local radios.	Informational	Collector	Collector	Alarm*	Radio Connect	1301						10.23.1.214	10.23.122.214
RF Unknown Command	Event informing that an event occurred in the Collector code that is not supported in Command Center.	Informational	Collector	Collector	N/A		1322						10.23.17.79	10.1.0.79
RF Water Active Sync	The endpoint has missed at least one passive sync, and was forced to perform active network sync.	Diagnostic	RF Water	Communication Module	Advisory		4135						24.22.5.253	24.23.74.42

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RF Water Active Sync flag	The endpoint has missed at least one passive sync, and was forced to perform active network sync.	Diagnostic	RF Water	Communication Module	Advisory		4370						24.22.18.253	24.23.74.42
RF Water Battery Low	Battery usage indicates possible low voltage. The battery is nearing end-of-life. The water module needs to be replaced.	Outage	RF Water	Communication Module	Alarm		4124						24.2.2.149	24.2.38.57
RF Water Battery Low Flag	Battery usage indicates possible low voltage. The battery is nearing end-of-life. The water module needs to be replaced.	Outage	RF Water	Communication Module	Alarm		4359						24.1.2.149	24.2.38.57
RF Water Boot Firmware Updated	The endpoint has updated the Boot firmware.	Informational	RF Water	Communication Module	Advisory		6313						24.11.17.236	24.11.17.24
RF Water Boot Firmware Updated flag	The endpoint has updated the Boot firmware.	Informational	RF Water	Communication Module	Advisory		6314						24.11.5.236	24.11.17.24
RF Water Config Change	The configuration of the endpoint has changed.	Informational	RF Water	Communication Module	Advisory		4130						24.13.7.24	24.7.17.24
RF Water Config Change Flag	The configuration of the endpoint has changed.	Informational	RF Water	Communication Module	Advisory		4365						24.2.5.44	24.7.17.24
RF Water Consumption Modified	Consumption value was modified.	Revenue Integrity	RF Water	Communication Module	Alarm		6303						24.33.1.24	24.20.87.24
RF Water Consumption Modified flag	Consumption value was modified.	Revenue Integrity	RF Water	Communication Module	Alarm		6304						24.33.2.24	24.20.87.24
RF Water Consumption Rollover	The consumption value has rolled from 0xFFFFFFFF to 0x00000000.	Revenue Integrity	RF Water	Communication Module	Advisory		4147						24.13.16.5	24.21.87.24
RF Water Consumption Rollover Flag	The consumption value has rolled from 0xFFFFFFFF to 0x00000000.	Revenue Integrity	RF Water	Communication Module	Advisory		4382						24.13.14.5	24.21.87.24
RF Water Disconnect Consumption	Water consumption was detected in DISCONNECT mode.	Revenue Integrity	RF Water	Communication Module	Alarm		4114						24.16.1.231	24.16.87.68
RF Water Disconnect Consumption Flag	Water consumption was detected in DISCONNECT mode.	Revenue Integrity	RF Water	Communication Module	Alarm		4349						24.16.2.231	24.16.87.68
RF Water Download Complete	All blocks of the new firmware have been received, and the endpoint is awaiting activation.	Communication Application	RF Water	Communication Module	Alarm		4112						24.11.7.5	24.11.43.25
RF Water Download Complete Flag	All blocks of the new firmware have been received, and the endpoint is awaiting activation.	Communication Application	RF Water	Communication Module	Alarm		4347						24.11.17.5	24.11.43.25
RF Water Download Error	An error occurred with the download of new firmware.	Communication Application	RF Water	Communication Module	Alarm		4113						24.11.7.85	24.11.43.85
RF Water Download Error Flag	An error occurred with the download of new firmware.	Communication Application	RF Water	Communication Module	Alarm		4348						24.11.17.85	24.11.43.85

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RF Water Download Started	A firmware download was started by the host.	Communication Application	RF Water	Communication Module	Alarm		4152						24.11.7.242	24.11.43.242
RF Water Download Started Flag	A firmware download was started by the host.	Communication Application	RF Water	Communication Module	Alarm		4387						24.11.17.242	24.11.43.242
RF Water Download Stopped	A firmware download was stopped by the host.	Communication Application	RF Water	Communication Module	Alarm		4153						24.11.7.243	24.11.43.243
RF Water Download Stopped Flag	A firmware download was stopped by the host.	Communication Application	RF Water	Communication Module	Alarm		4388						24.11.17.243	24.11.43.243
RF Water DST Change	The parent of the Water module has indicated a DST change.	Diagnostic	RF Water	Communication Module	Log Only		6305						24.13.3.93	24.36.56.24
RF Water DST Change flag	The endpoint has stopped gathering data for the Right Sizing operation.	Diagnostic	RF Water	Communication Module	Log Only		6306						24.13.17.93	24.36.56.24
RF Water Extreme Cold	The temperature is below the extreme cold threshold.	Diagnostic	RF Water	Communication Module	Advisory		4145						24.35.16.150	24.35.261.150
RF Water Extreme Cold Flag	The temperature is below the extreme cold threshold.	Diagnostic	RF Water	Communication Module	Advisory		4380						24.35.17.150	24.35.261.150
RF Water Extreme Hot	The temperature is above the extreme hot threshold.	Diagnostic	RF Water	Communication Module	Advisory		4146						24.35.16.93	24.35.261.93
RF Water Extreme Hot Flag	The temperature is above the extreme hot threshold.	Diagnostic	RF Water	Communication Module	Advisory		4381						24.35.17.93	24.35.261.93
RF Water Extreme Temp Change	The temperature has changed more than the allowed limit, which may cause clock/time errors.	Diagnostic	RF Water	Communication Module	Advisory		4144						24.35.16.261	24.35.261.24
RF Water Extreme Temp Change Flag	The temperature has changed more than the allowed limit, which may cause clock/time errors.	Diagnostic	RF Water	Communication Module	Advisory		4379						24.35.17.261	24.35.261.24
RF Water Failed Communication Error	One or more of the intervals in the reading push message is bad due to the module receiving no communication from a register, or receiving an invalid protocol that cannot be understood. No billable read was received for that time period.	Revenue Integrity	RF Water	Communication Module	Alarm		4116						24.16.14.106	24.21.59.85

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RF Water Failed Communication Error Flag	One or more of the intervals in the reading push message is bad due to the module receiving no communication from a register, or receiving an invalid protocol that cannot be understood. No billable read was received for that time period.	Revenue Integrity	RF Water	Communication Module	Alarm		4351						24.16.18.106	24.21.59.85
RF Water Field RF Session	A low power field RF programming session was initiated.	Communication Application	RF Water	Communication Module	Advisory		4141						24.26.12.242	24.26.12.242
RF Water Field RF Session Flag	A low power field RF programming session was initiated.	Communication Application	RF Water	Communication Module	Advisory		4376						24.26.17.242	24.26.12.242
RF Water Firmware Activated	New firmware was successfully activated.	Communication Application	RF Water	Communication Module	Alarm		4131						24.11.7.4	24.11.43.4
RF Water Firmware Activated Flag	New firmware was successfully activated.	Communication Application	RF Water	Communication Module	Alarm		4366						24.11.17.4	24.11.43.4
RF Water Host Busy	Attempt to communicate with the parent electric device has failed.	Diagnostic	RF Water	Communication Module	Advisory		4139						24.13.17.139	24.21.17.139
RF Water Host Busy Flag	Attempt to communicate with the parent electric device has failed.	Diagnostic	RF Water	Communication Module	Advisory		4374						24.13.18.139	24.21.17.139
RF Water Initial Time Rcvd	Initial time from parent endpoint for interval processing by Water endpoint.	Time	RF Water	Command Center	Host generated		6297						24.36.3.103	24.10.114.46
RF Water Interval Processing Delayed	Interval data processing was delayed by higher priority processes in the Water endpoint.	Informational	RF Water	Command Center	Host generated		6298						24.16.17.217	24.16.17.14
RF Water Interval Time Realigned	Time was realigned to network time during interval processing in the Water endpoint.	Time	RF Water	Command Center	Host generated		6299						24.16.17.264	24.16.116.24
RF Water Invalid Read Error	One or more of the intervals in the reading push message is bad due to invalid integers received in the message from the register. No billable read was received for that time period.	Revenue Integrity	RF Water	Communication Module	Advisory		5481						24.16.17.43	24.16.17.43

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RF Water Invalid Read Error Flag	One or more of the intervals in the reading push message is bad due to invalid integers received in the message from the register. No billable read was received for that time period.	Revenue Integrity	RF Water	Communication Module	Advisory		5482						24.16.18.43	24.16.17.43
RF Water Large Time Change	An excessive time change occurred. Some scheduled events were canceled.	Time	RF Water	Communication Module	Advisory		4143						24.36.2.93	24.36.114.24
RF Water Large Time Change Flag	An excessive time change occurred. Some scheduled events were canceled.	Time	RF Water	Communication Module	Advisory		4378						24.36.1.93	24.36.114.24
RF Water Leak Detected	A leak may have occurred during the configured time interval.	Diagnostic	RF Water	Command Center	Host generated		3968						24.29.1.177	24.29.48.177
RF Water Long Interval	Long interval in the Water endpoint due to a reboot or time error.	Revenue Integrity	RF Water	Command Center	Host generated		6300						24.16.14.102	24.16.59.102
RF Water Magnet Detected	A magnetic field was detected by the endpoint.	Informational	RF Water	Communication Module	Advisory		4140						24.7.7.152	24.7.43.3
RF Water Magnet Detected Flag	A magnetic field was detected by the endpoint.	Informational	RF Water	Communication Module	Advisory		4375						24.7.18.152	24.7.43.3
RF Water Master Reset	A Master Reset has been performed on the Water module.	Informational	RF Water	Communication Module	Alarm		6307						24.0.17.214	24.0.0.214
RF Water Master Reset flag	A Master Reset has been performed on the Water module.	Informational	RF Water	Communication Module	Alarm		6308						24.0.18.214	24.0.0.214
RF Water Meter Right Sizing Started	The endpoint has started gathering data for the Right Sizing operation.	Informational	RF Water	Communication Module	Alarm		6293						24.21.17.242	24.21.67.242
RF Water Meter Right Sizing Started Flag	The endpoint has started gathering data for the Right Sizing operation.	Informational	RF Water	Communication Module	Alarm		6294						24.21.18.242	24.21.67.242
RF Water Meter Right Sizing Stopped	The endpoint has stopped gathering data for the Right Sizing operation.	Informational	RF Water	Communication Module	Alarm		6295						24.21.17.243	24.21.67.243
RF Water Meter Right Sizing Stopped Flag	The endpoint has stopped gathering data for the Right Sizing operation.	Informational	RF Water	Communication Module	Alarm		6296						24.21.18.243	24.21.67.243
RF Water Module Reboot	Water endpoint rebooted during interval processing.	Informational	RF Water	Command Center	Host generated		6301						24.16.6.214	24.21.83.214
RF Water New Parent	The endpoint has been forced to pick a new host radio or the endpoint has rebooted.	Informational	RF Water	Communication Module	Alarm		4132						24.5.10.27	24.7.76.24
RF Water New Parent Flag	The endpoint has been forced to pick a new host radio or the endpoint has rebooted	Informational	RF Water	Communication Module	Alarm		4367						24.5.1.27	24.7.76.24
RF Water NVRAM Corrupt	An NVRAM read failed CRC.	Diagnostic	RF Water	Communication Module	Alarm		4122						24.18.1.85	24.18.72.43

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RF Water NVRAM Corrupt Flag	An NVRAM read failed CRC.	Diagnostic	RF Water	Communication Module	Alarm		4357						24.18.2.85	24.18.72.43
RF Water Power Mode Changed	The RF module has switched to a different power mode.	Informational	RF Water	Communication Module	Advisory		6309						24.26.17.24	24.26.17.242
RF Water Power Mode Changed flag	The RF module has switched to a different power mode.	Informational	RF Water	Communication Module	Advisory		6310						24.26.18.24	24.26.17.242
RF Water RDM Failure	A failure occurred during maintenance or when attempting to connect or disconnect the Remote Disconnect Meter (RDM).	Revenue Integrity	RF Water	Communication Module	Alarm		6448						24.31.17.79	24.31.17.85
RF Water RDM Failure flag	A failure occurred during maintenance or when attempting to connect or disconnect the Remote Disconnect Meter (RDM).	Revenue Integrity	RF Water	Communication Module	Alarm		6449						24.31.18.79	24.31.17.85
RF Water Reboot Command	A reboot command was issued.	Informational	RF Water	Communication Module	Advisory		4150						24.26.13.185	24.26.83.24
RF Water Reboot Command Flag	A reboot command was issued.	Informational	RF Water	Communication Module	Advisory		4385						24.26.13.214	24.26.83.24
RF Water Reverse Flow Detected	Reverse flow may have occurred. Interval data is reported as zero.	Informational	RF Water	Communication Module	Advisory		4155						24.30.5.270	24.39.48.270
RF Water Reverse Flow Detected flag	Reverse flow may have occurred. Interval data is reported as zero.	Informational	RF Water	Communication Module	Advisory		4360						24.30.18.270	24.39.48.270
RF Water Security Configuration Error	Endpoint security configuration resulted in an error.	Security	RF Water	Communication Module	Alarm		6323						n/a	n/a
RF Water Security Configuration Error Flag	Endpoint security configuration resulted in an error.	Security	RF Water	Communication Module	Alarm		6324						24.32.14.79	24.7.32.79
RF Water Security Configuration Success	Endpoint has been successfully configured for security.	Security	RF Water	Communication Module	Alarm		6321						n/a	n/a
RF Water Security Configuration Success Flag	Endpoint has been successfully configured for security.	Security	RF Water	Communication Module	Alarm		6322						24.32.14.244	24.7.32.58
RF Water Sensor Overload	The sensor has produced more counts than is possible in a single minute.	Revenue Integrity	RF Water	Communication Module	Advisory		4118						24.30.5.178	24.39.48.177
RF Water Sensor Overload Flag	The sensor has produced more counts than is possible in a single minute.	Revenue Integrity	RF Water	Communication Module	Advisory		4353						24.30.18.178	24.39.48.177
RF Water Short Interval	Short interval in the Water endpoint due to a reboot or time error.	Revenue Integrity	RF Water	Communication Module	Advisory		4115						24.16.14.79	24.16.58.79
RF Water Short Interval Flag	The current interval was shorter than 15 minutes, due to a reboot, or time error.	Revenue Integrity	RF Water	Communication Module	Advisory		4350						24.16.18.79	24.16.58.79
RF Water Stack Overflow Error	A stack overflow error has occurred.	Diagnostic	RF Water	Communication Module	Alarm		3928						24.17.17.79	24.17.17.79

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RF Water Stack Overflow Error Flag	A stack overflow error has occurred.	Diagnostic	RF Water	Communication Module	Alarm		3929						24.17.18.79	24.17.17.79
RF Water Stale Register	The register reading has not changed in allotted time.	Revenue Integrity	RF Water	Communication Module	Advisory		4127						24.36.2.209	24.36.89.79
RF Water Stale Register Flag	The register reading has not changed in allotted time.	Revenue Integrity	RF Water	Communication Module	Advisory		4362						24.36.1.209	24.36.89.79
RF Water Stuck Magnet Switch	The magnet switch is stuck.	Revenue Integrity	RF Water	Communication Module	Advisory		4120						24.7.5.152	24.5.66.66
RF Water Stuck Magnet Switch Flag	The magnet switch is stuck.	Revenue Integrity	RF Water	Communication Module	Advisory		4355						24.7.17.152	24.5.66.66
RF Water Switch Status Changed	The water meter has been disconnected (valve closed) or connected (valve opened).	Revenue Integrity	RF Water	Communication Module	Alarm		6360						24.31.17.24	24.31.17.24
RF Water Switch Status Changed flag	The water meter has been disconnected (valve closed) or connected (valve opened).	Revenue Integrity	RF Water	Communication Module	Alarm		6361						24.31.18.24	24.31.17.24
RF Water System Error	A system error such as task queue overflow.	Diagnostic	RF Water	Communication Module	Alarm		4154						24.17.17.177	24.18.0.177
RF Water System Error Flag	A system error such as task queue overflow.	Diagnostic	RF Water	Communication Module	Alarm		4389						24.17.18.177	24.18.0.177
RF Water Unused Interval Data	Unused or initialized interval indicated by Water endpoint.	Revenue Integrity	RF Water	Command Center	Host generated		6302						24.16.14.160	24.16.59.285
RF Water Watch Dog	A watch dog reset has occurred.	Diagnostic	RF Water	Communication Module	Alarm		4123						24.11.7.280	24.1.370.215
RF Water Watch Dog Flag	A watch dog reset has occurred.	Diagnostic	RF Water	Communication Module	Alarm		4358						24.11.17.280	24.1.370.215
RF Water Weak Parent	The endpoint has a weak connection to its parent.	Informational	RF Water	Communication Module	Advisory		6311						24.5.10.150	24.7.76.270
RF Water Weak Parent flag	The endpoint has a weak connection to its parent.	Informational	RF Water	Communication Module	Advisory		6312						24.5.1.150	24.7.76.270
RKM Failure	Event generated from Command Center when any of the RKM (RSA Key Managers) servers are unavailable.	Security	Command Center Generated	Command Center	Host generated		1504						7.32.18.85	0.12.32.160
RMS Voltage Above High Threshold	RMS Voltage above higher VM threshold	Diagnostic	Centron II Specific	Meter: Metrology	Log Only*	Centron II Group 31	3779						3.38.17.93	3.26.38.93
RMS Voltage Below Low Threshold	RMS Voltage below lower threshold	Diagnostic	Centron II Specific	Meter: Metrology	Log Only*	Centron II Group 31	3778						3.38.17.150	3.26.38.150
ROM failure detected	Event informing that a self check of the meter has found a ROM failure in the metrology.	Diagnostic	ANSI C12.19	Meter: Metrology	Alarm Advisory*	503 Meter Table Changed	2040			ROM failure detected	40		3.18.1.220	3.18.92.85
Router Battery Bad	Router Battery Bad	Diagnostic	Router	Router	Alarm		6473						11.2.17.17	11.2.17.37
Router Battery Good	Router Battery Good	Diagnostic	Router	Router	Alarm		6472						11.2.17.16	11.2.17.85
Routing error	This event is created when an unregistered endpoint is identified as best nearest neighbor.	Diagnostic	Command Center Generated	Command Center	Host generated		1368						1.19.17.156 30.19.17.156	0.1.74.85 30.1.74.85



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RTOS Event	Event confirming that the RTOS event is present.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory	S03 Meter Table Changed	4529						3.11.17.79	3.11.17.79
S03 Meter Table Changed	Event indicating a change has occurred in meter standard table 03.	Diagnostic	Communication Module	Communication Module	Advisory		3011							
Sag Log Overflow	Sag Log Overflow warning	Diagnostic	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	5112							
Sag Started Phase A	RMS voltage dipped below a configurable percentage on phase A.	Revenue Integrity	Meter	Meter:Metrology	FOCUS AX - Log Only* S4x - Advisory*	Voltage Sag/Swell Event	3256						3.38.1.223	3.26.131.223
Sag Started Phase B	RMS voltage dipped below a configurable percentage on phase B.	Revenue Integrity	Meter	Meter:Metrology	FOCUS AX - Log Only* S4x - Advisory*	Voltage Sag/Swell Event	3257						3.38.5.223	3.26.132.223
Sag Started Phase C	RMS voltage dipped below a configurable percentage on phase C.	Revenue Integrity	Meter	Meter:Metrology	FOCUS AX - Log Only* S4x - Advisory*	Voltage Sag/Swell Event	3258						3.38.14.223	3.26.133.223
Sag Stopped Phase A	RMS voltage sag condition ended on phase A.	Revenue Integrity	Meter	Meter:Metrology	FOCUS AX - Log Only* S4x - Advisory*	Voltage Sag/Swell Event	3250						3.38.5.224	3.26.126.28
Sag Stopped Phase B	RMS voltage sag condition ended on phase B.	Revenue Integrity	Meter	Meter:Metrology	FOCUS AX - Log Only* S4x - Advisory*	Voltage Sag/Swell Event	3251						3.38.9.224	3.26.134.28
Sag Stopped Phase C	RMS voltage sag condition ended on phase C.	Revenue Integrity	Meter	Meter:Metrology	FOCUS AX - Log Only* S4x - Advisory*	Voltage Sag/Swell Event	3252						3.38.14.224	3.26.135.28
Scheduled Demand Reset Failure	Event indicating the scheduled demand reset failed.	Revenue Integrity	Command Center Generated	Command Center	Host generated		2271						3.8.1.85	3.8.95.65
Scheduled Demand Reset Success	Event indicating the scheduled demand reset was successful.	Revenue Integrity	Command Center Generated	Command Center	Host generated		2312						3.8.6.61	3.8.95.215
Scheduled Event Collection Failed	Indicates failure in event generation through Scheduled Data Collection.	Informational	Meter	Command Center	Advisory		6465							3.17.44.85
SD Arm Completed	The arm operation successfully finished without any known errors	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm	Service Disconnect Operation	6022							3.31.0.76
SD Arm Started	The arm operation started	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm	Service Disconnect Operation	6019							3.31.0.242
SD Close Completed	The close operation successfully finished without any known errors	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm	Service Disconnect Operation	6020							3.31.0.11
SD Close Started	The close operation started	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm	Service Disconnect Operation	6017							3.31.0.5
SD Open Completed	The open operation successfully finished without any known errors	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm	Service Disconnect Operation	6021							3.31.0.12
SD Open Started	The open operation started	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm	Service Disconnect Operation	6018							3.31.0.6
SD Operation Error	Event indicating failure when attempting to disconnect switch operation (over voltage, under voltage, etc).	Service Switch	FOCUS AX Specific	Meter:Metrology	Alarm		2121						3.5.1.67	3.21.17.84

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SD Rejected: Current SD Operation	Command rejected because service disconnect was already in operation	Prepay	Landis+Gyr Specific DLMS	Meter:Metrology	Alarm	Service Disconnect Error	6015							3.31.12.85
SD Rejected: Emergency override is active	Command rejected because a close command is not allowed when Emergency Disconnect Override is active.	Prepay	Landis+Gyr Specific	Meter:Metrology			6057							3.31.362.84
SD Rejected: High Load Voltage	Command rejected because a load side voltage higher than the configurable threshold prevented the switch from closing	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm	Service Disconnect Error	6008							3.31.38.36
SD Rejected: Meter Not Armed	Command rejected because the service disconnect close button was pressed but the meter was not armed	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm	Service Disconnect Error	6011							3.31.91.66
SD Rejected: Meter Stand By Mode	Command rejected because the meter is in stand-by mode	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm	Service Disconnect Error	6016							3.31.108.85
SD Rejected: Meter Test Mode	Command rejected because the meter is in test mode	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm	Service Disconnect Error	6010							3.31.19.85
SD Rejected: SD Charging	Command rejected because service disconnect is currently charging	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm	Service Disconnect Error	6014							3.31.22.85
SD Rejected: SD Not Capable	Command rejected because service disconnect is not capable	Prepay	Landis+Gyr Specific DLMS	Meter:Metrology	Alarm	Service Disconnect Error	6012							3.31.46.160
SD Rejected: SD Not Enabled	Command rejected because service disconnect is not enabled	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm	Service Disconnect Error	6013							3.31.46.66
SD Switch Error	Meter detected an error condition when switching disconnect states.	Service Switch	ANSI C12.19 DLMS	Meter:Metrology	Advisory*	S03 Meter Table Changed	3209						3.31.18.67	3.31.0.84
Season Change	Event which notifies that a Season Change has occurred on the meter due to the current program.	Revenue Integrity	ANSI C12.19	Meter:Metrology	Log Only		2024			Season Change	24	3.36.16.228	3.36.228.24	
Security Config with Default Key	An endpoint has undergone Security Configuration using the default key.	Security	Command Center Generated	Command Center	Host generated		3096						3.32.7.58 10.32.7.58 11.32.7.58 24.12.32.7 30.32.7.58 4.12.32.7	3.12.32.7 26.12.32.7 24.12.32.7 4.12.32.7
Security Config with Previous Key	An endpoint has undergone Security Configuration using the previous key.	Security	Command Center Generated	Command Center	Host generated		3097						3.32.7.65 10.32.7.65 11.32.7.65 30.32.7.65	26.12.32.7
Security Configuration	An endpoint has undergone Security Configuration.	Security	Command Center Generated	Command Center	Host generated		5052						3.32.7.49 10.32.7.49 11.32.7.49 24.12.32.58 30.32.7.49 4.12.32.58	3.12.32.58 26.12.32.58 24.12.32.58 4.12.32.58
Security Token Exported	Security Configuration Token has been exported.	Security	Command Center Generated	Command Center	Host generated		2920						7.32.18.3	0.12.17.3

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Security Token Imported	Security Configuration Token has been imported.	Security	Command Center Generated	Command Center	Host generated		2919						7.32.18.4	0.12.17.4
Segment Group Keys Generated	Segment group keys have been generated.	Security	Command Center Generated	Command Center	Host generated		3004						7.32.18.26	26.12.32.33
Segment Keys Received	Endpoint received segment key.	Security	Communication Module	Communication Module	Log Only		3000						3.32.7.26 10.32.7.26 11.32.7.26 30.32.7.26 24.32.7.26 4.32.7.26	3.12.32.24 10.12.32.24 11.12.32.24 30.12.32.24 24.12.32.24 4.12.32.24
Segment Keys Received Flag	RF Water Endpoint generated event Segment Keys Received flag	Security	Communication Module	Communication Module	LogOnly		6338						24.32.3.26 4.32.3.26	24.12.32.24 4.12.32.24
Self check error detected	Event informing that the self check of the meter has found a Self Check error in the metrology.	Diagnostic	ANSI C12.19	Meter:Metrology	Alarm Advisory*	S03 Meter Table Changed	2038			Self check error detected		38	3.21.18.79	3.21.100.79
Self Read Cleared	Self Reads cleared as a result of Standard Procedure 4	Revenue Integrity	Centron II Specific	Meter:Metrology	Alarm*	Centron II Group 08	3593						3.21.15.28	3.21.87.28
Self Read Data Available	Event indicating self read data is available.	Revenue Integrity	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4470						3.21.15.231	3.21.87.46
Self Read Gap Reconciliation Retry Expired	Event generated when Gap Reconciliation process has tried to retrieve missing self read data and the retry attempts have been exceeded.	Revenue Integrity	Command Center Generated	Command Center	Host generated		4465						3.21.15.160	3.21.67.285
Self Read Occurred	Event that triggers when a Self Read occurs on a meter. Normally disabled so that we don't get the data and an event from the meter.	Informational	ANSI C12.19	Meter:Metrology	Disabled		2021			Self Read Occurred		21	3.21.17.231	3.21.17.46
Self Read Pointers Updated	Pointers updated as a result of Standard Procedure 5 call	Revenue Integrity	Centron II Specific	Meter:Metrology	Disabled*	Centron II Group 02	3541						3.21.15.142	3.21.64.24
Service Arm Started	An arm operation has started.	Service Switch	FOCUS AX Specific	Meter:Metrology	Alarm*	Service Disconnect Operation OK	3267						3.31.10.11	3.31.10.11
Service Arm Successful	Arm operation completed successfully.	Service Switch	FOCUS AX Specific	Meter:Metrology	Alarm*	Service Disconnect Operation OK	3264						3.31.17.11	3.31.17.11
Service Connect Started	A connect operation has started.	Service Switch	FOCUS AX Specific	Meter:Metrology	Alarm*	Service Disconnect Operation OK	3266						3.31.10.42	3.31.10.42
Service Connect Successful	Connect operation completed successfully.	Service Switch	FOCUS AX Specific	Meter:Metrology	Alarm*	Service Disconnect Operation OK	3263						3.31.17.42	3.31.17.42
Service Current Test Failure	Service Current Test Failure warning	Diagnostic	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	5104							
Service Disconnect Error	Service Disconnect Error	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm		6027							
Service Disconnect Operation	Service Disconnect Operation	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm		6026							
Service Disconnect Started	A disconnect operation has started.	Service Switch	FOCUS AX Specific	Meter:Metrology	Alarm*	Service Disconnect Operation OK	3265						3.31.10.68	3.31.10.68

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Service Disconnect Successful	Disconnect operation completed successfully.	Service Switch	FOCUS AX Specific	Meter:Metrology	Alarm*	Service Disconnect Operation OK	3262						3.31.17.68	3.31.17.68
Service Voltage Test Failure	Service Voltage Test Failure warning	Diagnostic	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	5103							
Signature Algorithm Error	Endpoint dropped a message due to invalid or unsupported signature algorithm.	Security	Communication Module	Communication Module	Log Only*	Signature Errors	2704						3.32.14.43 10.32.14.43 11.32.14.43 20.12.103.85 30.32.14.43 24.32.14.43 4.32.14.43	3.12.103.85 10.12.103.85 20.12.103.85 30.12.103.85 24.12.103.85 4.12.103.85
Signature Errors	Endpoint dropped a message due to signature errors.	Security	Communication Module	Communication Module	Log Only		2700							3.12.103.85
Signature Errors Flag	RF Water Endpoint generated event Signature Errors flag	Security	Communication Module	Communication Module	Log Only		6339						24.32.21.85 4.32.21.85	24.12.103.85 4.12.103.85
Signature General Error	Endpoint dropped a message due to general signature error.	Security	Communication Module	Communication Module	Log Only*	Signature Errors	2708						3.32.14.79 10.32.14.79 11.32.14.79 30.32.14.79 24.32.14.79 4.32.14.79	3.12.103.79 10.12.103.79 11.12.103.79 30.12.103.79 24.12.103.79 4.12.103.79
Signature Missing	Endpoint dropped a message because the signature was missing.	Security	Communication Module	Communication Module	Log Only*	Signature Errors	2701						3.32.14.160 10.32.14.160 11.32.14.160 30.32.14.160 24.32.14.160 4.32.14.160	3.12.103.160 10.12.103.160 11.12.103.160 30.12.103.160 24.12.103.160 4.12.103.160
Signature Usage Error	Endpoint dropped a message due to signature usage error.	Security	Communication Module	Communication Module	Log Only*	Signature Errors	2705						3.32.14.106 10.32.14.106 11.32.14.106 30.32.14.106 24.32.14.106	3.12.106.79 10.12.106.79 11.12.106.79 30.12.106.79 24.12.106.79
Signature Verification Error	Endpoint dropped a message due to signature verification error.	Security	Communication Module	Communication Module	Log Only*	Signature Errors	2707						3.32.14.271 10.32.14.271 11.32.14.271 30.32.14.271 24.32.14.271 4.32.14.271	3.12.103.35 10.12.103.35 11.12.103.35 30.12.103.35 24.12.103.35 4.12.103.35
Signature Verify Failure	Fired when a message fails its signature validation.	Security	Command Center Generated	Command Center	Host generated		1502						7.32.14.85	26.12.103.85
Small DCW installed	Event indicating that a small DCW has been downloaded and activated.	Communication Application	Communication Module	Communication Module	Advisory		2136							3.11.298.242
Small DCW terminated	Event indicating that a small DCW has been stopped.	Communication Application	Communication Module	Communication Module	Log Only		2138							3.11.298.243
SMS failure Detected	Indicates an SMS communication problem.	Diagnostic	Meter	Meter:Metrology	Advisory		6374							3.1.31.85
Special, Schedule Activation	Event that is triggered whenever a Special programmed rate change occurs.	Revenue Integrity	ANSI C12.19	Meter:Metrology	Advisory		2026			Special Schedule Activation	26		3.34.18.239	3.20.95.24
Standby Accumulation Error	Meter accumulated one or more pulses while in standby mode.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3218						3.6.1.194	3.28.84.79
Start of Interval	Load profile entry was captured as a special start of interval entry.	Informational	Meter	Meter:Metrology	Advisory		6363							3.16.59.54

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Status STD Table 23	Event confirming that the sum of STD Table 23 tier data is not equal to STD Table 23 total data.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory	S03 Meter Table Changed	4528						3.21.17.209	3.21.89.79
Stuck Switch Error	Test mode switch is stuck open.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3212						3.22.18.260	3.21.19.298
Suspend FF2 and EC Active	Suspend Fixed Fee 2, emergency credit is active	Prepay	Landis+Gyr Specific	Meter:Metrology	Alarm	Service Disconnect Operation	6023							3.31.81.41
Swell Started Phase A	RMS voltage rose above a configurable percentage oh phase A.	Revenue Integrity	Meter	Meter:Metrology	FOCUS AX - Log Only* S4x - Advisory*	Voltage Sag/Swell Event	3259						3.38.1.248	3.26.131.248
Swell Started Phase B	RMS voltage rose above a configurable percentage oh phase B.	Revenue Integrity	Meter	Meter:Metrology	FOCUS AX - Log Only* S4x - Advisory*	Voltage Sag/Swell Event	3260						3.38.5.248	3.26.132.248
Swell Started Phase C	RMS voltage rose above a configurable percentage oh phase C.	Revenue Integrity	Meter	Meter:Metrology	FOCUS AX - Log Only* S4x - Advisory*	Voltage Sag/Swell Event	3261						3.38.14.248	3.26.133.248
Swell Stopped Phase A	RMS voltage swell condition ended on phase A.	Revenue Integrity	Meter	Meter:Metrology	FOCUS AX - Log Only* S4x - Advisory*	Voltage Sag/Swell Event	3253						3.38.5.249	3.26.131.249
Swell Stopped Phase B	RMS voltage swell condition ended on phase B.	Revenue Integrity	Meter	Meter:Metrology	FOCUS AX - Log Only* S4x - Advisory*	Voltage Sag/Swell Event	3254						3.38.9.249	3.26.132.249
Swell Stopped Phase C	RMS voltage swell condition ended on phase C.	Revenue Integrity	Meter	Meter:Metrology	FOCUS AX - Log Only* S4x - Advisory*	Voltage Sag/Swell Event	3255						3.38.14.249	3.26.133.249
Sync time to line frequency time adjustment	Sync time to line frequency time adjustment	Informational	Landis+Gyr Specific	Meter:Metrology	Disabled		5458							
System Error	Meter detected expiration of watchdog timer or some other abnormal sequence.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3221						3.36.3.279	3.36.3.279
System Failure Detected	Indicates a fatal system failure within the microprocessor.	Diagnostic	Meter	Meter:Metrology	Advisory		6370							3.23.17.79
System Restart	Command Center Process has been restarted.	Security	Command Center Generated	Command Center	Host generated		1401						7.1.6.214	0.12.1.53
Table CRC Error	Event indicating table CRC error has been detected.	Diagnostic	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	5091							
Table Read Request	Table Read Request	Informational	Landis+Gyr Specific	Meter:Metrology	Disabled		5457							
Table Written To	This is an entry which marks changes that occur to the tables.	Informational	ANSI C12.19	Meter:Metrology	Disabled		2010			Table Written To	10		3.21.18.256	3.21.110.24
Table/Process Access Warning	Event indicating there was an attempt to access a table or execute a procedure with an invalid security key.	Security	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 05	4449						3.1.1.2	3.12.32.38
Tamper attempt suspected	Event indicating that the meter's power has gone out followed by negative kwh consumption.	Revenue Integrity	Meter	Meter:Metrology	Alarm Advisory*	S03 Meter Table Changed	2276			Tamper attempt suspected	47		3.33.1.257	3.12.0.257

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Temperature Threshold Exceeded	Temperature threshold has been exceeded on Elster meter.	Diagnostic	Elster REXU Specific	Meter:Metrology	Alarm*	Elster REXU Group 10	4464						3.35.18.139	3.35.261.139
Temperature Threshold Exceeded Error	Event indicating temperature threshold has been exceeded.	Diagnostic	Landis+Gyr Specific DLMS	Meter:Metrology	Alarm		2124						3.35.18.139	3.35.0.40
Teridian PIC Startup Sync Error	Event confirming that the self check of the meter has found a Teridian-PIC startup sync error.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory	S03 Meter Table Changed	4525						3.20.17.252	3.7.17.79
Terminal cover close - open	Event indicating terminal cover was on and someone removed it.	Revenue Integrity	DLMS	Meter:Metrology	Alarm		5010							3.12.141.39
Test mode Start Date	Event confirming that the meter has been changed to Test mode.	Informational	ANSI C12.19	Meter:Metrology	Alarm Advisory*	S03 Meter Table Changed	1338		Y	*Replace meter unless work order has been issued and meter technician is performing a field test.	Test mode started	32	3.22.19.242	3.7.19.242
Test mode stopped	Event confirming that the meter test mode option has been disengaged.	Informational	ANSI C12.19	Meter:Metrology	Alarm		2033		Y	*Replace meter unless work order has been issued and meter technician is performing a field test.	Test mode stopped	33	3.22.12.243	3.7.19.243
Tier Switch Change	Event sent in confirming that a Tier Switch has occurred.	Revenue Integrity	ANSI C12.19	Meter:Metrology	Advisory		2027				Tier Switch Change	27	3.34.16.262	3.20.113.24
Tilt Based Removal/Insertion-Tamper Detection	An alarm from the Meter Vibration-Tilt Sensor.	Security	ANSI C12.19	Meter:Metrology	Alarm		3969						3.33.1.263	3.12.0.263
Time Adjustment Error	The needed time adjustment is too large for the line frequency.	Time	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3210						3.36.14.93	3.36.115.79
Time Change	Time after the Time Sync occurred.	Time	ANSI C12.19 DLMS	Meter:Metrology	Log Only		1330				Time Changed (new time)	04	3.36.16.167	3.36.114.24
Time Change DST	Event indicating Daylight Savings event - either forward or backwards time shift.	Time	ANSI C12.19	Meter:Metrology	Log Only		1348				DayLight Savings Time On Daylight Savings Time Off	22 23	3.36.16.56	3.36.56.13
Time Change From	Time before the Time Sync occurred	Time	ANSI C12.19 DLMS	Meter:Metrology	Log Only		1328				Time Changed (old time)	03	3.36.16.174	3.36.116.17
Time Changed	Event indicating time has changed.	Time	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4472						3.36.16.264	3.36.17.24
Time Sync Alert	Event will be generated if the difference between the radio time and meter time exceeds the configured threshold, in addition to any mismatches found in meter timezone and module timezone.	Time	Communication Module	Communication Module	Advisory		3200						3.36.7.159	3.36.117.139

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Time sync failed: Meter I/O/clock failure(38)	Event indicating the time drift between meter and network is beyond acceptable values.  This event's default alarm setting is controlled by the 'Time Sync Alert' event unless 'Time Sync Alert' is set to disabled. If 'Time Sync Alert' is disabled, default alarm setting will be set to Alarm.	Time	Communication Module	Communication Module	Alarm S4x-Advisory Japan - Advisory	Time Sync Alert	1048						3.36.1.252	3.36.116.85
Time Synchronization	Event indicating a time synchronization has occurred.  This event's default alarm setting is controlled by the 'Time Sync Alert' event unless 'Time Sync Alert' is set to disabled. If 'Time Sync Alert' is disabled, default alarm setting will be set to Alarm.	Time	Communication Module	Communication Module	Alarm S4x-Advisory Japan - Advisory	Time Sync Alert	13							3.36.116.58
Time Zone Changed	Event indicating that the device timezone has changed.	Time	Command Center Generated	Command Center	Host generated		3801						3.36.17.24 10.36.17.24 11.36.17.24 30.36.17.24	3.36.118.24 10.36.118.24 11.36.118.24 30.36.118.24
Token Received	A Security Configuration token or MAT Certificate has been received with a valid signature.	Security	Communication Module	Communication Module	Advisory		2800							3.12.32.24
TOU Calendar Update	Event indicating TOU Calendar has been updated.	Prepay	Landis+Gyr Specific DLMS	Meter:Metrology	Advisory		5516							3.20.121.24
TOU Error	Current Year or season not configured or there is no battery	Revenue Integrity	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 06	3573						3.34.5.79	3.20.121.79
Transferring Image to Device	Event confirming the download image is being transferred to the device.	Communication Application	Communication Module	Communication Module	Advisory		2340						3.11.7.4	3.11.17.4
Transparent Pass Through Event	Event generated when any data gets written to the transparent port of the device.	Informational	Router	Router	N/A		4522						11.23.6.2 30.23.6.2	11.23.1.7 30.23.6.2
Unable to Reset Demand	Event indicating Demand Reset command was sent to a meter but the meter was unable to reset the demand.	Revenue Integrity	Command Center Generated	Command Center	Host generated		5402						3.8.6.62	3.8.0.65

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than)	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed)	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Unauthorized Requests	An unauthorized request is defined as a read or write attempt that got rejected due to insufficient security access to do the requested operation.	Security	Landis+Gyr Specific	Meter:Metrology	Residential - Disabled Commercial - Alarm		2120						3.1.5.2	3.12.1.7
Unbalanced Current Detected	Indicates difference between the minimum and maximum current value is more than normal conditions.	Diagnostic	Meter	Meter:Metrology	Advisory		6383							3.26.6.40
Unbalanced Voltage Detected	Indicates difference between the minimum and maximum voltage value is more than activation delay.	Diagnostic	Meter	Meter:Metrology	Advisory		6384							3.26.38.40
Undervoltage Condition Cleared - Phase A	Undervoltage Condition Cleared - Phase A	Diagnostic	ABNT	Meter:Metrology	Log Only*	Undervoltage	5245							3.26.131.353
Undervoltage Condition Cleared - Phase B	Undervoltage Condition Cleared - Phase B	Diagnostic	ABNT	Meter:Metrology	Log Only*	Undervoltage	5247							3.26.132.353
Undervoltage Condition Cleared - Phase C	Undervoltage Condition Cleared - Phase C	Diagnostic	ABNT	Meter:Metrology	Log Only*	Undervoltage	5249							3.26.133.353
Undervoltage Condition Cleared above threshold 2 - Phase A	Indicates that an undervoltage on phase A above the second threshold has disappeared.	Diagnostic	Meter	Meter:Metrology	Advisory		6437							3.26.131.32
Undervoltage Condition Cleared above threshold 2 - Phase B	Indicates that an undervoltage on phase B above the second threshold has disappeared.	Diagnostic	Meter	Meter:Metrology	Advisory		6438							3.26.132.32
Undervoltage Condition Cleared above threshold 2 - Phase C	Indicates that an undervoltage on phase C above the second threshold has disappeared.	Diagnostic	Meter	Meter:Metrology	Advisory		6439							3.26.135.286
Undervoltage Condition Cleared above threshold 3 - Phase A	Indicates that an undervoltage on phase A above the third threshold has disappeared.	Diagnostic	Meter	Meter:Metrology	Advisory		6443							3.26.131.32
Undervoltage Condition Cleared above threshold 3 - Phase B	Indicates that an undervoltage on phase B above the third threshold has disappeared.	Diagnostic	Meter	Meter:Metrology	Advisory		6444							3.26.132.286
Undervoltage Condition Cleared above threshold 3 - Phase C	Indicates that an undervoltage on phase C above the third threshold has disappeared.	Diagnostic	Meter	Meter:Metrology	Advisory		6445							3.26.135.32
Undervoltage Condition Detected below threshold 2 - Phase A	Indicates that an undervoltage on phase A below the second threshold has occurred.	Diagnostic	Meter	Meter:Metrology	Advisory		6434							3.26.131.286
Undervoltage Condition Detected below threshold 2 - Phase B	Indicates that an undervoltage on phase B below the second threshold has occurred.	Diagnostic	Meter	Meter:Metrology	Advisory		6435							3.26.132.286



Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Undervoltage Condition Detected below threshold 2 - Phase C	Indicates that an undervoltage on phase C below the second threshold has occurred.	Diagnostic	Meter	Meter:Metrology	Advisory		6436							3.26.135.32
Undervoltage Condition Detected below threshold 3 - Phase A	Indicates that an undervoltage on phase A below the third threshold has occurred.	Diagnostic	Meter	Meter:Metrology	Advisory		6440							3.26.131.286
Undervoltage Condition Detected below threshold 3 - Phase B	Indicates that an undervoltage on phase B below the third threshold has occurred.	Diagnostic	Meter	Meter:Metrology	Advisory		6441							3.26.132.286
Undervoltage Condition Detected below threshold 3 - Phase C	Indicates that an undervoltage on phase C below the third threshold has occurred.	Diagnostic	Meter	Meter:Metrology	Advisory		6442							3.26.135.286
Undervoltage Detected	Undervoltage occurred on all phases.	Diagnostic	Meter	Meter:Metrology	Advisory		6446							3.26.38.286
Undervoltage Detected - Phase A	Undervoltage Detected - Phase A	Diagnostic	ABNT	Meter:Metrology	Log Only*	Undervoltage	5244							3.26.131.352
Undervoltage Detected - Phase B	Undervoltage Detected - Phase B	Diagnostic	ABNT	Meter:Metrology	Log Only*	Undervoltage	5246							3.26.132.352
Undervoltage Detected - Phase C	Undervoltage Detected - Phase C	Diagnostic	ABNT	Meter:Metrology	Log Only*	Undervoltage	5248							3.26.133.352
Unexpected Demand Reset	An unexpected demand reset has occurred.	Revenue Integrity	Command Center Generated	Command Center	Host generated		4519						3.8.15.61	3.8.0.215
Unexpected Load Side Voltage	Meter assumed to be disconnected has reported Load side voltage indicating a potential case of tamper.	Service Switch	Command Center Generated	Command Center	Host generated		5057						3.31.1.143	3.26.38.270
Unexpected Unencrypted Message Received	Command Center has received an unencrypted message from a device when an encrypted message was expected.	Security	Command Center Generated	Command Center	Host generated		3109						3.19.14.155 10.19.14.155 11.19.14.155 30.19.14.155 24.19.14.155 4.19.14.155	3.12.31.63 10.12.31.63 26.12.31.63 24.12.31.63 4.12.31.63
Unprogrammed	Meter is unprogrammed.	Metrology Configuration	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3208						3.21.7.268	3.7.0.160
Untrusted Software Detected by Collector	Untrusted software detected by the Collector.	Security	Collector	Collector	Alarm		5136						10.12.21.159	10.12.4.159
Update List Pointers	This event tracks the internal metrology pointers state.	Informational	ANSI C12.19	Meter:Metrology	Log Only		2015			Update List Pointers	15		3.21.18.142	3.21.63.24
User Login Locked Out	A user has surpassed the number of failed login attempts and has been locked out.	Security	Command Center Generated	Command Center	Host generated		1400						7.1.1.147	0.12.65.66
User Programmable Temperature Threshold Exceeded	Instantaneous temperature exceeded the user threshold.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3213						3.35.18.261	3.35.261.139
Valid Service Detected	Event confirming that the self check of the meter has not found a valid service.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory	S03 Meter Table Changed	4527						3.20.17.3	3.21.17.3

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than)	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed)	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Velocity Threshold Exceeded	The command velocity threshold value has been exceeded.	Informational	Command Center Generated	Command Center	Host generated		5054						1.23.1.139	0.1.86.139
VHoldUp Low	Event indicating VHoldUp is low.	Revenue Integrity	Landis+Gyr Specific	Meter:Metrology	Alarm		4496						3.38.10.150	3.26.38.139
Vibration/Tilt based tamper detection (meter insertion)	An alarm from the Meter Vibration-Tilt Sensor.	Security	ANSI C12.19	Meter:Metrology	Alarm		6515						3.33.17.105	3.6.43.257
Volt Hour Above High Threshold	VM above high threshold	Diagnostic	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 32	3781						3.38.5.93	3.26.38.93
Volt Hour Below Low Threshold	VM below low threshold	Diagnostic	Centron II Specific	Meter:Metrology	Log Only*	Centron II Group 32	3780						3.38.5.150	3.26.38.97
Voltage Magnitude Imbalance Error	Event confirming that the self check of the meter has found a Gyrbox D5 diagnostic set.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	4551						3.38.17.98	3.26.67.79
Voltage Min Threshold	Command Center Voltage Reading Drops Below threshold has been met.	Revenue Integrity	Endpoint	Command Center	Host generated		3396						3.38.1.150	3.26.261.150
Voltage Monitoring: Voltage Returned to Normal (PhC)	Voltage Monitoring: Voltage Returned to Normal (PhC) has been detected.	Informational	Elster REXU Specific	Meter:Metrology	Disabled*	Elster REXU Group 07	4456						3.38.14.218	3.26.38.218
Voltage Monitoring:Maximum Voltage Threshold (PhA)	Voltage Monitoring:Maximum Voltage Threshold (PhA) has been detected.	Informational	Elster REXU Specific	Meter:Metrology	Disabled*	Elster REXU Group 06	4453						3.38.18.93	3.26.131.93
Voltage Monitoring:Maximum Voltage Threshold (PhC)	Voltage Monitoring:Maximum Voltage Threshold (PhC) has been detected.	Informational	Elster REXU Specific	Meter:Metrology	Disabled*	Elster REXU Group 06	4454						3.38.14.93	3.26.135.93
Voltage Monitoring:Minimum Voltage Threshold (PhA)	Voltage Monitoring:Minimum Voltage Threshold (PhA) has been detected.	Informational	Elster REXU Specific	Meter:Metrology	Disabled*	Elster REXU Group 06	4451						3.38.18.150	3.26.131.150
Voltage Monitoring:Minimum Voltage Threshold (PhC)	Voltage Monitoring:Minimum Voltage Threshold (PhC) has been detected.	Informational	Elster REXU Specific	Meter:Metrology	Disabled*	Elster REXU Group 06	4452						3.38.14.150	3.26.133.150
Voltage Monitoring:Voltage Returned to Normal (PhA)	Voltage Monitoring:Voltage Returned to Normal (PhA) has been detected.	Informational	Elster REXU Specific	Meter:Metrology	Disabled*	Elster REXU Group 06	4455						3.38.18.218	3.26.133.93
Voltage Outage	Indicates missing measurement voltage in all phases (complete outage).	Outage	Meter	Meter:Metrology	Advisory		6375							3.21.38.285
Voltage Phase Angle Error	Voltage phase angle GyrBox call in event.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3244						3.25.17.76	3.26.130.79
Voltage Phase Error	Event confirming that the self check of the meter has found a Voltage phase error.	Metrology Configuration	Landis+Gyr Specific	Meter:Metrology	Advisory	S03 Meter Table Changed	4524						3.38.14.79	3.26.25.79
Voltage RMS Magnitude Error	Voltage phase deviation GyrBox call in event.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3245						3.25.17.65	3.26.38.35
Voltage Sag	Voltage Sag Detected	Diagnostic	Aclara I210+c	Meter:Metrology	Alarm		6498						3.38.17.223	3.26.38.223
Voltage Sag Cleared	Voltage Sag Cleared	Diagnostic	Aclara I210+c	Meter:Metrology	Alarm		6505						3.38.17.224	3.26.38.224
Voltage Swell	Voltage Swell Detected	Diagnostic	Aclara I210+c	Meter:Metrology	Alarm		6499						3.38.17.248	3.26.38.248

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Voltage Swell Cleared	Voltage Swell Cleared	Diagnostic	Aclara I210+c	Meter:Metrology	Alarm		6506						3.38.17.249	3.26.38.249
VTA Exceeded	Voltage threshold alert call in event.	Diagnostic	ANSI C12.19	Meter:Metrology	Advisory*	S03 Meter Table Changed	3240						3.38.17.261	3.26.261.139
WAN Address Changed	Event indicating that the device WAN Address has changed.	Informational	Command Center Generated	Command Center	Host generated		3802						3.23.3.24 10.23.3.24 11.23.3.24 30.23.3.24	3.23.136.24 10.23.136.24 11.23.136.24 30.23.136.24
Warm Start	Meter firmware restart	Outage	Landis+Gyr Specific	Meter:Metrology	Disabled		6594						3.11.0.278	3.11.0.278
Warning Locks Display	Event indicated display has been locked for warning errors.	Diagnostic	Elster A3 Specific	Meter:Metrology	Advisory*	S03 Meter Table Changed	5115							
Water Meter Cut Wire	The water meter has reported a cut wire.	Diagnostic	RF Water	Communication Module	Alarm		6315						24.20.5.68	24.39.17.68
Water Meter Cut Wire flag	The water meter has reported a cut wire.	Diagnostic	RF Water	Communication Module	Alarm		6316						24.20.18.68	24.39.17.68
Water Meter Empty Pipe Detected	The water meter has reported an empty pipe condition.	Diagnostic	RF Water	Meter:Metrology	Alarm		6255						24.29.1.85	24.5.0.47
Water Meter Empty Pipe Detected Flag	The water meter has reported an empty pipe condition.	Diagnostic	RF Water	Meter:Metrology	Alarm		6256						24.29.18.85	24.5.0.47
Water Meter Exceeded Max Flow	The water meter has reported that the maximum allowed flow was exceeded.	Diagnostic	RF Water	Communication Module	Alarm		6319						24.21.17.139	24.5.48.139
Water Meter Exceeded Max Flow flag	The water meter has reported that the maximum allowed flow was exceeded.	Diagnostic	RF Water	Communication Module	Alarm		6320						24.21.18.139	24.5.48.139
Water Meter Leak Detected	The water meter has reported that a leak has occurred.	Diagnostic	RF Water	Meter:Metrology	Alarm		6253						24.29.5.57	24.5.0.57
Water Meter Leak Detected Flag	The water meter has reported that a leak has occurred.	Diagnostic	RF Water	Meter:Metrology	Alarm		6254						24.29.18.57	24.5.0.57
Water Meter Low Battery	The water meter has reported battery power below its configured threshold.	Outage	RF Water	Meter:Metrology	Alarm		6249						24.21.1.149	24.2.22.150
Water Meter Low Battery Flag	The water meter has reported battery power below its configured threshold.	Outage	RF Water	Meter:Metrology	Alarm		6250						24.21.18.149	24.2.22.150
Water Meter Pipe Burst	The water meter has reported a burst pipe.	Diagnostic	RF Water	Communication Module	Alarm		6317						24.20.5.85	24.5.17.85
Water Meter Pipe Burst flag	The water meter has reported a burst pipe.	Diagnostic	RF Water	Communication Module	Alarm		6318						24.20.18.85	24.5.17.85
Water Meter Reverse Flow	The water meter has reported that reverse flow has occurred.	Diagnostic	RF Water	Meter:Metrology	Alarm		6251						24.29.5.24	24.5.48.219
Water Meter Reverse Flow Flag	The water meter has reported that reverse flow has occurred.	Diagnostic	RF Water	Meter:Metrology	Alarm		6252						24.29.18.24	24.5.48.219

Event	Event Description	Functional Category	Event Type	Event Source	Default Alarm Setting	Alarm Setting Configurable Event Name (If different than	Command Center Event Type ID	Default Alarm Setting Not Configurable in Firmware (Grayed	Fatal Events	Recommended User Action	ANSI C12.19 Event Name	ANSI C12.19 Table 72 Standard Event code	CIM 1st Edition Event ID	CIM 2 <sup>nd</sup> Edition Event ID
Water Meter Tamper/Error	The water meter has reported a tamper or internal error event has occurred.	Diagnostic	RF Water	Meter:Metrology	Alarm		6257						24.33.1.257	24.12.0.257
Water Meter Tamper/Error Flag	The water meter has reported a tamper or internal error event has occurred.	Diagnostic	RF Water	Meter:Metrology	Alarm		6258						24.33.18.257	24.12.0.257
Zigbee Comm/Initialization Error	Event indicating something went wrong with Zigbee communication or Zigbee initialization.	HAN	HAN	HAN	Advisory		4426			* Contact Landis+Gyr			12.7.16.171	12.1.298.79
Zigbee firmware change complete	Event indicating Zigbee firmware change complete.	Communication Application	Communication Module	Communication Module	Advisory*	Download Image Command Received	2281						3.11.7.72	3.11.17.52
Zigbee firmware change complete from Command Center	Event indicating response Zigbee Firmware download complete.	Communication Application	Command Center Generated	Command Center	Host generated		3805						3.11.17.24	3.11.17.25
Zigbee firmware change started	Event indicating Zigbee firmware change started.	Communication Application	Communication Module	Communication Module	Advisory*	Download Image Command Received	2280						3.11.7.3	3.11.17.242
ZigBee Firmware Changed	Event indicating the Zigbee firmware has changed.	Communication Application	Elster REXU Specific	Meter:Metrology	Log Only*	Elster REXU Group 03	4436						3.11.5.72	3.11.17.24

\* These events are sub-events. Please contact L+G for instructions on how to change the default alarm setting.

The information contained in this document is subject to change without notice.

Landis+Gyr reserves the right to change the product specifications at any time without incurring any obligations.

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## A Single Software Platform For Sensor Health And Performance Management

Grid reliability begins with healthy endpoints and reliable data transmission. Using Landis+Gyr's Gridstream® Connect IoT platform, TechStudio provides commissioning, testing, and modification capability for RF network devices, including street light controllers, electric meters, gas/water modules, and line sensors, all from a single software platform. TechStudio also performs initial radio configuration, status checks of installed radios, and provides detailed network reports.

Windows-based TechStudio runs on a laptop or PC, using a portable Comms Adapter to provide RF communication to radios and endpoints. Role-based authorization allows utilities to tailor users' access to various tools based on job functions to ensure maximum efficiency and security.

### FEATURES

- Built-in automation of device preparation and test
- Meter shop testing to qualify orders
- Facilitates troubleshooting of radios & data acquisition
- Role-based user authorization for feature access
- Supports OTA meter program downloads and automatic OTA firmware upgrades
- Supports RF Mesh, Mesh IP, Wi-SUN
- Includes API to write custom automation software
- Supports one-way gas modules with Work Order Management integration
- Global platform in use across North America, South America, and Asia Pacific regions
- Localization features native support for English and Portuguese

### AUTOMATE THE METER SHOP

- Create test profiles to run automatically, saving time, and ensuring consistent coverage
- Set device installation mode to streamline commissioning
- Take advantage of wide range of reports for RF module and metrology to:
  - Facilitate troubleshooting
  - Assist with product acceptance
- Acquire meter reads, send directly to Command Center
  - Preserve data integration across apps such as MDM

### EFFICIENT OVER-THE-AIR ACCESS

- Automatically update metrology and RF firmware over the air (OTA), ensuring latest versions/features available



AUTOMATED METER SHOP



EFFICIENT OVER-THE-AIR ACCESS

# TechStudio

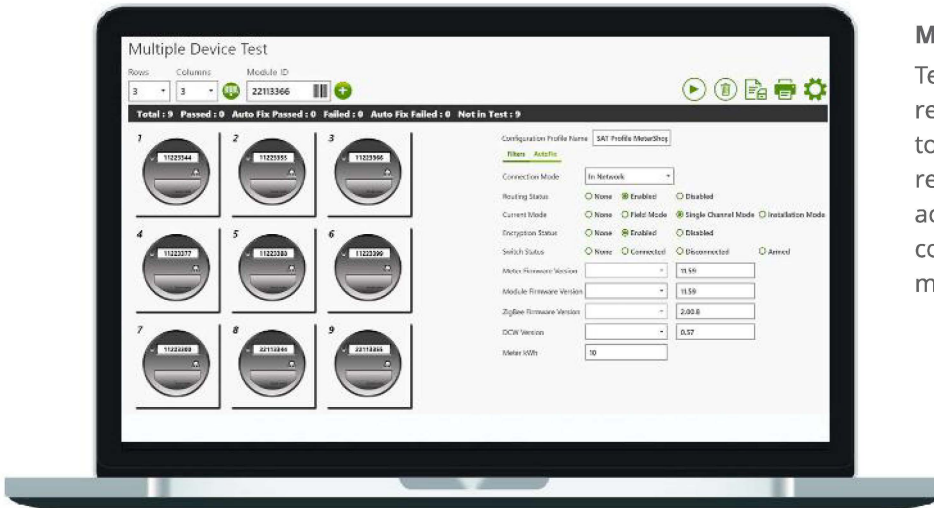
- RF Mesh, Mesh IP, and Wi-SUN support for full cross-platform comms coverage
- Send/review one-time execution apps (small DCWs) for discrete testing
- OTA download and retrieval of new meter programs from device to streamline meter management

## RECOMMENDED PC SPECIFICATIONS

- Windows 10 with 8 GB RAM and 2 GB disk storage
- High-speed internet connection to download pre-requisite software
- USB port to connect to local radio

## REPORTS

With the multiple device testing feature, utilities can create testing profiles, scan the meter wall, and let TechStudio automatically run tests, upgrade firmware, monitor service disconnect switch status, and set device to installation mode.



## MULTIPLE DEVICE TEST

TechStudio offers a wide range of reports for RF modules and metrology to facilitate troubleshooting. Advanced reports also assist with product acceptance testing by relating error counters, neighbor statistics, event logs, metering data, and more.

## GET IN TOUCH.

For more information and nationwide warranty terms, visit us at [landisgyr.com](http://landisgyr.com) or call us at 888-390-5733.



## LET'S BUILD A BRIGHTER FUTURE TOGETHER

Since 1896, Landis+Gyr has been a global leader of energy management solutions. We've provided more than 3,500 utility companies all over the world with the broadest portfolio of products and services in the industry. With a worldwide team of 1,300+ engineers and research professionals, as well as an ISO certification for quality and environmental processes, we are committed to improving energy efficiency, streamlining operations, and improving customer service for utility providers.

# Network Gateway



## Flexible and Interoperable Utility IoT Network Communications

Landis+Gyr's Network Gateway is an integral part of Gridstream® Connect, our industry-leading utility IoT platform. The Network Gateway is a powerful field data center that supports a variety of communications protocols. By enabling device and sensor interoperability, the Network Gateway provides unparalleled flexibility and limitless potential for growth.

### FLEXIBLE COMMUNICATIONS

- Supports a wide array of communications technologies, including RF Mesh, Mesh IP, and cellular WAN backhaul
- Multiple radio options

### BATTERY BACK-UP

- Maintenance-free Lithium Iron Phosphate battery

### LAYERED INTELLIGENCE: INTELLIGENCE WHEN AND WHERE YOU NEED IT

- On-board Linux processor
- Distributed data processing lowers cost of data sharing and networking

### FUTURE-READY AND SCALABLE

- Configurable, serviceable, and upgradeable
- Secure Wi-Fi for local configuration of radios or integrated sensor controller
- 2X Ethernet ports



FLEXIBLE  
COMMUNICATIONS



BATTERY  
BACK-UP



LAYERED  
INTELLIGENCE



FUTURE-READY  
AND SCALABLE

# Network Gateway

## PRODUCT SPECIFICATIONS

ELECTRICAL	
Input Voltage Range	120 to 240 VAC
Current	0.5A-0.25A
GATEWAY PROCESSING UNIT	
CPU	Cortex A5
RAM Memory	512 MB DDR2 RAM
FLASH Memory	2 GB NAND + 4 GB External
GATEWAY RADIO PROCESSING UNIT	
CPU	Dual-core Cortex M4
RAM Memory	304 Kbytes
FLASH Memory	2 MB + 4MB External
ROM Memory	8 Kbytes
SERIES 5 RADIO VARIANT	
Communication Protocol	IEEE 802.15.4g - SUN FSK PHY
RF Frequency Range	902-928 MHz
Channel Spacing	N2450 (RF Mesh IP): 400 KHz N2400 (RF Mesh): 100, 300 KHz
RF Data Rate	N2450 (RF Mesh IP): 50, 150, 200 Kbps N2400 (RF Mesh): 9.6, 19.2, 38.4, 115.2 Kbps
Modulation Type	2FSK, 2GFSK
SERIES 6 RADIO VARIANT	
Communication Protocol	IEEE 802.15.4 – 2015 SUNPHY
RF Frequency Range	902 – 928 Mhz 2400 – 2485 Mhz
Channel Spacing	400 KHz, 1200 KHz
RF Data Rate	50 Kbps to 600 Kbps (900 Mhz Band –Series 5 Compatibility Mode) 100 Kbps to 2400 Kbps (2400 Mhz Band)
Modulation Types	SUNFSK, O-QPSK, OFDM

Kbps = Kilobytes per second

This information is provided on an "as is" basis and does not imply any kind of guarantee or warranty, express or implied. Changes may be made to this information.

TRANSMITTER	
Output Power (at Antenna Connector)	Up to 1W
ETHERNET & WIFI	
ETH 0   ETH 1	10/100/1000 Ethernet   10/100 Ethernet
WI-FI	Yes
LTE Cat6	Yes
MECHANICAL	
Enclosure	Aluminum / IP67
Dimensions	10.94" W x 5.31" D x 12.23" H (278mm W x 135mm D x 311mm H)
Weight	11.7 lbs
Operating Temp Range	-40°C to 60°C (-40 to 140° F)
Storage Temp Range	-40°C to 70°C (-40 to 158° F)
REGULATORY COMPLIANCE	
Safety & EMC, FCC Class A Device	

## GET IN TOUCH.

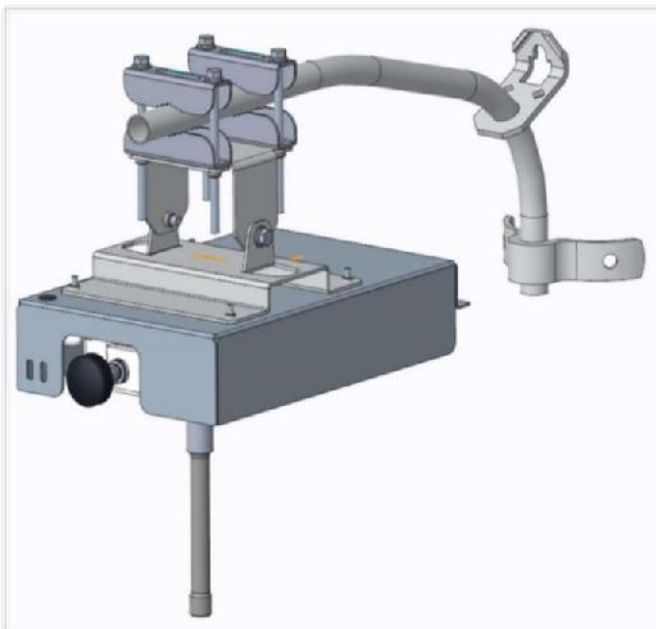
For more information and nationwide warranty terms, visit us at [landisgyr.com](http://landisgyr.com) or call us at 888-390-5733.



## LET'S BUILD A BRIGHTER FUTURE TOGETHER

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# Enhanced Mesh Router

## Features and Benefits

The Enhanced Mesh Router offers several benefits:

- ❑ Interoperability to enable integration with numerous partners and supported devices.
- ❑ Distributed intelligence to problem-solve and interact with legacy and future IoT devices.
- ❑ Lower utility TCO - via enhanced product with Lithium-Ion battery (life of unit).
- ❑ Dynamic routing by each radio in the mesh network.
- ❑ Backwards compatibility – Series 5 and Series 6 variants to support RF Mesh, RF Mesh IP and future update to Wi-SUN.
- ❑ Support for Distribution and mission critical sensors.
- ❑ GPS capability enabled for better location and optimization services.
- ❑ DC Power option is available for customers to provide options that fit your deployment needs.

## Product Overview

The Landis+Gyr Enhanced Mesh Router helps form the powerful Gridstream® RF wireless mesh network used in Advanced Metering, Distribution Automation and Demand Response applications. Network performance and reliability are assured via the routers basic mesh functions including full two-way, peer-to-peer communication to all devices in the network, asynchronous spread spectrum frequency hopping and dynamic message routing.

### Functions:

The Enhanced Router is designed to deliver enhanced on-board memory and communication speeds to support future application and development needs. In addition, advanced functionality enables individual message prioritization, automatic network registration and localized intelligence. The Enhanced Mesh Router also has GPS capability for enhanced location, troubleshooting and optimization services.

Description	Specification
Size	4.90" H x 11.82" W x 9.30" D
Weight	9.6 lbs
GPS	1.56GHz/1.57GHz/1.6GHz
Operating Temperature	-40°C – 70°C
Power Supply	Input AC Voltage – 120 -240 Vac -20%, +15% Power Consumption, Battery not charging – 2W typical Power Consumption, Battery charging – 7W typical
RF Output Power	820 mW
General Radio Items	RF Frequency Range – 902-928 MHz Channel Spacing – 200, 400 kHz (G5i) 100, 300, 500 kHz (GSP) RF Baud Rates – 50, 150, 200 kbps (G5i) 9.6, 19.2, 38.4, 115.2, 300 kbps (GSP) Battery Backup Time – 10 hours after 15 years Battery Life – 15 years
Processing	CPU – Dual-core Cortex M4 RAM – 304 Kbytes Flash Memory – 2 MB + 4MB External
Approvals	FCC CFR Title 47 (Part 15, Subpart B and C)
ANSI C12.1 Compliance	Operating vibration; operating shock; electromagnetic radiation emissions, electromagnetic susceptibility, surge withstanding capability, electrostatic discharge
Enclosure Material Type	Aluminum/Nema-4
Shipment Includes	White, die-cast aluminum all-weather enclosure AC power, 120 VAC or 240 VAC when connected to power source, DC (12/24 VDC) (optional) Standard N-Female antenna connector Mounting hardware Antenna kit Included



### Residential: FOCUS AXe Metering Platform

E331 FOCUS AXe/AXRe/RXRe  
E351 FOCUS AXe/AXRe/RXRe-SD



## Advanced Metering Performance and Safety

### Overview

The FOCUS® AXe platform for advanced electric metering and smart grid applications is designed to enhance your sensor ecosystem with proven reliability and innovative features. Expanding on Landis+Gyr's industry-leading FOCUS AX platform, the FOCUS AXe adds increased memory and processing power to enable greater measurement, power quality, and data profiling capabilities. Furthermore, the FOCUS AXe incorporates a sensor to detect meter removal and insertion as a possible indication of tamper as well as increased power supply capacity to support more advanced AMI modules for expanded communications abilities.

### Reliable disconnect service – for any type of residential installation

The E351 FOCUS AXe-SD provides reliable remote service disconnect and reconnect with a motor driven, cam action switch under the meter cover. Available in both CL200 and newly released CL320 UL certified models, the switches operate safely for thousands of iterations at full rated current. Along with direct switch actuation, the AXe-SD supports multiple load limiting features that initiate a disconnect when a specified instantaneous power or average demand level is reached. The AXe-SD Form 2SE delivers precedent setting remote

service disconnect capability to larger 320 amp installations, providing Landis+Gyr's unique solution to evolving utility requirements.

### Key Features:

- Active Energy “kWh” meter: Optional Reactive Energy “kVAh or kVARh”
- Two, simultaneous demands: kW, kVA, and kVAR
- Motor driven, cam action service disconnect switches: 200 amp and NEW 320 amp
- All meters exceed ANSI requirements for meter accuracy (0.2%) and surge protection (10KV)
- Power Quality Metrics: Sag, Swell and Total Harmonic Distortion
- Up to 8 channels of Load Profile standard
- Independent 2nd 8-channel Load Profile Recorder (optional)
- Every S Base meter form is UL listed
- Meter removal and insertion detection to indicate possible tamper
- Magnetic and DC presence detection
- Over-the-air firmware and program updates<sup>1</sup>
- Dedicated Voltage Log
- Configurable optical port lockout<sup>1</sup>

## Product Specifications: Focus AXe Residential Electric Metering Platform

### SPECIFICATIONS

General Specifications	ALL models support demand billing and are time-of-use (TOU) Ready – Battery Optional	
	Third Generation processor runs 2x as fast as FOCUS AX	
	2x RAM, 2x ROM, and 4x the Non-Volatile Memory as FOCUS AX	
	Designed for 20+ years life	
	Utilizes ANSI protocol (for optical port and between meter and AMI device)	
	9-Digit LCD	
	Display scroll sequence programmable (factory or end user)	
	Configuration Port – standard plastic: Optional ANSI C12.18 optical	
Operating Temperature	-40C to +85C under cover	
Nominal Voltage	120V or 240V	
Operating Voltage	80% to 115% of Nominal Voltage	
Frequency	60Hz +/- 5%	
Humidity	5% to 95% relative humidity, non condensing	
Starting Load (Watts)	Class 20	0.005 Amp (0.6W)
	Class 100	0.030 Amp (3.6W)
	Class 200	0.050 Amp (12W)
	Class 320	0.080 Amp (19.2W)
	Class 480	0.120 Amp (28.8W)
Voltage Burden	< 1.9W Max	
Load Performance Accuracy	Accuracy Class 0.2% (reactive energy 0.5%)	
Available Forms	Self-Contained	1S, 2S, 2SE (320A), 12S, 25S
	Transformer Rated	3S, 4S
	K-Base	2K (480A)
Display Options	Energy Metrics: +kWh, -kWh, Net kWh, added kWh (Security), kVAh or kVARh	
	Metric Energy Display Format – 4x1, 4x10, 5x1, 5x10, 6x1 or 6x10	
	TOU, demand billing and two demands (selectable kW, kVA or kVAR)	
Communications <sup>1</sup>	Modular Option - with or without AMI communication	
Configurable Transformer Factor	Up to 4096 as result of PT ratio x CT ratio	
Applicable Standards	ANSI C12.1 for electric meters	
	ANSI C12.10 for physical aspects of watt hour meters	
	ANSI C12.18 Protocol specifications for ANSI Type 2 Optical Port	
	ANSI C12.19 Utility Industry End Device Data Tables	
	ANSI C12.20 for electricity meters, 0.2 and 0.5 accuracy classes	
	CAN3-C17-M84 Canadian specifications for approval of type of electricity meters	
Service Disconnect	UL 2735 Standard for Electric Utility Meters	
	200A disconnect - 10,000 operations at full rated current (disconnect/connect) Available forms: 1S, 2S, 12S, 25S	320A disconnect - 3,000 operations at full rated current (disconnect/connect) Available forms: 2SE
International Certifications	Measurement Canada (MC) AE-1967 <i>Form 2SE-SD pending MC approval</i>	

1. Select features rely on a communications module. Meters that are AMI-enabled with communications are clearly labeled on meter face above digital display.

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## Gridstream RF Mesh Commercial & Industrial Endpoints



*Meter Platforms*  
Series 5 S4x  
Enhanced Elster A3  
Enhanced GE kV2c

### Options to Take Control of Advanced C&I Metering Applications

#### Overview

Robust, secure and future-proof. Landis+Gyr's Gridstream® RF Mesh Commercial & Industrial Endpoints bring electricity usage data to new levels.

The endpoint works with the polyphase meter to take advantage of advanced metrology and data values, while providing remote control of demand resets and TOU periods. The seamless integration delivers a direct read of the meter register to capitalized on advanced functionality.

The endpoint transmits and receives data through Gridstream's robust and self-healing, peer-to-peer mesh network, utilizing the 902 to 928 MHz unlicensed frequency. Endpoints prioritize messages based on application, expand to millions of endpoints and offer

control through the intuitive, browser-based interface for streamline network and data management. Full two-way communication ensures commands are sent to the endpoint to reconfigure settings or upgrade firmware, without disrupting the meter data flow.

In addition to kWh, kW, time-of-use and voltage readings, the RF endpoint reports load profile and up to 5-minute interval data for billing, engineering and customer service applications. Endpoints come standard with ZigBee® transmitter for communication with in-premise devices.

The Series 5 S4x platform accommodates a standards based stack firmware, enabling use of non-proprietary network managers and tools.

#### FEATURES & BENEFITS:

*Why Landis+Gyr makes a difference.*

- Multiple options and enhancement capabilities via over-the-air or DCW upgrade
- Full, four quadrant meter ensures revenue optimization
- Enhanced security – optical port lockout feature with Gridstream communications, cover removal switch and magnetic tamper detection
- Reactive, TOU and two separate load profiles are standard on every S4x Meter
- Support for new enhanced metrology features, including 31 new load profile channels and four-quadrant reactive energy
- Full two-way communication – on-demand or routine
- Advanced data support – demand, TOU, voltage
- Voltage monitoring and reporting capabilities

## Product Specifications: Gridstream RF Mesh Commercial & Industrial Endpoints

	S4x	Elster A3	GE kV2c
<b>Electrical</b>			
Voltage	10.5-13.5V (From meter's power supply)	13.5VDC + 1V, 50mA (limited duration from	28 VDC (From meter's power supply) meter's power supply)
Power	Max: 1.0W Typical: 0.3W	Max: 3.0VA Typical: < 1VA	Max: 1.0W Typical: 0.3W
<b>RF 900 MHz</b>			
Output Power	+26 dBm +/- 1 dBm	+26 dBm +/- 1 dBm	+26 dBm +/- 1 dBm
Adjacent Channel Power	+39 dBc Nominal	+39 dBc Nominal	+39 dBc Nominal
Transmit Frequency	902 to 928 MHz ISM unlicensed (FCC Part 15)	902 to 928 MHz ISM unlicensed (FCC Part 15)	902 to 928 MHz ISM unlicensed (FCC Part 15)
Receive Sensitivity	-110 dBm (typical, 9.6 kbps);	-110 dBm (typical, 9.6 kbps); -102 dBm (typical, 19.2 kbps)	-108 dBm minimum -102 dBm (typical, 19.2 kbps)
<b>RF ZigBee®</b>			
Output Power		+20 dBm +/- 2 dBm	
Adjacent Channel Power		40 dBc Nominal	
Transmit Frequency		2405-2480 MHz	
Receive Sensitivity		-104 dBm Minimum	
Communications Protocol		ZigBee Protocol	
<b>Standards Compliance</b>			
FCC Title 47 CFR Part 15		Radiated and Conducted Emissions (including intentional radiators)	
IEC 61000 4-2, 3, 4, 5, 11, 12		Electromagnetic Compatibility	
ANSI C12.16		Dielectric (2.5kV, 60 Hz for 1 minute)	
ANSI C12.19		Compatible with Utility Industry End	
ANSI C12.20-2002		National Standard for Electricity Meters - 0.2 and 0.5 accuracy class	
ANSI C12.21		Optical port protocol with 128-bit AES Authentication	
ANSI C12.1-2008		Code of Electricity Metering	
ANSI C37.90.1-2002		Standard Surge Withstand Capability (SWC) Tests	
ANSI 62.41		High Voltage Line Surge (1.2 x 50 Isec)	

### COMPATIBILITY

CLASS	VOLTAGE	1S	2S	2SE	3S	4S	5S	12S	9S	12SE	16S	25S	29S	25SE	12K	16K	27K	10A	45A
20	240/120/480				S4x	kV2c			S4x				S4x					S4x	S4x
200	120/480	S4x, kV2c	S4x, kV2c					S4x, kV2c			S4x, kV2c	S4x							
320	120/480		kV2c	S4x, kV2c				kV2c		S4x				S4x					
480	120/480														S4x	S4x	S4x		

# E650 S4x Polyphase



## Enhanced Metering for Commercial and Industrial Applications

Expanding upon the industry-leading flexibility of Landis+Gyr polyphase meters, the E650 S4x sets a new standard for versatility in a C&I metering platform. Out of the box, the S4x is a full-featured C&I meter that provides four-quadrant measurements of active and reactive energy, load profile, and TOU without a battery when existing on an AMI network.

The E650 S4x provides the metrics utilities need to take full advantage of advanced grid management technologies. Delivered, received, and per quadrant measurements of active, reactive, and apparent energy are all simultaneously calculated, as are their respective demand values. Additionally, the S4x provides two alternative methods for calculating reactive and apparent energy and demand values. They can be either directly measured or vectorially derived, giving an electric utility the ultimate flexibility in how they measure and bill their customers.

The E650 S4x provides all of its metrics at significantly higher resolution than most competitive C&I meters. All energy and demand metrics are stored with milliunit resolution. All instrumentation metrics such as voltage, current, and phase are stored in microunits.

The E650 S4x raises the bar on security and tamper detection capabilities. A tilt and vibration sensor can identify significant shock force applied to the meter. A dedicated Hall effect sensor is used to detect strong magnetic field presence. The physically actuated cover removal switch can trigger an alarm and log an event. A new optical port lockout feature allows total control over port access through a compatible communication module.

The S4x has significantly more RAM, ROM, and non-volatile memory for load profile, self-reads, and event logs. Standard 16 channel load profile memory of 256 KB can be upgraded to 1 MB without the need for additional hardware.

### SUPERIOR METRICS

- Four-quadrant measurement
- Delivered and received kW, kVA and kVAR demands
- Two alternate methods of VAR and VA calculation
- Milliunit energy and demand resolution
- Microunit instrumentation resolution

### LOAD PROFILE

- 16 CH 256K standard, 1 MB option
- 2nd recorder option
- 32 bit data storage

### HARDWARE OPTIONS

- Enhanced Gridstream RF module
- I/O board
- Three-phase power supply

### UNIQUE SECURITY

- Magnetic tamper detection
- Cover removal switch
- Tilt and vibration sensor

### RF COMMUNICATION OPTIONS

- Series 5
- Series 6



SUPERIOR  
METRICS



LOAD  
PROFILE



HARDWARE  
OPTIONS



UNIQUE  
SECURITY



RF COMMUNICATION  
OPTIONS

# E650 S4x Polyphase

An optional second 16 channel recorder can be configured with a different interval length than the first, making it an ideal instrumentation recorder for continuously monitoring voltage, current, phase, and frequency. Load profile data is stored in 32 bit registers that can easily handle the increased data resolution the S4x offers without interval overflow or the need for a scale factor.

The meter is available with multiple hardware options that further expand its capabilities. With the addition of an enhanced RF communications module, the S4x becomes a powerful C&I endpoint on the industry-leading Landis+Gyr Gridstream® Connect IoT network. An I/O board enables inputs that can increment a load profile channel or trigger a different billing rate; and outputs that can provide KYZ pulses or trigger load control devices. The Enhanced RF module and I/O board are available together for even greater functional versatility. A true three-phase power supply can ensure that the S4x keeps metering, even if a voltage phase is lost.

## PRODUCT SPECIFICATIONS

GENERAL SPECIFICATIONS	
<b>Specifications</b>	Active and reactive energy are standard TOU and 256K load profile are standard ANSI C12.19 standard protocol Unsurpassed 10KV surge protection for safety Designed for 20+ years of life Extensive event logging Magnetic tamper detection via Hall effect sensor Cover removal switch Tilt and vibration sensor
<b>Operating Temperature</b>	-40C to +85C under cover
<b>Frequency</b>	50 or 60Hz ± 5%
<b>Humidity</b>	Less than or equal to 95% relative humidity, non-condensing
<b>Accuracy Class</b>	Class 20, 120, 200, & 320 meters ± 0.2% Class 480 meters and forms 36S, 29S, 36A ± 0.5%
<b>Over Voltage Withstand</b>	Temporary (.5 sec) 150% rated voltage Continuous (5 hours) 120% rated voltage
<b>Voltage Burden</b>	≤ 2.5W
NOMINAL VOLTAGE	
<b>Standard Power Supply</b>	120–480V (2 and 3 wire 120, 208, 240, 277, 347, 480. 4 wire 120/208, 240/416, 277/480, 347/600)
<b>Three-phase Power Supply Option</b>	120– 277V (2 and 3 wire 120, 208, 240, 277. 4 wire 120/208, 277/480)

Kbps = Kilobytes per second

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OPERATING VOLTAGE	
<b>Standard Power Supply</b>	98 to 552 VAC (line to neutral) autoranging power supply
<b>Three-phase Power Supply Option</b>	98 to 318 VAC (line to neutral) autoranging power supply
STARTING CURRENT (AMPS)	
<b>Class 20</b>	0.005 Amp
<b>Class 150</b>	0.050 Amp
<b>Class 200</b>	0.050 Amp
<b>Class 320</b>	0.080 Amp
<b>Class 480</b>	0.120 Amp
AVAILABLE FORMS	
<b>Self-Contained S-Base</b>	2S, 12S, 14/15/16/17S, 25S, 1S, 2SE, 12SE, 14/15/16/17SE, 25SE
<b>Self-Contained K-Base</b>	12K, 14/15/16K, 27K
<b>Self-Contained A-Base</b>	16A
<b>Transformer Rated S-Base</b>	3S, 3SC, 4S, 8/9S, 45S, 36S, 29S
<b>Transformer Rated A-Base</b>	8/10A, 45A, 36A
APPLICABLE STANDARDS	
ANSI C12.1 for electric meters ANSI C12.10 for physical aspects of watt hour meters ANSI C12.20 for electricity meters, 0.2 and 0.5 accuracy class CAN3-C12-M84 Canadian specs for approval of electrical meters CAN3-Z234.4-79 Canadian specs for all numeric dates and times	

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## LET'S BUILD A BRIGHTER FUTURE TOGETHER

Since 1896, Landis+Gyr has been a global leader of energy management solutions. We've provided more than 3,500 utility companies all over the world with the broadest portfolio of products and services in the industry. With a worldwide team of 1,300+ engineers and research professionals, as well as an ISO certification for quality and environmental processes, we are committed to improving energy efficiency, streamlining operations, and improving customer service for utility providers.





# Street Light Management Solution

## Intelligent Lighting Management for Smarter Communities

Landis+Gyr's intelligent street lighting solution enables utilities to significantly reduce energy costs and extend lighting asset life with remote monitoring and control of both High Pressure Sodium (HPS) and LED luminaires. Smart lighting offers the ability to adjust and adapt lighting to provide optimal coverage and safety for traffic conditions. Using intelligent communications technologies, the system can also pave the way for other smart city applications, such as parking and traffic management, outage detection, air quality sensing, weather sensing, and more – all on a single, secure network.

## Building Blocks for Intelligent Lighting

Operating as part of Landis+Gyr's Gridstream® Connect IoT platform, the street light management solution incorporates both hardware and software components. As part of Gridstream Connect, Landis+Gyr's street light controller and management software serve as a foundation for other smart city applications, while vastly improving energy and operational efficiencies.

The street light controller uses the Gridstream Connect network to provide utilities with smart lighting features. The controller incorporates Landis+Gyr's Network Node, a fully functional, small IoT radio module capable of communicating on Wi-SUN compliant RF Mesh IP networks, to connect with the broader smart grid network, and can also route messages from other area sensors and devices. The street light management software integrates with Landis+Gyr's Command Center to enable utilities to monitor lights, receive reports, and set alarms.

## Illuminating Operational and Energy Efficiencies

### Smart lighting solutions enable a variety of use cases that:

- Cut energy costs
- Extend asset life
- Reduce costly truck rolls
- Lower O&M expenses
- Minimize light-related safety issues
- Support distribution design and operation
- Add network capacity and resiliency

**Example use cases include:**

	<b>AUTOMATE HEALTH MONITORING</b>	Automated monitoring detects luminaire issues and malfunctions, regardless of luminaire type. Eliminating the need for manual inspections reduces O&M expense and minimizes potential utility liability that could arise from malfunctioning lights that constitute a risk to public safety.
	<b>USE FOR POWER QUALITY SENSING</b>	The Landis+Gyr street light controller can function as a power quality sensor, providing information that the utility can use to support distribution design and operation. For example, using the controller to support volt/var optimization or to monitor the power factor on HPS lights.
	<b>MEASURE ACTUAL ENERGY USAGE</b>	The street light controller measures the amount of energy consumed by the light, enabling utilities to design new lighting rates based on actual energy consumption, to fully cover their costs of service.
	<b>PROVIDE CONSTANT LUMEN OUTPUT</b>	Landis+Gyr's street light management solution employs a dimming feature that uses the degradation constant for each vendor's luminaire to provide a constant lumen output over the life of the luminaire. This feature can save as much as 20 percent of energy use and cost over the life of the luminaire.
	<b>IMPLEMENT POWER-BASED DIMMING</b>	The solution enables utilities to set a dimming schedule for luminaire assets based on vehicular and pedestrian traffic patterns. In addition, Landis+Gyr offers power-based dimming to ensure that the dimming command translates into an equal reduction in metered power and energy savings.
	<b>MANAGE LOAD SHEDDING</b>	To minimize load spikes, the solution enables utilities to connect to street light assets in real time, turning them off, dimming them, or gradually ramping up the power level as needed to manage demand.
	<b>REMOTELY DISABLE AREA LIGHTS</b>	Using the head-end software's on-demand functionality, Landis+Gyr's streetlight management solution allows remote disablement of an area light in real time. This eliminates the need for costly truck rolls each time a customer moves out or requires a seasonal disconnect.
	<b>PROVIDE AMI ROUTING SUPPORT</b>	In addition to automating the light control, the street light controller can be set to support AMI routing, providing utilities with a cost-effective option to add filler routing support when and where needed. In addition, the controllers communicate with other endpoints on the network, adding resiliency.
	<b>MONITOR / LOCATE ASSETS</b>	The head-end software associated with the streetlight controllers can be used to manage a wide variety of asset attributes. The built-in GPC chipset also provides location information upon auto-discovery.
	<b>PAIR WITH WATER AND GAS METERS</b>	Since the street light controller uses the Landis+Gyr Network Node, it can be used to parent water and gas meters for utilities that don't have electric meters to pair with their water and gas meters.



## Future Directions: Sensor-Based Use Cases

Landis+Gyr’s sensor solutions will expand the portfolio of street light management applications to more fully support tomorrow’s smart communities.

**Example sensor-based use cases may include:**

<b>TRAFFIC SENSING</b>	Enhance street safety by providing traffic data to optimize lighting schedules and inform traffic planning. Radar-based system provides vehicle and pedestrian traffic count and speed data to take advantage of scheduling features, significantly reducing street light energy usage.
<b>DRIVER ALERT SENSING</b>	Enhance street safety by alerting drivers to special traffic situations. For example, warning drivers that an emergency vehicle is approaching; alerting drivers that children are present around schools; alerting drivers who are traveling the wrong way on one-way streets and on and off ramps.
<b>FREEZING TEMPERATURE SENSING</b>	Enhance road safety by alerting traffic to freezing and icy road conditions. Provides a visual signal that, due to a sufficient drop in the outside ambient temperature, potentially hazardous freezing or icy road conditions may be present even though they may not be visible on the roadway.
<b>ACOUSTIC MONITORING</b>	Inform noise management and mitigation strategies with acoustic monitoring and profiling. Enables utilities to implement a low-cost acoustic profiling system across their communities, identifying excessive-noise problem areas to develop strategies of mitigation.
<b>POLLUTION SENSING</b>	Cost-effective city-wide pollution mapping and profiling. Enables utilities to implement a low-cost pollution sensing solution with built-in networking and utilities grid connection.

# Solution Specifications

### Solution components:




- Street light controller with integrated Network Node
- Command Center 7.1 MR3 or later
- DA Gateway V1.3.7 or later
- Smart Community Center software

### Key features:

- Luminaire health monitoring
- Metering capabilities
  - Accumulated energy (0.5-1.0% accuracy)
  - Instantaneous current
  - Voltage and power
  - Power factor
- Accumulated lamp-on-time
- GPS location – maps with street light location visualization
- Photo sensor for dawn and dusk controls
- Supercapacitor support for outage scenarios
- Constant lumen output – ramp up power over time to maintain light levels
- On-demand: on, off, dim
- Dimming schedule creation
- Asset management
- Alarm management

# Smart Community Solutions for Today and Tomorrow

Landis+Gyr’s Street Light Management Solution provides utilities with the significant benefits of both lighting automation and grid modernization programs. The solution can also serve as a foundation for Smart City initiatives, enabling utilities to increase customer satisfaction and offering opportunities to generate new revenue streams from business-to-business services, such as:

 <p><b>DATA AS A SERVICE</b></p>	<p>Offer full connectivity service, including timely delivery of data from connected platform to third party</p>
 <p><b>NETWORK AS A SERVICE</b></p>	<p>Lease your network for connecting third-party head-end systems with their connected devices</p>
 <p><b>INFRASTRUCTURE AS A SERVICE</b></p>	<p>Enable third parties to participate with their own communications on your network infrastructure</p>

Landis+Gyr supports utilities in their efforts to evolve and succeed in the new energy economy. Our commitment is to help utilities meet today’s challenges, such as declining revenue and aging infrastructure, while addressing new industry drivers like integration of distributed energy resources and expanded services. In this way, Landis+Gyr’s long history as a trusted energy partner to utilities will continue well into the future.

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# Street Light Management



## Enabling Smart Cities and Utilities through Intelligent Lighting Management Solutions

The Landis+Gyr Street Light Management Solution enables our customers to monitor and manage street lights — both High Pressure Sodium (HPS) and LED luminaires – on Landis+Gyr’s communication network. The controller incorporates Landis+Gyr’s Network Node, a fully functional, small IoT RF radio module capable of communicating on Wi-SUN compliant RF Mesh IPv6 or RF Mesh networks. As part of our Gristream® Connect IoT portfolio, Landis+Gyr’s Street Light Controller and Management Software serve as a foundation for other smart city applications, while vastly improving energy and operational efficiencies.

### ENHANCED SAFETY FEATURES

- Luminaire health monitoring and outage detection
- Supercapacitor support for power outages

### IMPROVED OPERATIONAL & ENERGY EFFICIENCIES

- Improved energy and asset management
- GPS location—maps with street light visualization
- Dimming schedule creation
- Constant lumen output: ramp up power over time to maintain lumen efficacy

### METROLOGY CAPABILITIES

- Load-side accumulated energy, instantaneous current, voltage, power, and power factor

### COMPONENTS

- Landis+Gyr street light controller with integrated Network Node
- Command Center 7.1 MR3 or later
- Street Light Management Software



ENHANCED SAFETY  
FEATURES



IMPROVED  
OPERATIONAL &  
ENERGY EFFICIENCIES



METROLOGY  
CAPABILITIES



COMPONENTS

# Street Light Management



ENHANCED  
SAFETY  
FEATURES



IMPROVED  
OPERATIONAL  
& ENERGY  
EFFICIENCIES



METROLOGY  
CAPABILITIES



COMPONENTS

## PRODUCT SPECIFICATIONS

FCC Class B Device

CONTROLLER SPECS	
Dimensions of Controller	Diameter 3.5" (88mm), Height 3.6" (92mm)
Voltage	120-277V (50-60 Hz)
Material	Lexan™ SLX Polycarbonate
Ingress Protection	IP67, IP66
Temperature Rating	Operational -40°C to 60°C Storage -40°C to 85°C
Compatibility (General)	LED, HPS, and induction to a max load of 10A
Compatibility (Luminaire with ANSI C136.41 standard receptacle)	All Features supported by LED luminaires with 5 and 7 pin All features except dimming is supported on 3 pin HPS luminaires
Dimming Method	Complies with 0-10V DC (IEC60929) and DALI (IEC62386)
Dimming Ramping Process	Dimming in gradual steps every 6 seconds (e.g. 100% to 20% = 102 seconds)
Dimming Schedule	Daily or weekly recurring schedule with ability to schedule a special event, in 1 minute increments with 1% resolutions
On / Off Trigger	Photo sensor for local light detection (selectable) with GPS based astronomical dawn/dusk back up
Dawn / Dusk Levels	On: 2.5 foot candles (fc) Off: 3.9 foot candles (fc) Configurable over the air

RADIO SPECS	
Frequency Range	902 to 928 MHz
Supported Data Rates	RF Mesh (N500): 9.6, 19.2, 38.4, 115.2 kbps RF Mesh IP (N550): 50, 150, 200 kbps
Output Power	High Min: 25, Typical: 26, Max: 27 dBm
Receiver Sensitivity	9.6 kbps Min: -114, Typical: -112, Max: -110 dBm 19.2 kbps Min: -112, Typical: -110, Max: -108 dBm 38.4 kbps Min: -110, Typical: -108, Max: -106 dBm 115.2 kbps Min: -102, Typical: -100, Max: -98 dBm 50 kbps Min: -107, Typical: -105, Max: -103 dBm 150 kbps Min: -99, Typical: -97, Max: -95 dBm 200 kbps Min: -98, Typical: -96, Max: -94 dBm

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# Smart Community Center™



## Software Platform for Smart Street Light Management

Landis+Gyr's Smart Community Center is a central management software (CMS) system that enables utilities to configure, control, command, and monitor street light controllers. As part of the Gridstream® Connect IoT portfolio, Smart Community Center provides a platform for street light management initiatives that increase safety, improve operational efficiency, and optimize energy usage.

### IMPROVE OPERATIONAL EFFICIENCY

- **Remote control of assets**  
Provides operators with remote control, command, and monitoring of assets to reduce cost of onsite operations
- **Flexible interactive status monitoring**  
Access detailed status of the overall network and any individual street lights at any time from any location for optimal operations
- **Advanced reporting**  
View complete, detailed behavior history, and measurement data for each asset to inform performance analysis

### INCREASE SAFETY

- **Enhanced street light maintenance processes**  
Automatic identification, outage reporting, and ticketing system enhances maintenance and reduces lamp downtime, increasing citizen safety

### KEY FEATURES

- User-configured dashboard with graphical data display
- Inventory and device management, featuring flexible object model and drag-and-drop mapping
- Intuitive dimming schedule management interface
- Surveillance, monitoring, and control dashboard
- Asset management – luminaires, poles, maintenance, controller, related parameters

### OPTIMIZE ENERGY USAGE

- **Network and device usage information**  
Measure and report energy consumption on the street light network or connected devices to manage and optimize usage
- **Efficiency enhancement features**  
Reduce or contain energy consumption with lighting schedule and control features



OPTIMIZE ENERGY USAGE



IMPROVE OPERATIONAL EFFICIENCY



INCREASE SAFETY

# Smart Community Center

## Available Cloud and On-premise Implementation Models

Landis+Gyr's Smart Community Center CMS system is available as a fully-owned and operated on-premise implementation, or, alternatively, Landis+Gyr Cloud offerings provide the flexibility to outsource Smart Community Center Software-as-a-Service (SaaS). With the SaaS model, the system support and management is handled by our subject matter experts, leaving utility resources to focus on their core business.

### SaaS BENEFITS INCLUDE:

- **Reduced Costs**  
Shift from Capex to Opex with Landis+Gyr management of infrastructure, software licensing, and hardware refresh
- **Faster Stand-Up Time**  
Fit-for-purpose = quicker realization of benefits
- **Reduced Complexity**  
Utility can focus on core competency, not IT operational management
- **Financial Management**  
Strategic partnerships bring pre-integrated cost-management solutions
- **Standards Compliance and Security**  
Landis+Gyr is responsible for all data center environment security and compliance

### SOLUTION SPECIFICATIONS

- DA Gateway V1.5 or later
- Smart Community Center Software
- Street light controller with integrated Network Node
- Command Center 7.1 MR3 or later
- Compatible with Google Chrome and Mozilla Firefox browsers

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# Distribution Automation

## Multi-purpose Network Platform



Let Landis+Gyr guide you through grid modernization

In today's energy dependent world, rarely is a single technology or solution capable of providing everything that utilities and consumers need to manage energy better. Landis+Gyr has been providing Distribution Automation solutions for over 25 years – leading the market in bringing together a total end-to-end solution for distribution grid management and monitoring.

The Gridstream® Distribution Intelligence solution from Landis+Gyr includes distribution automation capabilities built on a secure, highly reliable and scalable communications network. This enables two-way communication, including peer-to-peer, for a variety of distribution automation and grid management applications. DA radios leverage the backbone of the RF Mesh network to establish continuous, around-the-clock communication paths for data collection, monitoring, and control functions.

The RF network supports robust, low-latency communications with devices to enable applications such as auto-sectionalization, transformer monitoring, capacitor bank control and fault detection. Intelligent applications

distributed among the DA radios and DA end devices allow decision making to happen at the device level and between multiple devices, in many cases, speeding results. These highly functional DA radios are interoperable with a multitude of distribution equipment that optimizes a utility's investment today and for future upgradeability that aligns with the utility's pace of business value.

### HIGHLIGHTS:

- Operates on multi-purpose network that supports AMI, Distribution Automation and other Landis+Gyr grid management solutions
- Provides proven integration with DA equipment such as RTUs, Switches, Reclosers, Regulators, Capacitor Banks, and FCIs from multiple manufacturers
- Supports battery-backed communications for control during outages
- Delivers messaging prioritization with SCADA control given highest priority
- Supports multiple protocols, including DNP, Modbus and others
- Offers Dynamic, Scheduled, and Exception polling of DA end devices
- Enables management of renewable and other types of distributed energy resources
- Supports standards-based network components, software and software integration
- Supports electric, water, wastewater, and gas utilities
- Provides over-the-air support of DA endpoints



# DISTRIBUTION AUTOMATION

## System Components

### Intelligent Sensing

Strategically placed throughout the distribution network, sensors provide multiple benefits including identification of fault locations and causes to support quicker restoration efforts and proactive actions to avoid future unplanned outages. This can drive improvements in reliability performance indices like SAIDI and CAIDI. Landis+Gyr's S610 Line Sensor is an intelligent sensor that provides fault detection, captures key power quality data for day-to-day grid management and supports renewable energy integration with the ability to detect and report on reverse power flows.

### Intelligent Automation and Control

Supervisory Control and Data Acquisition (SCADA) provides the remote visibility and control required for operating the power system. The use of SCADA in the distribution system allows operators in

the control center to monitor the activity and status of field devices. These include reclosers, voltage regulators, switches, and other electronically controlled devices that are equipped with communications technology such as the Landis+Gyr integrated DA radios. Operators can also issue commands to remote devices to take actions like open or close, or change settings. The Gridstream Distribution Intelligence solution integrates with the utilities existing SCADA system as well as Landis+Gyr's own SCADA solution, *SCADA Center*.

### Secure Data Management

The power industry has generalized the use of the DNP3 protocol for control center to field device communications. The use of DNP3 in a gateway between the utility's control system and the communications network ensures the security of the control operations, while supporting the continued use of legacy

devices and protocols such as DNP3, Modbus and others. Landis+Gyr's DA Gateway is an intelligent communications gateway software solution that provides a configurable interface between utility centralized control applications and the communications network.

### Distribution Management System

Distribution network operators face ever increasing challenges, with higher performance targets as customers and regulators raise the bar of expectations. The multi-purpose Gridstream communications network enables distribution utilities to deliver higher reliability, customer service and reduced operating costs while maintaining workforce safety and addressing major evolving technology challenges. A multi-purpose network expands capabilities for renewable integration, data analytics, outage management, load management, volt/var management, and more.



## Gridstream SmartData Connect

**Landis+Gyr+**  
manage energy better

### Providing More Flexibility in Engaging Consumers

#### Overview

SmartData Connect™ is a customer engagement platform that transforms meter data into an easy to use resource for both consumers and utility personnel.

It is a secure and flexible portal, integrated (standards based) with the Gridstream® Command Center head end as well as the Gridstream Meter Data Management (MDM) solutions. The application draws data from the CIS system and marries it with the AMI data to provide your end consumers with valuable insight into their usage, comparisons against weather and similar properties, as well as tools to help engage them on a regular basis. SDC also gives your Customer Support teams the same view into the data as your end customer allowing for shorter customer calls and higher customer satisfaction ratings. SDC is coupled with push messaging alerts, and capabilities to facilitate electronic and pre-pay billing.

In addition to electric energy, the application is also capable of reporting information from water and gas meters. We know

how important it is to give your customer a complete integrated experience, SDC is fully branded to your utility standards to give your customer the same experience as your utility website.

The SmartData Connect platform is a proven driver of utility benefits including increased customer satisfaction, quantifiable energy savings, and participation in peak demand management programs.



#### FEATURES & BENEFITS:

*Why Landis+Gyr makes a difference.*

- Provides consumer access to electric, water and gas usage
- Provides support personnel with a tool to more easily diagnose and resolve customer inquiries
- Supports energy managing programs such as dynamic pricing, peak alerts and behavioral efficiency
- Supports pre-pay programs and online billing
- Enables targeted rate and rebate offers guided by usage patterns and property type
- Improves customer communication with timely alerts and notifications
- Configurable to allow utility branding of the user interface

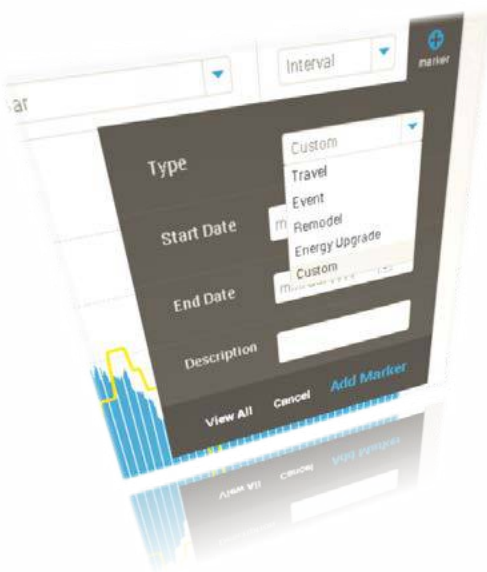
## Bringing Online the Customer Power Plant



### Data Visualization and Analytics

Downloadable data, same view for the CSR team, Bill Pay (integrated with backend utility payment systems), Bill View, Alerts, Admin tools/reporting, Customized widgets (At a glance information), net metering capabilities, bill forecasting, ability to show what the customer is using in dollars (education), property profile information to allow for targeted marketing, commercial benchmarking (energy star portfolio manager).

All locations are geo-coded to enable comparisons with local weather data and the energy use performance of similar homes or commercial facilities.



### Energy Markers™

Users can record events and energy improvements, examining pre and post energy use intensity to gauge the impact of actions on their usage.



### Pre-Pay Billing

Online capabilities to process payments, alert customers of balance thresholds and ensure alignment with CIS and billing systems.

### Proven Energy Savings

Engagement strategies have been found by third-party evaluators to yield overall behavioral energy savings reductions in excess of 2% annually, with persistence over multiple years.





Landis+Gyr

# Advanced Load Management

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## Gain Mastery Over Demand

Managing peak demand can be a challenge for utilities, resulting in disproportionate infrastructure expenses to address increasingly uncertain demand. Demand management provides a cost-effective alternative to traditional capacity expansion, as well as a means to integrate intermittent renewables. A robust load management program that includes demand response can benefit both utilities and their customers.

## Solutions in Action

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Seeking to help solar consumers adapt to new demand-based rates, Salt River Project deployed Landis+Gyr's Demand Manager meter-based application to help consumers automate the control of high-usage devices and avoid the cost of demand spikes during certain hours of the day.

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To avoid wholesale demand charges, Colquitt EMC used their AMI network and a Landis+Gyr Irrigation load control program to save nearly \$3M per year and decrease the time-to-payback on their AMI investment.

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To coordinate the demand response efforts of its members, Northwest Iowa Power Coop deployed a multi-tenant Power Center architecture that enhanced visibility at the G&T level and coordinated demand response strategies across multiple utilities.

## Linking AMI and Demand Response

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Effective demand response programs enable utilities to reliably control large, flexible electrical loads that can range from residential HVAC to agricultural irrigation pumps, while maintaining consumer engagement. Landis+Gyr's load control solutions take advantage of intuitive software, smart devices, and robust communication, to deliver effective demand response. When combined with Advanced Metering Infrastructure (AMI) investments, load control programs can be enhanced with improved targeting, streamlined measurement and verification, and better analytics, which can decrease the time for utilities to see a return on their AMI investments by two to four years.



### Software Control to Create Reliable and Dispatchable Load

Power Center, a cloud-based, near real-time control system, is the central component of Landis+Gyr's load management solutions. Power Center takes advantage of two-way communication to help utilities manage their load control devices, create and execute demand management strategies, and analyze the effectiveness of demand management events. Power Center offers a dashboard with a near real-time view of the flexible load that is available to dispatch. With this insight, operators can avoid ineffective demand response events and the associated financial penalties. With Power Center, utilities can:

- Adjust or augment their load control strategies on-the-fly;
- Detect, inspect, and fix off-line devices, often without requiring an on-site visit.

Integrations between Power Center and other utility systems like distribution SCADA further enable automation of load control dispatches based on real-time grid conditions. Power Center gives utilities the ability to transform load into a dependable capacity resource that can be managed like a power plant.

# Components of Holistic Demand Response

## INTELLIGENT LOAD CONTROL SWITCHES



Power Center relies on intelligent communicating devices to reliably execute demand management commands and report on real-time grid conditions.

Devices include multiple-relay load control switches for residential applications and an irrigation load switch that is hardened for external environments. All Landis+Gyr load management devices are fitted with a 900 MHz radio that communicates on the same cost-effective and reliable Gridstream Connect network as the company's measurement endpoints (electric, water, gas). With accurate on-board metrology, Landis+Gyr's load switches provide information on local usage and grid conditions that can be used by Power Center, or locally by applications designed to run on the Gridstream Connect network.

## SMART THERMOSTATS FOR SMART LOAD CONTROL



Consumers have been quick to adopt "smart," Wi-Fi-enabled thermostats that promise end users comfort, convenience, usability,

and most importantly, savings on energy spending. Utilities have responded by creating bring-your-own-thermostat (BYOT) programs that enable customers to register and use their smart thermostats in demand response events. Landis+Gyr has augmented its line of direct load control devices with a BYOT offering

from its partner, home automation leader Resideo. Landis+Gyr chose to collaborate with Resideo because of its strength in home automation technology and openness to extend its thermostat reach across various delivery models.

## CONSUMER-CENTRIC DEMAND MANAGEMENT



Rate-based programs can enhance direct load control. Automating load control for consumers is an evolutionary step in the journey to expand

demand response efforts. Landis+Gyr's Demand Manager is an award-winning consumer-centric application that resides on the utility meter, enabling the meter to forecast load based on real-time reads. Then, when a customer-set demand threshold is predicted to be breached, Demand Manager can control paired, in-home devices. Using a web or mobile customer interface, this solution allows a residential consumer to prioritize the devices that are controlled, and optimize their use for comfort, convenience, and ultimately cost.

# An End-to-End Load Management Solution

Landis+Gyr's advanced load management solutions enable a variety of use cases that:

## Aggregate Control / Visibility for G&Ts

A single instance of Landis+Gyr's Power Center can be shared amongst a generation and transmission electric cooperative (G&T) and its members, providing a cost-effective solution to coordinating load management programs.

## Automate Control

With the ability to define rules to dispatch load control events based on load measurements from SCADA systems, Power Center gives utilities the ability to reliably automate execution of their load control strategies.

## Manage EV Charging Stations

Hardware and software specifically designed to allow utilities to monitor, control and respond to signals at charging stations, with capability to implement a variety of tariffs.

## Increase Impact of Demand Response

Easily view, access, and control available load at any time. Landis+Gyr's load control devices and Power Center control system provide the measurable, verifiable data needed to operate and optimize demand response efforts.

## Promote Consumer Engagement

Consumer tools, such as smart mobile apps, text message services, and web portals help consumers to self-serve and effectively manage their participation in utility programs.



Load control solutions take advantage of a wide variety of smart devices including:



Meter



Thermostat



DG Integration



EV Charging



Mobile



Load Switch

Let's build a  
brighter future  
together.

To learn more about partnering with Landis+Gyr, visit [landisgyr.com](http://landisgyr.com), email us at [marketing@landisgyr.com](mailto:marketing@landisgyr.com), or call us at 888-390-5733.

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## Maximizing Data Value

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Landis+Gyr's Advanced Grid Analytics solution enables utilities to expedite achievement of their business goals, while delivering maximum performance and efficiency.

### PLATFORM

The Advanced Grid Analytics solution consists of a powerful enterprise platform and user-friendly, web-based applications. Key platform components include:

- **Dynamic Connectivity Model:** Web-based geospatial visualization of GIS data
- **NoSQL Database:** Scalable storage with fast multi-source data processing
- **Analytics Engine and Algorithms Library:** Developed and enhanced with utility partners over 15 years to provide advanced analysis
- **Integration Layer:** Standards-compliant adapters for easy integration
- **Automated Notifications:** Reports with configurable graphs and tables, as well as alarms based on user-defined thresholds

### SERVICES

Our professional services team offers a unique combination of data scientists, power system engineers, software and technology architects, and integration specialists. By leveraging Landis+Gyr's proven, best-in-class implementation methodology and standards-based adapters, utilities can start realizing benefits quickly. Our experts also provide custom solutions and reporting as part of our Analytics as a Service offering.

### DEPLOYMENT OPTIONS

Landis+Gyr provides multiple deployment options that are cost-effective, robust, and scalable to meet service levels now, and in the future. The solution can be deployed at the utility's data center, or hosted at Landis+Gyr's cloud-based, secure Network Operations Center.

Let's build a brighter future together.

To learn more about Advanced Grid Analytics, or partnering with Landis+Gyr, visit [landisgyr.com](https://landisgyr.com), email us at [marketing@landisgyr.com](mailto:marketing@landisgyr.com), or call us at 888-390-5733.

# Landis+Gyr

## Advanced Grid Analytics

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### Get Measurable Value from Your Smart Grid Data

Our Advanced Grid Analytics software collects your grid data and turns it into actionable insights so you can optimize operations, extend the life of your assets, and prioritize investments. It enables utilities to leverage data integration, visualization, and advanced algorithms for a wide range of analytics use cases.

[landisgyr.com](https://landisgyr.com)

# Landis+Gyr Analytics Offering

Optimizing the Flow of  
Energy on Your Grid

## METERING ANALYTICS

Gain insights from your meter data

- Meter-Transformer Mapping Validation
- Voltage Performance
- Meter Monitoring
- Revenue Protection
- Capacity Contribution

## OPERATIONAL ANALYTICS

Improve operations using grid data

- *Metering Analytics Package*
- Full Model Validation
- Loading Performance
- Grid Monitoring
- Capacity Planning

## RELIABILITY ANALYTICS

Optimize investments using historical  
reliability data

- Connectivity Model Validation
- Reliability Performance
- Project Prioritization
- Reliability Planning

# Metering Analytics



AMI

This is the first-tier analytics package. Integration with historical meter voltage, consumption, and events enables the following Advanced Grid Analytics (AGA) modules:



### MODEL VALIDATION

Identify meters incorrectly mapped to their transformers and recommend resolution



### VOLTAGE PERFORMANCE

Identify delivery voltage exceptions to gauge system performance



### METER MONITORING

Monitor bellwether meter voltage and meter outages across the system to support CVR in near real-time



### REVENUE PROTECTION

Reduce non-technical losses by recognizing meter consumption patterns, event sequences and energy diversion



### CAPACITY CONTRIBUTION

Identify demand contribution by customer class for tariff-making and DR programs

# Operational Analytics



AMI



SCADA



GIS

This package builds on the integration required for the Metering Analytics bundle with the electrical model, including asset connectivity, capacity, and impedance to enable the following AGA modules:



### MODEL VALIDATION

Identify meter-transformer mapping and asset rating issues, gaps in connectivity model, and evaluate power flow convergence



### LOADING PERFORMANCE

Identify overloaded and underutilized devices to gauge performance across asset base



### GRID MONITORING

Determine tripped devices, fault location, and affected customers to support FLISR efforts in near real-time



### CAPACITY PLANNING

Test various loading and control scenarios to address capacity bottlenecks, mitigate equipment failure, and support DER integration

# Reliability Analytics



GIS



OMS

This package leverages the connectivity model and historical reliability data including outage events and reliability indices.



### MODEL VALIDATION

Identify nodal and phase connectivity islands, and connectivity loops



### RELIABILITY PERFORMANCE

Process historical outage data system-wide to calculate SAIDI, SAIFI, CAIDI, and unserved energy



### PROJECT PRIORITIZATION

Calculate the return on investment of various reliability projects to optimize budget allocation



### RELIABILITY PLANNING

Test various reliability projects to estimate their technical impact based on historical outage events

# Landis+Gyr Security Architecture

June 2021

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**1 | Summary**

This document provides the architecture of the Landis+Gyr Gridstream Security offering for North America.

This document includes proprietary and confidential material. This material includes items that are kept confidential for both security purposes and commercial purposes.

## 2 | Smart Grid Security Landscape

Advances in smart grid technology offer a host of benefits to utilities and consumers and introduce compelling new ways to increase communication across the distribution system. However, they can also create areas of vulnerability and increase exposure to potential attacks. From bad data injection to spoofing, man-in-the-middle-attacks, decryption attacks, electromagnetic attacks, energy theft attacks and more, security threats are a real concern.

“Cyber threats to the electricity system are increasing in sophistication, magnitude and frequency,” according to the U.S. Energy Department in its report, *Transforming the Nation’s Electricity System*.<sup>2</sup> “The current cybersecurity landscape is characterized by rapidly evolving threats and vulnerabilities, juxtaposed against the slower-moving deployment of defense measures.”

In response to this landscape, best-in-class solutions providers continue to develop and improve security solutions that focus on industry standards and world-class security partners.

### **Threats from outside — and inside — the utility**

Unprotected smart grids face potential threats from both external hackers as well as a utility’s own employees or business partners.

Within an unprotected smart grid, meters can be hacked by accessing onboard memory, thereby reading diagnostic ports and other network interfaces. RF sniffing is the process of monitoring and capturing all the packets passing through a given network using radio sniffing tools in order to capture a smart meter’s consumption data. By sniffing and then breaking network encryption, attackers learn the communication protocol used in a meter.<sup>3</sup>

Not only must utilities fend off ever-present attacks from cybercriminals, but also employees and vendors can unknowingly release sensitive information. The data firm Recorded Future scoured Internet forums and “paste sites” trying to uncover the vulnerabilities involving employee “credentials” and found that 221 of the nation’s top companies had employee credentials exposed. Companies with exposed employee credentials included 49 percent of public utilities.<sup>4</sup> While some utilities have recently experienced highly public breaches to their technology environments, many incidents go unreported. Preventing an attack will require improving the security of the smart grid as well as intelligent constraints on how employees, consumers, and partners access applications and data.

### 3 | Key security principles

A simple but widely applicable security model is the **Confidentiality, Integrity and Availability (CIA)** triad, representing the three key principles that should be guaranteed in any kind of secure system. A fourth category, **Authentication**, is also discussed with regard to security concerns. It is these four principles that are often exploited through varying degrees of attacks.

#### **CONFIDENTIALITY**

Confidentiality is a concern because utilities need to prevent sensitive data from reaching the wrong people, while making sure the right people can still gain access. For example, utilities may want to ensure information such as scheduled customer billing data, meter alarm information, and home area network events are stored in an encrypted format to avoid being intercepted by a consumer's neighbor, another utility, or an attacker who could use the data to gain insight about a utility's advanced metering network.

#### **INTEGRITY**

Integrity involves a utility maintaining the consistency, accuracy, and trustworthiness of data over its entire network lifecycle. For example, meter data must not be changed in transit, and the utility must ensure that unauthorized personnel cannot alter data. Utilities need to rely on strong cryptographic mechanisms to ensure the integrity of meter readings, command and control data.

#### **AVAILABILITY**

Availability of data and equipment are the primary operational concerns for smart grid technology. Utilities must have the utmost confidence in their access to meter and billing data. Utilities can best ensure availability by rigorously maintaining hardware, performing repairs immediately when needed, and maintaining a functioning software system free of corruption or conflict. Additionally, security measures such as firewalls and proxy servers can help prevent downtime and mitigate malicious actions such as denial-of-service (DoS) attacks.

#### **AUTHENTICATION**

A utility must be aware of who is accessing its data. Unauthorized access could be the result of unmodified default access policies or lack of clearly defined access policy documentation. Utilities need to ensure only authorized utility personnel can view information or perform certain actions. It is vital that the head-end system, field tools, and network devices are deployed with a proper "root of trust." Without the ability to confidently authenticate a message or command originated from a trusted source, a malicious attacker could attempt to "spoof" themselves as the head-end system, field tool or as a legitimate network device in attempt to send an illicit command to a meter or inject malicious code into the network.

## 4 | Security best practices utilities should follow

### Meeting security needs with confidence

A utility's systems partners should follow best security practices throughout the entire utility network and incorporate standards and software to ensure all security concerns are addressed.

Confidentiality, integrity, availability, and authentication of data should be top priorities. Accordingly, communications methods/protocols should have fully integrated non-proprietary security standards validated by top federal and industry standards organizations, including Federal Information Processing Standards (FIPS) written by National Institute for Science and Technology (NIST), to ensure CIA of customer information. These security best practices ensure that proper access controls are implemented in the partner's solutions and that utilities feel safe knowing the confidential data of the utility and its customers is handled with best-in-industry security.

### Systematic protection

Look for a security solution that takes a holistic approach to people, technology, and process security for the smart grid network. Some security approaches focus on protecting the transportation of data messages, but the better solutions go beyond message transportation and offer protocols to validate the trust level of the originator of a data message, preventing the spread of unauthorized or malicious code.

### People and process

One key area of risk is an insider attack, whether malicious or accidental. External attackers can attempt to breach head-end security in many ways, but ensuring employees' legitimate access to systems is just as crucial. Consider head-end operating software and field tools that guard against unauthorized access to functionality and monitor and alert utilities about unusual or improper actions as they happen. To protect against activity by authorized employees, implement strong auditing and reporting processes and capabilities that capture user activity. By following these processes, utilities can quickly identify suspicious activity and pinpoint who performed the action, the date and time in which the action was performed, and the results of the transaction.

Head-end software with Role-Based Access Control (RBAC) provides the capabilities necessary for the Security Administrator to assign appropriate permissions to each user of the system. The AMI head-end software can streamline user administration by integrating with enterprise single sign-on solutions. Once the appropriate security settings have been established, the solution ensures a smooth process for network security configuration, device management, and network management.

### Data protection

Encryption is the process of transforming information using an algorithm to make it unreadable to anyone except those possessing the necessary encryption key(s). Encryption is just one tool to prevent



unauthorized access to your confidential data. Identifying critical data, such as meter data and customer billing information, is another step toward determining what data needs to be encrypted and confidential. End-to-end encryption maximizes data protection regardless of whether the data is in a public or private cloud, on a device, or in transit. It can be invaluable in combatting advanced threats, protecting against IoT-enabled cyber breaches, and maintaining regulatory compliance.

Securing stored data involves preventing unauthorized people from accessing it as well as preventing accidental or intentional destruction, infection, or corruption of information. Back up your data with confidence using flexible deployment options and rapid recovery across your environment. Prevent unauthorized access, disclosure and modification of data stored across your utility onsite or in the cloud. Additionally, make sure you apply retention policies for government-regulated data, legal or temporary events, and internally defined retention standards.

### **Resistance and local security**

Tamper resistance protects devices from being modified and monitored. This includes mechanisms such as keyed connectors, locks, and encrypted device-to-device mechanisms. Advanced security solutions should include signed and verified firmware, disabled JTAG/debug communications interface, encrypted flash memory, locked optical ports (configurable), meter tamper detection, backhaul protection, and other physical and system-level security features.

### **Compliance and auditability**

The NIST-produced NISTIR-7628 is a set of guidelines, or “a reference document,” for implementing smart grid security. The information and requirements within NISTIR-7628 provide valuable direction for developing effective cyber security strategies. Utilities should use the NIST guidelines and requirements when researching prospective smart grid solution vendors. The vendor you choose should take a proactive approach to following the guidelines:

- Implement security controls in all phases of the development cycle, from design through implementation, maintenance, and device/product decommissioning
- Develop and perform ongoing risk assessments and penetration tests to identify assets, vulnerabilities, threats, and impacts that can be used to prioritize and implement necessary mitigating security features
- Create a robust, future-ready, systemic feature set leveraging the requirements documented in NISTIR 7628 Volume 1
- Implement appropriate privacy controls based on information provided in NISTIR 7628 Volume 2
- Leverage the vulnerability classes listed in NISTIR 7628 Volume 3 to ensure your security solution has the necessary controls to mitigate the vulnerabilities listed

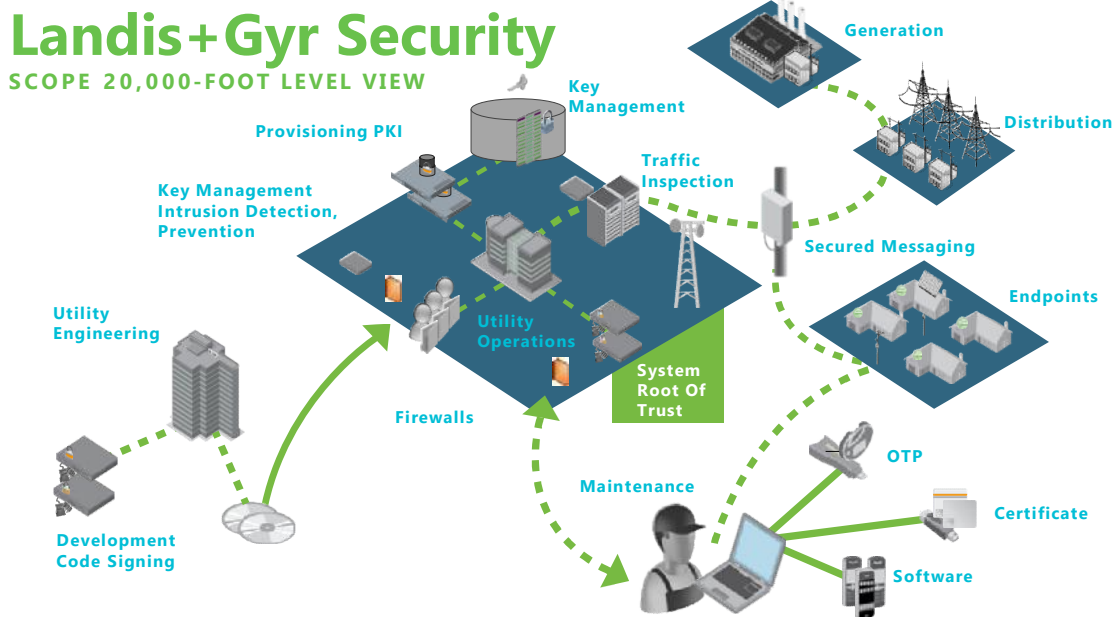
Utilities should use the NIST guidelines and requirements when researching prospective smart grid solution vendors.

### Intentional Third-Party Penetration Testing

Utilities that engage penetration testers receive value from revealing vulnerabilities in their end-to-end implementation of smart grid solutions and can focus technology investments in mitigating security measures wisely. Penetration testers attempt to exploit the identified vulnerabilities to show the utility what could occur in the case of a real attack. The target utility’s security team should be able to detect multiple attacks and respond in a timely manner. These attacks should be automatically detected, with alerts generated and acted on according to the utility’s internal procedures. An independent third party that identifies vulnerabilities can help guide utility leadership to allocate additional funds for cyber-security before a real breach occurs. These tests may also be essential to comply with regulations and pass future audits to obtain necessary certifications.

## 5 | Landis+Gyr Gridstream Connect Security Overview

Smart grid networks introduce a variety of new and attractive ways to increase communication across the distribution system. However, the growing number of network entry points may also increase exposure to potential attackers. If left unsecured, potential vulnerabilities might allow an attacker to penetrate the network, gain access to control software, and alter load conditions to destabilize the distribution grid.



Landis+Gyr’s Gridstream Connect solution provides utilities with a highly flexible, interoperable, open

standards-based, and adaptable platform capable of supporting an ever-increasing list of utility applications and connected devices. To help utilities safely realize the potential of this connected network platform, Landis+Gyr has developed a comprehensive security architecture providing end-to-end protection across the entire network.

Designed to provide security controls and mechanisms at a system level, the Gridstream Connect security solution incorporates FIPS 140-2 validated components and utilizes open standards and cryptographic protocols for RF communication end-to-end with the head end system. The network solution protects endpoints, applications, systems, networks from unauthorized access, exploitation, modification, or denial of any network resources. This allows for addressing exposure risk at each area of the RF network to be addressed, including:

- Command Center head-end system (HES)
- Backhaul communication over the Wide Area Network (WAN)
- Network layer communication (LAN)
- Physical protection of the network devices
- Mobile Administration tool security
- Home Area Network (HAN) security

The Gridstream Connect security solution meets or exceeds both US government and international industry security standards, including NISTIR 7628, Wi-SUN, AMI-SEC, NERC CIP, DOE and others.

Landis+Gyr's proactive involvement with standards organizations such as the NIST Cyber Security Working Group (CSWG), the Wi-SUN Alliance, and the IEEE 802 committees is helping drive the development and adoption of future industry standards and best practices, ensuring that utility investments made today will continue to provide operational and economic benefits for years to come.

#### **Gridstream Connect Security Features:**

- Upstream and downstream message confidentiality and integrity
- Firmware signing and authentication
- Strong auditing control and reports
- Role-based access control
- Security configuration capabilities
- Device tamper detection
- Integration with Active Directory

#### **Gridstream Connect Security Provisions to Prevent and Mitigate Unauthorized Access:**

##### **Role Based Access Control**

The HES enforces access controls through a Role-Based Access Control (RBAC) functionality. RBAC allows the security administrator within a utility to manage user credentials and privileges assignment. In this way, the utility can manage which employees have access to commands and features related to the devices in the network.

RBAC effectively controls access to various network functions based on the credentials provided by the user. The designated security administrator uses the RBAC controls to delegate the ability to remotely access meter data or meter control functions.

### **Audit Logs**

The HES logs all activity engaged by users and makes it available to privileged users like administrators through reports or dashboards (i.e. Security Dashboard). In addition, every device in the network has an event log and transmits new events periodically to the HES.

### **Meter Tamper Alarms**

Landis+Gyr meters offer tamper alarms such as reverse energy flow, tilt/tamper and outage notifications in case a meter is removed from the socket. The alarms are transmitted to the HES upon occurrence and logged by the head end, displayed on the GUI, and optionally emailed to appropriate users.

### **Network Gateway and Network Bridge Tamper Alarm**

In the event that the cover of the network gateway or network bridge is removed, an alarm will be immediately sent to the head end, displayed on the GUI, and optionally emailed to the appropriate users.

### **Firmware Integrity**

All firmware images released by Landis+Gyr are digitally signed utilizing the Landis+Gyr asymmetric private key (ECC). Each endpoint within the network will validate the digital signature using the Landis+Gyr public key. If the key doesn't match the Landis+Gyr signature, the device will not upgrade that firmware version. This is a strong prevention mechanism to avoid injection of rogue code into the network.

### **Field Tools**

Field Tools used to manage and troubleshoot, enforce usage of network access defined at the HES level and enforced at the device level.

### **Third Party Penetration Testing**

To validate the Gridstream Connect security solution set initially, security partner Lockheed Martin performed a risk assessment using NISTIR-7628 guidelines and the NERC-CIP standard. Additionally, on an ongoing basis, Landis+Gyr performs risk assessments and penetration tests to identify vulnerable assets and implements mitigating security features for discovered security threats. World-class penetration testing partners include Lockheed Martin, IBM, Wurldtech and IOActive among others on a rotating basis. These assessments provide perspective that Landis+Gyr directly incorporates into our research and development process to consistently improve smart grid security.

Landis+Gyr has performed, and will continue to perform, internal and external penetration tests with security industry experts, such as Lockheed Martin and IBM in an effort to stay on top of the increasing

number of threats and new attack vectors.

## **6 | Advanced Security**

### **6.1 | Certified Root of Trust**

In the same line, we have partnered with Gemalto SafeNet to integrate their LUNA Hardware Security Modules (HSM) into the Gridstream Connect architecture. The HSM serves as the root of trust where the utility ECC private key is vaulted. The private key is used to generate digital signatures to downstream commands sent by the HES. The HSM also features FIPS 140-2 and Common Criteria Level 4 certifications, providing a strong protection for one of the critical elements in the advanced security architecture.

### **6.2 | Individual and Segment Keys**

The Gridstream Connect security solution provides for encryption key segmentations at the individual and group levels. First, each endpoint is required to generate its own AES 256-bit encryption key to encrypt upstream and downstream messages sent to and from each endpoint. All endpoint individual keys are further vaulted in a Key Manager.

Second, the HES system assigns a segment key to one or more mesh pockets (a mesh pocket is comprised of a collector and associated endpoints). The segment key is used to protect the transmission of broadcast downstream commands to all endpoints associated to a specific collector.

### **6.3 | Secure Key Storage and Lifecycle Management**

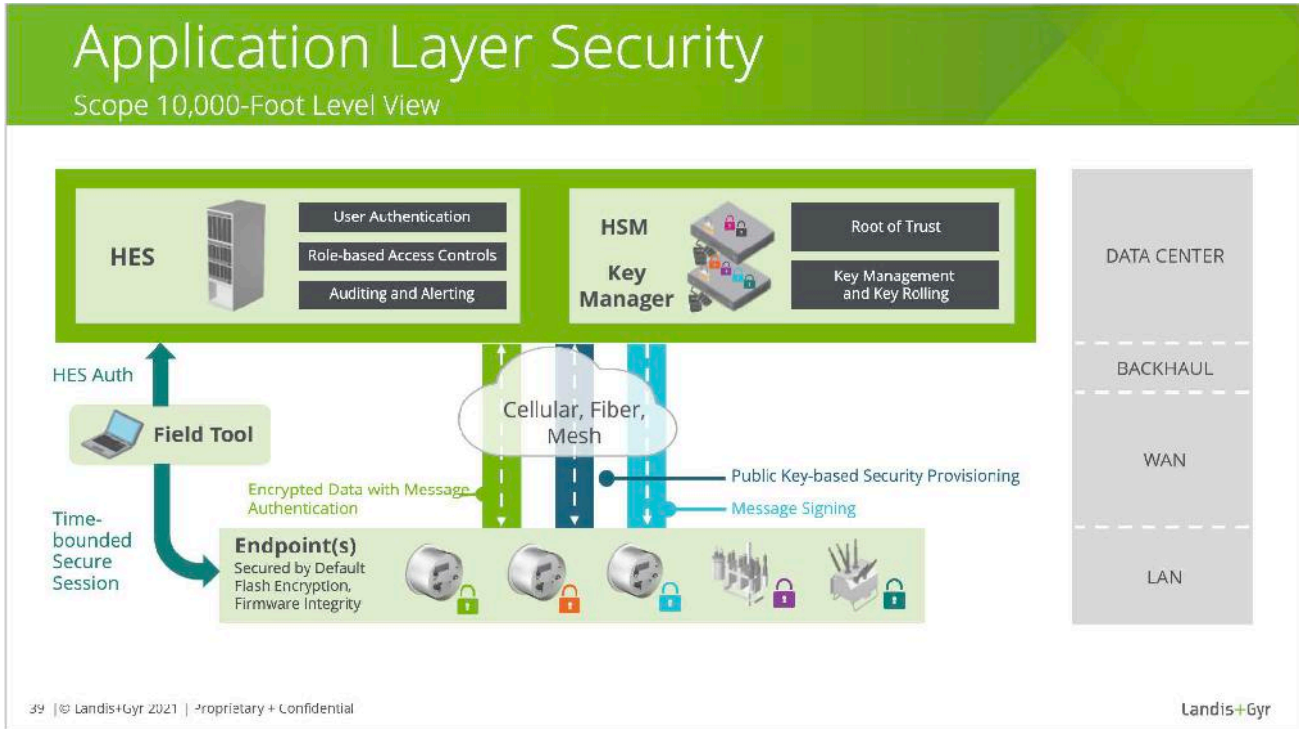
Secure storage of device-specific keys protected via encryption to protect key storage at rest and during system use. Further, device-specific keys and network-specific keys have configurable and mature key rolling and lifecycle management processes. These tools enable the customer to use Gridstream Connect technology along with customer-specific security procedures to follow NISTIR-7628 guidelines for key lifecycle management.

### **6.4 | Message Authentication**

All commands are signed using ECDSA standard based on the utility ECC private key. Endpoints will enforce signature validation before acting on any command, thus providing a control mechanism to prevent rogue commands or man-in-the-middle vulnerability.

### **6.5 | Mobile Administration Tool Authentication**

During a communication request with a network AMI endpoint, field tools must present a digitally signed certificate as a means of validating and authenticating the field tool is authorized to perform a command or action on that device that would allow them access to meter data or meter control functions.



## 7 | Conclusion

Security solutions must protect the utility today, while anticipating evolving threats in order to meet the needs of tomorrow. Industry standards that are challenged and fully vetted in open standards organizations as well as in industry alliances must be used to set a high standard for consistent and interoperable solution performance. By developing a best-in-class security solution that focuses on industry-driven standards, open non-proprietary standards, and FIPS-validated cryptography, Landis+Gyr is able to provide the necessary confidence that data security and critical infrastructure are secure, electric service is protected, and the utility's reputation is protected.

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# Landis+Gyr Project Delivery Order to Acceptance Methodology

## Order to Acceptance (OTA) - Our Proven Methodology

Order to Acceptance (OTA), the project implementation methodology described herein, is informed by Landis+Gyr’s long history and strong reputation for solution execution over two (2) decades. The OTA process is rooted in the principles of the internationally recognized Project Management Institute’s Project Management Body of Knowledge (commonly called PMI’s PMBOK). All of Landis+Gyr’s Project and Program Managers are certified by the Project Management Institute (PMI) as Project Management Professionals (PMPs), meaning each project leader has been trained in project management best practices and certified as a project management expert. Landis+Gyr’s methodology functions in accordance with the Landis+Gyr Integrated Management System (IMS), with rigorous and disciplined ISO 9001 (Quality Management), 14001 (Environmental Management) and 18001 (Health and Safety Management) registered processes.

OTA is a gated process that has been applied and refined in over hundreds of deployments of all sizes. The OTA process is comprised of four (4) main implementation phases:

1. Initiate
2. Plan
3. Execute & Control
4. Project Transition

Figure 1 illustrates the phases and main activities that occur within OTA phases.

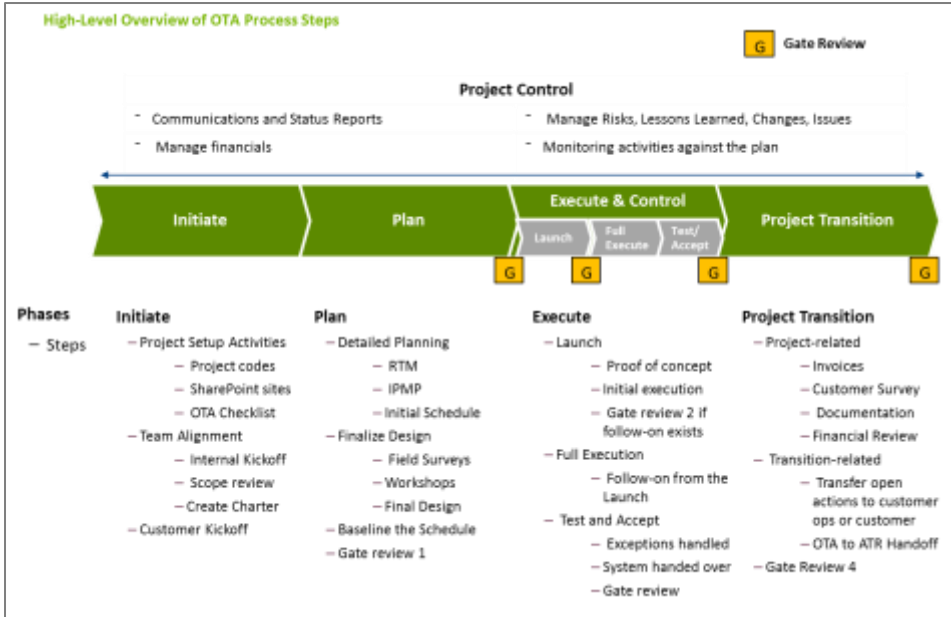


FIGURE 1 OVERVIEW OF THE CUSTOMER OTA PROCESS



## Initiate Phase

In the Initiate Phase, the Project Manager (PM) engages internal resources to setup the project, develops an initial understanding of project requirements, obtains internal authorization to allocate team resources to the project, engages the Landis+Gyr project team, and kicks off the project with the Customer in an on-site review. Customer-facing Project Deliverables (**Table 1**) are presented at the Customer Kickoff and may require input from the Customer.

Landis+Gyr Deliverable	Customer Responsibility
Team member definition (Landis+Gyr and Customer)	Provide Customer lead as primary contact point for project; identify other team members or stakeholders
Project Scope overview	Validation / input to ensure concurrence
Initial system design	Provide accurate premise data as requested by Landis+Gyr to assure accurate design
Initial project schedule and milestones (typical milestones are shown in the Statement of Work (SOW))	Provide accurate order forecasts to the PM and clear expectations for when activities should take place
High-level project management plan (management of scope, schedule, change, risk, communication, testing and acceptance)	During meeting, Customer clearly states expectations in response to the PM's initial plan
Next steps as the project moves into the Planning Phase	Provide input to achieve concurrence

TABLE 1 INITIATE PHASE CUSTOMER DELIVERABLES

## Plan Phase

In the Plan Phase, the project team plans for success by preparing for project execution, including formally documenting and achieving agreement with the Customer on the final requirements, final system design, the Integrated Project Management Plan (IPMP), and the baseline schedule. The Plan Phase concludes with a Landis+Gyr internal gate review. For a list of Customer deliverables in the Plan Phase, refer to **Table 2**.

Landis+Gyr Deliverable	Customer Responsibility
<b><u>Requirements Traceability Matrix (RTM)</u></b> approved by the Customer	Requirement review and discussion as required to achieve concurrence; explicit approval
<b><u>Integrated Project Management Plan (IPMP)</u></b> approved by the Customer that defines how the project will be managed (management of scope, schedule, change, risk, communication, testing and acceptance)	Project plan review and discussion as required to achieve concurrence; explicit approval
Completed Site Survey Report (including final quantities and locations of hardware)	Resources as required to guide Landis+Gyr RF technicians to equipment premise locations

Landis+Gyr Deliverable	Customer Responsibility
Final System Design Documents	Review and discussion as required to achieve concurrence; explicit approval
Materials orders are validated for accuracy and delivery	Updated POs for materials as required; clear, prompt answers to specification questions; Customer FAT testing completed on time
<b><u>Baseline Project Schedule defines the agreed upon tasks and dates for completion to execute the project</u></b>	Review and discussion as required to achieve concurrence; explicit approval

TABLE 2 PLAN PHASE CUSTOMER DELIVERABLES

## Execute & Control Phase

In the Execute & Control Phase, the PM actively manages and controls the project delivery according to the methods described in the IPMP. Delivery is divided into three (3) stages:

1. Launch
2. Full Execution
3. Test and Acceptance

### Execute & Control Phase – Launch

Launch is an execution stage in which system suitability is verified before moving forward into full execution. It may also be referred to as a Proof of Concept (POC) Phase. In this sub-phase:

- Software is installed and configured in the appropriate and specified environment. As applicable, the headend system (HES), work order management systems (WOMS), and field tools, are installed, and network security is set up.
- Integration workshops are held and integration support services are provided to the Customer
- Customer completes training to install and operate the system
- Network device installation and commissioning is completed
- Endpoints are deployed in the field and registered into the HES and meter data management system (MDMS), if applicable
- Written Customer approval to proceed to full deployment is obtained

After Customer approval to proceed is granted, an internal gate review takes place that allows the project to move forward to the Full Execution stage. If the project scope only includes management of the Launch stage, the Full Execution stage is omitted, and the project moves to Test and Acceptance.

### Execute & Control Phase – Full Execution

Depending on the contract agreement and scope of the project, the Customer may continue deploying endpoints independently, thereby allowing the PM and supporting project team to disengage from the

project. Alternatively, if Landis+Gyr is contracted to deploy a portion or all of the full system, the PM will continue to manage the project.

- Remaining network and endpoints are delivered, installed and commissioned according to the project schedule
- Network optimization is completed
- Design documents are updated to reflect optimization efforts
- Plans are updated and adjusted, as necessary
- Advanced training for command and control, monitoring, and exception processing takes place, as required, typically in a classroom setting
- Exception handling processes take place to resolve discovered issues

**Execute & Control Phase – Test and Acceptance**

In the Test and Acceptance stage, formal and rigorous test plans are administered to validate system performance against agreed-upon performance criteria. The project is completed, and the Customer is positioned for system operation and sustainment.

- Testing and exception handling processes take place
- Issues are resolved or escalated if required for resolution
- The PM verifies that all training has been completed; if the PM is not satisfied that the Customer has demonstrated sufficient capability through the training provided, he/she recommends additional Landis+Gyr training to the Customer
- Customer System Acceptance Testing (SAT) is completed
- The Requirements Traceability Matrix (RTM) is completed
- The project is completed, all requirements have been met, and the Customer accepts the system from Landis+Gyr
- The Project Manager requests a gate review and provides appropriate documentation as required in the OTA Checklist. If the gate review is approved, the project moves forward into the Project Transition Phase.

For a list of Customer deliverables in the Execute & Control Phase, refer to **Table 3**.

Landis+Gyr Deliverable	Customer Responsibility
Project management activities and records completed and updated	Participate in agreed-upon communication meetings and adhere to the project plan components
Commissioning completed and records captured	Depending on the scope of services offered, commissioning by Landis+Gyr may be limited; remaining commissioning to be completed by the

Landis+Gyr Deliverable	Customer Responsibility
	Customer
Network Optimization and Design Doc Revisions	If additional equipment is required beyond the initial scope, the Customer is required to agree to purchase additional equipment and install
SAT Completed	Customer agrees to participate in test case development and execution
<b>RTM</b> completed (requirements are checked off and agreed to as completed)	Customer understands requirements and concurs with results; clearly states exceptions where belief exists that requirements are not met
Final Training completed	Customer completes training; validates with project team members that sufficient understanding of system function and operation exists; if not, accepts recommendations for further training
Written Customer Acceptance	Customer provides written acceptance of project

TABLE 3 EXECUTE &amp; CONTROL PHASE CUSTOMER DELIVERABLES

## Project Transition Phase

In this final phase, the project is prepared for internal Landis+Gyr closure and the Customer is transitioned to Landis+Gyr Customer Operations as specified in the Customer agreement.

- The PM issues the Customer Satisfaction Survey to the Customer
- The PM conducts the OTA to Acceptance to Retirement (ATR) handoff meeting, seeking written approval from Customer Operations to make the transition
- After ATR, the PM prepares a thorough and accurate Lessons Learned report and uploads all project documentation to the project's SharePoint site
- The PM requests a gate review and provides appropriate documentation as required in the OTA Checklist

For a list of Customer deliverables in the Project Transition Phase, refer to **Table 4**.

Landis+Gyr Deliverable	Customer Responsibility
Customer Survey	Complete the Customer survey and return to the Project Manager
Transition Customer to support as specified in contract documents	Begin using the Customer Support desk for support rather than the PM

TABLE 4 PROJECT TRANSITION PHASE CUSTOMER DELIVERABLES

# Sample Statement of Work

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# 1 Project Overview

## 1.1 Purpose

This Statement of Work (SOW) defines a business transaction between Inter-County Energy (“Customer”) and Landis+Gyr in which the latter will provide consulting services (Work) related to a specific Landis+Gyr (or “Landis+Gyr”) service offering or a customized service. This document establishes the Scope of the Work to be performed; defines the context of the work; describes specific tasks, activities, and deliverables; and identifies responsibilities for both parties.

This SOW is subject to any terms and conditions in a given Master Services Agreement (MSA) between Greenwood Utilities and Landis+Gyr and is made a part thereof. To the extent that there are any conflicts or inconsistencies between this SOW and the MSA, the provisions of the MSA shall govern and control unless alternate provisions are expressly provided herein. This SOW supersedes any prior Landis+Gyr proposal, written or oral.

## 1.2 Scope

The objective of this project is for Landis+Gyr to assist Customer by:

- Providing the services, systems, and metering hardware to enable Customer to successfully deploy the Landis+Gyr Advanced Meter Infrastructure (AMI) System

These services shall be accomplished according to the specifications contained in the documents listed here in order of precedence in the event of inconsistent or contradictory terms, conditions or provisions among them:

- This Scope of Work

All deliverables associated with services will be completed in no more than 12 months from contract signature date. The service duration assumes receipt of purchase orders and all required documentation at the time of contract signature. If deliverables are not completed within 12 months, additional charges may apply depending on reason for delay. If desired, Customer may elect to extend delivery services at an additional cost. Such an extension will be managed through a formal project change process that will be mutually-agreed-upon by both Landis+Gyr and Customer.

## 1.3 Core Deliverables

This Statement of Work covers the following core deliverables, based on Section 1.2 Scope.

TABLE 1. CORE DELIVERABLES

Deliverables	Lead	Support
Project Management and Technical Delivery Services as noted in Section 3	Landis+Gyr	Customer
AMI training as noted in Section 3	Landis+Gyr	Customer

Deliverables	Lead	Support
Hosted or Self-Hosted Command Center Instance for a production environment	Landis+Gyr	Customer
Delivery of 31 Network Gateways, 460 Routers, and 25,573 electric meters	Landis+Gyr	Customer
System Acceptance Testing (SAT) execution	Customer	Landis+Gyr
<b>Command Center Integrations Support:</b>		
Command Center to Customer CIS (SEDC)	Landis+Gyr	Customer

## 1.4 Key Assumptions

The provisions of this Statement of Work are based on the following assumptions. If these assumptions are not valid, both the cost and schedule of this project may be impacted.

- Landis+Gyr will support Customer for Phase 1 of their AMI deployment, indicated as broken down into three phases:
  - Phase 1: Initial pilot deployment of electric
  - Phase 2: Full deployment of remaining electric endpoints
- Landis+Gyr will provide standard integration services between Command Center and Customer's MDMS, as well as Command Center and Customer's CIS; Customer will be responsible for all other integrations
- Specific roles and responsibilities for both parties will be mutually reviewed and confirmed and/or assigned or modified.
- Customer will provide timely access to 3<sup>rd</sup>-party application integration specifications and relevant system documentation for meter reading and other interfacing systems in use by Customer (e.g. MDMS, CIS).
- Customer is responsible for installation of all network equipment and electric endpoints
- Customer is responsible for procuring applicable servers and hardware for installation of Command Center according to specifications provided by Landis+Gyr (self-hosted only)

### 1.4.1 Out of Scope Items

The following items are excluded from the [Subject] project and are considered out-of-scope for Landis+Gyr as part of this SOW:

- Command Center integration to the following Customer systems:
  - Outage Management System
  - Data Analytics
- Direct management of network and endpoint installation contractor

## 1.5 Critical Success Factors

Critical success factors for the AMI Implementation are listed below to ensure expectations are managed properly between Customer and Landis+Gyr and the implementation project is successful.

- Development and active management of a mutually agreeable implementation schedule
- Development and completion of Systems Testing, Integration Testing and User Acceptance Testing cases
- Resolution of any critical “show stopping” defects.
- Availability and commitment of both Landis+Gyr and customer project resources.
- Mutual adherence to the content and proactive management of any change regarding this statement of work.
- Implementation of network and metering hardware according to Landis+Gyr specifications
- Installation of network equipment according to final network design or consultation with Landis+Gyr network design team regarding any proposed deviations from this design
- Deployment of metering endpoints in a contiguous manner

## 2 Project Roles and Responsibilities

### 2.1 Overview

In this Statement of Work, Landis+Gyr has indicated in general which party (Landis+Gyr or Customer) is responsible for various tasks throughout this project plan. The intention is that the project is a highly collaborative effort; however, specific deliverables are the responsibility of one party. In all cases, it is expected that the responsible party will be able to count on the reasonable support and assistance of the other party to help achieve each deliverable. Detailed roles and responsibilities will be defined as a result of the Planning Stage.

The assigned Landis+Gyr Project Manager will actively participate in all stages of the project and will be the point of escalation for any issues requiring escalation. Other Landis+Gyr Subject Matter Experts will also be called upon to participate periodically in various stages of the project. These roles are not called out specifically in the stages below; however, they are implied throughout and have been considered in resource plans. Weekly status updates, which summarize progress, plans, and challenges, will be provided by the Landis+Gyr Project Manager throughout the project.

## 3 Project Approach

The project is broken down to four separate stages:

- Initiation Stage
- Planning Stage
- Execution and Control Stage



- Closeout Stage

### 3.1 Initiation Stage

In the Initiation Phase, the Project Manager (PM) engages internal resources to setup the project, develops an initial understanding of project requirements, obtains internal authorization to allocate team resources to the project, and engages the Landis+Gyr project team. The key deliverables and activities for this stage follow.

TABLE 2. INITIATION STAGE DELIVERABLES

Deliverables	Lead	Support
Meter Programs and PCA Worksheet	Landis+Gyr	Customer
Initial Design and Infrastructure Spreadsheet for Full Deployment	Landis+Gyr	Customer
POs for Services and Equipment	Customer	Landis+Gyr

TABLE 3. INITIATION STAGE ACTIVITIES

Landis+Gyr Resource	Services Provided	Customer Responsibility	Customer Resource
Project Manager	Validates requirements with the Customer	Reviews requirements with the Landis+Gyr Project Manager	Project Manager
	Conducts internal planning, obtains resources, plans for kickoff meeting	Works with Landis+Gyr PM to create agenda, provide personnel contact list for kickoff meeting	
Network Design Engineer	Develops initial design and infrastructure spreadsheet for Initial Deployment Area	Provides meter coordinates and asset information to Landis+Gyr as available	Field Services
Sales / Distributor	Conducts 1132 meter programming software training	Attends training	Meter Engineer
	Creates meter programs	Defines meter functional requirements	

### 3.2 Planning Stage

In the Plan Phase, the project team prepares for project execution; including formally documenting and achieving agreement with Customer on the final requirements, final system design, and the baseline

schedule. Landis+Gyr will also conduct workshops on configurations and integrations to be performed, all site surveys, and formal training.

The key deliverables and activities for this stage follow.

TABLE 4. PLANNING STAGE DELIVERABLES

Deliverables	Lead	Support
Project Kick-Off Meeting	Landis+Gyr	Customer
Project Management Plans including: Project schedule, resource plan, materials plan, communications plan, and risk/mitigation plans	Landis+Gyr	Customer
Documentation from onsite kickoff meeting	Landis+Gyr	Customer
Completion of 3 Gateway and 30 Router site surveys	Landis+Gyr	Customer
Final design and infrastructure spreadsheet for Initial Deployment Area based on review of field site surveys completed during the project services term	Landis+Gyr	Customer
Command Center server specifications (self-hosted only)	Landis+Gyr	Customer
Procurement of Command Center servers (self-hosted only)	Customer	Landis+Gyr
Delivery of PCA meters, network equipment for Initial Deployment Area (Phase 1)	Landis+Gyr	Customer
Command Center classroom training	Landis+Gyr	Customer
Network Deployment classroom training	Landis+Gyr	Customer

TABLE 5. PLANNING STAGE ACTIVITIES

Landis+Gyr Resource	Services Provided	Customer Responsibility	Customer Resource
Program Manager / Landis+Gyr Project Team	Develops schedule, established weekly status update meeting	Coordinates with Landis+Gyr PM, attends weekly meetings	Project Manager / Customer Project Team
	Leads project kickoff meeting	Confirms agenda, provides resources	
	Manages materials flows, including PCA meter delivery	Coordinates testing and validation of PCA meters	

Landis+Gyr Resource	Services Provided	Customer Responsibility	Customer Resource
		and approves for production	
<b>Technical Implementation Engineer</b>	Conducts Product Configuration Approval (PCA) review on meters	Coordinates internal PCA testing, approves, and places materials orders	Project Manager Meter Shop
<b>Technical Implementation Manager</b>	Leads workshops on IT network configuration, integration planning, test planning	Provides input to workshops	Project Manager System Admin/ AMI Admin
<b>Field Service Rep</b>	Assist in training for site surveys	Participates in site surveys with Landis+Gyr Field Service Rep	Field Operations
<b>Training</b>	Conducts Command Center, Network Deployment	Attends Command Center, Network Deployment	Field Operations, Head End Operations
<b>Field Service Rep</b>	Conduct training for site surveys	Attend training for site surveys for entire deployment area	Field Operations
<b>Network Design Engineer</b>	Develops final design from site surveys	Confirms acceptance of the final design; orders additional hardware as needed	Project Manager

### 3.3 Execution and Control Stage

In the Execution and Control Phase, the PM actively manages and controls the project delivery according to the methods described in the Project Management Plans. Specifically, Landis+Gyr will ensure Command Center is installed and functional, that the network has been deployed effectively, and that endpoint installations are running smoothly. The key activities and deliverables for this stage follow.

TABLE 6.

EXECUTION AND CONTROL STAGE DELIVERABLES

Deliverables	Lead	Support
Hosted or On-Premise Command Center instance and initial login credentials	Landis+Gyr	Customer
System Commissioning of Command Center	Landis+Gyr	Customer
Commissioning of network equipment, electric endpoints and ensuring “Normal” status in Command Center	Landis+Gyr	Customer
Integration scope and plan, including: Documentation from integration workshop, including finalized integration scope, standard integration diagram, and sample test plan	Landis+Gyr	Customer
Integration implementation, including functional Command Center extracts and/or Multispeak/CIM web service calls	Landis+Gyr	Customer
Coordination of meter deliveries to align to Customer’s installation schedule	Landis+Gyr	Customer
Testing and acceptance of the system	Customer	Landis+Gyr

TABLE 7. EXECUTION AND CONTROL STAGE ACTIVITIES

Landis+Gyr Resource	Services Provided	Customer Responsibility	Customer Resource
<b>Technical Implementation Manager</b>	Supports Field Tools installation	Install Field Tools	System/AMI Admin
	Configures Command Center and assists Customer with security tokens and system keys	Conducts security token and system key process	
	Leads IT network configuration	Participates in IT network configuration	
	Implements standard integration to known file-based or via MultiSpeak webservice calls for CIS and MDMS	Implements any needed changes to CIS and MDMS	

Landis+Gyr Resource	Services Provided	Customer Responsibility	Customer Resource
	Assists in testing and acceptance of the system, resolves technical issues as they arise	Leads testing effort and identifies issues as they arise	
<b>Solution Architect</b>	Leads on premise Command Center installation and configuration (self-hosted only)	Assists in system access and procuring server specifications	System/AMI Admin
<b>Technical Implementation Manager, Field Service Rep, Deployment Manager</b>	Leads RF Network Commissioning for up to SAT Network Equipment <ul style="list-style-type: none"> <li>• Verifies network settings and communications</li> <li>• Ensures meter endpoints registration and function</li> <li>• Verifies network field installation</li> </ul>	Installs field infrastructure and devices prior to Commissioning <ul style="list-style-type: none"> <li>• Network and backhaul installation</li> <li>• Electric endpoints to provide basis for system commissioning</li> </ul>	Field Operations / AMI Admin
	Ensures endpoints are “Normal” and communicating in Command Center	Installs Electric endpoints	

### 3.4 Closeout Stage

In this final phase, the project is prepared for internal Landis+Gyr closure and Customer is transitioned to Landis+Gyr Customer Operations as specified in Customer agreement.

TABLE 8. CLOSEOUT STAGE DELIVERABLES

Deliverables	Lead	Support
The PM issues Customer Satisfaction Survey to Customer	Landis+Gyr	Customer

The PM conducts the Customer closeout meeting, seeking written approval from Customer Operations to make the transition	Landis+Gyr	Customer
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TABLE 9. EXECUTION AND CONTROL STAGE ACTIVITIES

Landis+Gyr Resource	Services Provided	Customer Responsibility	Customer Resource
Project Manager	Conducts closeout, transitions customer to service desk	Accepts project, attends transition meeting to service desk	Project Manager

## 4 Project Management

Our project implementation methodology is rooted in the principles of the internationally recognized Project Management Institute (PMI) Project Management Body of Knowledge (PMBOK). Landis+Gyr Project and Program Managers are PMI certified as Project Management Professionals (PMPs), meaning each project leader has been trained in project management best practices and certified as project management experts.

### 4.1 Initial Network Design

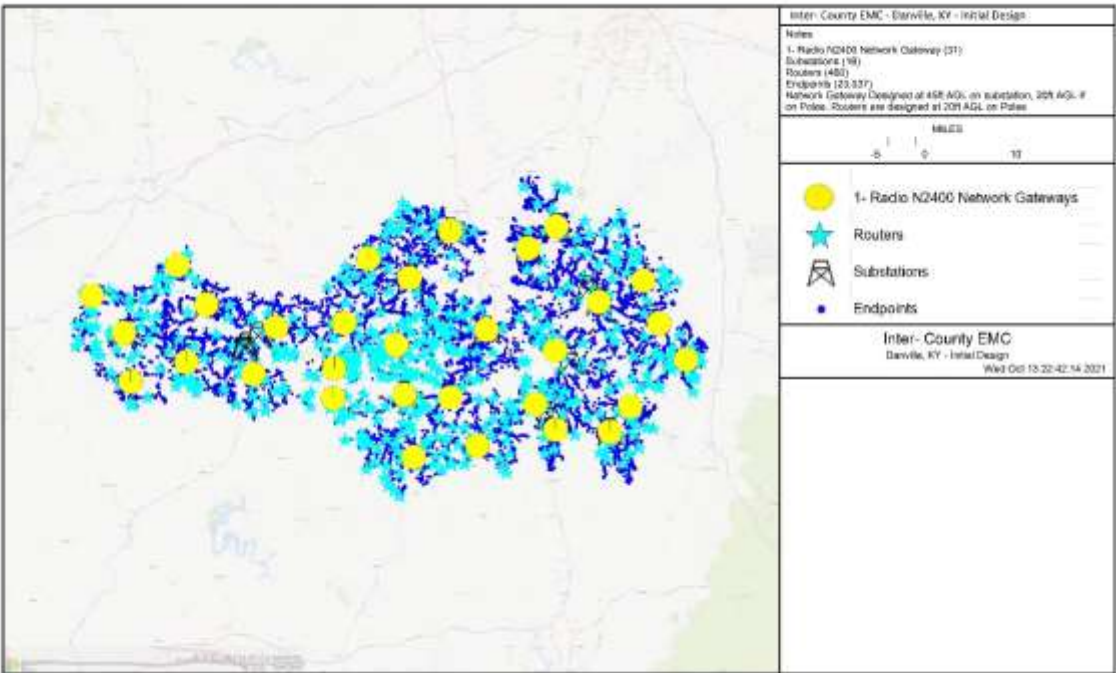


FIGURE 2 INITIAL NETWORK DESIGN

## 4.2 Resource Plan

The following tables outlines the expected resource requirements for Landis+Gyr and Customer by resource type:

TABLE 10. LANDIS+GYR RESOURCES

Resource Type	Responsibilities	Abbreviation
<b>Senior Project Manager</b>	Leads and manages project	PM
<b>Technical Implementation Manager</b>	Accountable for end-to-end implementation of technical solutions to meet customer requirements as well as consulting on technical domains including configuration, system performance monitoring, troubleshooting, defect resolution, and security	TIM
<b>Business Integration Analyst</b>	Leads detailed integration requirements session, provides standard APIs and specifications, provides best practices, and supports customer integration activities to facilitate integration with customer systems	BIA
<b>Solution Architect</b>	Provides overall strategic consulting on various existing and future technical solutions to solve customer business challenges Provides guidance for implementing all interconnected systems and the data flows between each system	SA

TABLE 11. PROPOSED CUSTOMER RESOURCES

Resource Type	Responsibilities	Abbreviation
<b>Project Manager</b>	Leads and manages project	PM
<b>Field Services Leads/Technicians</b>	Assist in network installation/surveys and troubleshooting backhaul issues. Additionally, Field Services will be responsible for analysis, coordination, and execution of maintenance activities relating to the RF Network (Two-way Network devices, Meters and Telecommunications) once the system is implemented.	Field Services
<b>Meter Shop Lead</b>	Representative for leading testing of meters before putting in field	Meter Shop
<b>System Administrator</b>	Effective provisioning, installation/configuration, operation, and maintenance of systems hardware and	System Admin

Resource Type	Responsibilities	Abbreviation
	software and related infrastructure. This individual ensures that system hardware, operating systems, software systems, and related procedures adhere to organizational values, enabling staff, volunteers, and Partners	
<b>Database Administrator</b>	Perform database administration (DBA) activities for the AMI environments; monitors the head end and analyzes data; resolves discrepancies; generates / builds reporting for end users	Database Admin

### 4.3 Remote or On-Site Support

The work defined within this agreement which will be provided by Landis+Gyr to Customer will be mutually agreed upon and could be remote or onsite support.

For remote support provided by Landis+Gyr, Customer must provide adequate remote access for delivery of services described in this statement of work. Landis+Gyr will coordinate with Customer to discuss level of access required and test connectivity within the Planning Stage of agreement.

### 4.4 Change Management Process

The Change Management Process is intended to set expectations on how the changes will be managed, what defines a change, the purpose and role of the change control board, and the overall change management process.

Depending on the extent and type of proposed changes, changes project documentation and the communication of these changes will be required to include any approved changes into the project plan and ensure all stakeholders are notified. Types of changes include:

- Scheduling Changes: changes which will impact the approved project schedule.
- Financial Changes: changes which will impact the approved project budget.
- Scope Changes: changes which are necessary and impact the project's scope which may be the result of unforeseen requirements not considered during the Planning Stage.

The Landis+Gyr Project Manager must ensure that any approved changes are communicated to the project stakeholders. Additionally, as changes are approved, the Project Manager must ensure that the changes are captured in the project documentation where necessary. These document updates must then be communicated to the project team and stakeholders as well.

#### 4.4.1 Change Process Steps

- 1) Identify a needed change; Change Requestor will submit written change request to the Landis+Gyr Project Manager



- 2) Project Manager logs change in Landis+Gyr Project and Portfolio Management Tool (Project and Portfolio Management System- Daptiv)
- 3) Perform project review and impact analysis- Landis+Gyr Project Manager evaluates the change conducting a preliminary analysis on the impact of the change to risk, budget, schedule, and scope and seeks clarification from team members and the change requestor. If the change is within the approval authority of the Project Manager, he provides disposition of the change. Otherwise, the Project Manager works with both Landis+Gyr Project Management office and Customer Project Manager with the preliminary analysis
- 4) Disposition of Change Request- Customer Project Manager and Landis+Gyr Project Manager will discuss the proposed change and decide whether it will be approved based on all submitted information.
- 5) Implementation of Approved Changes– If a change is approved by the Customer Project Manager and/or Customer Sponsor and applicable Landis+Gyr project leadership, the Project Manager will update and re-baseline project documentation as necessary. This includes SOW, Schedule and Pricing.

#### 4.4.2 Change Management Responsibilities

##### 4.4.2.1 *Landis+Gyr will:*

- Log all requests for change.
- Seek clarification from change requestors.
- Evaluate changes for risk, cost, schedule, and scope.
- Process requests for change at the Project level.
- Provide feedback change requestors.
- Document changes.

##### 4.4.2.2 *Customer will:*

- Request changes through Landis+Gyr.
- Seek clarification from change requestors.
- Support provision of contractual changes as needed to document changes prior to execution.
- Approve the change

# Training Plan

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## Training Objective

Training is essential for ensuring the customer's success during implementation of the Gridstream Solution. Our goal at Landis+Gyr is to provide a foundation of knowledge that will allow personnel to quickly and accurately understand how the system functions and take full advantage of the information provided. Modular, process-based training allows employees from all areas of the utility to understand their role in the Gridstream system and enables them to integrate it into their daily processes. Below are the recommended session agendas, each agenda can be customized to accommodate specific deployments.

## Required Training - AMI

Training includes introductory training on the Equipment and Head-End Systems software of the Gridstream solution. Training consists of two online, Landis+Gyr instructor led, Standard Security training sessions, as well as two (2) three (3) day classroom training sessions at client's location. Recommended class size is 12 people at a large appropriate classroom type setting and typical training days are Tuesday-Thursday, 8:30 AM to 4:30 PM with one (1) hour for lunch.

### RF Network Deployment Training Class

**Class Length:** 3 Days – Classroom training at a client's location (This training will be conducted after receipt of network equipment in conjunction with field services installation.)

- Gridstream Mesh System Overview
- Network Gateway Installation & Configuration
- Router Installation & Configuration
- TechStudio Software
- RadioShop Software

### Command Center Software Training Class

**Class Length:** 3 Days – Classroom training at a client's location (This training is scheduled based on planned meter deployment.)

- Setting up Command Center
- Deploying and managing collectors
- Deploying meters and routers
- Managing meters and routers
- Daily system monitoring
- Command Center reports
- Billing & Extract tools

## Responsibilities for On-site training event

### 1. Landis+Gyr-Provided Services:

- Landis+Gyr will provide an instructor certified in each area of instruction.
- Landis+Gyr is responsible for all of the instructor's travel and expenses incurred.
- The primary Utility contact will be provided with suggested outlines for class content. The Landis+Gyr instructor will work with this contact.
- Training manual/materials will be provided for each attendee.

### 2. Utility-provided Services:

#### • TRAINING ROOM REQUIREMENTS

- The customer (utility) will provide the following for each classroom training:
- A mutually agreed to conference room or other location conducive to classroom style training
- LCD projector
- Flip chart or White Board
- Meals for all attendees and trainers during training sessions

# Premium Support

Applying expertise, industry knowledge, and proven best practices to optimize your smart grid investments



## World-class support services to increase operational efficiency and ensure success

As your trusted partner, Landis+Gyr is completely committed to your success. Our goal is to build a long-term relationship with each of our customers, enabling us to apply our years of utility industry experience and solution expertise to optimize your implementation, whenever and wherever you need it.

Beginning at system acceptance, Premium Support provides a standard set of best-practice services for your Advanced Metering Infrastructure (AMI) and/or Meter Data Management System (MDMS) solutions. Premium Support services are customizable to meet your needs for a defined term as part of your business operations requirements. With Premium Support, your utility is assigned a designated expert, available from 7:00 a.m. - 7:00 p.m., who develops a deep knowledge of your systems and operational processes, supporting your specific solution with a focus on ongoing operations and consultation for maintenance. In this way, your designated Premium Support resource assists with analysis, reporting, and support of day-to-day tasks to improve operational efficiency.



With Premium Support, we coordinate issue resolution, system performance queries, after-hours maintenance support, and problem management, covering your:

- Head End System (HES) - Command Center
- HES Subsystem
- HES Infrastructure
- Field Area Network
- Meter Data Management System (MDMS)

Your Premium Support expert will also help you navigate ongoing developments in the Landis+Gyr solution set that may affect your implementation.



EXTEND THE VALUE  
OF YOUR GRID  
INVESTMENTS



LOWER OPERATIONAL  
COSTS AND COST  
AVOIDANCE



IMPROVE SPEED  
TO MARKET

# PREMIUM SUPPORT

## Premium Support includes:

- Designated technical expert(s)
- Performing initial troubleshooting with in-depth solution knowledge
- Performing initial risk assessment of solution when issues identified with adjacent systems
- Tracking of and routine updates on product issues/cases
- Assisting with configuration management and adjustments for refined business processes, new product releases, etc.
- Enhanced coordination and management of escalated issues with internal Landis+Gyr teams
- Recording and tracking the status of pending support issues/change requests
- Discount on purchase of additional Landis+Gyr service offerings\*
- Conducting regular operational review meetings with customer (including product roadmap discussions, release notes review, etc.)
- Support for planning of system enhancements, network/head end upgrades
- Customer-provided best practices (queries, processes, and procedures ) for your specific utility
- Assistance with firmware upgrades
- Leveraging lessons learned from other deployments to ensure smooth operations for your utility
- Monthly delivery of all updated/released Landis+Gyr documentation
- MDM System Health Check (if applicable) with a report of findings and recommended action

## Service expertise and solutions for the digitized utility industry

Landis+Gyr's comprehensive, integrated portfolio of services is designed to flexibly address evolving industry needs, as well as ensure maximum value from your technology investments. Our Professional Services portfolio provides services and expertise that:

- Extend the value of your grid investments
- Lower operational costs & cost avoidance
- Improve speed to market

### Professional Services

Implementation Services

Managed Services

Advanced Services

Within the Professional Services portfolio, Advanced Services provide unparalleled technical consulting and services to ensure reliability and performance of your operations. Advanced Services include Premium Support, Hyper Care Services, Network Monitoring, and Technology Consulting.

\*Contact your Landis+Gyr representative for more information

This information is provided on an "as is" basis and does not imply any kind of guarantee or warranty, express or implied. Changes may be made to this information.

## GET IN TOUCH

For more information and nationwide warranty terms, visit us at [landisgyr.com](http://landisgyr.com) or call at 888-390-5733.

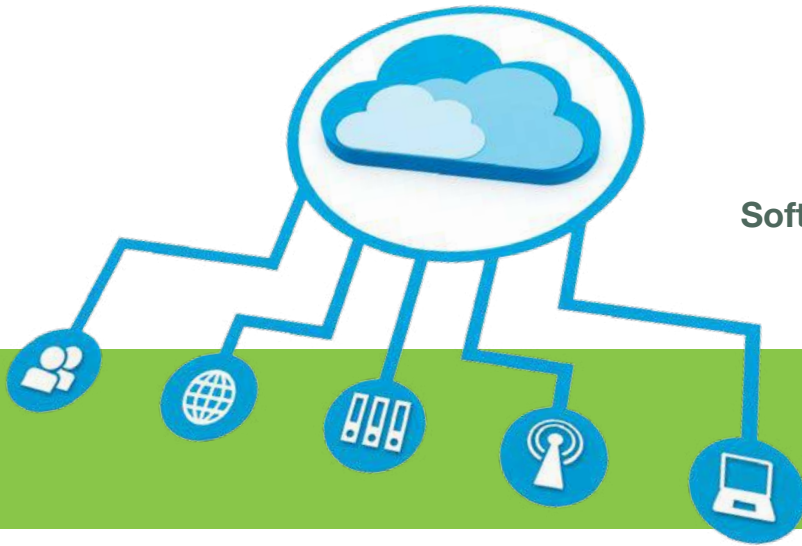


## LET'S BUILD A BRIGHTER FUTURE TOGETHER

Since 1896, Landis+Gyr has been a global leader of energy management solutions. We've provided more than 3,500 utility companies all over the world with the broadest portfolio of products and services in the industry. With a worldwide team of 1,300+ engineers and research professionals, as well as an ISO certification for quality and environmental processes, we are committed to improving energy efficiency, streamlining operations, and improving customer service for utility providers.

[landisgyr.com](http://landisgyr.com)

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## Cloud Services: Software as a Service



### Complementing Utility Expertise with Subscription-Based Outsourcing

#### Overview

Providing customers with exceptional service and managing day-to-day business activities can leave utilities little time to focus on smart grid operations. Now you can alleviate the issue of where to dedicate valuable internal resources by leveraging the expertise of Landis+Gyr for your AMI, MDM and Grid Management requirements.

Our Software as a Service (SaaS) solutions, tailored to your IT infrastructure and application needs, deliver flexibility to streamline deployment and boost customer satisfaction—all while minimizing risk, improving your bottom line and ensuring a future ready system.

#### SaaS Cloud Services

With the comprehensive Landis+Gyr SaaS model, the software license and the associated support and maintenance, are all included in the subscription fee. You pay only for the software functionality you require. Landis+Gyr manages the

underlying solution IT infrastructure including network, servers, operating systems, databases, storage and individual application capabilities. And, software access is always at your disposal.

The Landis+Gyr delivery team consists of domain experts with more than 20 years of experience managing software environments for utilities. By leveraging Landis+Gyr's proven and best in class services offering, utilities can start realizing benefits quickly.



#### FEATURES & BENEFITS:

*Why Landis+Gyr makes a difference.*

- **Reduced Costs:** Shift from Capex to Opex with Landis+Gyr management of IT infrastructure, software licensing and hardware refresh
- **Faster Stand-Up Time:** Fit-for-purpose = quicker realization of benefits
- **Reduced Complexity:** Focus on your core competency, not IT operational management
- **Financial Management:** Strategic partnerships bring you pre-integrated cost-management solutions
- **Standards Compliance and Security:** Landis+Gyr is responsible for all data center environment security and compliance

## Smart Grid Services: **Software as a Service**

As an alternative to a fully owned and operated model, Landis+Gyr Cloud offerings give you the flexibility to outsource portions of your system support and management to our subject matter experts.

	Description
<b>Software &amp; Software Support</b>	Applications software including AMI head end, MDMS and Grid Management
<b>Data Center</b>	Data Center Hosting
<b>System Resources</b>	Hardware, System Software, Database and Middleware Licenses and Storage assets required to operate the system
<b>Software Implementation</b>	Initial installation and configuration of the software applications in our data center per utility preferences and Landis+Gyr best practices
<b>IT Operations</b>	Daily technical operations, including monitoring and managing processes and resources
<b>IT Upgrades</b>	Upgrade and maintenance of the IT infrastructure
<b>Technical Support</b>	Database administration and technical support services
<b>Application Upgrades</b>	Installation and testing of product upgrades; Landis+Gyr validation
<b>Application Administration</b>	Apply customer-selected configurations; maintain access rights per customer direction
<b>Application Operations</b>	Daily business operations of the application – monitoring jobs; reporting; coordination of issues resolution and maintenance scheduling
<b>Designated Customer Liaison</b>	Program Management oversight services: semi-annual program reviews, escalation as required
<b>End User Training</b>	Provided initially onsite for new users and new features delivered remotely
<i>Add-On Services</i>	
<b>Disaster Recovery</b>	Back-up system at our Disaster Recovery facility for failover



**Streamlined Business Operations and Focus on Customer Satisfaction**

**Landis+Gyr and You: Working Together for Full Utility Optimization**

- + Proven and Trusted Partner**  
Utilities helped us define benchmarks and optimize the processes we use in our Services programs
- + Decades of hosting and AMI Experience and 100+ Years of Field Utility Services**  
Team proficient in managing and streamlining for timely implementation and cost savings
- + Standards-Driven and Interoperable Solutions**  
Reduce deployment risks and position for future integration requirements
- + Secure, State-of-the-Art Data Center**  
Standards compliance SSAE16 and ISO 9001, 14001 and 18001. ITIL certified staff
- + Optimized Asset Life Cycle**  
As technology evolves, we deliver solutions transition paths that leverage previous investments

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FAX: **678.258.1550**

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4.26.16

**Landis+Gyr**  
manage energy better

## Cloud Services: Data Center



### Secure and Extensible Smart Grid Delivery Platform

#### Overview

Landis+Gyr's Cloud Data Center helps ensure reliability and availability for mission critical applications. An end-to-end, certified delivery facility with built-in security, redundancy and disaster recovery measures, our data center delivers customers operational success.

The Landis+Gyr team focuses exclusively on Smart Grid Data and is driven by industry best practices. The data center's high availability architecture is key to providing utilities of all sizes the most cost effective service possible.

Our primary North America data center campus is located in Lenexa, Kansas. Here and throughout the U.S., all centers are configured to provide an elastic, accessible, secure and compliant platform for Landis+Gyr's cloud based solutions. Successfully serving over 250 customers for 20+ years, we continue to expand our services offered to meet the evolving demands of today's utility.

#### FEATURES & BENEFITS:

*Why Landis+Gyr makes a difference.*

- **99.9% Uptime Guaranteed:**  
Automated redundant systems ensure maximum uptime for mission critical systems
- **High Availability Architecture:**  
Flexible physical and virtual server farms support varied applications and database platforms backed by an on-site generator for power redundancy
- **Standards Driven:**  
ISO, ITIL and SSAE16 certified personnel and processes. Ongoing reviews ensure compliance to the latest standards
- **Secure Environment:**  
Preserving consistent operations with state-of-art cooling and fire suppression systems, and controlled facilities access with 24x7 monitoring
- **Proven and Trusted Partner:**  
20+ years of data center operation experience with utility-only customers helped define benchmarks and optimize processes for today's Landis+Gyr services





## Superior Data Center Facilities

### Campus Facilities and Access

All data centers are secure facilities. Employees and visitors are monitored 24/7/365 via on-site staff and digital surveillance. Key cards are required to access all internal and external doors.

### Power Distribution and Backup Power Supply

Power systems are fully redundant and have 99.9% guaranteed uptime availability. Should an outage occur, a generator and UPS provide an alternate power source and can run for 48 hours without intervention.

### Fire Detection and Suppression

In addition to VESDA smoke and high-temperature heat detectors and early warning fire detection, data centers are equipped with a fully monitored fire suppression system with zone specific discharge.

### Environmental Control

A full data-grade HVAC system with N+1 redundancy and cooling systems ensure the air flow, temperature and humidity levels are appropriate and consistent, maintaining the ambient air temperature at 72°F (+/-2 °) and humidity at 45% (+/-5%). The environment is equipped with a continuous monitoring and alerting system for temperature and humidity.

### Certifications

Landis+Gyr Data Centers undergo regularly scheduled audits to maintain the following certifications: SSAE16 (certified by KPMG), ISO 9001; 2000, 14001; 2004 and 18001; 2007.

### Staffing

Data center staff have earned ITIL certifications including, Foundations, Operations Support and Analysis (OSA) and Planning Protection and Optimization (PPO). Every day, without exception, the staff monitors access, systems and alerts to ensure a fully operational facility.

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## Technical Summary

### Internet Connectivity

Our fully redundant internet connection is carrier-neutral with dedicated, leased connections to multiple providers on a variety of physical paths.

### Network Architecture

Our network architecture provides maximum uptime with redundancy and rapid failover across the switching infrastructure. This minimizes unplanned service interruption and supports increasing network speed demands.

### Virus Control

All data centers utilize an enterprise level anti-virus system, deployed at the hypervisor level, resulting in immediate alerts upon any virus detection or removal. Pattern files are updated daily for immediate defense against targeted attacks and zero-day exploits.

### Security Firewall/Data Access

The secured environment exceeds industry standards for data and asset protection. Perimeter firewalls are logically placed between all Landis+Gyr field offices, customer installations and data center infrastructure. IPS/IDS appliances are strategically placed on all ingress interfaces, and all inspected traffic is collected and monitored 24x7. Landis+Gyr applications use secure interfaces for seamless data integration with other business applications, including CIS, OMS and analytics.

### Monitoring, Change Management and Support

Landis+Gyr's enterprise monitoring is a best-of-breed SNMP application environment tailored to monitor communication devices and applications. To proactively identify cascading impacts of proposed changes, all processes strictly adhere to ITIL-based change management policies

### Data protection, Backups and Disaster Recovery

In compliance with industry best-practices, primary data is stored on RAID-protected disks in a high availability, fault tolerant environment. Data is accessed via a secure VPN connection to both primary and disaster recovery sites. Backups are managed by via online and near-line solutions that provide multiple points from which to restore. Recovery options include cold and warm site designations. The data protection process is regularly audited and evaluated to ensure the most timely and efficient methods to protect every stage of the information lifecycle.

## MASTER PURCHASE, LICENSE AND SERVICES AGREEMENT

THIS MASTER PURCHASE, LICENSE AND SERVICES AGREEMENT is effective as of the last signature date below (“**Effective Date**”) and is between Legal Account Name, a Account Legal Entity Type (“**Customer**”) with principal offices located at Account Address1, Account Address2, and Landis+Gyr Technology, Inc., a Delaware corporation (“**Landis+Gyr**”) with principal place of business at 30000 Mill Creek Avenue, Suite 100, Alpharetta, GA 30022. Customer and Landis+Gyr are a “**Party**” and, or collectively, are the “**Parties**”.

**WHEREAS**, Customer desires to engage Landis+Gyr to perform Services and to provide Products to Customer for the provision of a Type of Solution solution as referenced in this Agreement for Customer’s deployment and implementation of the Advanced Metering Infrastructure (AMI) system.

**WHEREAS**, Landis+Gyr will supply to Customer the Products and perform the Services as set forth herein and as described in the attached Exhibit(s) to this Agreement.

**NOW THEREFORE**, for valuable consideration, the receipt and sufficiency of which are hereby acknowledged, and intending to be legally bound, the Parties agree as follows:

### 1. Definitions

The terms listed below are defined as follows:

- 1.1 “**Agreement**” means this Master Purchase, License and Services Agreement, including all exhibits and Statements of Work, which is by and between Customer and Landis+Gyr. In the event there are any conflicting provisions or requirements among the Agreement documents, the provision and requirements of the Agreement document shall be enforced in the following order of descending priority: (i) any amendment to this Agreement; (ii) the body of this Agreement; and (iii) any other document included as an Agreement document.
- 1.2 “**Collector**” means the Landis+Gyr two-way radio base station that transmits data between the Meters, Routers and the data center.
- 1.3 “**Customer Data**” means (i) any and all information related to the Customer’s customers, end user or consumers relating to electricity, natural gas and/or water consumption, load profile, billing history, or credit history that is or has been obtained or compiled by Customer in connection with supplying such services to that customer or group of customers (“**Personal Information**”) (regardless of the media in which it is contained) that may be disclosed to or accessed by Landis+Gyr at any time or to the Field Tools by Customer or its employees, agents, consultants, contractors, suppliers or customers in connection with Landis+Gyr’s performance of the Services; (ii) any and all Personal Information created, obtained, used or accessed by Landis+Gyr (or the Field Tools) in its performance of the Services, or derived from such information or materials; and (iii) all data and information of Customer, its employees or customers.
- 1.4 “**Deployed**” means Equipment, as applicable, that has been commissioned in the field and properly installed by the installation contractor, or Customer, and signed off by Customer as ready for use.
- 1.5 “**Documentation**” means any and all manuals, instructions, specifications and other documents and materials that Landis+Gyr provides or makes available to Customer in any medium and which

describe the functionality, components, features or requirements of the Software, including any one or more of installation, configuration, integration, operation, use, support or maintenance thereof.

- 1.6 “**Endpoint**” means a sensory-type device, e.g., electric meter, water meter, gas meter, DA device, load control switch, etc., that is equipped with an AMI communication module.
- 1.7 “**Equipment**” means Network Equipment, Endpoints, Load Control Equipment, and/or hardware that Customer purchases from Landis+Gyr.
- 1.8 “**Event of Bankruptcy**” means any of the following events or circumstances with respect to a Party:
- (a) That Party makes a general assignment for the benefit of creditors;
  - (b) That Party institutes proceedings to be adjudicated a voluntary bankrupt, or consent to the filing of a petition of bankruptcy against it;
  - (c) That Party is adjudicated by a court of competent jurisdiction as being bankrupt or insolvent;
  - (d) That Party seeks reorganization under any bankruptcy act, or consent to the filing of a petition seeking such reorganization; or
  - (e) That Party has a decree entered against it by a court of competent jurisdiction appointing a receiver, liquidator, trustee, or assignee in bankruptcy or in insolvency covering all or substantially all of such Party’s property or providing for the liquidation of such Party’s property or business affairs.
- 1.9 “**Field Tools**” means the Landis+Gyr proprietary field tools provided by Landis+Gyr hereunder, or which are obtained by Customer under this Agreement including Field Tools, RadioShop, Endpoint Test Manager and/or TechStudio for RF or their successors or replacements.
- 1.10 “**Firmware**” means software embedded in and provided with the Equipment.
- 1.11 “**Load Control Equipment**” means hardware that Customer purchases from Landis+Gyr hereunder, or which is obtained by Customer under this Agreement in connection with the Load Control Solution, including, but not limited to “Load Control Switches”.
- 1.12 “**Load Control Software**” means the “Gridstream Power Center Load Control Software”, or its successor or replacement.
- 1.13 “**Load Control Solution**” means the Gridstream Advanced Load Management Solution, a real-time, intelligent load management system communicating over the Landis+Gyr Gridstream RF mesh AMI network. The solution enables Customer to manage peak demand during high energy use to improve utility operations.
- 1.14 “**Network Equipment**” means the Collectors, Routers, and radios substation network equipment (Collectors and TCUS) that are or will be under this Master Agreement physically deployed in the Customer service territory. The term does not include the system backhaul, the network operations center, any system equipment that is not located in the Customer service territory, Meters, or any aspect or component of the system components that is not used by Customer.
- 1.15 “**Meter**” means a device that measures the supply of electricity, gas, or water provided by Customer to Customer’s consumer.

- 1.16 “**Products**” means Equipment, Firmware, Software, and/or any other items purchased or licensed from Landis+Gyr under this Agreement.
- 1.17 “**Purchase Order**” means a Customer order, including, without limitation, a purchase order offered by Customer, to purchase Products or Services from Landis+Gyr that Landis+Gyr accepts. Each Purchase Order will be deemed to include the terms and conditions of this Agreement.
- 1.18 “**RMA**” means return material authorization.
- 1.19 “**RMA Form**” means the form and process to return faulty Equipment that is still under warranty to Landis+Gyr under the return material authorization process.
- 1.20 “**Router**” means Landis+Gyr-furnished Network Equipment that provides intermediate communication and data processing between Endpoints and Collectors. Routers may also communicate with other Routers.
- 1.21 “**Services**” means project management services, training, project delivery services, commissioning services, load control services, and/or other services described in Exhibit A.
- 1.22 “**Software**” means computer application and programs, including Field Tools, Load Control Software, in any form that Customer licenses from Landis+Gyr, referenced in Exhibit A.
- 1.23 “**SOW**” means a Statement of Work signed by both Parties.
- 1.24 “**System**” means Equipment, Firmware, Field Tools and Software purchased hereunder and used by the Customer to monitor and manage its consumer’s usage of Customer offerings.
- 1.25 “**Third Party Products**” means, if any, goods and software that Customer purchases or sub-licenses from Landis+Gyr that are not manufactured or provided by Landis+Gyr that display the logo or copyright of another manufacturer, or that are not proprietary to Landis+Gyr.

## **2. Orders; Cancellations and Modifications**

- 2.1 Equipment Forecasts. Within thirty (30) days after the Effective Date of this Agreement, Customer shall supply to Landis+Gyr a written forecast of total anticipated Landis+Gyr Equipment needs by month. Any changes to the Equipment forecast should also be furnished to Landis+Gyr. Failure to provide an accurate forecast, within reason, may negate the stated Landis+Gyr equipment lead times and may adversely impact delivery of product to Customer (i.e. if a far greater amount of Equipment is ordered on a shorter timeline).
- 2.2 Written Orders. Customer may issue Purchase Orders to Landis+Gyr by mail, facsimile communication or electronic mail. Landis+Gyr may accept Customer’s Purchase Order by signing it, acknowledging it using facsimile or electronic mail, or by delivering the Products which Customer ordered. Customer’s Purchase Order will be accepted solely for purposes of establishing the items and quantities ordered and the desired shipment dates and shipment method. Customer’s desired shipment dates shall take into account Landis+Gyr’s current lead times at the time of the Purchase Order. Lead times will be provided to Customer by a Landis+Gyr representative and are defined as the cycle time from acknowledgement of Order to fulfillment of Order, assuming the Equipment was initially forecasted in accordance with Section 2.1. It is acknowledged by the parties that all instrument and documents issued or delivered by either Party pursuant to this Agreement, including all Purchase Orders, order acceptance, order acknowledgements, invoices and other instruments (“**Order Documents**”) shall incorporate the terms and conditions of this Agreement, irrespective of whether any such Order Document expressly references this Agreement,

and shall be subject to the terms and conditions contained in this Agreement. The Parties agree that any terms and conditions contained in an Order Document other than quantities, product and service description and other required details and shipping instructions, will not apply unless each Party has amended this Agreement.

2.3 Cancellation and Modifications. Customer may not cancel, modify, reduce or terminate for convenience an Equipment Order within sixteen (16) weeks of the scheduled delivery date. Notwithstanding the foregoing, cancellation charges do not apply to Software or Services Orders.

2.4 Equipment and Software Intellectual Property. Landis+Gyr retains ownership of all intellectual property rights in the Equipment, Firmware and Software. Customer agrees that Customer shall not, and that Customer shall not allow any third party, to attempt to reverse engineer, de-compile, or disassemble the Equipment Firmware or the Software or otherwise discover the trade secrets in the Firmware for any reason.

### **3. Shipment**

3.1 Shipments. Landis+Gyr will ship or deliver Equipment to Customer's warehouse or other location designated by Customer. All Equipment will be shipped to Customer DAP (Delivery At Place) in full truckload shipments in accordance with INCOTERMS 2020; additional charges may apply if actual shipment is less than a truckload to the extent applicable. Customer agrees to inspect Equipment within one (1) week of receipt and to promptly notify Landis+Gyr of any known or visible defects. After expiration of such inspection period, Customer shall be precluded from rejecting any Equipment based on a visible defect. Customer will be deemed to have accepted the Equipment unless Customer notifies Landis+Gyr within one (1) week after receipt of the Equipment that the Equipment is rejected. The acceptance of any Equipment by Customer shall not preclude the subsequent removal thereof if such Equipment shall be found to be operationally defective after installation; in such event, the Agreement's warranty terms shall apply.

### **4. Prices and Taxes**

4.1 Prices. If the ordered Product is described on Exhibit A hereto, the Purchase Order will state the applicable price set forth thereon. If the Purchase Order does not state a Product price or is for a Product not set forth on Exhibit A, the price will be Landis+Gyr's then-current price for such item at such quantity, for such item, which Landis+Gyr shall confirm in writing to Customer and offer Customer the right to confirm or cancel the order. Landis+Gyr shall honor all pricing made at the time of an accepted Purchase Order. Unless Landis+Gyr has offered guaranteed pricing for a particular period of time (e.g., as provided in Section 4.2), Landis+Gyr may increase Customer's price for items from time to time; provided that no price increase of any kind will be valid or effective unless and until Landis+Gyr provides Customer with at least one hundred twenty (120) days advanced written notice of the proposed price increase. Prior to the conclusion of the one hundred twenty (120) day period, Customer may submit one or more Purchase Orders under the previous pricing. Landis+Gyr shall notify Customer of the price increase, and Customer shall have the option of cancelling or otherwise modifying its order, without penalty. Also, price increases for Services or Software licensed for a periodic fee will apply to subsequent billing periods. The above notwithstanding, set forth in Exhibit A are unit prices for Products contemplated in the event Customer expands its system.

4.2 Price Adjustment for Pricing in Exhibit A. Pricing by Landis+Gyr set forth in Exhibit A will remain firm for two (2) years from the Effective Date. Following year two (2), pricing set forth in the pricing table in Exhibit A shall be subject to an annual increase equal to the percentage annual adjustment in the CPI. The CPI will be obtained from U.S. Bureau of Labor Statistics

([www.bls.gov/cpi](http://www.bls.gov/cpi)) and is designated as of the June-to-June twelve-month percentage change to the Consumer Price Index – Urban Wage Earners and Clerical Workers, Not seasonally adjusted.

- 4.3 Taxes and Other Charges. Unless otherwise stated herein, Product and Services prices include shipment but does not include installation charges, charges associated with preparing the Customer site; and all taxes that relate to Customer's acquisition or use of Products and Services, including sales, use, VAT and property (ad valorem) taxes, other governmental charges and taxes, and assessments after audit. Customer agrees to pay those charges and taxes, except for taxes based on Landis+Gyr's net income. If Customer qualifies for tax exemptions, Customer must provide Landis+Gyr with appropriate exemption documentation. Without limiting the foregoing, Customer shall have the right to receive any Software or Documentation to be provided hereunder solely in electronic form.

## **5. Invoice and Payment**

- 5.1 Invoice and Payment. Landis+Gyr will issue invoices to Customer for all amounts owed to Landis+Gyr hereunder in accordance with the Agreement. Invoices will be issued (i) for Equipment, upon shipment of the Equipment, (ii) for Services, 50% upon contract execution and the remaining 50% upon completion of the Services; and (iii) for Software license fees, in advance of delivery. Payment is due within thirty (30) days of the invoice date. Late payments will be subject to interest from the due date at the lesser of one percent (1%) per month or the maximum rate allowed by law.

## **6. Software**

- 6.1 Firmware License. The Firmware is licensed to Customer, not sold. Customer is granted a perpetual, non-transferable, non-exclusive license to use the Firmware solely in connection with Customer's use of the Equipment for use solely with Gridstream communication network. Customer understands and agrees that it is not permitted to distribute the Firmware in any form, or to use the Firmware except as it is embedded in the Equipment.
- 6.2 License to Software. Landis+Gyr hereby grants to Customer a non-exclusive, non-sublicensable, non-transferable, limited license to install, execute and otherwise use the Software in object code form only in the Customer service territory pursuant to the terms of this license. Landis+Gyr hereby licenses the use of Software solely for use in conjunction with the Equipment. Customer agrees that Customer shall not, and shall not allow any third party to (i) attempt to reverse engineer, de-compile, or disassemble the Software or Firmware or otherwise discover the trade secrets in the Software for any reason, (ii) make alterations to, or modifications of the Software or Firmware, in whole or part, or (iii) combine the Software or Firmware, or any part of it with, or incorporate it in, any other programs without express permission from Landis+Gyr (provided that nothing is intended to prevent Customer to integrate the Software into its computer network or modify Customer configurable Software settings). Customer agrees not to copy Software or Firmware without express written authorization from Landis+Gyr, except that Customer may copy the Software or Firmware as required for backup, archival, testing, training and/or other similar purposes. Customer must reproduce and include the copyright notices on any such copies. Customer's employees, consultants and contractors (if any) shall be deemed authorized users of the Software and Firmware provided that each such employee, consultant and/or contractor has agreed to comply with the terms hereof, and further provided that Customer remains liable for any breach of the terms of the license by such employee(s), consultant(s) or contractor(s).
- 6.3 Intellectual Property Rights. All proprietary and intellectual property rights in and to the Firmware and Software provided hereunder are owned by Landis+Gyr (or its third party licensors) and

Landis+Gyr (and/or its third party licensors) retains title to the original Firmware and Software provided to Customer and any copies made from it.

- 6.4 Software Support and Maintenance Support. Upon payment of the applicable fees, Landis+Gyr will provide the Software support and maintenance services set forth in the separate Software Support and Maintenance Agreement (the “**Support Agreement**”).
- 6.5 System Security. Customer acknowledges that Software may be accessible from the Internet if configured to do so by Customer. Customer is responsible for establishing system security that will allow only authorized users to access the Software.
- 6.6 Customer Responsibilities relating to Software. Except to the extent that Customer purchases Support and/or Maintenance services, Customer is responsible for, including but not limited to: (i) performing all system administration activities, reports and APIs utilizing the functionality built into the Software (if licensed) and loading it into Customer’s systems, (ii) performing any exception processing that is associated with endpoints that do not have billing data available for a particular billing cycle window; (iii) purchasing, installing and physically maintaining all software System network communications infrastructure; (iv) purchasing, installing, configuring and maintaining all IT hardware needed to operate Software (if licensed) and related applications, (v) administering all Software logins and passwords for its personnel; (vi) handling all support for its own end-use consumers, including, without limitation, any matters relating to end-use consumer billing and utility usage; (vii) performing database administration such that database tables are archived/truncated to store no more than 90 days of data on-line at all times, (viii) installing and maintaining all Third Party Products and third party services, (ix) granting secure remote access to Software to authorized Landis+Gyr personnel if Customer hosts the Software, (x) allowing Landis+Gyr to run a read-only script on Customer’s Software to collect key performance metrics to help monitor and troubleshoot issues, (xi) providing help desk support to Customer’s own employees as well as assessing skill deficiencies and readdressing training with Customer’s own employees, (xii) reporting incidents to Landis+Gyr promptly upon Customer being aware of such incidents, (xiii) assigning appropriate priority to incidents, action items, and service requests, and (xiv) notifying Landis+Gyr prior to any scheduled downtime (performed by Customer) on any Customer systems that could impact services provided by Landis+Gyr.

## 7. **Services**

- 7.1 Services. Landis+Gyr will provide the Services as set forth in Exhibit A and as may be stated in a separate Statement of Work. Exhibit A sets forth the description of the Services, pricing, duration and any other terms specific to the Services described therein. To the extent Customer purchases software maintenance support, Landis+Gyr will provide the Maintenance Services set forth in the separate Maintenance Agreement. To the extent Customer purchases Software support, Landis+Gyr will provide the Support Services set forth in the separate Support Agreement.

## 8. **Limited Warranties**

- 8.1 Equipment Limited Warranty. Landis+Gyr represents and warrants that the Equipment, including Firmware will, when sold to Customer and during its applicable warranty period, (a) be new, (b) conform in all material respects with its specifications, (c) be free from all liens, claims and encumbrances and (d) not fail when Deployed in the field as a result of a material defect, provided that the warranty is contingent upon such Equipment being returned based upon the Return Materials Authorization (RMA) process. Units returned under warranty via an RMA to the designated Landis+Gyr facility will be repaired or replaced by Landis+Gyr and then returned to Customer as set forth in Section 8.2 below. The warranty period shall be calculated from date of

shipment as follows: (i) for Tech Studio Communication Adapter, six (6) months, (ii) for RF Thermostats, 12 months and (iii) for all other Equipment, 18 months.

## 8.2 RMA Process.

8.2.1 Upon the occurrence of a breach of warranty, Customer may contact Landis+Gyr's customer support and request an RMA Form. After an RMA is issued, Landis+Gyr will provide Customer with shipping instructions, via email, for the warranted Equipment. Customer will remove and ship to Landis+Gyr, at Customer's expense, any such defective Equipment. Landis+Gyr shall repair or replace, at Landis+Gyr's option and expense, (and as Customer's sole and exclusive remedy for breach of any equipment warranty) the defective Equipment within ninety (90) days of receipt of such returned Equipment. Landis+Gyr shall ship the repaired or replaced warranted Equipment back to Customer, at Landis+Gyr's expense. Customer will reinstall the repaired or replaced warranted Equipment, at Customer's expense.

8.2.2 For any Equipment that is not under warranty, Landis+Gyr will at Customer's direction, (i) attempt repairs, upon Customer's written request, based on Landis+Gyr current prevailing rates or (ii) ship the non-warranted Equipment back to the Customer, at Customer's expense, or (iii) dispose of the Equipment.

8.2.3 Any repaired or replaced Equipment shall be warranted as set forth in this Section for a period equal to the greater of (i) the balance of the applicable warranty period relating to such Equipment or (ii) six (6) months from the shipment date to Customer.

8.2.4 If more than three percent (3%) of Meters returned by Customer for the prior twelve (12) month period have no defect ("**Non-Defective Equipment**"), then Customer will pay twenty-five dollars (\$25.00) per Meter (subject to a CPI increase) above that three percent (3%) threshold to cover Landis+Gyr's costs of handling and testing the Non-Defective Equipment.

8.2.5 ALL CLAIMS FOR BREACH OF WARRANTY MUST BE RECEIVED BY LANDIS+GYR NO LATER THAN THIRTY (30) DAYS AFTER THE EXPIRATION OF THE WARRANTY PERIOD.

8.3 Software Limited Warranty and Software Remedy. Landis+Gyr warrants that all Software will materially comply with its specifications, Documentation and functional requirements for a period of thirty (30) days from delivery ("**Software Warranty Period**"). As sole remedy for defective Software, Landis+Gyr will use commercially reasonable efforts to promptly remedy the performance associated with the Software within forty-five (45) days after written notice from Customer, unless such notice period is otherwise mutually extended. The limited warranties set forth in this Section 8.3 apply only if Customer: (a) notifies Landis+Gyr in writing of the warranty breach before the expiration of the Software Warranty Period or can otherwise substantiate a breach of warranty occurred during the Software Warranty Period, provided that notice is received by Landis+Gyr within thirty (30) days following the expiration of the Software Warranty Period; (b) has promptly installed all maintenance releases to the Software that Landis+Gyr previously made available to Customer at no cost (provided that such maintenance release actually prevents, corrects or mitigates the problem the Customer has encountered); and (c) as of the date of notification, is in compliance with all terms and conditions of this Agreement (including the payment of all license fees then due and owing).



- 8.4 Services Warranty and Services Remedy. Landis+Gyr warrants that it (a) will provide Services using skilled personnel, with all requisite experience and qualifications and in a professional and workmanlike manner in accordance with the industry best practices for similar services and (b) shall devote adequate resources to fulfill its obligations under this Agreement. The Services warranty period shall be ninety (90) days after completing a service except in the cases of installation services when applicable which shall be twelve (12) months from the date of installation. In the event of a breach of this warranty, Landis+Gyr shall re-perform the Services in a manner consistent with this warranty and cure such breach without undue delay but in no event within thirty (30) days after written notice.
- 8.5 Warranty Limitations and Exclusions. Landis+Gyr's warranty obligations with respect to the Equipment, Firmware and Software comprising the System do not apply to the extent a failure or warranty non-conformity is caused by: third party software or hardware, Customer's or a third party's infrastructure or data; Customer's or a third party's misuse of the equipment or software comprising the System; installation by Customer or a third party not in compliance with training or manuals provided by Landis+Gyr; operation, maintenance or use by Customer or third parties not in compliance with applicable training, manuals or specifications provided by Landis+Gyr; Customer's or a third party's neglect, modification, accident, vandalism or other intentional damage; exposure to adverse conditions exceeding performance levels required by applicable specifications; or any other limitation or exclusion described herein; data provided by Customer.
- 8.6 DISCLAIMER. OTHER THAN THE EXPRESS WARRANTIES SET FORTH IN THIS AGREEMENT, LANDIS+GYR MAKES NO REPRESENTATIONS OR IMPLIED WARRANTIES TO CUSTOMER WITH RESPECT TO ANY EQUIPMENT, NETWORK EQUIPMENT, FIELD TOOLS, SOFTWARE, FIRMWARE AND/OR SERVICES PROVIDED UNDER THIS AGREEMENT, INCLUDING WITHOUT LIMITATION, ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, INFRINGEMENT OR WARRANTIES THAT MAY BE IMPLIED BY TRADE USAGE OR CUSTOM.
- 8.7 Third Party Products. The warranties provided by Landis+Gyr do not extend to third party products that are manufactured by a third party. For avoidance of doubt, Landis+Gyr makes no representations or warranties with respect to any third party product. Landis+Gyr will assign to Customer the warranties provided by such third party to the extent they are assignable.
- 8.8 Exclusive Remedies. Each Party's rights and remedies set forth in this Section are exclusive and in lieu of all other rights and remedies with respect to breaches of warranties.
- 9. General Indemnity; Infringement Indemnity**
- 9.1 General Indemnity. Each Party (the "**Indemnifying Party**") will indemnify and defend the other Party and its officers, directors, shareholders, agents, employees, and representatives (collectively, the "**Indemnified Party**") from all third party claims, and related liabilities, fines, interest, costs, expenses and damages (including reasonable attorneys' fees) incurred by the Indemnified Party (collectively, the "**Indemnified Losses**"), for any property damage, injury, death, loss or destruction of any kind to persons or property, to the extent the damage, injury, death, loss or destruction arises out of or is related to the gross negligence, willful misconduct or misrepresentation on the part of the Indemnifying Party or any of its officers, representatives, agents, employees or contractors.
- 9.2 Infringement Indemnity by Landis+Gyr. Landis+Gyr agrees to indemnify and defend Customer and its officers, directors, shareholders, agents, employees, and representatives from and against any Indemnified Losses resulting from a third party claim alleging that any Products or any

resulting use of the Products constitutes an infringement of any United States patent or copyright or misappropriation of any trademark or trade secret, or constitutes a breach of any intellectual property right of any third party (an “**Infringement Claim**”).

9.3 Remedies for an Infringement Claim. If the sale or use of any of the Products is enjoined in connection with any such Infringement Claim, Landis+Gyr agrees to, at its option, without cost or expense to Customer:

- (a) procure for Customer and its end users the right to use such Products and Services at no cost to Customer and its end users;
- (b) replace such Products with equivalent non-infringing products that perform the same or materially same function as the Products being replaced; or
- (c) modify such Products so they become non-infringing provided that such modification does not render such Products unacceptable to Customer.

Notwithstanding the foregoing, Landis+Gyr will have no liability under this Section or otherwise for any Infringement Claim to the extent such a claim is caused by (i) the misuse or unapproved modification of the Products or Services by or at the direction of Customer (ii) the failure of Customer to use corrections or enhancements made available to Customer at no cost to Customer, where such corrections or enhancements would have remedied such Infringement Claim or (iii) use of the Products in combination with other equipment or software not provided by Landis+Gyr but only to the extent such claim is attributable to the combination or other equipment or software and if such claim would have been avoided but for such combined use. Customer will consult with Landis+Gyr, as the subject matter expert in this space, before making any unilateral change(s) to the operating environment (such as Microsoft). If Landis+Gyr notifies Customer that making the proposed change(s) would likely lead to an Infringement Claim and Customer moves forward with those changes despite Landis+Gyr’s advisement, then Landis+Gyr will have no liability pursuant to this Section or otherwise for any resulting Infringement Claim. Excluding the indemnity obligation owed by Landis+Gyr to Customer, this Section 9.3 sets forth the entire liability of Landis+Gyr with respect to an Infringement Claim.

9.4 Indemnification Procedures. The Party seeking indemnification will promptly notify the Indemnifying Party in writing of any Claims for which such Party seeks indemnification pursuant to this Section 9 and cooperate with the Indemnifying Party at the Indemnifying Party's sole cost and expense. The Indemnifying Party will immediately take control of the defense and investigation of such Claim and will employ counsel reasonably acceptable to the other Party to handle and defend the same, at the Indemnifying Party's sole cost and expense. The Indemnifying Party will not settle any Claim on any terms or in any manner that adversely affects the rights of the other Party or any Indemnitee without the other Party's prior written consent, which will not be unreasonably withheld or delayed. The other Party and any Indemnitee may participate in and observe the proceedings at its own cost and expense with counsel of its own choosing. A Party's failure to perform any obligations under this Section 9.4 will not relieve the Indemnifying Party of its obligations herein except to the extent that the Indemnifying Party can demonstrate that it has been prejudiced as a result of such failure.

9.5 Exceptions and Limitations on Indemnification. Notwithstanding anything to the contrary in this Agreement, the Indemnifying Party is not obligated to indemnify or defend Indemnified Party against any claim (whether direct or indirect) if such claim or corresponding Indemnified Losses arise out of or result from Indemnified Party's:

- (a) gross negligence or more culpable act or omission (including recklessness or willful misconduct); or

- (b) use of the Products in any manner that does not materially conform with the usage guidelines or specifications provided by Landis+Gyr to Customer.

**10. Term; Termination**

- 10.1 Term. This Agreement shall become effective on the Effective Date and continue in full force and effect for three (3) years unless sooner terminated in accordance with the provisions hereof. Thereafter, the term shall renew on a year to year basis unless either Party receives written notice from the other of the other Party's intent to terminate the Agreement upon the expiration of the then current one (1) year term. Such notice shall be delivered no later than sixty (60) days prior to the expiration of the then current one (1) year term.
- 10.2 Right to Terminate. Prior to the expiration of the initial three (3) year term, either Party may terminate this Agreement upon sixty (60) days prior written notice to the other Party for failure of such Party to fulfill any of its material obligations hereunder. In the event that the breaching Party corrects the breach within the sixty (60) day period, this Agreement shall continue in full force and effect as it would have had such breach not occurred. Failure to perform due to a force majeure shall not be considered a substantial or material default under this Agreement. A Party hereto may, at its option, terminate this Agreement upon an Event of Bankruptcy of the other Party.
- 10.3 Effect of Termination. The expiration or termination of this Agreement, for any reason, shall not release either Party from any liability to the other Party, including any payment obligation that has already accrued hereunder. If Customer shall terminate this Agreement other than for reasons of a default by Landis+Gyr, Customer shall upon such expiration or termination, within 30 days, at Landis+Gyr's option and at Customer's expense, return to Landis+Gyr or destroy all materials containing Landis+Gyr's Confidential Information.
- 10.4 Survival. The provisions of Sections 1, 6 through 10, and 12 through 15 shall survive the expiration or earlier termination of this Agreement for any reason, provided that with respect to Section 13, each Party's obligations under this Section 10.4, shall survive the expiration or earlier termination of this Agreement for a period of five (5) years from the date of such expiration or termination, except for Confidential Information that constitutes a trade secret under any applicable law, in which case, such obligations shall survive for as long as such Confidential Information remains a trade secret under such law.

**11. Change Management Process**

- 11.1 Change Management. If changes are requested by either Party following the Effective Date, the requesting Party shall provide a request to the other Party's Project Manager or other designated staff in writing. The other Party will analyze the impact and inform the other Party's Project Manager of any impacts to cost, schedule, and other implications to perform the change. If both parties approve of the written change, accepted Change Requests will be deemed amendments to this Agreement and are incorporated into this Agreement by reference. Execution of the requested work cannot begin until both parties have accepted the change order in writing.

**12. Governing Law; Submission to Jurisdiction**

- 12.1 Governing Law; Submission to Jurisdiction.
  - (a) This Agreement and all related documents, and all matters arising out of or relating to this Agreement, are governed by, and construed in accordance with, the laws of the State of Georgia, without regard to Georgia's conflict of laws principles. The Uniform Computer Information Transactions Act does not have any application to this Agreement.

(b) Any legal suit, action or proceeding arising out of or related to this Agreement or the licenses granted hereunder will be instituted exclusively in the federal courts of the United States or the courts of the State of Georgia in each case located in Fulton County, and each Party irrevocably submits to the exclusive jurisdiction of such courts in any such suit, action or proceeding. Service of process, summons, notice or other document by mail to such Party's address set forth herein will be effective service of process for any suit, action or other proceeding brought in any such court.

12.2 Waiver of Jury Trial. Each Party irrevocably and unconditionally waives any right it may have to a trial by jury in respect of any legal action arising out of or relating to this Agreement or the transactions contemplated hereby.

### 13. Confidentiality

13.1 Confidential Information. From time to time during the Term of this Agreement, either Party (as the “**Disclosing Party**”) may disclose or make available to the other Party (as the “**Receiving Party**”) non-public, proprietary, confidential information about its business affairs, products, services, confidential intellectual property, trade secrets, third party confidential information and other sensitive or proprietary information in oral, written, electronic or other intangible form marked or indicated as “**Confidential**” or “**Proprietary**” at the time of disclosure (collectively, “**Confidential Information**”). Confidential Information, however, shall not include: (a) Information which is already generally available to the public; (b) Information which hereafter becomes generally available to the public, except as a result of the direct or indirect action of the Receiving Party in breach of this Agreement; (c) Information known to the Receiving Party or its Representatives on a non-confidential basis prior to receipt by the Disclosing Party; (d) Information that is independently developed without access to or use of the Disclosing Party's Confidential Information; and (e) Information disclosed under legal compulsion; provided, however, that prior to a disclosure pursuant to an order or applicable law, the Receiving Party, to the extent permitted by law, promptly provides the other Party written notice of such proposed disclosure and reasonably cooperates with the other Party in its attempts to limit or prevent such disclosure. The Receiving Party shall use the Confidential Information solely for the performance of this Agreement and shall not disclose or permit access to Confidential Information other than to its Affiliates and its or their employees, officers, directors, attorneys, accountants and financial advisors (including insurers) (collectively, “**Representatives**”) who: (a) need to know such Confidential Information for the performance of this Agreement; (b) know of the existence and terms of this Agreement and (c) are bound by confidentiality obligations no less protective of the Confidential Information than the terms contained herein. These non-disclosure obligations shall survive the termination of this Agreement and shall continue for a period of five (5) years thereafter, except for Confidential Information that constitutes a trade secret under any applicable law, in which case, such obligations shall survive for as long as such Confidential Information remains a trade secret under such law. Information need not be marked “Confidential” to be considered Confidential Information. “Confidential Information” includes any Confidential Information disclosed prior to the effective date of this Agreement.

13.2 Safeguarding Confidential Information. The Receiving Party shall safeguard the Confidential Information from unauthorized use, access or disclosure using at least the degree of care it uses to protect its most sensitive information and no less than a reasonable degree of care. The Receiving Party shall promptly notify Disclosing Party of any unauthorized use or disclosure of Confidential Information and take all reasonable steps to cooperate with Disclosing Party to prevent further use or disclosure. The Receiving Party will be responsible for any breach of this Agreement caused by its Representatives.

- 13.3 No Rights in Confidential Information. Customer and Landis+Gyr hereby acknowledge and agree that all Confidential Information of the other Party shall remain the sole and exclusive property of such other Party and that the Receiving Party shall have no proprietary rights, title or interests therein except as otherwise provided in this Agreement.
- 13.4 Termination. Upon termination for any reason, or at any other time that Customer or Landis+Gyr demands, the other Party shall promptly deliver and/or certify destruction of Confidential Information, as appropriate, to the requesting Party all Confidential Information (copies and originals) of the requesting Party as may be in the other Party's possession or under its control, provided that nothing in this paragraph is intended to obligate a Party to delete electronic information that is stored on back-ups, provided that the Party's confidentiality obligations shall continue uninterrupted for as long as the Party retains such back-ups.
- 13.5 Injunctive Relief. The Parties agree that the actual, attempted, or threatened violation of this Section 13 will cause irreparable harm and that either Party may seek any injunctive or equitable relief appropriate in such circumstances. These remedies are in addition to any other remedies at law or in equity. The prevailing Party shall be entitled to its reasonable attorneys' fees and court costs.

#### **14. Limits of Liability**

- 14.1 EXCLUSION OF INDIRECT DAMAGES. EXCEPT WITH RESPECT TO (A) A BREACH OF CONFIDENTIALITY OBLIGATIONS, (B) PERSONAL INJURY OR DEATH OR DAMAGE TO ANY REAL OR TANGIBLE PERSONAL PROPERTY CAUSED BY EITHER PARTY'S GROSS NEGLIGENT ACTS OR OMISSIONS OR WILLFUL MISCONDUCT, IN NO EVENT SHALL EITHER PARTY BE RESPONSIBLE FOR ANY LOSSES OR DAMAGES THAT ARE INDIRECT, CONSEQUENTIAL OR PUNITIVE, INCLUDING, LOSS OF REVENUE, LOSS OF PROFITS, OR LOSS OF BUSINESS OPPORTUNITY.
- 14.2 CAP ON DIRECT DAMAGES. EXCEPT WITH RESPECT TO (A) A BREACH OF CONFIDENTIALITY OBLIGATIONS, (B) OBLIGATIONS UNDER THIS AGREEMENT RELATED TO INTELLECTUAL PROPERTY RIGHTS INFRINGEMENT, (C) PERSONAL INJURY OR DEATH OR DAMAGE TO ANY REAL OR TANGIBLE PERSONAL PROPERTY CAUSED BY EITHER PARTY'S GROSSLY NEGLIGENT ACTS OR OMISSIONS OR WILLFUL MISCONDUCT, THE TOTAL LIABILITY OF EITHER PARTY IN RESPECT OF ALL CLAIMS IN THE AGGREGATE, REGARDLESS OF WHETHER SUCH LIABILITY IS BASED ON BREACH OF CONTRACT, TORT, STRICT LIABILITY, BREACH OF WARRANTIES, FAILURE OF ESSENTIAL PURPOSE OR OTHERWISE, UNDER THIS AGREEMENT SHALL BE LIMITED TO ALL SUMS PAID BY CUSTOMER TO LANDIS+GYR DURING THE TWELVE (12) MONTH PERIOD PRECEDING THE EVENT GIVING RISE TO THE CLAIM.

#### **15. General**

- 15.1 Complete Agreement, Modification and Assignment. The parties agree that this Agreement and any ancillary agreements, exhibits or schedules constitutes the complete and exclusive agreement between them with respect to its subject matter and supersedes all previous understandings, negotiations, proposals, acknowledgements, and representations, whether oral or written with respect thereto. No modification of this Agreement will be effective unless it is in writing and signed by authorized representatives of Customer and Landis+Gyr. Customer may not assign this Agreement, a Purchase Order, or its rights or obligations under them without the express written consent of Landis+Gyr which shall not be unreasonably withheld. Any exhibit attached hereto is incorporated herein by this reference.

15.2 Notices. Notices, other than routine communications having no legal effect, shall be in writing and shall be sent by certified United States mail (return receipt requested), by guaranteed overnight delivery, by courier, or by confirmed facsimile addressed to the addresses set forth below:

For Customer:           Legal Account Name  
                                  Account Address1  
                                  Account Address2  
                                  Attn: Legal Contact  
                                  Facsimile No: Fax Number

For Landis+Gyr:        Landis+Gyr Technology, Inc.  
                                  30000 Mill Creek Avenue, Suite 100  
                                  Alpharetta, GA 30022  
                                  Attn: Legal Department  
                                  Facsimile No: 678.258.1686

Notices sent in accordance with this Section 15.2 will be deemed effectively given: (a) when received, if delivered by hand (with written confirmation of receipt); (b) when received, if sent by a nationally recognized overnight courier (receipt requested); (c) on the date sent by facsimile with confirmation of transmission, if sent during normal business hours of the recipient, and on the next business day, if sent after normal business hours of the recipient; or (d) on the fifth (5th) day after the date mailed, by certified or registered mail, return receipt requested, postage prepaid and properly addressed.

15.3 Force Majeure. Except for payment obligations, neither Party is liable for failing to fulfill its obligations due to acts of God, civil or military authority, war, riots, strikes, fire, or other causes beyond its reasonable control. To the extent a Party is substantially delayed by force majeure from performing its obligations hereunder, such Party shall give notice and details of the force majeure to the other Party as soon as practicable, then the parties may extend the time for performance by written agreement. In the event it shall become impossible for Landis+Gyr or Customer to perform its respective obligations because of force majeure, then in such event the Party so unable to perform may terminate this Agreement upon written notice to the other. In no event shall an event of force majeure excuse or delay the payment of any amount owed by one Party to the other Party under this Agreement.

15.4 No Third Party Beneficiaries. There are no third-party beneficiaries to this Agreement, and no party other than Landis+Gyr and Customer, or their successors, shall have any legally enforceable rights under this Agreement.

15.5 Headings. All headings used in this Agreement are for reference purposes only and are not part of this Agreement.

15.6 Waiver; Severability. No delay or omission by Customer or Landis+Gyr in enforcing its rights or remedies under this Agreement shall impair such right or remedy or be deemed to be a waiver thereof. Any waiver, in whole or in part of any provision of this Agreement will not affect or be considered to be a waiver of any other provision. No waiver of this Agreement shall be valid unless in writing and signed by the parties thereto. If any term of this Agreement is found to be unenforceable or invalid for any reason, such term shall not affect the other provisions, but such unenforceable term shall be deemed modified to the extent necessary to render it enforceable, preserving to the fullest extent permitted the intent of Customer and Landis+Gyr set forth in this Agreement, and all other terms will remain in full force and effect.

- 15.7 Independent Contractor. Nothing in this Agreement shall be read as appointing either Party as the agent or legal representative of the other Party for any purpose whatsoever, nor shall either Party hold itself out as such. This Agreement does not create and is not intended to create any express or implied relationship of joint ventures, partners, employer and employee, associates, or principal and agent between the parties, and both parties are acting as independent contractors and principals for their own accounts. Neither Party is granted any right or responsibility for or on behalf of the other or otherwise to bind the other. In providing the Services and Products, Landis+Gyr shall have sole responsibility for all persons employed by it in connection with the performance of such Services; and, except as provided in this Agreement, Landis+Gyr shall solely determine the methods, details, and means of performing the Services.
- 15.8 **EEOC and Affirmative Action.**
- (a) **Landis+Gyr is and shall remain in compliance with all of the laws and Executive Orders prohibiting discrimination, including but not limited to Title VII of the Civil Rights Act of 1964 as amended, the Civil Rights Act of 1991, 42 USC 2000(e), et seq., and all applicable state and local laws against discrimination.**
- (b) **Landis+Gyr and subcontractor, if any, shall abide by the requirements of 41 CFR §§ 60-1.4(a), 60-300.5(a) and 60-741.5(a). These regulations prohibit discrimination against qualified individuals based on their status as protected veterans or individuals with disabilities, and prohibit discrimination against all individuals based on their race, color, religion, sex, or national origin. Moreover, these regulations require that covered prime contractors and subcontractors take affirmative action to employ and advance in employment individuals without regard to race, color, religion, sex, sexual orientation, gender identity national origin, protected veteran status or disability.**
- 15.9 Export Regulation. The Products, including any software, documentation and any related technical data included with, or contained in, such Products, and any products utilizing any such Products, software, documentation or technical data (collectively, “**Regulated Products**”) may be subject to US export control laws and regulations, including the Export Administration Regulations and the International Traffic in Arms Regulations. The Customer shall not, and shall not permit any third parties to, directly or indirectly, export, re-export or release any Regulated Products to any jurisdiction or country to which, or any Party to whom, the export, re-export or release of any Regulated Products is prohibited by applicable federal or foreign law, regulation or rule. The Customer shall be responsible for any breach of this Section 15.8 by its, and its successors’ and permitted assigns’, affiliates, employees, officers, directors, partners/members/shareholders, customers, agents, distributors, resellers or vendors. The Customer shall comply with all applicable federal or foreign laws, regulations and rules, and complete all required undertakings (including obtaining any necessary export license or other governmental approval), prior to exporting, re-exporting or releasing any Regulated Products.
- 15.10 Publicity. Notwithstanding any other provision of the Agreement, Landis+Gyr shall not, without the Customer’s prior written consent, publish any information pertaining to this Agreement, whether during the term of this Agreement or thereafter. Nor shall the Customer, without Landis+Gyr’s prior written consent, publish any information pertaining to the agreement, whether during the term of this Agreement or thereafter. Consent from either Party will not be unduly withheld. However, neither Party shall be required to obtain the other Party’s prior written consent to any press release required by law or by the stock exchange on which it is listed or to any disclosure of information, documents or data to a Governmental Body with regulatory jurisdiction over Landis+Gyr.

- 15.11 Further Assurances. Each Party will, upon the reasonable request, and at the sole cost and expense, of the other Party, promptly execute such documents and perform such acts as may be necessary to give full effect to the terms of this Agreement.
- 15.12 Interpretation. For purposes of this Agreement: (a) the words “include,” “includes” and “including” are deemed to be followed by the words “without limitation”; (b) the word “or” is not exclusive; and (c) the words “herein,” “hereof,” “hereby,” “hereto” and “hereunder” refer to this Agreement as a whole; and all personal pronouns, whether used in the feminine, masculine, or neuter gender, include all other genders and the singular will include the plural and vice versa. Unless the context otherwise requires, references herein: (x) to Sections, Schedules and Exhibits refer to the sections of, and schedules and exhibits attached to, this Agreement; (y) to an agreement, instrument or other document (including this Agreement) means such agreement, instrument or other document as amended, supplemented and modified from time to time to the extent permitted by the provisions thereof, and together with all schedules and exhibits thereto; and (z) to a statute or regulation means such statute as amended from time to time and includes any successor legislation thereto and any regulations promulgated thereunder. The Exhibits and Schedules referred to herein will be construed with, and as an integral part of, this Agreement to the same extent as if such Exhibits and Schedules were set forth verbatim herein.
- 15.13 Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed an original, and will become effective and binding upon the parties as of the Effective Date at such time as all the signatories hereto have signed a counterpart of this Agreement, including via electronic signatures and signature by PDF.

**Acknowledged and agreed by the authorized representatives of the Parties.**

Landis Gyr Entity

Legal Account Name

Signature

Signature

Printed Name

Printed Name

Title

Title

Date

Date



## Software as a Service Agreement

This Software as a Service (SaaS) Agreement (referred to hereinafter as “**Agreement**” or “**SaaS Agreement**”), dated as of last signature date below (“**Effective Date**”), is by and between **Legal Account Name**, (“**Customer**”) with offices located at, **Account Address1**, **Account Address2**, and **LANDIS+GYR TECHNOLOGY, INC.** with offices located at 30000 Mill Creek Avenue, Suite 100, Alpharetta, GA 30022 (“**Landis+Gyr**”).

WHEREAS, Customer requires third-party hosted “software as a service” (the “**SaaS Services**,” as further described herein) with respect to certain of Customer’s information technology needs and related smart grid program;

WHEREAS, Landis+Gyr has agreed to provide the SaaS Services to Customer, all on the terms and conditions set forth herein.

NOW, THEREFORE, in consideration of the mutual covenants and representations set forth in this Agreement, the parties hereby agree as follows:

1. Definitions. Capitalized terms used herein and not otherwise defined shall have the meanings set forth in this Section.

“**Access Credentials**” means any user name, identification number, password, license or security key, security token, PIN or other security code, method, technology or device used, alone or in combination, to verify a person’s identity and authorization to access and use the SaaS Services.

“**Affiliate**” means any entity (including any person, without limitation, any corporation, company, partnership, limited liability company or group) that directly through one or more intermediaries, controls, is controlled by or is under common control with Landis+Gyr or Customer for so long as such control exists. For purposes of this definition, “control” means having more than fifty percent (50%) of the shares or other equity interest with voting rights in the legal entity or organization at issue.

“**Authorized Users**” means any Customer employee, contractor or agent, or any other person authorized by Customer to access and use the SaaS Services through Customer's account under this Agreement.

“**Business Day**” means a day other than a Saturday, Sunday or other day on which commercial banks in New York City are authorized or required by Law to be closed for business.

“**Customer Data**” means any and all information, data, materials, works, or other content, relating to Customer’s end customers’ information relating to electricity, water or natural gas consumption, load profile, billing history, or credit history that is or has been obtained or compiled by Customer in connection with supplying electric services, water services or gas services to that customer or group of customers (regardless of the media in which it is contained) that may be disclosed at any time to Landis+Gyr by Customer or Customer’s employees, agents, consultants, contractors, or suppliers in anticipation of, in connection with, or incidental to Landis+Gyr’s performance of the SaaS Services for or on behalf of Customer .

**“Customer Systems”** means the Customer's information technology infrastructure, including computers, software, hardware, databases, electronic systems (including database management systems) and networks, whether operated directly by Customer or through the use of third-party services.

**“Documentation”** means any manuals, instructions or other documents or materials that Landis+Gyr provides or makes available to Customer in any form or medium and which describe the functionality, components, features or requirements of the SaaS Services or Provider Materials, including any aspect of the installation, configuration, integration, operation, use, support or maintenance thereof.

**“Disabling Code”** means any software, virus, Trojan horse, time bomb or other code that is harmful, disabling or which enables unauthorized access to the Landis+Gyr Systems or Customer Systems, or theft or damage to Customer Data, or otherwise impairs the operation of the Landis+Gyr Systems, any Customer Systems, or any Third Party system utilized by Landis+Gyr in the Landis+Gyr Systems.

**“Endpoints”** means each of the following types of physical devices installed for use in the delivery of any commodity:

- i. a meter measuring the quantity of a commodity delivered, at a utility customer premise or at any other point within the distribution system, with respect to which the Software stores, processes, or makes accessible data specifically identified to that premise or distribution point for use in one or more of the utility operations the Software performs or supports; and
- ii. an unmetered supply point with respect to which the Software performs calculations of quantities of a commodity delivered in lieu of metering.

For avoidance of doubt, Endpoints do not include: aggregations of data from multiple Endpoints; interfaces between the Software and other systems or applications; sub-meters or devices installed at a utility customer premises beyond the meter; or devices only used to read, retrieve, or transmit data from Endpoints.

**“Intellectual Property Rights”** means any and all intellectual property rights whether registered or unregistered, and all applications for and renewals or extensions of such rights, including rights comprising or relating to: (a) patents, patent disclosures and inventions (whether patentable or not); (b) trademarks, service marks, trade dress, trade names, logos, corporate names and domain names, together with all of the goodwill associated therewith; (c) works of authorship, designs, copyrights and copyrightable works (including computer programs) and rights in data and databases; (d) trade secrets, know-how and other confidential information; and (e) all similar or equivalent rights or forms of protection.

**“Interfaces”** means Landis+Gyr's file transfer communications interfaces and data feeds mechanisms between the Landis+Gyr Systems and the Customer's Systems which are developed, operated, owned and maintained by Landis+Gyr pursuant to this Agreement including, as applicable, any configuration and customization required to meet the requirements of this Agreement, but excluding ownership of any customization that constitutes a component or derivative of Customer's Systems.

“**Landis+Gyr Materials**” means all devices, documents, data, know-how, methods, processes, software and other inventions, works, technologies and materials, including any and all Service Software, Documentation, computer hardware, programs, reports and specifications, client software and deliverables provided or made available to Customer in connection with Landis+Gyr’s performance of the SaaS Services, in each case developed or acquired by Landis+Gyr independently of this Agreement.

“**Landis+Gyr Personnel**” means all employees and agents of Landis+Gyr, all subcontractors and all employees and agents of any subcontractor, involved in the performance of Services.

“**Law**” means any statute, law, ordinance, regulation, rule, code, order, constitution, common law, judgment, decree or other requirement or rule of any federal, state, local or political subdivision thereof, or any arbitrator, court or tribunal of competent jurisdiction.

“**Permitted Uses**” means any use of the SaaS Services by Customer or any Authorized User for the benefit of Customer in or for Customer's internal business operations.

“**Person**” means an individual and any entity, including, but not limited to, any corporation, partnership, joint venture, limited liability company, governmental authority, unincorporated organization, trust or association.

“**Process**” means to perform any operation or set of operations on any data, information, material, work, expression or other content, including to (a) collect, receive, input, upload, download, record, reproduce, store, organize, combine, log, catalog, cross-reference, manage, maintain, copy, adapt, alter, translate or make other improvements or derivative works, (b) process, retrieve, output, consult, use, disseminate, transmit, submit, post, transfer, disclose or otherwise provide or make available, or (c) block, erase or destroy. “**Processing**” and “**Processed**” have correlative meanings.

“**Supported Release**” means versions of Service Software currently supported by Landis+Gyr. Landis+Gyr will support at a minimum the current generally available release in addition to the prior generally available release of Service Software.

“**Representatives**” means a party's employees, officers, directors, consultants, legal advisors and, with respect to Landis+Gyr, Landis+Gyr's subcontractors, and, with respect to Customer, solely those of Customer’s independent contractors or service providers that are Authorized Users.

“**Service Software**” means Landis+Gyr software application or applications and any third-party or other software, and all new versions, updates, revisions, improvements and modifications of the foregoing, that Landis+Gyr uses to power the SaaS Services made available to Customer via remote access.

“**Territory**” means the Customer’s service territory.

“**Third Party Materials**” means materials and information, in any form or medium, including any software, documents, data, content, specifications, products, equipment or components of or relating to the Services that are not proprietary to Landis+Gyr.

“**Upgrade**” means upgrading the Service Software to the most current generally available version.

2. Services.

2.1 Services. Subject to and conditioned on Customer's and its Authorized Users' compliance with the terms and conditions of this Agreement, during the Term, Landis+Gyr hereby grants to Customer and its Authorized Users a non-exclusive, worldwide, subscription license, to access via a web-based interface, execute and otherwise use certain of Landis+Gyr's hosted software and hardware products, as more fully set forth in the applicable Service Order and shall provide the following services: infrastructure and infrastructure monitoring, technical support, backup and recovery, data center access training, and Service Software upgrades for Customer's productive use of such services. Throughout the Term and at all times in connection with Landis+Gyr's actual or required performance under this Agreement, Landis+Gyr will, in accordance with all terms and conditions set forth in this Agreement and each applicable Service Order, provide to Customer and its Authorized Users the following services ("**Services**"):

- a) the hosting, management and operation of the Service Software for availability and other services for remote electronic access and use by the Customer and its Authorized Users ("**SaaS Services**") as described in one or more written, sequentially numbered service orders specifically referencing this Agreement, which, upon execution of such service orders will be attached as part of Schedule B and by this reference are incorporated in and made a part of this Agreement (each, a "**Service Order**");
- b) service maintenance and the Support Services as set forth in the applicable Service Order and the Service Level Agreement described in Schedule A; and
- c) such other services as may be specified in the applicable Service Order.

2.2 Landis+Gyr will provide the SaaS Services for 24 hours a day, 7 days a week in accordance with the Service Level Agreement in Schedule A except for Scheduled Downtime, service downtime or degradation caused by a Force Majeure Event or any other circumstances beyond Landis+Gyr's reasonable control, including Customer's or any Authorized User's use of Third Party Materials, misuse of the SaaS Services, or use of the Services other than in compliance with the express terms of this Agreement and the Documentation. For avoidance of doubt, the SaaS Services do not include managed services and Customer agrees that it shall be responsible for monitoring its access to the platform and shall promptly notify Landis+Gyr of any issues.

2.3 Documentation. Landis+Gyr represents and warrants that (i) the Documentation for the Service Software will accurately and completely describe the functions and features of the Service Software, including all subsequent revisions thereto and (ii) the Documentation will be understandable by a typical end user having commensurate skill with using and maintaining metering and monitoring systems technology and will provide Authorized Users with sufficient instruction such that an Authorized User will have a foundation to become self-reliant with respect to access and use of the SaaS Services. Customer will have the right to make any number of additional copies of the Documentation for internal business purposes at no additional charge.

2.4 Service Orders. Service Orders will be effective only when signed by Customer and Landis+Gyr. The initial Service Orders are attached hereto. Any modifications or changes to the SaaS Services under any executed Service Order will be effective only if and when memorialized in a mutually agreed written change order ("**Change Order**") signed by both Parties. Where a Change Order may result in an adjustment to fees, Landis+Gyr will provide a written estimate of such adjustment to Customer within ten (10) calendar days of Landis+Gyr's receipt of a Change Order. Upon

approval of the written estimate to complete the Change Order, the parties will each ratify the Change Order indicating any adjustments to the fees, or delivery schedule.

2.5 Professional Services. During the Term of this Agreement, Landis+Gyr may also perform certain implementation, consulting, training and/or support services (“**Professional Services**”) as specified in mutually agreed upon written Statement of Work (“**SOW**”). Each SOW will contain a reference identifying it as a SOW under this Agreement and will contain the following information, as applicable:

- (a) a description of scope of the Professional Services;
- (b) any other items to be delivered (“**Deliverable**”);
- (c) the fees;
- (d) an estimated schedule;
- (e) assumptions on which the performance of the Professional Services or delivery of the Deliverables is conditioned;
- (f) any modifications to the ownership of Intellectual Property provisions of this SaaS Agreement; and
- (g) itemization, if any, of Reimbursable Expenses as identified pursuant to Section 6.3.

Any provision of a SOW that deems any Deliverable developed by Landis+Gyr to be a “work for hire” or the property of Customer will be contingent upon payment to Landis+Gyr of all amounts properly invoiced to Customer pursuant to the applicable SOW.

2.6 No Software Delivery Obligation. Landis+Gyr has no software delivery obligation and will not ship copies of any of the Service Software used to provide the SaaS Services to Customer as a part of the SaaS Services or as part of any Deliverable under a SOW. Upon the end of the Service Order, Customer’s right to access or use the Service Software specified in the Service Order and the SaaS Services will terminate.

2.7 Use of Subcontractors. Landis+Gyr may from time to time in Landis+Gyr’s discretion engage third parties to perform Services (each, a “**Subcontractor**”).

2.8 Designation of Responsible Contacts. Customer will provide Landis+Gyr with current appropriate contact information such that Landis+Gyr may communicate maintenance notifications, outages, support items and other communications under this Agreement to Customer on an ongoing basis.

### 3. Customer Obligations

3.1 Customer Systems and Cooperation. Customer, at all times during the Term to the extent applicable for the specific Service Order, will: (a) set up, maintain and operate in good repair and in accordance with the Documentation all Customer Systems on or through which the Services are accessed or used; and (b) provide all cooperation and assistance as Landis+Gyr may reasonably request to enable Landis+Gyr to exercise Landis+Gyr’s rights and perform Landis+Gyr’s obligations under and in connection with this Agreement. To the extent it becomes necessary for Landis+Gyr to have access to Customer Systems in order to perform the Services in accordance

with the Availability Requirements as set forth in the Service Level Agreement, Customer will provide Landis+Gyr with such access. Unless otherwise stated in a Service Order, Customer agrees that it will not send or provide Landis+Gyr access to any personally-identifiable information (“PII”), whether in data or any other form. Should Customer mistakenly provide PII to Landis+Gyr, Customer shall immediately notify Landis+Gyr in writing in accordance with the notice provisions herein, and reasonably cooperate with Landis+Gyr to take any mitigating actions deemed necessary to remove such PII from the Landis+Gyr Systems.

- 3.2 Effect of Delay. Neither party is responsible or liable for the portion of any delay or failure of performance caused in whole or in part by the other party’s delay in performing, or failure to perform, any of Customer’s obligations under this Agreement.
- 3.3 Corrective Action and Notice. If Customer becomes aware of any actual or threatened activity prohibited by Section 3.4, Customer shall, and shall cause its Authorized Users to, immediately: (a) take all reasonable and lawful measures within respective control of Customer and its Authorized Users that are necessary to stop the activity or threatened activity and to mitigate the effects of such activity (including, where applicable, by discontinuing and preventing any unauthorized access to the Services and Landis+Gyr Materials and permanently erasing from Authorized Users’ systems and destroying any data to which any of the Authorized Users have gained unauthorized access); and (b) notify Landis+Gyr of any such actual or threatened activity.
- 3.4 Suspension or Termination of Services. In addition to any other suspension or termination rights of Landis+Gyr pursuant to the Agreement, certain extraordinary circumstances may require Landis+Gyr to temporarily suspend Customer’s access to and/or use of, or otherwise modify, the SaaS Services and /or any component thereof, if: (a) Landis+Gyr receives a judicial or other governmental demand or order, subpoena or law enforcement request that expressly or by reasonable implication requires Landis+Gyr to do so; or (b) Landis+Gyr believes, in its good faith and reasonable discretion, that: (i) Customer or any Authorized User has failed to comply with, any term of this Agreement, or accessed or used the Services beyond the scope of the rights granted or for a purpose not authorized under this Agreement or in any manner that does not comply with any instruction or requirement of the Documentation; (ii) Customer or any Authorized User is, has been, or is likely to be involved in any dangerous, fraudulent, misleading or unlawful activities relating to or in connection with any of the Services; or (iii) this Agreement expires or is lawfully terminated pursuant to its terms. This Section 3.4 does not limit any of either party’s other rights or remedies, whether at law, in equity or under this Agreement.
4. Authorization and Restrictions.
- 4.1 Authorization. Subject to and conditioned on Customer’s payment of the Fees and compliance and performance in accordance with all other terms and conditions of this Agreement, Landis+Gyr hereby authorizes Customer, to access and use, solely in the Territory during the Term, the Services and such Landis+Gyr Materials as Landis+Gyr may supply or make available to Customer for the Permitted Uses by and through Authorized Users in accordance with the Documentation and the conditions and limitation set forth in this Agreement or any Service Order. In addition, Customer is authorized to:
- (a) generate, print, copy, upload, download, store and otherwise Process all GUI, audio, visual, digital and other output, displays and other content as may result from any access to or use of the SaaS Services;

- (b) prepare, reproduce, print, and download a reasonable number of copies of Documentation as may be necessary or useful for any Permitted Uses of the SaaS Services under this Agreement;
- (c) access and use (i) the SaaS Services for production uses and (ii) any applications provided by Landis+Gyr as may be necessary or useful for the effective use of the SaaS Services for the Permitted Uses hereunder; and
- (d) perform, display, execute, and reproduce and distribute and otherwise make available to Authorized Users, any Landis+Gyr Materials solely to the extent necessary to access or use the SaaS Services in accordance with the terms and conditions of this Agreement.

4.2 Authorization Limitations and Restrictions. Customer will not and will not knowingly permit any other Person to access or use the Services or Landis+Gyr Materials except as expressly permitted by this Agreement and/or any Service Order and, in the case of Third-Party Materials, the applicable third-party license agreement. For purposes of clarity and without limiting the generality of the foregoing, Customer shall not, except as this Agreement or any Service Order expressly permits:

- (a) rent, lease, lend, sell, sublicense, assign, distribute, publish, transfer or otherwise make the Services or Landis+Gyr Materials available to any third party that is not an Authorized User;
- (b) copy, modify or create derivative works or improvements of the Services or Landis+Gyr Materials;
- (c) reverse engineer, disassemble, decompile, decode, adapt or otherwise attempt to derive or gain access to the source code of the Services or Landis+Gyr Materials, in whole or in part;
- (d) bypass or breach any security device or protection used by the Services or Landis+Gyr Materials or access or use the Services or Landis+Gyr Materials other than by an Authorized User through the use of his or her own then valid Access Credentials;
- (e) use or authorize the use of the Services or Documentation in any manner or for any purpose that is unlawful under applicable Law.
- (f) remove, delete, alter or obscure any trademarks, Documentation, warranties or disclaimers, or any copyright, trademark, patent or other intellectual property or proprietary rights notices from any Services or Landis+Gyr Materials, including any copy thereof;
- (g) access or use the Services or Landis+Gyr Materials in any manner or for any purpose that infringes, misappropriates or otherwise violates any Intellectual Property Right or other right of any third party, or that violates any applicable Law;
- (h) access or use the Services or Landis+Gyr Materials for purposes of competitive analysis of the Services or Landis+Gyr Materials, the development, provision or use of a competing software service or product or any other purpose that is to Landis+Gyr's detriment or commercial disadvantage; or
- (i) otherwise access or use the Services or Landis+Gyr Materials beyond the scope of the authorization provided in this Agreement or in any applicable Service Order.

- 4.3 Excess Use. If Customer's use of the SaaS Services exceeds the volume of use authorized in the applicable Service Order (including as to the number of Endpoints), Customer will pay Landis+Gyr the Fees attributable to the excess use in accordance with the applicable Service Order.
- 4.4 Non-Interference with Landis+Gyr's Customers. Customer agrees that its use of the SaaS Services shall not restrict, inhibit, interfere with, or degrade other Landis+Gyr customer's use of the SaaS Services (such as running custom queries against the database). If Customer's use of the SaaS Services violates such restrictions as determined by Landis+Gyr, Landis+Gyr may suspend or limit the SaaS Services of Customer that is causing the degradation of the services without penalty. In addition, Landis+Gyr shall have the right to implement controls necessary to stop or limit future occurrences of a similar nature.
5. Term and Termination
- 5.1 Term. This Agreement will begin on the Effective Date and will remain in full force and effect until three (3) years thereafter ("**Initial Term**") unless terminated by either party for cause, as described in Section 5.4, "**Termination for Cause**," in which case this Agreement and all Service Orders/SOWs will also be terminated. Except in the case of termination for breach by Landis+Gyr, within thirty (30) days of the date of termination, Customer must pay all amounts remaining unpaid for SaaS Services provided prior to the effective date of termination, plus related taxes and expenses.
- 5.2 Term of Service Orders/SOWs. Each Service Order/SOW will remain in effect until the earlier to occur of: a) termination of such Service Order/SOW by either party for cause as described in Section 5.4 below; b) termination of such Service Order/SOW upon mutual written consent of the Parties; or c) expiration of the Service Order Term or completion of all Services and the delivery of all Deliverables required under the Service Order/SOW.
- 5.3 Renewal. Upon expiration of the Initial Term, this Agreement shall automatically renew for successive one (1) year periods (each a "**Renewal Term**" and together with the Initial Term, the "**Term**"), unless a party provides the other party with written notice of its intent not to renew this Agreement at least ninety (90) days prior to the expiration of the then current Term.
- 5.4 Termination for Cause. A party may terminate a Service Order/SOW and this Agreement if:
- (a) the other party is in default of a material obligation under the applicable Service Order/SOW or this Agreement, and such default has not been cured within thirty (30) calendar days after receipt of written notice (specifying the default) from the non-defaulting party. If the default specified in such notice is cured within the thirty (30) day period, the Service Order/SOW and Agreement will remain in effect; or
  - (b) the non-terminating party enters into liquidation (apart from a solvent liquidation for the purposes of amalgamation or reconstruction) or is dissolved or declared bankrupt or has a receiver, administrator or administrative receiver appointed over all or part of its assets or enters into an arrangement with its creditors or takes or suffers any similar action.
- 5.5 Survival. The terms, conditions and warranties contained in this Agreement that by their sense and context are intended to survive the performance thereof by either party hereunder will so survive the completion of the performance, cancellation or termination of this Agreement, including without limitation, Confidentiality, Infringement and Limited Warranties.



6. Fees and Expenses.
- 6.1 Invoices. Invoices shall be issued monthly in arrears for (i) the monthly Service fees (ii) for time and materials in a Statement of Work and (iii) Reimbursable Expenses based on expenses incurred in the previous month. Fees for fixed bid SOW's shall be invoiced upon completion of the milestone as set forth in the applicable SOW. If Customer validly disputes any invoiced amount it shall pay the undisputed amounts and provide written notice of the basis of that dispute to Landis+Gyr within thirty (30) days following delivery of that invoice. The parties will work diligently, promptly and in good faith to resolve any such disputes.
- 6.2 Fees. Customer agrees to pay for all services ordered as set forth in the applicable Service Order or SOW (the "**Fees**"). All Fees are due thirty (30) days from the date of invoice. Any Fees not paid within thirty (30) days after the date on which Customer receive an invoice (the "**Due Date**") will accrue interest on the overdue balance from the Due Date at the rate of one percent (1%) per month, or the maximum lawful rate allowable under applicable law, whichever is lower.
- 6.3 Fees During Renewal Terms. Landis+Gyr's Fees are fixed during the Initial Term. Landis+Gyr fees for Renewal Terms shall escalate annually as of each anniversary of the Effective Date of the Service Order by the amount of the increase in the Consumer Price Index – All Urban Consumers of the Bureau of Labor Statistics of the U.S. Department of Labor for U.S. for All Items with Base Years 1982-1984=100. Those increases will be measured applying the twelve (12) month period ending in the month for which the most recent index results are available as of that anniversary of the Effective Date.
- 6.4 Reimbursable Expenses. If a Service Order and/or SOW permits reimbursement of expenses by Customer ("**Reimbursable Expenses**"), Landis+Gyr will be reimbursed for those reasonable expenses, at cost. In addition, if there are any system communication fees that are incurred by Landis+Gyr (i.e. long-distance charges), Landis+Gyr will invoice Customer monthly for the communications fees, which Customer agrees to pay.
- 6.5 Taxes. Customer is exclusively responsible for the collection and remittance of all sales and use, value added, duties, tariffs or other similar charges or taxes on the SaaS Services, other than taxes based upon Landis+Gyr's income. All amounts set forth in an applicable Service Order/SOW are exclusive of taxes and taxes are not included in the Fees. Applicable taxes payable by Customer will be separately itemized on invoices sent to Customer.
7. Ownership and Restrictions.
- 7.1 Ownership of Customer Data. As between Customer and Landis+Gyr and its Subcontractors, Customer is and will remain the sole and exclusive owner of all right, title and interest in and to all Customer Data, including all Intellectual Property Rights relating thereto, subject only to the limited license granted in Section 7.2.
- 7.2 Limited License to Use Customer Data. During the Term of this Agreement and subject to the terms and conditions of this Agreement, Customer hereby grants Landis+Gyr a limited, royalty-free, non-exclusive, non-transferable and non-sublicensable license to Process the Customer Data in the United States as instructed by Customer or an Authorized User and solely as necessary to provide the SaaS Services for Customer's benefit as provided in this Agreement.
- 7.3 Reservation of Rights. Nothing in this Agreement grants any right, title or interest in or to (including any license under) any Intellectual Property Rights in or relating to, the Services, Landis+Gyr

Materials and Documentation or Third Party Materials, whether expressly, by implication, estoppel or otherwise. All right, title and interest in and to the Services, the Landis+Gyr Materials and the Third Party Materials are and will remain with Landis+Gyr and the respective rights holders in any such materials.

8. Confidentiality.

8.1 Confidential Information. From time to time during the Term of this Agreement, either Party (as the “**Disclosing Party**”) may disclose or make available to the other Party (as the “**Receiving Party**”) non-public, proprietary, confidential information about its business affairs, products, services, confidential intellectual property, trade secrets, third party confidential information, source code and other sensitive or proprietary information in oral, written, electronic or other intangible form marked or indicated as “**Confidential**” or “**Proprietary**” at the time of disclosure (collectively, “**Confidential Information**”). Confidential Information, however, shall not include: (a) Information which is already generally available to the public; (b) Information which hereafter becomes generally available to the public, except as a result of the direct or indirect action of the Receiving Party in breach of this Agreement; (c) Information known to the Receiving Party or its Representatives on a non-confidential basis prior to receipt by the disclosing party; (d) Information that is independently developed without access to the Disclosing Party's Confidential Information; and (e) Information disclosed under legal compulsion; provided, however, that prior to a disclosure pursuant to an order or applicable law, the Receiving Party, to the extent permitted by law, promptly provides the other party written notice of such proposed disclosure and reasonably cooperates with the other party in its attempts to limit or prevent such disclosure. The Receiving Party shall use the Confidential Information solely for the performance of this Agreement and shall not disclose or permit access to Confidential Information other than to its Affiliates and its or their employees, officers, directors, attorneys, accountants and financial advisors (including insurers) (collectively, “**Representatives**”) who: (a) need to know such Confidential Information for the performance of this Agreement; (b) know of the existence and terms of this Agreement and (c) are bound by confidentiality obligations no less protective of the Confidential Information than the terms contained herein. These non-disclosure obligations shall survive the termination of this Agreement and shall continue for a period of five (5) years thereafter. Information need not be marked “**Confidential**” to be considered Confidential Information. “**Confidential Information**” includes any Confidential Information disclosed prior to the effective date of this Agreement. Any subcontractor retained pursuant to Section 2.6 shall adhere to this Section 8 as it regards to Confidential Information that comes into its possession.

8.2 Safeguarding Confidential Information. The Receiving Party shall safeguard the Confidential Information from unauthorized use, access or disclosure using at least the degree of care it uses to protect its most sensitive information and no less than a reasonable degree of care. The Receiving Party shall promptly notify Disclosing Party of any unauthorized use or disclosure of Confidential Information and take all reasonable steps to cooperate with Disclosing Party to prevent further use or disclosure. The Receiving Party will be responsible for any breach of this Agreement caused by its Representatives.

8.3 No Rights in Confidential Information. Customer and Landis+Gyr hereby acknowledge and agree that all Confidential Information of the other party shall remain the sole and exclusive property of such other party and that the receiving party shall have no proprietary rights, title or interests therein except as otherwise provided in this Agreement.

- 8.4 Termination. Upon termination for any reason, or at any other time that Customer or Landis+Gyr demands, the other party shall promptly deliver and/or certify destruction of Confidential Information, as appropriate, to the requesting party all Confidential Information (copies and originals) of the requesting party as may be in the other party's possession or under its control.
9. Data Security and Privacy.
- 9.1 Without limiting Landis+Gyr's obligation of confidentiality as further described herein, Landis+Gyr shall establish and maintain a data privacy and information security program ("**Data Security Terms**"), including physical, technical, administrative, and organizational safeguards, that is designed to: (i) ensure the security and confidentiality of the Customer Data; (ii) protect against any anticipated threats or hazards to the security or integrity of the Customer Data; (iii) protect against unauthorized disclosure, access to, or use of the Customer Data; (iv) ensure the proper disposal of Customer Data; and, (e) ensure that all employees, agents, and subcontractors of Landis+Gyr, if any, comply with all of the foregoing, and which are: (y) no less rigorous than those maintained by Landis+Gyr for its own information of a similar nature; (z) no less rigorous than generally accepted industry standards, including ISO 27001 and 27002; and (aa) required by all applicable federal and state laws, rules and regulations relating to privacy, the protection of PII and data protection laws and regulations (including without limitation applicable security breach notification laws) (collectively "**Data Privacy Laws**").
- 9.2 The Data Security Terms implemented and maintained by Landis+Gyr pursuant to this Section 9 shall include, without limitation:
- (a) User identification and access controls designed to limit access to Customer's Data to authorized users;
  - (b) the use of appropriate procedures and technical controls regulating data entering Landis+Gyr's network from any external source, including regular monitoring of security device controls (e.g., firewalls, intrusion prevention system, etc.);
  - (c) the use of encryption techniques when Customer's Data is transmitted or transferred from the RF Network into the hosted environment and when Customer's Data is at rest within the System;
  - (d) physical security measures, including without limitation securing Customer's Data within a secure facility where only authorized personnel and agents will have physical access to Customer Data;
  - (e) operational measures, including without limitation processes designed to ensure the correct and secure operations of information processing activities;
  - (f) periodic employee training regarding the security programs referenced in this Section; and
  - (g) periodic testing of the systems and procedures outlined in this Section, including regular automated vulnerability scanning of infrastructure components with commercial scanning tools, with tracked mitigation effort.
- 9.3 Unauthorized Access. Landis+Gyr will use commercially reasonable efforts to prohibit access to Customer Systems, in whole or in part, whether through Landis+Gyr's Systems or otherwise.
- 9.4 Landis+Gyr Systems. Landis+Gyr will be responsible for the security, management and maintenance of Landis+Gyr's information technology infrastructure, including all computers, software, databases, electronic systems (including database management systems) and networks

used by Landis+Gyr on Landis+Gyr's systems to access the Customer Systems or otherwise in connection with the provision of the SaaS Services.

10. Audit Rights

- 10.1 Landis+Gyr will procure from an independent third party, on at least an annual basis, a SOC 1 audit as set forth in the American Institute of Certified Public Accountants Statement on Auditing Standards for Attestation Engagements (SSAE) No. 18 and once available, SOC 2. Such audit will cover Landis+Gyr's networks, systems and premises (collectively, the "**Landis+Gyr Systems**"). Landis+Gyr will provide Customer with the report of each such audit within five (5) business days of report availability. Landis+Gyr will provide an annual report and bridge letter delivery schedule no less than annually; including (i) whether the audit revealed any material vulnerability in the Landis+Gyr Systems; and (ii) if so, the nature of each vulnerability discovered. If the audit reveals one or more material vulnerabilities, Landis+Gyr will correct each such vulnerability at its sole cost and expense and will certify in writing to Customer when it has corrected all such vulnerabilities. Landis+Gyr will complete all vulnerability corrections within a commercially reasonable period of time.
- 10.2 Customer, at its own expense, will be limited to auditing Landis+Gyr output and deliverables against the applicable currently contracted scope of the services. Scope will not include provisions already covered within SSAE18 audits.
- 10.3 Third Parties: If a third party conducts an audit on the Customers behalf, in no event shall such third party be: (i) a competitor of Landis+Gyr; or (ii) an entity whose substantial business function is not performing audits of service providers; provided however, that a government agency may conduct such audit.
- 10.4 Notification of Intent to Audit: Customer will submit, and Landis+Gyr will receive, in writing, a request for an audit at least ninety (90) days prior to the commencement of same. The written request must include a proposed scope for the audit. The Customer and Landis+Gyr must mutually agree upon the final scope of the review. The actual audit will be conducted at the times and locations acceptable to Landis+Gyr.
- 10.5 Frequency and Duration: Customer shall be permitted to perform one audit per calendar year with a maximum duration of two (2) business days, or other time frame mutually agreed upon by the parties. All fees and expenses incurred by Customer for this audit are paid by Customer.
- 10.6 Non-Disclosure: Prior to the commencement of any audit, Customer/Customer auditors must enter into Landis+Gyr's standard non-disclosure agreement.
- 10.7 Use of Audit Software: Landis+Gyr will not permit Customer/Customer auditors to install any audit/test software on any Landis+Gyr system or use it to test any Landis+Gyr network, database, file, or hosting center.
- 10.8 Actions Subsequent to the Audit: Landis+Gyr will be provided with a written report of findings and recommendations from the audit. Landis+Gyr is under no obligation to implement any changes in its controls or practices resulting from the audit. Landis+Gyr alone will determine what, if any, corrective actions will be taken.

- 10.9 Access to Other Customers Information: Customer and/or Customer auditors will not be permitted to access, view, or summarize other customer's data or information.
- 10.10 Copy and Removal of Documents from Landis+Gyr Premises: Customer will be permitted to examine (at the Landis+Gyr location) manuals, written policies, reports, computer generated listings, memorandum and other materials Landis+Gyr directly related to the scope of the audit in progress. In general, Customer may not copy and/or remove such materials from Landis+Gyr premises. Under certain circumstances, Customer may be permitted to remove such materials if they pertain exclusively to that Customer and such materials would otherwise routinely be available to Customer as a part of normal processing.
- 10.11 No Physical Access to Data Center: Customer shall not have access to shared hosting cages within the co-located data center.
11. Disaster Recovery.
- 11.1 Landis+Gyr shall maintain throughout the Term of this Agreement a disaster recovery plan and business continuity plan that will enable Landis+Gyr to recover from a disaster and continue providing the Services under this Agreement, within the recovery time objectives set forth in such plan, or other recovery time objectives as mutually agreed to by the parties. Upon request, Customer shall have the right to review a summary of Landis+Gyr's then current plan. Landis+Gyr will test the operation and effectiveness of the plan at least annually. Upon request, Landis+Gyr will provide Customer with an annual summary audit report for disaster recovery effectiveness. If such tests reveal material deficiencies in the plan Landis+Gyr will respond with steps that will be taken to mitigate recovery deficiencies within a reasonable time frame. Landis+Gyr reserves the right to make the changes as required to the Disaster Recovery plan.
12. Information Security Incident Response.
- 12.1 In the event that Landis+Gyr confirms that the security of the System, or Customer Data, has been compromised, or that such Customer Data has been or is reasonably expected to be subject to a use or disclosure not authorized by this Agreement (an "**Information Security Incident**"), Landis+Gyr shall: (i) promptly (and in any event within 24 hours of such confirmation of an Information Security Incident), notify Customer, in writing, of the occurrence of such Information Security Incident per the Landis+Gyr Global Security Incident Response plan; (ii) investigate such Information Security Incident and conduct a reasonable analysis of the cause(s) of such Information Security Incident; (iii) provide periodic updates of any ongoing investigation to Customer; (iv) develop and implement an appropriate plan to remediate the cause of such Information Security Incident to the extent such cause is within Landis+Gyr's control and to mitigate the effects of the Information Security Incident; and (v) cooperate with Customer's reasonable investigation or Customer's efforts to comply with any notification or other regulatory requirements applicable to such Information Security Incident. In connection with an Information Security Incident, at Client's request, Landis+Gyr will provide, effect or accept responsibility for the following (collectively, "**Mitigation Steps**"): (a) investigate, remediate, and mitigate (1) the cause of the Information Security Incident, and (2) the effects of the Information Security Incident; (b) provide the Client with appropriate details of its remediation plan to help ensure that such Information Security Incident will not recur; and (c) provide commercially reasonable assistance to enable Client to notify public authorities or the individuals whose data were or may have been compromised.
13. Indemnification.

- 13.1 Landis+Gyr's Indemnification Obligations. Landis+Gyr will indemnify and defend Customer and its Affiliates and their respective officers, directors, employees, shareholders and members from and against any losses, claims, penalties, fines, judgments, damages, liabilities or expenses, including reasonable attorneys' fee ("**Losses**"), or threatened Losses arising out of third party claims relating to, incurred in connection with, or based upon any claim, threatened claim, suit, action or proceeding ("**Claim**") made against Customer:
- (a) that that the Services infringe any Intellectual Property Rights of a third party enforceable in the U.S. ("**Infringement Claim**"); or
  - (b) any claim for bodily injury or death of any individual, or the loss, damage or destruction of any real or personal property, resulting from the willful, negligent, reckless, fraudulent or intentional acts or omissions of Landis+Gyr or its Subcontractor.
- 13.2 Indemnification Limitations. Landis+Gyr will have no liability or obligation for any Losses to the extent that such Loss arises out of or results from any:
- (a) alteration or modification of the SaaS Services by or on behalf of Customer without Landis+Gyr's authorization (each, a "**Customer Modification**"). For this subsection (a) to be in effect, any Infringement Claim must allege infringement which would not have occurred without the Customer Modification;
  - (b) Customer's access to or use of the SaaS Services that is expressly prohibited by this Agreement or otherwise outside the scope of access or manner or purpose of use described or contemplated anywhere in this Agreement, the Documentation or the applicable Service Order; or
  - (c) breach of this Agreement by Customer or noncompliance herewith by any Authorized User.
- 13.3 Customer's Indemnification Obligations. Customer will indemnify and defend Landis+Gyr, its Subcontractors, Affiliates and such person's respective officers, directors, employees, shareholder and members from and against Losses arising out of a Claim made against Landis+Gyr relating to, incurred in connection with, or based upon:
- (a) Customer's use of the SaaS Services in breach of this Agreement; or
  - (b) any Infringement Claim asserted by any third party based upon Customer materials provided to Landis+Gyr; or
  - (c) any claim for bodily injury or death of any individual, or the loss, damage or destruction of any real or personal property, resulting from the willful, negligent, reckless, fraudulent or intentional acts or omissions of Customer.
- 13.4 Indemnification Procedures. The party seeking indemnification (the "**Indemnified Party**") will promptly notify the other party ("**Indemnifying Party**") in writing of any Claims for which it seeks indemnification pursuant to this Section 13 and reasonably cooperate with the Indemnifying Party at the Indemnifying Party's sole cost and expense. The Indemnifying Party will immediately take control of the defense and investigation of such Claim and will employ counsel reasonably acceptable to the other party to handle and defend the same, at the Indemnifying Party's sole cost and expense. The Indemnifying Party will not settle any Claim on any terms or in any manner that

adversely affects the rights of the other party or any Indemnitee without the other party's prior written consent, which will not be unreasonably withheld or delayed. The other party and any Indemnitee may participate in and observe the proceedings at its own cost and expense with counsel of its own choosing. A party's failure to perform any obligations under this Section 13.4 will not relieve the Indemnifying Party of its obligations herein except to the extent that the Indemnifying Party can demonstrate that it has been prejudiced as a result of such failure.

13.5 Option. In addition to the foregoing indemnification obligations, if all or any part of the SaaS Services is subject to an Infringement Claim, Landis+Gyr may, at its discretion and expense, take the following actions:

- (a) Procure for Customer the right to continue using the SaaS Services; or
- (b) Modify or replace the allegedly infringing aspect of the SaaS Services to make it non-infringing, provided, however, that such modification or replacement will not degrade the operation or performance of the SaaS Services.
- (c) If neither of the remedies set forth in this Section 13.5 is reasonably available with respect to the Infringement Claim features then Landis+Gyr may direct Customer to cease any use of any materials that have been enjoined or finally adjudicated as infringing, provided that Landis+Gyr will refund to Customer any prepaid Fees for SaaS Services that have not been provided.
- (d) Excluding the indemnity obligation owed by Landis+Gyr to Customer, the remedies set forth in this Section 13.5 are Customer's exclusive remedies with respect to any Infringement Claim.

14. Limitations of Liability.

14.1 EXCLUSION OF INDIRECT DAMAGES. EXCEPT WITH RESPECT TO A BREACH OF CONFIDENTIALITY OBLIGATIONS, IN NO EVENT SHALL EITHER PARTY BE RESPONSIBLE FOR ANY LOSSES OR DAMAGES THAT ARE INDIRECT, CONSEQUENTIAL, PUNITIVE OR FOR ECONOMIC LOSS, LOSS OF REVENUES, LOSS OF PROFITS, OR LOSS OF BUSINESS OPPORTUNITY.

14.2 CAP ON DIRECT DAMAGES. EXCEPT WITH RESPECT TO A BREACH OF CONFIDENTIALITY OBLIGATIONS, OBLIGATIONS UNDER THIS AGREEMENT RELATED TO INTELLECTUAL PROPERTY RIGHTS INFRINGEMENT, PERSONAL INJURY OR DEATH OR DAMAGE TO ANY REAL OR TANGIBLE PERSONAL PROPERTY CAUSED BY EITHER PARTY'S NEGLIGENT ACTS OR OMISSIONS OR WILLFUL MISCONDUCT, THE TOTAL LIABILITY OF EITHER PARTY IN RESPECT OF ALL CLAIMS IN THE AGGREGATE, REGARDLESS OF WHETHER SUCH LIABILITY IS BASED ON BREACH, CONTRACT, TORT, STRICT LIABILITY, BREACH OF WARRANTIES, FAILURE OF ESSENTIAL PURPOSE OR OTHERWISE, UNDER THIS AGREEMENT SHALL BE LIMITED TO THE FEES PAID BY CUSTOMER TO LANDIS+GYR DURING THE TWELVE (12) MONTH PERIOD PRIOR TO ANY INCIDENT UNDER WHICH OR IN RELATION TO WHICH THE LIABILITY ARISES.

15. Representations and Limited Warranties.

15.1 Mutual Representations and Warranties. Each party represents and warrants to the other party that:

- (a) it is duly organized, validly existing and in good standing as a corporation or other entity as represented herein under the laws and regulations of its jurisdiction of incorporation, organization or chartering;
- (b) it has, and throughout the Term and any Renewal Terms during which it does or is required to perform the SaaS Services will retain, the full right, power and authority to enter into this Agreement and perform its obligations hereunder;
- (c) the execution of this Agreement by its representative whose signature is set forth at the end hereof has been duly authorized by all necessary corporate/ action of the party; and
- (d) when executed and delivered by such party, this Agreement will constitute the legal, valid and binding obligation of such party, enforceable against such party in accordance with the Agreement terms, except as the enforceability thereof may be limited by bankruptcy and similar Laws affecting creditors' rights generally and by general equitable principles.

15.2 Additional Landis+Gyr Warranties. Landis+Gyr represents, warrants and covenants to Customer that:

- (a) it is in the business of providing the SaaS Services;
- (b) it is the lawful licensee or owner of the SaaS Services (excluding any Customer Data therein) and has all the necessary rights in the SaaS Services to grant the use of the SaaS Services to Customer;
- (c) the Service Software and Services will in all material respects conform to and perform in accordance with the Documentation and all requirements of this Agreement;
- (d) it will use its best efforts to ensure that no Disabling Code is introduced into Customer's computing and network environment by the SaaS Services; and
- (e) it will perform all Services in a timely, professional and workmanlike manner with a level of care, skill, practice and judgment consistent with generally recognized industry standards and practices for similar services, using personnel with the requisite skill, experience and qualifications, and will devote adequate resources to meet Landis+Gyr's obligations under this Agreement.

15.3 Additional Customer Warranty. Customer represents, warrants and covenants to Landis+Gyr that:

- (a) Customer owns or otherwise has and will have the necessary rights and consents in and relating to the Customer Data so that, as received by Landis+Gyr and Processed in accordance with this Agreement, Customer does not and will not infringe, misappropriate or otherwise violate any Intellectual Property Rights, or any privacy or other rights of any third party or violate any applicable Law.
- (b) prior to Customer's delivery to Landis+Gyr of any Customer Data that is outside of the Landis+Gyr Systems, Customer shall use current industry state-of-the-art anti-virus measures to detect, prevent and remove Disabling Code, and to prevent the spread of Disabling Code between the Parties when accessing and/or exchanging data or software through the Interfaces or any other network connectivity.



- 15.4 DISCLAIMER OF WARRANTIES. EXCEPT FOR THE EXPRESS WARRANTIES SET FORTH IN SECTION 15.1, SECTION 15.2 AND SECTION 15.3, ALL SERVICES AND LANDIS+GYR MATERIALS ARE PROVIDED “AS IS” AND LANDIS+GYR HEREBY DISCLAIMS ALL WARRANTIES, WHETHER EXPRESS, IMPLIED, STATUTORY OR OTHER, AND PROVIDER SPECIFICALLY DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE AND NON-INFRINGEMENT, AND ALL WARRANTIES ARISING FROM COURSE OF DEALING, USAGE OR TRADE PRACTICE. ALL THIRD-PARTY MATERIALS ARE PROVIDED “AS IS” AND ANY REPRESENTATION OR WARRANTY OF OR CONCERNING ANY THIRD PARTY MATERIALS IS STRICTLY BETWEEN CUSTOMER AND THE THIRD-PARTY OWNER OR DISTRIBUTOR OF THE THIRD-PARTY MATERIALS.
16. Force Majeure.
- 16.1 Force Majeure Events. Neither party will be liable in damages or have the right to terminate this Agreement for any reasonable delay or default in performing under this Agreement if such delay or default is caused by conditions beyond the party’s reasonable control, including without limitation acts of God, natural disasters, war or other hostilities, labor disputes, civil disturbances, governmental acts, orders or regulations or failures or fluctuations in electrical power, heat, lights, air conditioning or telecommunications equipment (each of the foregoing, a “**Force Majeure Event**”), provided that the non-performing party is without fault in causing such condition. Subject to the party so delaying promptly notifying the other party in writing of the reason for the delay and the likely duration of the delay, the performance of the delaying party’s obligations, to the extent affected by the delay, will be temporarily suspended during the reasonable period of time that the cause persists, provided that if performance is not resumed within thirty (30) days after that notice, the non-delaying party may by notice in writing immediately terminate this Agreement.
17. General Provisions.
- 17.1 Compliance with Laws/Export. The Parties will comply with all applicable Laws, regulations and codes, including procurement of permits and licenses, when needed, of their respective states, territories, and/or countries in the performance of this Agreement, provided such is not in violation of the U.S. Government’s Export and Anti-boycott Rules and Regulations. The SaaS Services and Deliverables and related technical information, documents and materials are subject to export controls under the U.S. Export Administration Regulations and other applicable laws. Customer will (a) comply strictly with all legal requirements established under these controls; (b) cooperate fully with Landis+Gyr in any audit or inspection that relates to these controls; and (c) not export, re-export, divert or transfer, directly or indirectly, any such item to any country or person who or which is embargoed by Executive Order or any applicable law, including any rules, regulations or policies promulgated thereunder.
- 17.2 Further Assurances. Each party will, upon the reasonable request, and at the sole cost and expense, of the other party, promptly execute such documents and perform such acts as may be necessary to give full effect to the terms of this Agreement.
- 17.3 Relationship of the Parties. The relationship between the parties is that of independent contractors. Nothing contained in this Agreement will be construed as creating any agency, partnership, joint venture or other form of joint enterprise, employment or fiduciary relationship between the parties, and neither party will have authority to contract for or bind the other party in any manner whatsoever.

- 17.4 Notices. All notices, requests, consents, claims, demands, waivers and other communications hereunder, other than routine communications having no legal effect, will be in writing and addressed to the parties as follows (or as otherwise specified by a party in a notice given in accordance with this Section):

If to Landis+Gyr:

Landis+Gyr Technology, Inc.  
3000 Mill Creek Avenue, Suite 100  
Alpharetta, GA 30022  
Attn: Legal Department  
Facsimile: 678.258.1686

If to Customer:

Legal Account Name  
Account Address1  
Account Address2  
Attn: Legal Contact  
Facsimile: Fax Number

Notices sent in accordance with this Section 17.4 will be deemed effectively given: (a) when received, if delivered by hand (with written confirmation of receipt); (b) when received, if sent by a nationally recognized overnight courier (receipt requested); (c) on the date sent by facsimile with confirmation of transmission), if sent during normal business hours of the recipient, and on the next business day, if sent after normal business hours of the recipient; or (d) on the fifth (5th) day after the date mailed, by certified or registered mail, return receipt requested, postage prepaid.

- 17.5 Interpretation. For purposes of this Agreement: (a) the words “include,” “includes” and “including” are deemed to be followed by the words “without limitation”; (b) the word “or” is not exclusive; [and] (c) the words “herein,” “hereof,” “hereby,” “hereto” and “hereunder” refer to this Agreement as a whole; and all personal pronouns, whether used in the feminine, masculine, or neuter gender, include all other genders and the singular will include the plural and vice versa. Unless the context otherwise requires, references herein: (x) to Sections, Schedules and Exhibits refer to the sections of, and schedules and exhibits attached to, this Agreement; (y) to an agreement, instrument or other document (including this Agreement) means such agreement, instrument or other document as amended, supplemented and modified from time to time to the extent permitted by the provisions thereof, and together with all schedules and exhibits thereto; and (z) to a statute means such statute as amended from time to time and includes any successor legislation thereto and any regulations promulgated thereunder. The Schedules and Exhibits referred to herein will be construed with, and as an integral part of, this Agreement to the same extent as if such Schedules and Exhibits were set forth verbatim herein.
- 17.6 Headings. The headings in this Agreement are for reference only and will not affect the interpretation of this Agreement.
- 17.7 Entire Agreement. This Agreement, including all Service Orders and other Schedules and Exhibits and any other documents, agreements or instruments incorporated by reference herein, constitutes

the sole and entire agreement of the parties to this Agreement with respect to the subject matter contained herein, and supersedes all prior and contemporaneous understandings and agreements, both written and oral, and all subsequent oral understandings and agreements with respect to such subject matter. In the event of any conflict between the terms of this Agreement and those of any Schedule, Exhibit or other document, the following order of precedence will govern: (a) first, this Agreement, excluding its Exhibits and Schedules; (b) second, the Exhibits and Schedules to this Agreement as of the Effective Date; and (c) third, any other documents, instruments or agreements incorporated herein by reference. This Agreement and all Service Orders take precedence over any purchase order issued by Customer, which may be accepted by Landis+Gyr for administrative convenience only.

- 17.8 Assignment. Neither party will assign or otherwise transfer any of its rights, or delegate or otherwise transfer any of its obligations or performance, under this Agreement without the other party's prior written consent, which consent will not unreasonably be withheld or delayed. Any purported assignment, delegation or transfer in violation of this Section 14.8 is void. This Agreement is binding upon and inures to the benefit of the parties hereto and their respective permitted successors and assigns.
- 17.9 No Third-party Beneficiaries. This Agreement is for the sole benefit of the parties hereto and their respective permitted successors and permitted assigns and nothing herein, express or implied, is intended to or will confer on any other person or entity any legal or equitable right, benefit or remedy of any nature whatsoever under or by reason of this Agreement.
- 17.10 Amendment and Modification; Waiver. This Agreement may only be amended, modified or supplemented by an agreement in writing signed by each party hereto. No waiver by any party of any of the provisions hereof will be effective unless explicitly set forth in writing and signed by the party so waiving. Except as otherwise set forth in this Agreement, no failure to exercise, or delay in exercising, any right, remedy, power or privilege arising from this Agreement will operate or be construed as a waiver thereof; nor will any single or partial exercise of any right, remedy, power or privilege hereunder preclude any other or further exercise thereof or the exercise of any other right, remedy, power or privilege.
- 17.11 Severability. If any term or provision of this Agreement is invalid, illegal or unenforceable according to Law, such invalidity, illegality or unenforceability will not affect any other term or provision of this Agreement or invalidate or render unenforceable such term or provision. Upon such determination that any term or other provision is invalid, illegal or unenforceable, the parties hereto will negotiate in good faith to modify this Agreement so as to affect the original intent of the parties as closely as possible in a mutually acceptable manner in order that the transactions contemplated hereby be consummated as originally contemplated to the greatest extent possible.
- 17.12 Governing Law; Submission to Jurisdiction.
- (a) This Agreement and all related documents, and all matters arising out of or relating to this Agreement, are governed by, and construed in accordance with, the laws of the State of Governing Law, without regard to Governing Law's conflict of laws principles. The Uniform Computer Information Transactions Act does not have any application to this Agreement.
  - (b) Any legal suit, action or proceeding arising out of or related to this Agreement or the licenses granted hereunder will be instituted exclusively in the federal courts of the United

States or the courts of the State of Governing Law in each case located in Fulton County, and each party irrevocably submits to the exclusive jurisdiction of such courts in any such suit, action or proceeding. Service of process, summons, notice or other document by mail to such party's address set forth herein will be effective service of process for any suit, action or other proceeding brought in any such court.

- 17.13 Waiver of Jury Trial. Each party irrevocably and unconditionally waives any right it may have to a trial by jury in respect of any legal action arising out of or relating to this Agreement or the transactions contemplated hereby.
- 17.14 Equitable Relief. The Parties will be entitled to seek injunctive or other equitable relief whenever the facts or circumstances would permit a party to seek equitable relief in a court of competent jurisdiction.
- 17.15 Attorneys' Fees. In the event that any action, suit, or other legal or administrative proceeding is instituted or commenced by either party hereto against the other party arising out of or related to this Agreement, the prevailing party will be entitled to recover its reasonable attorneys' fees, expert witness fees and out-of-pocket and court costs from the non-prevailing party.
- 17.16 Limitations on Actions. No actions, regardless of form, arising from the transactions under this Agreement, may be brought by either party more than two (2) years after the cause of action has accrued.
- 17.17 Schedules and Exhibits. All Exhibits that are referenced herein and attached hereto, or are signed by both parties on or after the Effective Date, are hereby incorporated by reference. The following Schedules and Exhibits are attached hereto and incorporated herein:
- Schedule A     Service Level Agreement
- Schedule B     Service Order; Pricing
- 17.18 Publicity. Notwithstanding any other provision of the Agreement, Landis+Gyr shall not, without the Customer's prior written consent, publish any information pertaining to the Agreement, whether during the term of the Agreement or thereafter. Nor shall the Customer, without Landis+Gyr's prior written consent, publish any information pertaining to the agreement, whether during the term of the agreement or thereafter. Consent from either party will not be unduly withheld.
- 17.19 Counterparts. This Agreement may be executed in counterparts, each of which will be deemed an original, but all of which together will be deemed to be one and the same agreement and will become effective and binding upon the parties as of the Effective Date at such time as all the signatories hereto have signed a counterpart of this Agreement. A signed copy of this Agreement delivered by facsimile, e-mail or other means of electronic transmission (to which a signed PDF copy is attached) will be deemed to have the same legal effect as delivery of an original signed copy of this Agreement.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed as of the Effective Date by their duly authorized representatives.

Landis Gyr Entity

Legal Account Name

By:

By:

Name:

Name:

Title:

Title:

Date:

Date:

## SCHEDULE A

### SERVICE LEVEL AGREEMENT

Landis+Gyr shall provide Customer with Service Levels on the terms and conditions set forth in this Schedule and the Software as a Service (SaaS) Agreement dated as of the Effective Date, by and between Legal Account Name and Landis+Gyr Technology, Inc. (the “**SaaS Agreement**”). All capitalized terms that are not defined in this Schedule shall have the respective meanings given to such terms in the SaaS Agreement.

1. Definitions. For purposes of this Schedule the following terms have the meanings set forth below.

“**Error**” means any reproducible failure of the Service Software to operate in all material respects in accordance with the Documentation and, to the extent consistent with and not limiting of the Documentation, including any problem, failure or error referred to in the Service Level Table.

“**Service Levels**” means the defined Error severity levels and corresponding required service level responses and response times referred to in the Service Level Table.

“**Service Level Table**” means the table set out in Section 2.4.

“**Support Period**” means the Service Order Term as set forth in the applicable Service Order.

2. Availability Requirement. Subject to the terms and conditions of the SaaS Agreement and this Schedule, Landis+Gyr will use commercially reasonable efforts to make the SaaS Services Available, as measured over the course of each calendar month during the Support Period and any additional periods during which Landis+Gyr does or is required to perform any SaaS Services (each such calendar month, a “**Service Period**”), at least 99.5% of the time, excluding only the time the SaaS Services are not Available solely as a result of one or more Exceptions (“**Availability Requirement**”). “**Available**” means the SaaS Services are available and operable for normal access and use by Customer and its Authorized Users over the Internet in material conformity with the Documentation.

- 2.1 Exceptions. No period of SaaS Service degradation or inoperability will be included in calculating Availability to the extent that such downtime or degradation is due to any of the following (“**Exceptions**”):

- (a) Customer's misuse of the SaaS Services;
- (b) failures of Customer's or its Authorized Users' Internet connectivity;
- (c) internet or other network traffic problems other than problems arising in or from networks actually or required to be provided or controlled by Landis+Gyr or its Subcontractor; or
- (d) Customer's or any of its Authorized Users' failure to meet any minimum hardware or software requirements set forth in the Documentation.
- (e) Force Majeure Event

- (f) Failure, interruption, outage or other problem with any software, hardware, system, network, facility or other matter not supplied by Landis+Gyr pursuant to the SaaS Agreement or this Schedule.
  - (g) Scheduled Downtime; or
  - (h) disabling, suspension or termination of the Services pursuant to Section 3.4 of the SaaS Agreement.
3. Support Services. Landis+Gyr will provide SaaS Service maintenance and support services (collectively, “**Support Services**”) during the support hours throughout the Support Period in accordance with the terms and conditions of this Schedule and the SaaS Agreement, including the Service Levels and other Landis+Gyr obligations set forth herein. The Support Services are included in the SaaS Services, and Landis+Gyr will not assess any additional fees, costs or charges for such Support Services.
- 3.1 Support Service Responsibilities. Landis+Gyr will:
- (a) respond to Support Requests in accordance with the Service Levels;
  - (b) provide responsive telephone or email support as set forth in Section 3.6.
  - (c) Provide online access to technical support bulletins and other user support information and forums, to the full extent Landis+Gyr makes such resources available to its other customers.
- 3.2 Service Monitoring and Management. Landis+Gyr will continuously monitor and manage the SaaS Services to optimize Availability (defined herein) that meets or exceeds the Availability Requirement. Such monitoring and management will include:
- (a) proactively monitoring on a twenty-four (24) hour by seven (7) day basis all SaaS Services, infrastructure and other components of SaaS Service security;
  - (b) if such monitoring identifies, or Landis+Gyr otherwise becomes aware of, any circumstance that is reasonably likely to threaten the Availability of the SaaS Service, taking all necessary and reasonable remedial measures to eliminate such threat and ensure Availability;
  - (c) if Landis+Gyr receives knowledge that the SaaS Service or any SaaS Service function or component is not Available (including by notice from Customer pursuant to the procedures set forth herein or in the applicable Service Order):
    - i. Landis+Gyr will confirm the outage by a direct check of the associated facility or facilities;
    - ii. if Landis+Gyr's facility check in accordance with clause (i) above confirms a SaaS Service outage in whole or in part: (A) notifying Customer pursuant to the procedures set forth herein or in the applicable Service Order that an outage has occurred, providing such details as may be available, including a Landis+Gyr trouble ticket number, if appropriate, and time of outage; and (B) working all problems causing and caused by the outage until they are resolved as Critical Service Errors in accordance with the Support Request Classification set forth in the Service Level Table.

- iii. Landis+Gyr will continuously maintain the SaaS Services to optimize Availability that meets or exceeds the Availability Requirement. Such maintenance services will include providing to Customer and its Authorized Users:
  - a. such updates, bug fixes, enhancements, new releases, new versions and other improvements to the SaaS Services, including the Service Software, that Landis+Gyr provides at no additional charge to Landis+Gyr's other similarly situated customers. Specific upgrades are set forth in the applicable Service Order; and
  - b. all such services and repairs as are required to maintain the SaaS Services or are ancillary, necessary or otherwise related to Customer's or its Authorized Users' access to or use of the SaaS Services, so that the SaaS Services operate properly in accordance with this Agreement and the Documentation.

3.3 Scheduled Downtime. Planned maintenance and updates are not expected to exceed ten (10) hours in a normal month. Landis+Gyr will use commercial reasonable efforts to provide Customer advance notification (via email) of scheduled maintenance that is anticipated to involve system unavailability of two (2) hours or more. Landis+Gyr will use commercially reasonable efforts to notify Customer at least 48 hours (via email) in advance to schedule maintenance and updates (“**Scheduled Downtime**”). Landis+Gyr will use commercially reasonable efforts to perform scheduled maintenance outside the hours of 7:00 AM – 7:00 PM Central Standard Time, Monday – Friday.

3.4 Service Levels.

Response times will be measured from the time Landis+Gyr receives a Support Request until the respective times Landis+Gyr has responded to that Support Request. Landis+Gyr shall respond to all Support Requests within the following times based on Landis+Gyr's designation of the severity of the associated Error, in accordance with the Table below, subject to the parties' written agreement to revise such designation after Landis+Gyr's investigation of the reported Error and consultation with Customer:



Severity Level of Incident	Definition	Target Response Time	Status
Critical	<p><u>Critical Business Impact</u> – Impacts multiple users and halts or severely impacts the division's ability to conduct critical operations. Postponement of any critical interface file that can delay Field Services, Billing and daily critical activities.</p>	1 Hour or less	Within 4-8 Hours
High	<p><u>Significant Business Impact</u> – Impacts individual or small work group. Normal operations may be degraded but can continue.</p>	4 Hours or less	1 Business Day
Medium	<p><u>Some Business Impact</u> – Impacts individual or small work group. Normal operations may be degraded but can continue, and service response may be delayed until a mutually established future time. Issue is informational in nature, a request, suggestion or report. No immediate remedial action is expected.</p>	1 Business Day	3 Business Days
Low	<p><u>Non-Business Impact</u> – Maintenance request, data requests, and non-critical process enhancements.</p>	2 Business Days	6 Business Days

Landis+Gyr will respond to and investigate any suspected Incident in the Software within the time provided above. Resolution of such Incidents may take the form of a written response, supplementary documentation, work-around, coding change, product patch, or other correctional aids, which Landis+Gyr

will provide to Customer. In order for Landis+Gyr to meet Responses Time outlined above, customers should make contact via telephone to report Critical or High Incidents.

Should business requirements call for a more customized level of support, Landis+Gyr also offers Premium Support packages, which include dedicated technical support, client management and executive dashboard views to open technical views and more. Premium Support includes discounted rates for additional Smart Grid service offerings as well. Pricing for Premium Support is based on an agreed scope of work based on the options selected and can be quoted upon request.

### 3.5 Support Requests and Customer Obligations.

- (a) Support Requests. Customer may request Support Services by way of a Support Request. Customer shall classify its requests for Error corrections in accordance with the severity levels classifications and definitions of the Service Level Table set forth in Section 3.4 (“**Support Request**”). Customer shall notify Landis+Gyr of each Support Request by e-mail, telephone or such other means as the parties may agree to in writing. Customer shall include in each Support Request a description of the reported Error and the time Customer first observed the Error.
- (b) Customer Obligations. Customer will, by and through its employee or consultants provide Landis+Gyr with:
  - i. prompt notice of any Errors; and
  - ii. each of the following to the extent reasonably necessary to assist Landis+Gyr to reproduce operating conditions similar to those present when Customer detected the relevant Error and to respond to the relevant Support Request:
    - a. direct access to the Customer Systems and the Customer’s files and personnel;
    - b. output and other data documents and information, each of which is deemed Customer’s Confidential Information as defined in the SaaS Agreement; and
    - c. such other reasonable cooperation and assistance as Landis+Gyr may request.

3.6 Service Desk Contact Information. Landis+Gyr shall provide Customer with access to the Service Desk. Landis+Gyr’s current Service Desk business hours are 7:00 AM to 6:00 PM Central Time, Monday through Friday, excluding Landis+Gyr observed holidays (available upon request) and weekends (“**Business Hours**”). In addition, emergency access to on-call personnel via Landis+Gyr’s Emergency Dispatch Service will be provided by Landis+Gyr from 6:01 PM through 6:59 AM, and 24 hours per day on weekends and holidays. Landis+Gyr shall provide advanced troubleshooting, via telephone or e-mail, as deemed necessary by qualified Landis+Gyr personnel, to resolve Customer issues.

3.7 Submission Method. Customer can contact the Service Desk through:

- i. Telephone direct dial-in at 888.390.5733;
- ii. Fax to 218.562.5530, or

iii. E-mail at solutionsupport.na@landisgyr.com

All contact information is subject to change and update by delivery of notice and by posting on the Landis+Gyr Website at www.landisgyr.com.

4. Backup and Recovery. Landis+Gyr will conduct or have conducted at minimum, daily backups of Customer Data and perform or cause to be performed other periodic backups (snapshots, differential backups, etc.). At least one backup will be stored online (directly accessible) and one full backup will be stored near-line. Both copies will be less than one week old and may be overwritten as they are replaced with newer backups. Weekly backups are stored for a minimum of one month. Monthly backups are stored off-site for a minimum of one (1) year.
5. Business Continuity and Disaster Recovery Protection. Landis+Gyr has an ongoing Business Continuity (“**BC**”) program (that includes Risk Assessment) that covers its primary locations as well as a Disaster Recovery (“**DR**”) program for restoring its data center operations. Landis+Gyr uses industry best practices and exercises its DR program, (i.e. failing over its customer services to an alternate datacenter with client verification) for an additional fee.
6. Communications. In addition to the mechanisms for giving notice specified in the SaaS Agreement, unless expressly specified otherwise in this Schedule or the SaaS Agreement, the parties may use e-mail for communications on any matter referred to herein.

**LANDIS+GYR**  
**SUPPORT AGREEMENT**

This Landis+Gyr Support Agreement (this “**Agreement**”), effective as of the last signature date below (“**Effective Date**”) by and between Landis+Gyr Technology, Inc. (“**Landis+Gyr**”) and Legal Account Name (“**Customer**”) sets forth the parties’ supplemental rights and obligations with respect to (i) maintenance and support for the Software licensed and (ii) Landis+Gyr Equipment purchased by Customer from Landis+Gyr, under the separate Master Purchase, License and Services Agreement by and between Landis+Gyr and Customer dated also as of the Effective Date (the “**Master Agreement**”). Defined terms used but not defined in this Agreement have the meaning given to them in the Master Agreement or as defined below.

**1. Definitions.**

“**Audit Date**” means the date that Customer surveys the system to determine the number of communication modules in use within the Software.

“**Case**” means a communication from Customer to Landis+Gyr through the case tracking mechanisms of Landis+Gyr reporting a suspected Defect or other problems/questions the Customer is having with the Software or Equipment.

“**Commercially Reasonable Efforts**” means taking all such steps and performing in such a manner as a well-managed company would undertake where it was acting in a determined, prudent and reasonable manner to achieve a particular desired result for its own.

“**Customer Service Alert**” is a communication to a Customer regarding a required Customer action including but not limited to software, firmware or hardware related to Landis+Gyr products.

“**Customer Support**” means a range of services provided by Landis+Gyr to address questions and issues associated with Landis+Gyr Software and products. Services include troubleshooting, best practices, correct application of the Software and Equipment as per Documentation, assistance recreating issues, addressing product Defects and accepting all product enhancement requests.

“**Defect**” means a reproducible failure of the Software or Equipment to perform in substantial conformity with the specifications set forth in the Documentation.

“**Diagnose**” means to troubleshoot an issue, including making a determination whether or not the root cause is a Software or Firmware Defect.

“**Documentation**” means any and all manuals, instructions, specifications and other documents and materials that Landis+Gyr provides or makes available to Customer in any medium and which describe the functionality, components, features or requirements of the Software, including any one or more of installation, configuration, integration, operation, use, support or maintenance thereof.

“**Endpoint**” means a sensory-type device, e.g., electric meter, water meter, gas meter, DA device, load control switch, etc., that is equipped with an Advanced Metering Infrastructure (AMI) communication module.

“**Equipment**” means Network Equipment, Endpoint (a sensory device), and/or hardware that Customer has purchased either (i) directly from Landis+Gyr or (ii) through an authorized agent.

“**Firmware**” means software embedded in the Network Equipment, Endpoints and/or hardware that the Customer has purchased either directly from Landis+Gyr or an authorized agent.

“**Maintenance Release**” means any update, upgrade, release or other adaptation or modification of the Software, including any updated Documentation, that Landis+Gyr may provide to Customer from time to time during the term, which may contain, among other things, error corrections, enhancements, improvements or other changes to the user interface, functionality, compatibility, capabilities, performance, efficiency or quality of the Software, but does not include any New Version.

“**Major Release**” means updated release of Software to support major enhancements and addition of new functionality/modules, typically where the number to the right of the first decimal has been changed.

“**New Version**” means any new functional module of the Software that Landis+Gyr may from time to time introduce and market as a distinct licensed product, and which Landis+Gyr may make available to Customer at an additional cost via an amendment to this Agreement.

“**Patch**” means a change to the Software or its supporting data released to update, fix, improve, or to address a critical failure or Software Defect.

“**Respond**” means to take the following steps: (i) acknowledge to Customer that a Case has been received; (ii) open a ticket for the Case in Landis+Gyr’s Case Management System and enter the relevant data; and (iii) request any additional information not included in the initial Case that is necessary for Landis+Gyr to reproduce the cause of the Case and begin to Diagnose it.

“**Service Exception**” has the meaning set forth in Section 7.

“**Service Levels**” means the corresponding service level responses and response times associated with defined severity levels referred to in the Service Level Table.

“**Service Level Table**” means the table set out in Section 5.

“**Software**” means executable, object code version of the Landis+Gyr proprietary application licensed to Customer, under a separate agreement, as listed on Exhibit A, and any Maintenance Releases provided hereunder.

“**Supported Release**” means the most recent Major Release of the Software and two preceding Major Releases, including Maintenance Releases and Patches issued since the time that preceding Major Releases became Generally Available; provided, however, for Meter Data Management System Software, each Major Release will remain as a Supported Release for Thirty Six (36) months after it is made Generally Available by Landis+Gyr.

2. **Term; Termination.** This Agreement will commence on the Effective Date and continue for an initial term of one (1) year (the “**Initial Term**”).

- 2.1 **Renewal.** Upon expiration of the Initial Term, this Agreement shall automatically renew for successive one (1) year periods (each a “**Renewal Term**” and together with the Initial Term, the “**Term**”), unless a party provides the other party with written notice of its intent not to

renew this Agreement at least ninety (90) days prior to the expiration of the then current Term.

- 2.2 Fees During Renewal Terms. Landis+Gyr's Fees are fixed during the Initial Term. Fees for Renewal Terms may increase annually as of each anniversary of the renewal period by the Percentage of the Consumer Price Index (CPI-U) published for the end of Past Calendar Year. Consumer Price Index here is defined as – All Urban Consumers of the Bureau of Labor Statistics of the U.S. Department of Labor for U.S. for All Items with Base Years 1982-1984=100.
- 2.3 Termination. Either party may terminate this Agreement for cause upon sixty (60) days written notice for a default of material obligations by the other party not cured within such sixty (60) day period.
- 2.4 Effect of Termination. Upon termination for any reason, or at any other time that Customer or Landis+Gyr demands, the other party shall promptly deliver and/or certify destruction of Confidential Information, as appropriate, to the requesting party all Confidential Information (copies and originals) of the requesting party as may be in the other party's possession or under its control.

### **3. Support and Maintenance Services.**

- 3.1 Subject to the terms and conditions of this Agreement and the Software license terms and conditioned on Customer's compliance therewith, during the Term, Landis+Gyr will provide to Customer Landis+Gyr's standard customer support services in connection with the identification, diagnosis, and correction of Software Defects and/or Equipment issues, the provision of: (a) multi-channel assistance via Customer Support; (b) remote services via the Customer Support using screen share tools; (c) access to technical information on Landis+Gyr's website for proper use of the Software and Equipment (collectively, the "**Support Services**").
- 3.2 "**Maintenance Services**" will consist of Landis+Gyr providing all new releases and versions of the Software that are made commercially available by Landis+Gyr.
- 3.3 Landis+Gyr shall notify its customers in a commercially reasonable period of time should Landis+Gyr find it necessary to end of life (EOL) any Landis+Gyr Software or Equipment. Support for such EOL Software or Equipment will be limited to troubleshooting and knowledge sharing.

### **4. Customer Support and Access.**

- 4.1 Case (or Support Request) and Customer Obligations.
  - (1) Customer may request support services by way of a Case request. Customer along with Landis+Gyr shall classify Customer's requests for corrections in accordance with the severity levels classifications and definitions within the Service Level Table set forth below ("**Support Request**"). Customer shall submit each Case by e-mail, telephone, portal or such other means. Customer shall include in each support Case a description of the reported issue/question.
  - (2) Customer Obligations. Customer will, by and through its employees or consultants provide Landis+Gyr with:

1. prompt notice of any product Defects; and
  2. each of the following to the extent reasonably necessary to assist Landis+Gyr to reproduce operating conditions similar to those present when Customer detected the relevant issue and to respond to the relevant Case:
    - a. access to the Customer systems and the Customer’s files and personnel;
    - b. output and other data documents and information, each of which is deemed Customer’s Confidential; and
    - c. such other reasonable cooperation and assistance as Landis+Gyr may request.
- 4.2 Customer Support Hours. Landis+Gyr’s Customer Support business hours are 8:00 AM to 7:00 PM Eastern Time, Monday through Friday, excluding Landis+Gyr observed holidays (available upon request) and weekends (“**Support Hours**”). In addition, emergency access to on-call personnel via Landis+Gyr’s Emergency Service will be provided by Landis+Gyr after business hours, and 24 hours per day on weekends and holidays. Landis+Gyr shall provide advanced troubleshooting, via telephone or e-mail or portal, as deemed necessary by qualified Landis+Gyr personnel, to resolve Customer issues.
- 4.3 Submission Method. Customer may contact the Customer Support through:
- (a) Customer support portal
  - (b) 1-888-390-5733
  - (c) [solutionsupport.na@landisgyr.com](mailto:solutionsupport.na@landisgyr.com)

**5. Service Levels**

Landis+Gyr shall provide Customer with support Services on the terms and conditions set forth herein.

- 5.1 Support Service Responsibilities. Landis+Gyr will:
- (1) respond to support Cases in accordance with the Service Level targets;
  - (2) provide telephone or email or portal support as set forth below.
  - (3) Provide online access to Customer Service Alerts and other user support information and forums, to the full extent Landis+Gyr makes such resources available to its other customers.
- 5.2 Target Response Levels.

Landis+Gyr shall respond to all support Cases within the following targeted Response times based on designation of the severity of the associated Case:

Severity	Definition	Initial Target Response Time	Subsequent Target Response Time
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Severity 1 (Critical)	<p>A Severity 1 (Critical) issue indicates the production system is completely shut down or system operations or mission-critical applications are down. A Severity 1 issue also includes an application that is in final testing, facing a critical Production Use go-live time frame.</p> <p>Landis+Gyr promptly initiates the following procedures:</p> <ul style="list-style-type: none"> <li>• Assigns specialist(s) to correct the issue on an expedited basis.</li> <li>• Provides ongoing communication on the status.</li> <li>• Landis+Gyr team immediately begins work to provide a fix or temporary workaround</li> </ul> <p>The assumption is that customer resources are available during the contractual service hours, as necessary, to collaborate on a workaround or fix.</p>	1 Hour	2 Hours
Severity 2 (High)	<p>A Severity 2 (High) issue indicates the production system is functioning but severely impacted with limited capabilities, or is unstable with major periodic interruptions, or mission critical applications, while not being affected, have experienced material system interruptions. A Severity 2 issue may also indicate there is a time sensitive question impacting performance. Landis+Gyr assigns a specialist, and provides additional, escalated procedures as determined necessary by Landis+Gyr support services staff. Landis+Gyr exercises commercially reasonable efforts to provide a workaround or include a fix for the Severity 2 issue in the next maintenance release.</p>	4 Hours	1 Business Day



Severity 3 (Medium)	A Severity 3 (Medium) issue indicates the production system is still functioning but capabilities are moderately impacted, or the system is unstable with minor periodic interruptions or a minor loss of product functionality. There is a medium-to-low impact on the business, but the business continues to function, including by using a procedural workaround.	1 Business Day	3 Business Days
Severity 4 (Low)	A Severity 4 (Low) issue is a general usage question, request for information, reporting of a documentation error, or recommendation for a future product enhancement or modification. There is low-to-no impact on the business or the performance or functionality of the system.	3 Business Days	5 Business Days

In order for Landis+Gyr to meet Target Response Times outlined above, customers should make contact via telephone to report Critical or High issues. Any resolution of such Cases may take the form of a written response, supplementary documentation, work-around, coding change, product patch, or other correctional aids, which Landis+Gyr will provide to Customer.

**6. Support Escalation Policy:**

- 6.1 For each and every support issue presented to Landis+Gyr, the Customer Support teams work to respond as per the targeted initial and subsequent target response times. Occasionally, an issue requires a faster response, more attention, and a deeper understanding of the impact on your business.
- 6.2 When Severity Level cases classified as Critical are received, all Landis+Gyr support teams, including Support Managers, Escalations Manager, and Executive Leadership are immediately notified. The critical issue is triaged immediately. And then, the escalations leader and/or case owner contacts the customer and/or opens a phone bridge to begin efforts to address the issue. Both Landis+Gyr and Customer will work in good faith to address the issue. The critical issue is worked until a work-around or resolution is provided, or customer agrees the case severity is no longer critical and can be changed to other than severity one.
- 6.3 Regardless of the case severity, if a Customer believes that they are not receiving the proper response, the Customer may escalate the concern to Landis+Gyr. A customer may escalate the issue by notifying the concern to their Account Executive or ask the case owner to escalate their case to a customer Support Manager.
- 6.4 For any critical or escalated issue, the Customer Support Manager becomes involved and is responsible for ensuring the shortest possible resolution time through engaging the appropriate people and communicating the agreed action plans to the stakeholders from any of the personnel involved. They proactively engage the senior executives, as appropriate, to

improve customer relationships and demonstrate Landis+Gyr's commitment to the customer at the highest levels.

7. **Releases.** During the warranty period and the period for which Maintenance has been purchased by Customer and as part of Maintenance, Landis+Gyr will provide to Customer all Major Releases, Maintenance Releases, and all critical Patches of the licensed Software and Firmware as available (collectively, the "**Releases**").
  - 7.1 All Releases shall be included in the definition of Software under the separate license agreement. Such obligation is limited to Releases which Landis+Gyr generally releases to all its customers during such time period.
  - 7.2 Customer is responsible for installation and integration of any Release, excluding a Release relating to Infringement (which Release shall be the sole responsibility of Landis+Gyr). If the parties agree upon terms for Landis+Gyr to provide services in connection with the installation or further integration of a Release, that understanding will be documented under a separate consulting services agreement.
  - 7.3 Landis+Gyr will not be obligated or provide Maintenance if Customer has not installed a Supported Release.
  - 7.4 For avoidance of doubt, Software upgrades do not include new modules, application extensions, components, interfaces and adapters supporting additional functions.
  - 7.5 Landis+Gyr may issue Customer Service Alerts when necessary. Landis+Gyr will make the most current user manuals available through a customer portal that will be provided to Customer at no additional charge.
  - 7.6 Landis+Gyr will test Releases applying its Commercially Reasonable Efforts before certifying them as generally available.
  - 7.7 Custom code developed by Landis+Gyr for the Customer may be agreed upon under a mutually agreed statement of work for additional fees. Support for such customized code would be described in such statement of work.
8. **Customer Responsibilities.** Maintenance under this Agreement does not include and will not be provided by Landis+Gyr to Customer to the extent Customer does not comply in all material respects (to the extent applicable to the particular Software, Firmware and Equipment) with the following responsibilities of Customer:
  - (a) Ensure that the physical system environment, e.g., hardware requirements and configurations, temperature, humidity, physical security, is within Landis+Gyr's recommended parameters as specified in the Landis+Gyr recommended environments Documentation which is provided to Customer prior to implementation.
  - (b) Customer will perform field maintenance on the Equipment. This includes, but is not limited to, updating the Firmware and communication module Firmware to the latest versions which have been provided by Landis+Gyr
  - (c) Check system operational logs for Software Defects and verify that non-AMI network events are excluded.
  - (d) Check file system for any corruption.

- (e) Monitor disk space.
- (f) Back up the Landis+Gyr application software and configure files on a regular basis (weekly and monthly).
- (g) As applicable, maintain system users' password control and network security at all levels.
- (h) Investigate faults relating to the interconnection between the Software and the hardware of the host system.
- (i) Generate and monitor system statistics as recommended in writing by Landis+Gyr during the project kick off meeting.
- (j) Make available to Landis+Gyr if necessary, a remote communication connection to the Software for Landis+Gyr to provide remote system support.
- (k) Reasonably cooperate with and assist in Landis+Gyr's verification and replication of Defects.
- (l) Provide to Landis+Gyr all reasonable access to the location of the Software, Equipment and the host system hardware, including access to all relevant utilities, data communications sources, and data. Access can be in the form of secure VPN, web conferencing, remote access, or other secure access methodology as agreed by the parties in writing.
- (m) When reporting a suspected Defect, Customer is obligated to: (i) ensure that the use of the Software and Equipment is in accordance with its Documentation; (ii) use commercially reasonable efforts to eliminate any third party hardware, any operating system software, and any third party application software deficiencies; (iii) capture all relevant data, reasonably document the relevant operating conditions and other operating information, and supply Landis+Gyr with reasonably requested diagnostic information in English; and (iv) implement mutually agreed upon remedial, corrective or work-around procedure(s) and reasonably describe any limitations imposed by such corrections or workarounds that are known to Customer.
- (n) Once Customer completes its testing and validation procedures, Customer will promptly install all Software and Equipment provided by Landis+Gyr from time to time pursuant to this Agreement within a reasonable time after receipt thereof provided that such Software and Equipment is at no additional cost to Customer. Customer will use reasonable efforts to notify Landis+Gyr of any such installation of Software and Equipment within a reasonable period of time after installation. Customer shall endeavor to notify Landis+Gyr of verified resolution or otherwise take action within 10 Business Days of a shipment from Landis+Gyr with respect to a suspected Defect.

**9. Exclusions from Coverage.**

- 9.1 Matters Which Cause an Exclusion of Coverage. Support services does not include and will not be provided with respect to any case which is in part or whole caused by or the result of any of the following (each a "Service Exception"):

- (a) Any modification of the Software and Equipment performed by any party other than (i) Landis+Gyr or (ii) a third party approved in writing by Landis+Gyr in advance which performs such modifications in accordance with the Documentation.
- (b) Any use of the Software and Equipment not in compliance with Landis+Gyr Documentation.
- (c) Any hardware, peripheral products, or software not provided by Landis+Gyr or the interoperability of those products with the Software and Equipment other than those contemplated under the Agreement or the Documentation.
- (d) Any Defect, performance degradation, deficiencies, or non-compliance in any hardware or any other software used in connection with the Software, but not supplied by Landis+Gyr.
- (e) Unsealing, opening, or any modification of the Equipment performed by any party other than (i) Landis+Gyr or (ii) a third party approved in writing by Landis+Gyr in advance which performs such modifications in accordance with the Documentation.
- (f) Landis+Gyr hardware or equipment purchased from an unauthorized seller, dealer, or distributor.
- (g) Customer specific code installed and managed by the customer.
- (h) Customer specific code developed and managed by a third party.
- (i) Any other event not caused by Landis+Gyr.

9.2 Matters Excluded from Coverage. Maintenance is only provided as specified in this Agreement. Any additional services are not included in Maintenance and will require other agreements between the parties. The following services are not included in Maintenance:

- (a) Design and configuration of the Software.
- (b) System administration work that should be completed by Customer's system administrator, as addressed in the applicable SOW or project kick off meeting.
- (c) On-Site support services.
- (d) Delivery, license, or implementation of Software Releases other than those Releases specified herein.
- (e) Server hardware repairs and replacements.
- (f) Advanced Signaling Certification and Maintenance. Certification (ANSI/ITU compliance) and maintenance for SS7, ISDN, and future advanced signaling protocols.

9.3 Reproducible Matters. Customer will promptly notify Landis+Gyr of a Defect. The parties acknowledge that maintenance under Agreement (and any warranty services in this Agreement with respect to the Software and Equipment) may be difficult to provide unless a Defect or alleged Defect is reproducible or verifiable by Landis+Gyr.

## 10. Limitation of Liability

- 10.1 No Consequential or Indirect Damages. IN NO EVENT SHALL EITHER PARTY OR ANY OF ITS REPRESENTATIVES BE LIABLE UNDER THIS AGREEMENT TO THE OTHER PARTY OR ANY THIRD PARTY FOR ANY INDIRECT, CONSEQUENTIAL, INCIDENTAL, SPECIAL, PUNITIVE, OR EXEMPLARY DAMAGES (EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES), INCLUDING WITHOUT LIMITATION, LOSS OF BUSINESS, REVENUE OR PROFIT, ARISING OUT OF, RELATING TO, OR IN CONNECTION WITH THIS AGREEMENT, REGARDLESS OF THE FORM OF ACTION UPON WHICH A CLAIM FOR DAMAGES MAY BE BASED, WHETHER IN CONTRACT, TORT, STRICT PRODUCT LIABILITY, OR ANY OTHER LEGAL OR EQUITABLE THEORY. THESE LIMITATIONS WILL APPLY EVEN IF ANY LIMITED REMEDY FAILS IN ITS ESSENTIAL PURPOSE.
- 10.2 Maximum Liability. IN NO EVENT SHALL EITHER PARTY'S AGGREGATE LIABILITY ARISING OUT OF OR RELATED TO THIS AGREEMENT, WHETHER ARISING OUT OF OR RELATED TO BREACH OF CONTRACT, TORT (INCLUDING NEGLIGENCE) OR OTHERWISE, EXCEED THE TOTAL AMOUNT PAID TO LANDIS+GYR PURSUANT TO THIS AGREEMENT IN THE TWELVE (12) MONTH PERIOD PRECEDING THE EVENT GIVING RISE TO THE CLAIM. THE FOREGOING LIMITATIONS SHALL APPLY EVEN IF THE NON-BREACHING PARTY'S REMEDIES UNDER THIS AGREEMENT FAIL OF THEIR ESSENTIAL PURPOSE.
- 10.3 Exceptions. THE LIMITATIONS AND EXCLUSIONS SET FORTH IN THIS SECTION 12 SHALL NOT APPLY TO DAMAGES OR LIABILITIES ARISING FROM: PERSONAL INJURY OR DEATH OR DAMAGE TO ANY REAL OR TANGIBLE PERSONAL PROPERTY CAUSED EITHER PARTY'S NEGLIGENT ACTS OR OMISSIONS, OR WILLFUL MISCONDUCT.

## 11. General

- 11.1 Complete Agreement, Modification and Assignment. The parties agree that this Agreement and any ancillary agreements, exhibits or schedules constitutes the complete and exclusive agreement between them with respect to its subject matter and supersedes all previous understandings, negotiations, proposals, acknowledgements, and representations, whether oral or written with respect thereto. No modification of this Agreement will be effective unless it is in writing and signed by authorized representatives of Customer and Landis+Gyr. Customer may not assign this Agreement, or its rights or obligations under them without the express written consent of Landis+Gyr which shall not be unreasonably withheld. Any exhibit attached hereto is incorporated herein by this reference.
- 11.2 Notices. Notices, other than routine communications having no legal effect, shall be in writing and shall be sent by certified United States mail (return receipt requested), by guaranteed overnight delivery, by courier, or by confirmed facsimile addressed to the addresses set forth below:

For Customer:                      Legal Account Name  
   Account Address1  
   Account Address2

Attn: Legal Contact  
Facsimile No: Fax Number

For Landis+Gyr: Landis+Gyr Technology, Inc.  
30000 Mill Creek Avenue, Suite 100  
Alpharetta, GA 30022  
Attn: Legal Department  
Facsimile No: 678.258.1686

- 11.3 Force Majeure. Except for payment obligations, neither party is liable for failing to fulfill its obligations due to acts of God, civil or military authority, war, riots, strikes, fire, or other causes beyond its reasonable control. To the extent a party is substantially delayed by force majeure from performing its obligations hereunder, such party shall give notice and details of the force majeure to the other party as soon as practicable, then the parties may extend the time for performance by written agreement. In the event it shall become impossible for Landis+Gyr or Customer to perform its respective obligations because of force majeure, then in such event the party so unable to perform may terminate this Agreement upon written notice to the other. In no event shall an event of force majeure excuse or delay the payment of any amount owed by one party to the other party under this Agreement.
- 11.4 No Third Party Beneficiaries. There are no third-party beneficiaries to this Agreement, and no party other than Landis+Gyr and Customer shall have any legally enforceable rights under this Agreement.
- 11.5 Headings. All headings used in this Agreement are for reference purposes only and are not part of this Agreement.
- 11.6 Waiver; Severability. No delay or omission by Customer or Landis+Gyr in enforcing its rights or remedies under this Agreement shall impair such right or remedy or be deemed to be a waiver thereof. Any waiver, in whole or in part of any provision of this Agreement will not affect be considered to be a waiver of any other provision. No waiver of this Agreement shall be valid unless in writing and signed by the parties thereto. If any term of this Agreement is found to be unenforceable or invalid for any reason, such term shall not affect the other provisions, but such unenforceable term shall be deemed modified to the extent necessary to render it enforceable, preserving to the fullest extent permitted the intent of Customer and Landis+Gyr set forth in this Agreement, and all other terms will remain in full force and effect.
- 11.7 Independent Contractor. Nothing in this Agreement shall be read as appointing either party as the agent or legal representative of the other party for any purpose whatsoever, nor shall either party hold itself out as such. This Agreement does not create or is intended to create any express or implied relationship of joint ventures, partners, employer and employee, associates, or principal and agent between the parties, and both parties are acting as independent contractors and principals for their own accounts. Neither party is granted any right or responsibility for or on behalf of the other or otherwise to bind the other. In providing the Maintenance, Landis+Gyr shall have sole responsibility for all persons employed by it in connection with the performance of such Maintenance and, except as provided in this Agreement, Landis+Gyr shall solely determine the methods, details, and means of performing the Services.

- 11.8 No Personally Identifiable Information. Landis+Gyr software support specialists may request that Customer send Landis+Gyr the problem information, systems data or test cases, etc., or that Landis+Gyr support specialists be able to view it with Customer electronically. To accomplish this, Customer may be offered several options by the Landis+Gyr support specialist. Customer agrees that it will not send or provide Landis+Gyr access to any personally-identifiable information (“**PII**”), whether in data or any other form. Customer agrees to be fully responsible for reasonable costs and other amounts that Landis+Gyr may incur relating to any such information mistakenly provided to Landis+Gyr or the loss or disclosure of such information by Landis+Gyr, including those arising out of any third-party claims. Should Customer mistakenly provide PII to Landis+Gyr, Customer shall immediately notify Landis+Gyr in writing, and reasonably cooperate with Landis+Gyr to take any mitigating actions deemed necessary to remove such PII from the Landis+Gyr systems.
- 11.9 Governing Law. This Agreement shall be deemed to be a contract made under the laws of the State of Georgia and shall for all purposes be construed and enforced in accordance with Georgia law without regard to its conflicts of laws principles.
- 11.10 EEOC and Affirmative Action.
- Landis+Gyr is in compliance with all of the laws and Executive Orders prohibiting discrimination, including but not limited to Title VII of the Civil Rights Act of 1964 as amended, the Civil Rights Act of 1991, 42 USC 2000(e), et seq., and all applicable state and local laws against discrimination.**
- Landis+Gyr and subcontractor, if any, shall abide by the requirements of 41 CFR §§ 60-1.4(a), 60-300.5(a) and 60-741.5(a). These regulations prohibit discrimination against qualified individuals based on their status as protected veterans or individuals with disabilities, and prohibit discrimination against all individuals based on their race, color, religion, sex, or national origin. Moreover, these regulations require that covered prime contractors and subcontractors take affirmative action to employ and advance in employment individuals without regard to race, color, religion, sex, national origin, protected veteran status or disability.**
- 11.11 Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed an original, and will become effective and binding upon the parties as of the Effective Date.

**Acknowledged and agreed by the authorized representatives of the parties.**

Legal Account Name

Landis Gyr Entity

Signature

Signature

Printed Name

Printed Name

Title

Date

Title

Date



**Exhibit A**

*[Note: L+G to customize this Exhibit A for each customer taking into consideration the software being supported]*

**Fees and Payment Terms**

Invoice and Payment. Landis+Gyr will issue invoices to Customer for all amounts owed to Landis+Gyr hereunder. Invoices for Support and Software Maintenance Services shall be issued yearly in advance. Payment is due within thirty (30) days of the invoice date. Late payments will be subject to interest from the due date at the lesser of one percent (1%) per month or the maximum rate allowed by law.

Training: Landis+Gyr shall provide annually, at no additional cost to Customer, one (1) Landis+Gyr training course not to exceed sixteen (16) credits for a single participant. These credits can be applied to any University standard course offering. Training credits not exercised annually shall expire. Landis+Gyr’s list of standardized training is available within the customer portal. Customer will be responsible for all Customer expenses incurred, including trainee’s transportation, lodging and meals. **[NOTE: This provision is used only when Customer has purchased a Command Center license or purchasing support for Command Center]**

**Primary Contacts at Utility:**

Training: Name: \_\_\_\_\_ Email: \_\_\_\_\_

Technical Product: Name: \_\_\_\_\_ Email: \_\_\_\_\_

**Support Fee:**

The Support Fee is based on the number of Endpoints in use by Customer on the Audit Date.

For customers with the RF, Cellular, or PLC technologies, customer shall pay an annual base fee of \$ \_\_\_\_\_ and an additional \$ \_\_\_\_\_ each for Endpoint.

**Endpoints Licensed:**

Customer has conducted an audit of its system and certifies that the following numbers of endpoints deployed on the Audit Date:

PLC Endpoints Licensed: \_\_\_\_\_

RF Endpoints Licensed: \_\_\_\_\_

Cellular Endpoints Licensed: \_\_\_\_\_

**MDM Support and Software Maintenance Fee**

The maintenance fee for the maintenance year is \$ \_\_\_\_\_.

**AGA Support and Software Maintenance Fee**

The maintenance fee for the maintenance year is \$\_\_\_\_\_.

5.2.1 Meter Data Management System Requirements	YES	NO	Comments
<p>The MDMS supports time dynamic pricing (TOU, Critical Peak, Peak Rebate, Real-time Pricing) and load control rebate rates, inclining block rate, Bi-directional, and demand side management elements.</p>	<p><b>X</b></p>		<p>SmartWorks Compass can synchronize with the appropriate system of record for rate and tariff information to support time dynamic pricing. It can leverage this data to compute simple to complex billing requirements including demand, Bi-directional, block TOU, tiered or Block rates, seasonal rates, and power factor calculations. It is fully capable of supporting electric services for TOU, Real-time pricing, volumetric and Critical Peak Pricing processes and InterCounty’s current and future rate tariffs. Business process, billing requirements, rate structures etc. vary by utility and SmartWorks Compass provides the flexibility to meet these diverse needs. Our proposal includes support for the capture, storage, reporting of TOU registers and demand etc. from the AMI head-end and generation of billing determinants to deliver to CIS. The MDM supports the ability to calculate these billing determinants using interval data. Note that the scope of this effort to calculate from interval data is currently not included in our proposal as utility requirements vary.</p> <p>Our optional Rate &amp; Revenue Analysis module enables utilities to:</p> <ul style="list-style-type: none"> <li>• Configure or import TOU framing and complex rates with blocks/tiers</li> <li>• Calculate what-if bills and assess cost delta for an account</li> <li>• Calculate what-if revenue and impact of changes on utility revenue</li> <li>• Identify consumers most impacted by rate structure changes</li> </ul>
<p>The MDMS supports Prepayment (pay-as-you-go).</p>	<p><b>X</b></p>		<p>SmartWorks Compass fully supports publishing data to third party applications such as Prepay. Typical integrations require MeterSense MDM to provide usage information to the pre-payment tool for credit decrement and may also require SmartWorks Compass to facilitate a remote disconnect/reconnect based on information obtained from the pre-payment solution. Current SmartWorks Compass functionality comprehensively supports these requirements and for systems that support MultiSpeak, SmartWorks Compass utilizes the “GetLatestReadings” method for</p>

		<p>providing the meter reads. Additional capabilities include initiation of Remote Connect, Disconnect and Arming commands to AMI endpoints that support this feature.</p> <p>Some of the prepay features that leverage MultiSpeak (both v3.0 and v4.1) methods are:</p> <ul style="list-style-type: none"> <li>• On Demand Read</li> <li>• Remote Connect, Disconnect &amp; Arm</li> <li>• Register Reads Interface for Prepay support</li> <li>• Service Orders</li> </ul> <p>Note that our proposal does not include an integration to a pre-pay system. Pricing for this integration available upon request</p>
<p>The MDMS has the capability to aggregate usage across multiple meters.</p>	<p><b>X</b></p>	<p>SmartWorks Compass has the capability to aggregate usage across multiple meters. This aggregated usage can be used to develop line loss profiles, which SmartWorks Compass is able to then use to analyze how these groups affect the system as a whole, by comparing their performance to metering points across the system. These profiles can be aggregated in time sequences and compared to system metering points specifically at the substation bus that allows the monitoring of line losses more frequently and more precisely. The ability to detect line losses down to the line segment allows a management strategy to define regions that fall outside of accepted line losses where attention can be focused to inspect and correct impediments to power flow that reduce efficiencies in the system. These impediments can come from adverse harmonics, failing plant, theft from both meter and secondary taps and adverse settings on conditioning equipment. It tracks multiple assets, with multiple data-streams and associations between assets, identification of delivered versus received consumption and calculated usage represented in virtual meters.</p>
<p>The MDMS will receive, validate, estimate and edit AMI collected meter readings for every meter, every day, to ensure accurate billing data.</p>	<p><b>X</b></p>	<p>SmartWorks Compass receives, validates, estimates and edits AMI-collected meter readings daily for every meter to ensure accurate billing data is being pushed to the CIS. SmartWorks recommends the upload and processing of all interval data at least once daily, if not more frequently as needed and received through the AMI Head-end system by the MDM. MeterSense MDM enables the multi-threaded</p>

			processing of meter read data at a frequency that matches the AMI system. Rather than scheduling the processing once per day as a batch job, our VEE Job Scheduler is a daemon process that runs 24x7 and handles all VEE in the system. In cases where meter data is delivered more in real time via the MultiSpeak interval data interface, or even in near-real time via frequent file delivery, this design makes validated meter data available for downstream processing (such as billing or web presentment) much sooner than it was previously.
The MDMS tracks which intervals have been provided for billing and supports exception processes for subsequent edits or replacements of the data.	X		SmartWorks Compass tracks and identifies which intervals have been provided for billing purposes and supports exception processes for subsequent edits or data replacements. All changes in information regarding account, premise, rate, meter data, etc. is imported on a daily frequency at least once a day, but can be configured to function as often as needed. Any exceptions are identified and resolved during our robust Validation/Estimation/Editing process. Please see Appendix – MeterSense MDM (VEE) for additional information.
<b>6.2.1 Meter Data Management System Requirements</b>	<b>YES</b>	<b>NO</b>	
The MDMS captures and stores all meter events that are provided by the AMI System.	X		SmartWorks Compass captures and stores all meter events as provided by the AMI headend system. SmartWorks Compass is a scalable enterprise class system that is designed for long-term storage of large volumes of AMI data. The system provides core capability for storing (and presenting) the raw data (reads and events) obtained from the AMI system and the data that has been through the VEE process. This means that the utility will have access to both versions of the data if the need arises. The system is flexible and can be architected to support the data storage requirements from the onset or configured to match the growth of the AMI system over time. SmartWorks will work with InterCounty in defining the scope that will meet InterCounty's requirements now and in the future.
The MDMS has the capability to identify unauthorized consumptions extracted from the AMI System status and alerts and from disconnect status information extracted from the existing SEDC Meridian system.	X		SmartWorks Compass has the capability to identify unexpected consumption with data received from the AMI, as well as identify alerts, events and connect/disconnect statuses with data received from the SEDC CIS. One method of detecting unauthorized usage is leveraging the AMI data along with available distribution point/ meter relationships to identify usage comparison discrepancies to report

		<p>using our Meter Usage Comparison report. Depending on the capabilities of the CIS system, SmartWorks Compass can perform queries to obtain account status information and use this data to generate Unexpected Consumption and Zero Consumption reports. Please see Appendix – Reporting for more details regarding how this extracted information is used to create various reports within SmartWorks Compass.</p>
<p>The MDMS has the capability to identify theft of service as indicated by AMI status and alerts extracted from the AMI System.</p>	<b>X</b>	<p>SmartWorks Compass has capability to support the identification of service theft as indicated by information received from account status in the CIS as well as any associated alerts that support the AMI status. Our optional Loss Analysis module supports the ability to identify unauthorized usage / theft. SmartWorks Compass has the ability to use pre-defined algorithms to detect line losses down to the line segment allows a management strategy to define regions that fall outside of accepted line losses where attention can be focused to inspect and correct impediments to power flow that reduce efficiencies in the system. These impediments can come from adverse harmonics, failing plant, theft from both meter and secondary taps and adverse settings on conditioning equipment. Pricing and additional information can be provided as needed for the optional module functionality.</p>
<p>The MDMS stores meter read intervals in the increment supplied by the meter: 5 min, 15 min, 30 min, hourly, daily, monthly from AMI System.</p>	<b>X</b>	<p>SmartWorks stores meter read intervals in the increments supplied by the meter. There is no limit on the level of granularity/frequency of interval or other data channels per meter that the solution can support; SmartWorks Compass has typical capability to store 5, 15, 30 and 60 minute interval data reads. However, the level of granularity/frequency can be configured as needed to meet InterCounty's final requirements and may impact the server specifications in a on-premise deployment and pricing for a SaaS / hosted deployment. The server specifications included with our proposal is based on the current request and standard number of channels for the requested deployment. Additional information can be provided should these requirements change.</p>
<p>The MDMS supports consumer lifecycle-move in/move out, disconnect/ connect at pole, disconnect/connect at meter.</p>	<b>X</b>	<p>SmartWorks Compass provides native capability for handling remote service connect and disconnect business processes, through an integration with the AMI system. SmartWorks Compass communicates with AMI systems using the MultiSpeak web service protocol.</p>

		<p>For batch processing of multiple Connect / Disconnect orders at the meter, SmartWorks Compass provides native ability in the GUI to manually initiate Mass Remote actions on an ad-hoc basis (on demand) – including the verification and auditing of these transactions. It also provides the ability to broker these transactions automatically on a schedule via standard interfaces between the CIS, SmartWorks Compass and the AMI.</p> <p>SmartWorks Compass also enables the authorized personnel to be able to perform remote service switch operation, through the MDMS – CIS integration. SmartWorks Compass is CIS/AMI agnostic, and is therefore able to tightly integrate with any CIS and AMI system. Service switch operations initiated in the CIS are brokered through SmartWorks Compass, which then initiates a request to the AMI system which operates the service switch to cut off/turn on services.</p> <p>SmartWorks requests a discovery to determine scope, effort and cost to configure a solution that will meet the project needs.</p>
<p>All reads that are presented to the consumer through NISC’s MDM must be validated through the MDMS before presentation.</p>	<p><b>X</b></p>	<p>Comply. SmartWorks Compass tracks and audits all interval reads through the validation process before this information is pushed to external systems for presentation purposes. We welcome a discussion to better understand the scope of presentation through the NISC MDM.</p>
<p>The MDMS supports the meter provisioning process through SEDC Meridian.</p>	<p><b>X</b></p>	<p>Recommended best practices are that a direct interface between the system of record, CIS and AMI be utilized for this requirement. However, SmartWorks Compass can be configured to pass meter provisioning information between the two systems, if required. It supports AMI deployment activities and with full integration with other utility systems can provide enhanced functionality. It has proven data collection and AMI system performance reporting, such as status, install data, non-communicating meters, collector association, communication routing (RF mesh networks), hop length, hop level and hop count. It can also correlate the data from multiple systems to identify potential provisioning issues. Some out-of-the-box reports include:</p> <ul style="list-style-type: none"> <li>• Unknown Meters – communicating meters that do not have a matching installation feedback order</li> </ul>

		<ul style="list-style-type: none"> <li>• Orphan Meters – Installed meters that are not communicating</li> <li>• Meters that have never reported data</li> <li>• Meters that have not communicated in a user-defined period of time</li> </ul>
The MDMS has the capability to store latitude and longitude coordinates for meter location.	X	SmartWorks Compass has capability to store meter location information including latitude and longitude coordinates via synchronization with the CIS. Reports in SmartWorks Compass allow the user to search by location and/or meter number to track and view meter data.
The MDMS provides the capability for users to create new validation and estimation rules.	X	SmartWorks Compass provides capability for user-created, custom validation and estimation routines. The custom validation routine allows the utility to implement a site-specific validation routine, and the custom estimation routine allows a site-specific estimation to be added to the system.
The MDMS includes validation rules such as sum check, spike check, kvar check, hi-lo check, and missing data check.	X	<p>Listed below are “Out of the Box” Validation Routines included in MeterSense:</p> <ol style="list-style-type: none"> <li>1. Interval Flags Validation Routine</li> <li>2. Future Date Validation Routine</li> <li>3. Interval Length Validation Routine</li> <li>4. UOM Validation Routine</li> <li>5. Comm Module Validation Routine</li> <li>6. Max Demand Validation Routine</li> <li>7. Register Increasing Validation Routine</li> <li>8. Spike Check Validation Routine</li> <li>9. Sum Check Validation Routine</li> <li>10. Zero Duration Validation Routine</li> <li>11. HiLo Validation Routine</li> <li>12. Past Read Validation Routine</li> <li>13. HiLo Demand Validation Routine</li> <li>14. Watt Var Validation Routine</li> <li>15. Has Minimum Data Validation Routine</li> </ol>



		<p>16. Continuous Usage Validation Routine</p> <p>17. Negative Reads Validation Routine</p> <p>18. <i>Custom Validation Routine – This validation routine allows the utility to implement a “site specific” validation routine</i></p>
The MDMS has the flexibility to apply validation and estimation rules to various configured groups.	X	Standard functionality exists within SmartWorks Compass to allow user the flexibility to apply validation and estimation rules to various, user-configured groups as needed for analysis and reporting purposes.
The MDMS allows configuration thresholds and boundaries for estimation on specific accounts by meter/consumer, group, tariff/rate, or service provider.	X	Standard functionality exists within SmartWorks Compass that allows configuration thresholds and boundaries to be defined for estimation on specific accounts by meter group, customer group, tariff/rate, or service provider.
The MDMS provides reports on edited interval data, including original and new values, reason, process, and user.	X	SmartWorks Compass provides reports on all interval data, both original and newly edited values, the reason for the edit, which editing process was used and by which user.
The MDMS adjusts meter estimates based on recent interval values that are received after the fact to ensure accurate billing data.	X	SmartWorks Compass automatically adjusts estimated meter data based on recently obtained interval values to ensure accurate billing data is passed to the CIS for billing purposes.
The MDMS has the ability to perform line loss analysis.	X	Our optional Line Loss Analysis module supports the full extent of these capabilities; pricing and additional details can be provided as needed. SmartWorks Compass has capability to perform line loss analysis. By utilizing line loss profiles on aggregated and individual meter data, SmartWorks Compass is able to analyze how these groups affect the system as a whole, by comparing their performance to metering points across the system. These profiles can be aggregated in time sequences and compared to system metering points specifically at the substation bus that allows the monitoring of line losses more frequently and more precisely. The ability to detect line losses down to the line segment allows a management strategy to define regions that fall outside of accepted line losses where attention can be focused to inspect and correct impediments to power flow that reduce efficiencies in the system. These impediments can come from adverse harmonics, failing plant, theft from both meter and secondary taps and adverse settings on conditioning equipment. It tracks multiple assets, with multiple data-streams and associations between assets,

		identification of delivered versus received consumption and calculated usage represented in virtual meters.
The MDMS allows line loss analysis to be broken down by substation and feeder.	<b>X</b>	Using our optional Line Loss Analysis module, the solution allows line loss analysis results to be broken down by various parameters including by substation and feeder.
The MDMS has the ability to perform transformer loading analysis.	<b>X</b>	SmartWorks Compass offers optional modules such as transformer load analysis, electric loss analysis, and outage supervision that provide analytics to support varying distribution automation functionality, provided by external systems such as SCADA and AMI. Pricing for these modules and associated services is not included in our current proposal; however, we welcome a discussion to better understand your specific transformer loading analysis requirements or additional analysis needs.



# SaaS Pricing

*Presented to*

*Inter-County Energy Co-operative*



**Smartworks SaaS Pricing:**

The following are modules SmartWorks has proposed and included in our core subscription.

- MeterSense MDM
- KPI Dashboard

SaaS	
Annual SaaS Fee	\$73,126
Services (charged upfront)	\$207,000
Initial Infrastructure Setup Fee	\$10,000
Total (yr1)	\$290,126

**Pricing Notes:**

- Maintenance N/A (covered in SaaS Fee)
- Extended Infra Support N/A (covered in SaaS Fee)

For the core modules listed above the following is a high-level description of the implementation services that will be undertaken (SaaS);

- Install, configure and implement the SmartWorks Software
- Initiate the collection and management of interval, register, and operational data from AMI head-end within SmartWorks Software.
- Integrate with the AMI systems, CIS to import meter usage, event and location data and to provide the necessary meter, event, and billing data as required.
- Deliver system training designed to develop competency with the use and configuration of the SmartWorks Software.
- Provide support during User Acceptance Testing (UAT)
- Perform functional and integration testing

**Meter Counts & Server Sizing:**

SmartWorks’ assumption on server sizing and hosting costs are based on Inter-County’s full deployment of AMI meters for electric services.

SmartWorks Compass will store the interval and register read data according to the following table:

Service	Number of Meters	Interval Length	Number of Channels
Residential	19,761	15	1
Residential	1,040	15	2
Commercial	3,120	15	1
Commercial	2,080	15	2

- The number of daily processed reads is estimated to be **2,795,520**.
- Actual read numbers may vary over time. The server size is recommended with the assumption that the number of services may expand by 25% over five years.
- A minimum of three (3) years of data must be retained for immediate access.
- An additional five (5) years can be maintained for secondary access via the Compass APR process (Archive Purge and Restore)



# SMARTWORKS **COMPASS**

Solution Summary

<http://www.HarrisSmartWorks.com>

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## 1. THE VALUE IN SMARTWORKS COMPASS

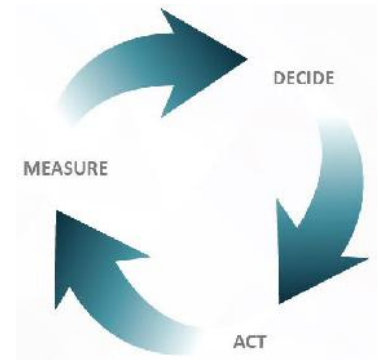
**SmartWorks Compass** is a utility decision management solution that delivers the benefits of smart infrastructure investments to electric, water and gas utilities. Comprised of robust analytics, metrics, visualization and automation tools, **SmartWorks Compass** enables utilities to maximize return on investments in their smart infrastructure by seamlessly converting massive volumes of data into powerful insights and automated actions.

### Utility Decision Management:

Utility Decision Management (UDM) empowers utilities to make better decisions, more efficiently. **SmartWorks Compass** is designed specifically to improve *decision yield*, a metric formally defined as the combination of precision, consistency, speed, agility and cost in making decisions. This entails rapid integration with multiple systems for source data, deep analytics to assess conditions, automation to execute the required actions and visualization of metrics to show quantified results.

By employing UDM, utilities are able to monitor the financial and operational impact of decisions, in order to better define and improve future actions.

**SmartWorks Compass** provides highly sophisticated, yet cost-effective functionality right out of the box. It is easy to implement, simple to use and painless to upgrade.



SmartWorks views software solutions from the point of view of the utility's business processes and **SmartWorks Compass** has been designed specifically to streamline those processes. While utilities struggle with the challenge of realizing the value in their AMI investments, **SmartWorks Compass** can deliver the value by tying the AMI technology tightly into the business processes.

For example, comprehensive Validating, Estimation and Editing (VEE) routines in **MeterSense** MDMS monitor incoming interval data, filling gaps, fixing anomalies and efficiently delivering the cleansed data to the CIS in the form of billing determinants. Timely and accurate data improves the billing process. Interval data graphs and summaries are placed at the fingertips of the Customer Service Rep (CSR), as is the ability for instant remote meter reads and remote connect/disconnect, all from within the CIS user interface, thereby reducing call times and improving efficiency while increasing customer satisfaction.

**SmartWorks Compass** helps to identify non-technical losses – through managing tamper notifications, analysing usage and improving processes for credit-challenged customers – thereby maximizing revenue.

As a reliable and robust system of record for meter data, **SmartWorks Compass** provides standard reports that measure and score card the performance of the meter data collection systems, comparing percentage of reads delivered with promised reliability targets – an independent validation of your Service

Level Agreements (SLA). The utility also gains the ability to measure the results of conservation or demand management initiatives, allowing better prioritization and management of utility programs.

Efficiencies are realized both with internal resources and in the distribution system itself. The available **Outage Performance** module can add intelligence and context to outage notifications, identifying likely causes of an outage and automatically initiating service orders, thereby making outage response faster and more efficient.

The **Transformer Loading Analysis** module can be leveraged to perform transformer loading analyses that can help to optimize the distribution system. The **Line Loss Analysis** module can be leveraged to quantify losses in distribution systems

In addition to improving the effectiveness and efficiency of the Customer Service organization, **SmartWorks Compass** can directly engage the customer by serving up usage data via web portal technology. This empowers the customer with information presented either through the utility's own web page or through a separate portal, resulting in reduction in calls and call times for your CSR department. **SmartWorks Compass** plays a significant role in enabling price response through TOU rates or critical peak pricing while it can also be used to monitor conditions and initiate direct load control.

These are just a few examples of how **SmartWorks Compass** can tie smart grid technologies into the business processes to help utilities realize the true value of their investments.



## 2. MEETING YOUR REQUIREMENTS

### 2.1. Solution Flexibility

**SmartWorks Compass** offers flexibility in many respects, allowing the utility to deploy a solution that will quickly and cost-effectively meet its specific needs. Some examples follow:

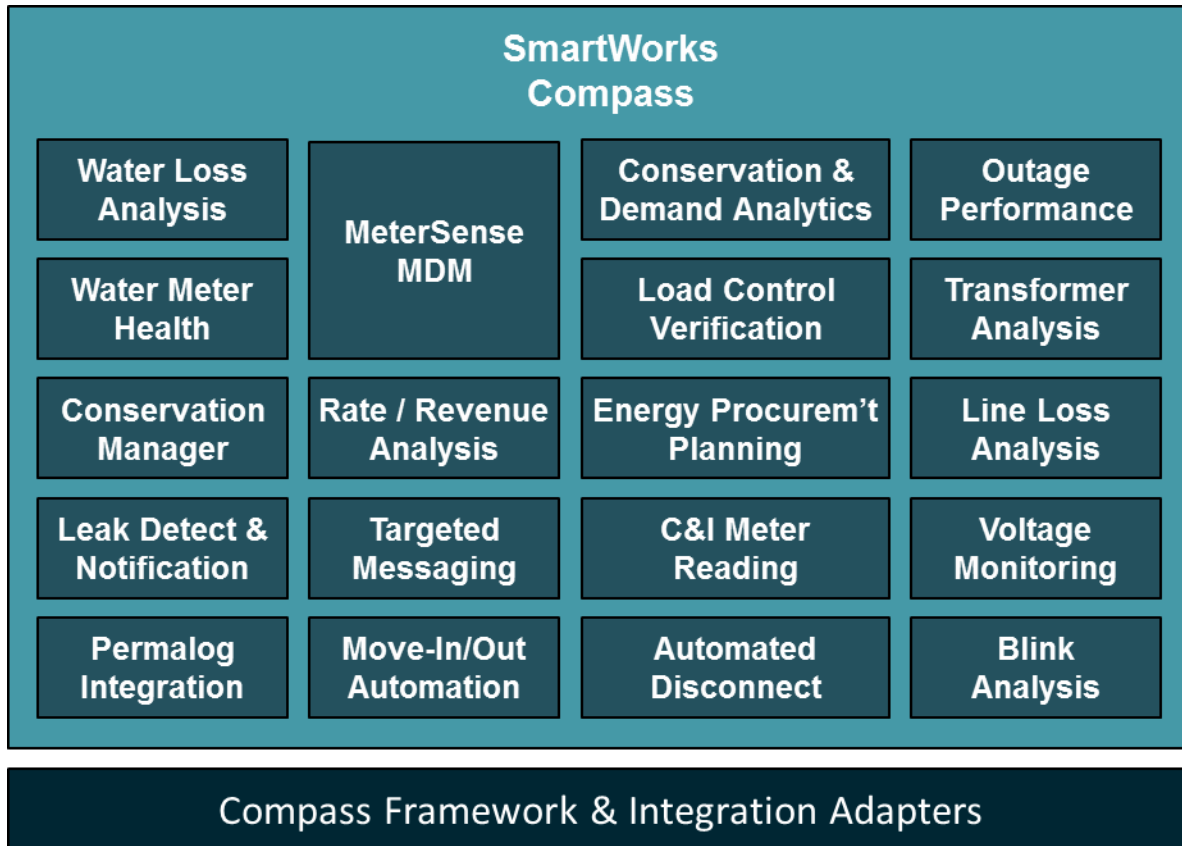
#### 2.1.1. Modularized Solution

**SmartWorks Compass** offers a flexible toolset that enables utilities to deploy targeted functionality that serves immediate needs, while providing the ability to grow the solution as their business evolves – all without the need for customization. The **SmartWorks Compass** suite includes the **MeterSense** MDM – a powerful, scalable and configurable meter data management (**MDM**) solution that quickly manages and intelligently interprets growing volumes of critical smart meter data. It also includes series of decision management modules that combine integration, automation and workflow with deep analytics to streamline utility processes.

#### 2.1.2. Licensing

The solution can be purchased as a software license or in the form of Software as a Service (SaaS), which involves monthly payments.

This conceptual view of **SmartWorks Compass** indicates the modules that can be licensed.



The major modules are summarized in the MODULES section below.

## 2.2. Reporting

**SmartWorks Compass** provides multiple levels of reporting capabilities depending on the needs of the user and the combination of modules purchased and deployed. It provides an extensive list of standard reports available in the native browser-based user interface. Additionally, administrative users can generate reports by identifying an existing report and pre-configuring the setup parameters, or by defining a SQL query, then registering the new report.

The **SmartWorks Compass** database also allows connection by third party reporting tools that are already in use by the utility or procured separately. Such tools include IBM Cognos, Crystal Reports, Business Objects and others.

### 3. MODULES

The major modules are detailed below.

#### 3.1. MeterSense Meter Data Management (MDM)

**MeterSense** is a comprehensive Meter Data Management (MDM) system that gathers data from multiple meter data collection systems, cleanses the data, provides long term storage with robust audit trail of any changes to data and delivers billing determinants as required. The system makes this data available for support of Customer Services processes. Where needed, **MeterSense** validates the installation and provision of smart metering in order to identify problems before they affect your business.

**MeterSense** incorporates the following, where configured:

- System Interfaces (quoted specific to the project) for:
  - Synchronization with CIS or other system of record for meter, location, and other information
  - Import of meter data from AMI and/or meter data collection systems
  - Delivery of billing determinants
- Validation, Estimation and Editing (VEE)
  - Configurable routines to identify gaps and fill with estimates based on configurable layered techniques, using historical data or standard class profiles, where needed
  - Configurable routines to identify bad data and replace with estimates
  - Audit trail of all changes to the data
  - Exception handling processes that allow users to investigate discrepancies, with supporting information placed at their fingertips
  - Intelligent routines to identify usage patterns that warrant further investigation, e.g. continuous consumption or threshold-based monitoring
- Reporting & Analysis for meter data
  - Meter data reports
  - Event reporting

The solution focuses on streamlining the following core functions:

- AMI Deployment Support

Assesses new meters as they are deployed as assets, checking that they are delivering data and are provisioned correctly. Problems are identified before they start affecting your business.
- AMI Health & Performance

Assess data delivered by AMI for completeness and accuracy. Tracks the numbers of reads and measures them against any service level commitments from the AMI vendor.
- VEE / Billing Support

Cleanses the incoming meter data to ensure high quality data for billing and analysis. Calculates billing determinants and delivers those determinants to the Customer Information System for billing.
- Customer Service Support

Places data at the fingertips of Customer Service personnel so that they are equipped to handle incoming customer calls, reducing call times and increasing first call resolution.

Key AMI analysis features, subject to AMI data availability:

- Map View with filtering and color coding
- Meter Communication Route
- Dependent Meters
- Meters with Most Dependents
- Color Coding Collectors by Number of Meters
- Color Coding Meters by Number of Hops
- View Collectors on Map
- Meters with Intermittent Dependents
- Meters per Collector Report
- Long Hop Report

### 3.2. KPI Dashboard

The **Key Performance Indicator (KPI) Dashboard** provides a snapshot view of distribution system performance within one or more configurable, personalized screens. It enables utilities to monitor and easily share information regarding operations and processes. The **KPI Dashboard** is equipped with many KPIs and multiple dashboards out of the box. These standards dashboards utilize data that is readily accessible in **SmartWorks Compass**.

Utilities and their consultants are able to extend the KPI Dashboards by collecting data from other systems and creating new KPIs and new dashboards. This could include data from any accessible system, e.g. CIS, MDM, SCADA, OMS.

The **KPI Dashboard** calculates key metrics based on the data, tracks how those metrics change over time, and monitors the results against key thresholds. Metrics are displayed through powerful visualization tools that enable utilities to drill down and view the detailed underlying data; explore the root cause of any significant changes; and view trends through a movie / time lapse feature. It also enables utilities to easily share information with others so that utilities can react quickly by mobilizing resources.

Key features:

- Graphical dashboard display of KPIs
- Drillable links to underlying data and metrics
- Time lapse / movie view of key metrics over time
- Scheduled KPI reports at regular intervals
- Share KPIs (on a scheduled- or exception-basis)

### 3.3. Targeted Messaging

This module empowers the utility to deliver personalized communications to selected segments of their customer population.

The solution uses Intelligent Segmentation, which is the categorization and grouping of customers into distinct groups that share similar characteristics, such as demographics, usage patterns, locations and

other criteria. The **Targeted Messaging** module provides utilities the means to automatically target selected customer segments with personalized messages that contain customer-specific information. It can dramatically improve the effectiveness of your customer communications, with better focus and greater response rates at lower cost.

Some use cases for targeted messaging are:

- Automatically generate monthly reports or score cards for customers
- Prioritize content delivery to maximize effectiveness of programs
- Targeting customers for conservation or demand response programs or specific communications

Periodic reports or score cards are highly configurable and contain rich data specific to each customer. Ad Hoc emails can be configured for one-time communications to groups of customers, e.g. for specific events or programs.

### 3.4. Automated Move-In/Move-Out

SmartWorks Compass Automated Move-In/Move-Out (MIMO) module automates the process of populating and resolving MIMO service orders with start reads and final reads to save the CSRs the time to do it manually.

Virtual Disconnect is enabled by monitoring for usage on inactive accounts and proactively notifying the utility if usage is discovered.

Physical disconnection and reconnection of service can be included where required and where the meters are equipped with an integral service switch.

KPI Dashboards provide tracking of the MIMO processes in general and the effort saved by automating them.

KPI Dashboards of processes including:

- Actions performed
- Number of successes, number of failures
- Effort saved due to automation of these processes

### 3.5. Rate and Revenue Analysis

The **Rate and Revenue Analysis** module enables utilities to evaluate the financial impact of various operational scenarios both on consumers' costs and on the utility's revenues.

The **Rate & Revenue Analysis** module enables utilities to:

- Configure or import TOU framing and complex rates with blocks/tiers
- Calculate what-if bills and assess cost delta for an account
- Quantify the effect of rate changes on customers
- Quantify the impact of changes on utility revenue

- Identify consumers most impacted by changes to rate structures or by switching rates.
- Assess changes to parameters in existing rates or assess groups of customers changing from one rate structure to another.

### 3.6. Automated Disconnect/Reconnect

The **Automated Disconnect/Reconnect** module is for the operation of a service switch to disconnect or reconnect service, independent of the Move-In/Move-Out process. It is most commonly used for situations with credit issues, with disconnect actions triggered by failure to pay and reconnect actions triggered by payments made.

The solution for automation of service disconnection & reconnection includes the following functions:

- Automated execution of Service Disconnect operation (open the service switch at the meter) for “Failure to Pay” Service Orders that have been set up in the Customer Information System.
  - Check if account is flagged as special/protected for non-disconnect, e.g. due to life support or other medical situations.
  - Logic to accommodate seasonality (e.g. no disconnect during Christmas holidays) or weather (e.g. no disconnect when the temperature is above or below a specified comfort/safety threshold).
  - Scheduled timing of connection operations, e.g. disconnect process to begin at 8:00am.
  - Throttling of Disconnect operations, e.g. to spread out a large number of disconnects in batches over period of several hours, to avoid a flood of calls to Customer Service at the same time.
  - Audit trail recording confirmation of successful operation at time of execution.
- KPI Dashboards of processes, including
  - Actions performed.
  - Number of Successes, number of failures.
  - Time saved or \$ saved by automating this process

### 3.7. Outage Performance

The **Outage Performance** module provides valuable visibility at reasonable cost where there is no comprehensive Outage Management system in place. Outages events by meter are recorded for display and analysis, allowing users to immediately understand the extent of an outage and the progress of restoration efforts.

The information made available to the user includes the following:

- Outages can be viewed on a map with color-coded icons.
- Outage Event summary analysis indicates which meters have experienced outages, how many, over what timeframe and whether they are currently out of service.
- Outage Event listings provide the details of individual outage notifications.

- User can assign Reason Codes for further reporting or analysis.
- The system calculates Outage Statistics for frequency & duration (SAIDI, SAIFI, CAIDI, CAIFI), allowing the user to view those metrics filtered by outage duration or reason code.
- KPI Dashboard displays metrics on outage events and outage statistics

There are multiple sources of information on which meters are experiencing outage conditions. Any combination of these may be implemented (as defined in the Statement of Work) for a specific deployment.

- Outage Notifications and Outage Restoration Notifications from any meters delivered as part of the periodic meter data transfer.
- Outage Notifications and Outage Restoration Notifications from AMI meters delivered in near real-time via MultiSpeak integration.
- Loss of power or restoration of power keyed in by Customer Service personnel from customer phone calls

### 3.8. Transformer Loading Analysis

The SmartWorks **Transformer Loading Analysis** module continually analyses loads on distribution transformers and identifies those at risk of failure, resulting in improved system reliability and better asset utilization. “What-if” scenario planning determines the optimum replacement size for overloaded transformers, and helps determine if existing transformers have sufficient capacity for newly constructed locations.

The system performs a complex set of calculations and analysis, yet presents the results in a simple, intuitive fashion. The algorithms have a thoroughly researched and generally useful set of default parameters, but also permit a high degree of flexibility for advanced users. Power factor corrections, load growth adjustments, optimal operating band definitions and even notification settings are all easily configured to produce results that are the most meaningful to the utility.

Key features:

- Improved System reliability with reduced downtime & reduced restoration costs
- Increased customer satisfaction
- Reduce physical losses by operating transformers within their optimal loads
- Reduce asset costs by right-sizing underutilized transformers.

### 3.9. Line Loss Analysis

The **Line Loss Analysis** Module will quantify losses for all master metered points in the distribution network while identifying and flagging the biggest areas of loss and loss trending over time.

Functionality Included:

- KPI Dashboard:
  - Number of Metered Distribution Points that show losses above a specific threshold
  - Losses specific to a number of critical Metered Distribution Points

- Map views of points color coded by level of loss
- Registered Reports that display these points by level of loss
- Loss Analysis report by metered distribution point

### 3.10. Voltage Analysis

The **Voltage Analysis** modules provides visibility in voltage performance of the distribution network. At allows the utility to monitor high and low voltage levels throughout the network. It also provides the ability for notifications where individual locations experience voltages outside specified thresholds.

Functionality delivered (subject to the nature of voltage data available):

- Voltage KPI Dashboard
  - Display of multiple voltage performance metrics such as number of low voltage instances of the past x days or number of instances of a location remaining below a voltage threshold for a period of time.
- Voltage Analyses
  - Tabular view of meters exhibiting instances of voltage above or below a specific threshold
- Voltage Summary Report
  - Tabular view of all meters attached to a specific feeder
- Voltage Map
  - Meters mapped and color coded by high or low voltage meter notifications / events / thresholds
  - Threshold Based Map
  - Meter Event Map
- Voltage Data Reporting
  - Graphs showing Min, Max, or Average Voltages depending on availability of data
  - Tabular Reports
  - Meter Events
  - Event Type Summary
  - Meter Event Detail Listing

### 3.11. Blink Analysis

The SmartWorks Compass **Blink Analysis** module will analyze blinks counts or momentary outages by meter, and relate them to the network connectivity relationships, to infer the number of operations of each circuit breaker or recloser. The solution therefore empowers the utility to plan recloser maintenance around number of operations rather than equipment age or installation date. The solution also helps to identify intermittent connections in the network that cause blinks.



**Functionality Included:**

- KPI Dashboard:
  - Number of Transmission CBs with operations
  - Number of Distribution CBs with operations
  - Number of Reclosers with operations
  - Total number of blinks and total blinks per meter
- Color coded map with:
  - Meters color coded by number of blink counts
  - Reclosers and Circuit Breakers color coded by blink count
- Registered Reports to show Blink Count per Meter or per reclosing device
- Graphical View of Daily Blink Count for a meter or per reclosing device

### 3.12. Energy Procurement Planning

The **Energy Procurement Planning** module empowers utilities to predict consumption patterns, peak demand levels and load contributors using algorithms that combine historical consumption information with weather normalization and other adjustments. The **Energy Procurement Planning** module optimizes the balance of accurate forecasts with ease of use. It provides usage forecasts through straightforward configuration and offers invaluable insights to purchasing departments, distribution planners, finance staff, production or demand planners, rate analyzers and customer service personnel.

When combined with other optional modules, such as **Rate and Revenue Analysis**, the **Energy Procurement Planning** module offers even more powerful functionality and enables utilities to:

- Identify and quantify the needs for reliability-driven or price-driven demand management through an accurate understanding of predicted load. It provides input into the optimum level of demand management, as well as the design and selection of the appropriate programs.
- Determine optimum candidates for conservation or peak demand management initiatives by assessing forecasted demand and identifying consumers that are predicted to exceed specific thresholds for consumption or demand. Utilities can then target those consumers with specific programs or incentives.
- Improve distribution and supply planning by accurately predicting medium term consumption patterns, while modeling different scenarios for new types of consumption (e.g. irrigation systems with significant water draw or electric vehicles that demand high energy at specific times).
- Enhance customer service by forecasting accurate bills for commercial and industrial, as well as residential consumers. Utilities can predict bills by applying rate structures to forecasted usage.
- Create more accurate budgets and mitigate risk by producing consumption forecasts based on varying weather predictions or changes in demand. Utilities can define best, expected and worst case scenarios, then apply cost structures to assess financial impact.

- Make better procurement decisions by providing enhanced visibility into consumption and peak demand events for months and years into the future. With more accurate consumption projections, utilities can make better decisions on water rights, supply planning or energy purchases.

### 3.13. Direct C&I Meter Reading

While MeterSense is typically configured to import data from an AMI Head End System, we provide the capability to collect data directly from meters that are accessible over the internet and which support the ANSI C12.18 and C12.19 data and communication standards. This capability can be extremely valuable if it can eliminate the need for a utility to deploy and maintain a separate meter reading system for their Commercial & Industrial meters.

### 3.14. Water Conservation Manager

The SmartWorks **Water Conservation Manager** empowers decision makers at water agencies to make wise, informed decisions on how best to allocate their limited conservation budgets and resources. It tracks costs, participants and parameters of each conservation program, initiative and trial. It empowers water agencies to direct their future time and money into the initiatives that provide the biggest benefit per dollar spent and calculate the actual water savings from each program to determine the return on investment. The solution works with or without AMI data and will:

- Track all of your conservation-related data in a single system of record, rather than a collection of custom databases and spreadsheets
- Measure the level of water conservation for each customer under each conservation program using a variety of sophisticated baseline and forecasting algorithms with scientifically proven statistical accuracy. The algorithms are designed to leverage AMI/Smart Meter data if available, but will effectively work with only monthly meter reads
- Compare the measured conservation benefit of each program with control groups to separate the effects of temperature, rainfall, or unknown factors

The solution includes program analyses that summarize key data for each program, including program costs, number of participants, total water savings and cost per unit volume of water saved. It includes views for customer Service Representatives that summarize program and savings for an individual customer plus customer-specific scorecards that can be shared with customers.

### 3.15. Leak Detection & Notification

With this module, SmartWorks helps the utility to identify potential leaks on the customer's side of the meter, prioritize and categorize the leaks and notify those customers so they can take actions. A continual analysis of results is displayed in a KPI Dashboard.

The **Leak Detection & Notification** module identifies potential leaks both from meter notifications and using intelligent data analysis. A prioritized list of customers to be contacted is then produced, filtered for false positives and duplicates, and refined on an ongoing basis to eliminate wasted effort.

### Functionality Delivered:

- Import Leak Events from AMI meters.
- Monitor for Continuous Consumption, with parameters configurable by group.
- Generate Leak Notifications using either or both approaches above.
- Provide notification summary reports to utility personnel
- Leaks are intelligently processed to determine whether they are repeat or ongoing leaks, whether a service order has been created and whether the customer has already been notified.
- Customer notifications are initiated subject to utility processes:
  - Send notifications via email to customers, or
  - Create Leak Detection Service Order in CIS
- Leak Detection KPI Dashboard, displaying.
  - Leaks Detected: Number of locations with a suspected leak.
  - Average Leak Time: Average time of leak, based on Continuous Consumption statistics.
  - Average Leak Volume: Average leak volume, takes the average of each interval that reported a Continuous Consumption failure.
  - Leak Notifications Sent: Leak Notifications sent to customers.

### 3.16. Water Loss Analysis

This module will calculate and continually monitor losses to the greatest level of detail enabled by the utility's existing metering in the distribution network. The utility can focus efforts in the areas of greatest loss, immediately identify increases in loss, and reap greater loss reduction without increasing field costs.

The **Water Loss Analysis** module makes loss analysis MORE TIMELY for the utility, quantifying losses as soon as data is available to the system, and MORE GRANULAR, by assessing losses for each individual area of the distribution system that can be isolated.

The solution includes the following elements:

- KPI Dashboard that summarizes losses over recent time periods.
- Map of distribution areas, color-coded by loss.
- Loss Summary Reports, including Total Production volume, loss volume, loss percentage and other metrics.

The solution accommodates meters that are not part of the AMI system that may be read automatically and recorded in SCADA or read through a more manual approach. Storage facilities are also incorporated into the calculations where storage volumes or levels are recorded.

### 3.17. Water Meter Health

The SmartWorks **Water Meter Health** module uses advanced analytics to identify malfunctioning meters and perform *targeted* meter replacements or repairs.

Key features are:

- Detecting Stuck Meters: Find meters showing no measured usage recently. Eliminate accounts with vacancy, seasonal vacancy, onsite wells, etc.
- Detecting Degrading Meters: Advanced algorithms determine the most likely meters degrading in accuracy over time.
- With hourly AMI data, identify over-sized and under-sized meters based on meters rated capacity.
- Track meter problems and meter replacements
- Track associated reduction in apparent losses on an ongoing basis.

Users are presented with actionable lists of candidate meters for replacement (filter, prioritized and tracked), configurable analyses that allow categorization of meters by severity of in accuracy, map views of problem meters, dashboard of meter replacements and revenue recovered.

Where applicable, the solution employs time-lapse aerial imagery for deeper analysis to identify and filter locations with irrigation changes.

The benefits of these analytics are varied:

- Assess meter accuracy
- Stopped meters
- Degrading accuracy
- Identify isolated meters for replacement
- Focus replacement programs, e.g. AMR/AMI, to areas where accuracy can be most impacted
- Manage warranty issues for installed meters
- Enables data-driven decisions based on revenue recovery versus costs.

### 3.18. Acoustic Leak Integration

Acoustic Leak Detection systems operate by deploying acoustic sensors at various points in the water distribution system to listen for the characteristic sound of water leaks. They report their data back for recording & analysis. The **Acoustic Leak Integration** module brings the acoustic leak detection data into SmartWorks Compass for display and monitoring, where the data is communicated back through the AMI head end system.

The standard module out of the box is based on Permalog sensors communicating over the Sensus FlexNet AMI system and relies on the standard integration approach agreed between SmartWorks and Sensus. Permalog Acoustic Leak Detection Sensors (LDS) are manufactured by Fluid Conservation Systems Inc. (FCS), a well-established North American provider of leak-detection technology. The Permalog LDS can be equipped with a Sensus SmartPoint so that the data it generates can be transmitted over the Sensus FlexNet network.

For other leak detection systems or other AMI networks, SmartWorks will need to deploy an additional data adapter and may need to update the analytics, which are subject to quote.

Key features:

With the daily data retrieved from the Permalog devices, users can:

- View the Leak Detection Sensors (LDS) on a map
- View a list of LDS that are currently in a leak condition
- View a graph of the Leak, Level and Spread for each LDS.

## 4. SELF-FUNDING IMPLEMENTATION

The flexibility of **SmartWorks Compass** makes it highly suited to rapid deployment followed by progressively phasing in additional functionality. This means that savings from the early phases can fund the cost of future phases.

Based on discussions for a specific project, we would base our recommended deployment plan on the project quantifiable benefits. As an illustration, a typical project progression may encompass the following steps:

- Step 1 (sample):  
Meter to Cash processes, AMI interface, **SmartWorks Compass** geo-coding of meter locations, communication status tracking, **AMI Deployment Monitoring**.
- Step 2 (sample):  
**Customer Service Streamlining**, usage profiling, on-demand reading, remote service switch operation. Volumetric billing based on AMI reads.
- Step 3 (sample):  
**Flexible Tiered and Volumetric Billing**, tariff evaluation as well as additional CS improvements through rate analysis.
- Step 4 (sample):  
Automated analysis of incoming notifications, tight integration to CIS and automatic creation of service orders and communication with crews.
- Step 5 (sample):  
**Operational Analysis**, via integration with SCADA.
- Step 6 (sample):  
**Revenue Assurance** through automatic variance monitoring and intelligent parsing of tamper notifications. Partial automation of workflows for credit-challenged customers.
- Step 7 (sample):  
**Consumer Portal** to empower customers with score carding.

These sample steps represent one possible illustration. There are many feasible approaches and the optimum path can only be determined through discussion of objectives for your utility.

## 5. CAPABILITIES

### 5.1. Validation, Estimation & Editing

**MeterSense** MDMS dramatically improves the quality of data by processing every single interval through its comprehensive Validating, Estimation and Editing (VEE) routines. The VEE process selectively fills gaps and fixes data anomalies based on user configuration and also selectively presents certain validation exceptions for manual review, again based on user configurable parameters. Register and Intervals reads are processed through an extensible validation engine for validating, editing, and estimating data received from the AMI. VEE can be customized along multiple lines of categorization, including down to the individual meter level. Data is stored both in its raw, incoming form and its cleansed, processed form, with an audit trail of any changes.

MeterSense enables the multi-threaded processing of meter read data. Rather than scheduling the processing once per day as a batch job, the VEE Job Scheduler is a daemon process that runs 24x7 and handles all VEE in the system. In cases where meter data is delivered more in real time via the MultiSpeak interval data interface, or even in near-real time via frequent file delivery, this design makes validated meter data available for downstream processing (such as billing or web presentment) much sooner than it was previously.

### 5.2. Reporting

**SmartWorks Compass** provides multiple levels of reporting capabilities depending on the needs of the user and the combination of modules purchased and deployed.

#### 5.2.1. SmartWorks Native Reporting

**SmartWorks Compass** provides an extensive list of standard reports available in the native browser-based user interface. Each report is accessed either by clicking through the appropriate folder in the menu, or via the menu search feature. Reports are configured by the user by selecting dates, meters and/or filters to define what the report shows. Reports may be printed or exported to PDF or Microsoft Excel with a single click. Reports may also be generated on a user-defined schedule and emailed.

Users may create their own menus specific to their daily activities. This is done by identifying frequently used reports and adding them to the “My Menu” feature, defining menu folders if desired. Each user may also select the first page viewed upon login.

#### 5.2.2. SmartWorks User-Created Reports

Also within the core **SmartWorks Compass** solution, administrative users may generate reports by identifying an existing report and pre-configuring the setup parameters, or by defining a SQL query, then registering the new report. These user-created reports are known as Registered Reports. They may be added to the user interface menus, with permissions assigned by Roles.

Registered Reports provide an immense amount of power and flexibility to create reports in tabular form. Registered Reports can be extremely useful to users that want to access them through the menus or schedule their delivery. They can also be used in automated processes executed by the Rules Engine.

### 5.2.3. Third Party Reporting

The **SmartWorks Compass** database allows connection by third party reporting tools that are already in use by the utility or procured separately. Such tools include IBM Cognos, Crystal Reports, Business Objects and others. For users that would like to use third party reporting tools, SmartWorks offers the option for a metadata model to streamline the report creation process.

Third party custom reporting tools can be useful when custom reporting needs extend beyond tabular reports and require rich graphical reporting. They are also useful when **SmartWorks Compass** data needs to be combined with data from systems outside **SmartWorks Compass** for reporting purposes.

## 5.3. Integration

The general integration strategy for **SmartWorks Compass** is to implement open standards- based interfaces with techniques that are best-suited to the specific integration point objectives. We employ different techniques depending on the volume of data being transferred and how close to real-time the communication needs to occur. **SmartWorks Compass** is flexible enough to allow multiple integration approaches. This allows us to execute the most cost-effective, robust and reliable interfaces for specific circumstances.

For example:

- **Direct Database Connection** – used for tasks such as synchronization that are most efficiently performed with a database query and response.
- **Web Services** – used for exchanges that require parameters to be communicated in real-time, usually in smaller scale, typically with confirmation that an action has been performed, e.g. for On-Demand Read or Remote Connect Disconnect.
- **File Transfer** – used for large scale transfer of data such as a daily meter data file from AMI to MDM. May also be used for synchronization in instances where direct database connection is not feasible. File formats follow accepted industry standards wherever feasible, e.g. MultiSpeak, CMEP, HHF.

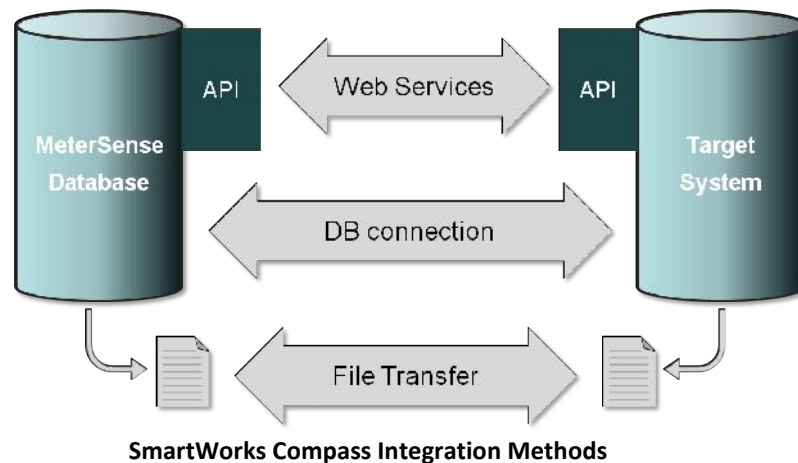
### 5.3.1. MultiSpeak Support:

MultiSpeak is a standards-based set of interfaces for system integration in the utility industry. It defines SOAP/XML web services for a large number of different data flows and transactions between utility systems. In recent years, it has benefited from greater and greater adoption among smart grid software vendors.



The value of MultiSpeak is obvious: plug and play interoperability between utility systems, resulting in much faster and less expensive software implementations. The **MeterSense** MDM currently supports the MultiSpeak standard for some of the more common MDM use cases, and plans to expand the scope of supported MultiSpeak interfaces in future releases.

**MeterSense** supports both MultiSpeak 3.0 and MultiSpeak 4.1. MultiSpeak 3.0 has been in use for many years, and is still the most commonly used and supported version. MultiSpeak 4.1 at the time of writing is in the late stages of definition, and is just beginning to gain some vendor adoption, however it contains many improvements over 3.0 and much better support for Smart Grid technology. **MeterSense** can simultaneously support both MultiSpeak 3.0 and 4.1.



Interfaces are developed based on the specific project and these requirements are established and agreed during an extensive Discovery process at the project outset. In this way, we are gearing our interfaces to specific project objectives instead of canning them or enforcing rigid formats or protocols. SmartWorks works closely and collaboratively with the Utility and the Utility’s other technology providers to ensure that data integrations meet the needs of the business processes and are performed in robust, reliable and cost-effective ways. Our customers appreciate SmartWorks’ flexibility and collaboration in its integration approaches in a complex field where many vendors are (at least temporarily) limited to a small number of rigid formats or protocols.

### 5.3.2. CIS Systems

The Customer Information System (CIS) is typically the database of record for all customer information including which meter is attached to an account. We therefore synchronize **SmartWorks Compass** with the CIS for meter, customer, location, account and other basic information. **SmartWorks Compass** can also use other systems of record at the same time for synchronization, where necessary.

It is critical to ensure all consumption data is accurately gathered, validated, edited and sent from the AMI to the utility's CIS. **MeterSense** MDM cleanses incoming usage data, then sends billing determinants to the CIS on a user-defined schedule.

In many cases, Utilities need the ability to send control commands or make other use of two-way communication between the CIS and meters in the field. **SmartWorks Compass** enables this through web services interfaces.

**SmartWorks Compass** has been designed to integrate with any CIS system. Even with older CIS systems that were not built on the most open of standards, we can perform the necessary synchronization through the exchange of pertinent information in flat files.

### 5.3.3. AMI/AMR Systems

**SmartWorks Compass** is AMI/AMR agnostic and is designed to load interval data, register reads, meter events any other available data from any AMI vendor.

In addition to the acquisition of data from the utility's AMI, **SmartWorks Compass** handles meter data from multiple sources, such as handheld, mobile, fixed network, etc. and facilitates the integration of multiple advanced meter reading technologies from multiple suppliers. It will also support loading MVRS file formats for meter read information from other reading collection methods. It seamlessly integrates multiple technologies in conjunction with traditional meter reading methods, and the ability to merge modern and traditional meter reading methods and technologies without impacting or modifying downstream billing processes. This is critical given most utilities will continue to manually collect meter read data while they deploy their AMI network.

### 5.3.4. SCADA, OMS & Other Operational Systems

**SmartWorks Compass** has been designed to integrate with the utility's core business systems. This includes SCADA and Outage Management Systems (OMS). It also includes other tools such as Distribution Modeling tools that may hold value information on the relationships between meters and distribution assets.

Included Process Automation functionality allows for the receipt, analysis, and display of outage related events from the AMI. As **SmartWorks Compass** stores asset relationships, it is capable of analyzing the root cause of outage events received from the AMI, e.g. if the outage is the results of a distribution transformer failure. Using on-demand read requests, **SmartWorks Compass** is also able to determine if a reported customer outage is an issue on the utility's side of the meter, or on the customer's side. **SmartWorks Compass** will simplify and streamline the dispatching process for field service crews.

### 5.3.5. GIS Systems

**SmartWorks Compass** will synchronize and store GIS co-ordinates for all meters, collectors, and transformers from whatever system is the master database of this information (CIS, GIS, Asset Management, etc.). Map-based reports will be available within the **SmartWorks Compass** product, and

**SmartWorks Compass** information can also be made available within the utility's GIS system user interface, with the appropriate integration.

### 5.3.6. Third Party Interfaces

**SmartWorks Compass** has been designed to use industry standard means for extracting data in order to integrate with other 3rd party applications. In addition to CIS, OMS other 3rd party applications may include GIS, WEB products, Load Forecasting /Profiling tools, etc. A MultiSpeak interface enables connectivity to many utility industry applications.

**SmartWorks Compass** was developed with an extensive Application Programming Interface (API) that utilized industry-standard SOAP/XML/HTTP web services. A data dictionary is also available for integration with the Oracle relational database.

## 5.4. Security

As information technology security comes under deserved scrutiny, it is crucial that any Meter Data Management (MDM), Analytics or Reporting solution incorporates a sound security strategy based on tested and proven industry standard components.

**SmartWorks Compass** is built on the Compass Framework. This Framework provides a role- based security model that is both flexible and granular. Some of the key features are:

- Multiple available approaches allowing the utility to deploy a system that leverages their existing security practices.
- Functions and data are highly compartmentalized, allowing access to be strictly controlled.
- Access is controlled by pre-defined and tightly controlled user Roles. For each Role, access to data and functionality is controlled by rights and permissions.
- User/password authentication can be performed either by an external LDAP server, or by the Compass Framework Oracle database.
- Role membership can be managed either within the solution, or can be managed externally in an LDAP server, thus providing the option of leveraging existing LDAP user groups.
- In all configurations, the database access is enforced by Oracle, not by the application, thus making it impossible for users to gain unauthorized access to data.

The Compass Framework provides three options for security authentication and access control.

- Approach 1: Framework manages Authentication, Role Membership and Access.
- Approach 2: LDAP Manages Authentication.
- Approach 3: LDAP Manages Authentication and Role Membership.

SmartWorks recommends Option 2 (LDAP Authentication Only) for most customers. It can be implemented easily and eliminates the need for password management within our solution. However, if the organizational IT policy requires centralized LDAP management of group/role management, then Option 3 is the best choice. Option 1 is available to be used if there is no LDAP-compliant authentication server available.

Note also that the system can be easily re-configured from one security option to another, allowing flexibility to change approaches at a future date.

## 5.5. Hosting Services

The SmartWorks Hosting Solution offers our clients a cost-effective alternative to in-house operation of their SmartWorks applications. By choosing the SmartWorks Hosting Solution, our clients can eliminate capital expenditure costs for hardware and software licensing, as well as alleviating the need for in-house management of servers, database and backup.

The environment utilizes cloud services by IBM Cloud®, an IBM Company. IBM Cloud® operates 28 Data Centers in 15 Countries, including USA and Canada. By default, our systems are located in a Toronto, Ontario facility. If desired, clients can choose to have their systems located in one of the US data centers or in any of the other international data centers.