Cumberland Valley Electric
A Touchstone Energy Cooperative

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FEB 01 2018
PUBLIC SERVICE COMMISSION

January 29, 2018

Ms. Gwen R. Pinson
Executive Director
Kentucky Public Service Commission
211 Sower Boulevard
P.O. Box 615
Frankfort, KY 40602-0615

Re: Cumberland Valley Electric, Inc.
Application for Certificate of Public Convenience and Necessity – Automated Metering Infrastructure System

Dear Ms. Pinson:

Enclosed are an original and ten (10) copies of Cumberland Valley Electric, Inc.'s application for a Certificate of Public Convenience and Necessity to install an Advanced Metering Infrastructure System (AMI). Also enclosed is a motion for confidential treatment of certain information contained in the application. Accordingly, 10 copies of the application with the confidential information redacted are included, and one copy in a separate envelope marked "confidential" with the confidential information highlighted in yellow.

Please contact Mark Abner, Manager of Engineering, at Cumberland Valley Electric at mark.abner@cumberlandvalley.coop or 606-258-2242, should you have any questions or need additional information.

Respectfully,

Ted Hampton

Ted Hampton
President & CEO

Enclosures

MAIN OFFICE:
P.O. Box 440 • Gray, KY 40734
Phone: 606-528-2677 • Fax: 606-523-2698

DISTRICT OFFICE:
P.O. Box C • Cumberland, KY 40823
Phone:606-589-4421 • Fax: 606-589-5297

COMMONWEALTH OF KENTUCKY
BEFORE THE
KENTUCKY PUBLIC SERVICE COMMISSION

IN THE MATTER OF:

THE APPLICATION OF CUMBERLAND VALLEY ELECTRIC, INC. FOR COMMISSION APPROVAL FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY TO INSTALL AN ADVANCED METERING INFRASTRUCTURE (AMI) SYSTEM PURSUANT TO KRS 807 KAR 5:001 AND KRS 278.020	)))))))	**CASE NO. 2018-00056**

APPLICATION

Cumberland Valley Electric, Inc. (hereinafter designated as "Cumberland Valley"), respectfully states:

1. The applicant Cumberland Valley is a nonprofit electric cooperative without capital stock organized under KRS Chapter 279 and is engaged in the business of distributing retail electric power to member-consumers in the Kentucky counties of Bell, Clay, Knox, Laurel, Harlan, Leslie, Letcher, McCreary and Whitley. This application is submitted pursuant to KRS 278.020 and 807 KAR 5:001(9).
2. The name and post office address of the applicant are Cumberland Valley Electric, Inc. PO Box 440 Gray, KY 40734. Cumberland Valley's email address is psc@cumberlandvalley.coop. [807 KAR 5:001, Section 14(1)].
3. The Articles of Incorporation and all amendments thereto for Cumberland Valley are included in Case No. 7772 [807 KAR 5:001, Section 14(2)]. Cumberland Valley was incorporated July 12, 1940 and is in good standing in the state of Kentucky. See Exhibit 1 for Cumberland Valley's certificate of existence.
4. The applicant seeks a Certificate of Public Convenience and Necessity ("CPCN") to install an Advanced Metering Infrastructure System ("AMI") over a 24 month period.

5. Cumberland Valley will construct the proposed AMI project from general funds until such time as new loan funds are needed. At that time Cumberland Valley will use RUS loan funds. Cumberland Valley's Construction Work Plan has been modified to reflect this project. RUS approval has been received.
6. Estimated cost of the project is [redacted]. Annual estimated operating cost is [redacted]. See Exhibit 4 for estimated Project Cost.
7. Attached hereto and made a part of this Application are the following:

EXHIBIT 1	Certificate of Existence
EXHIBIT 2	Applicant AMI Background, Vendor Assessment and Vendor Choice
EXHIBIT 3	Description of Silver Spring's AMI technology
EXHIBIT 4	Project Pricing
EXHIBIT 5	Projected benefits for Applicant and its Members
EXHIBIT 6	Copy of RUS Amendment to Current Approved Construction Work Plan
EXHIBIT 7	Testimony of Mark D. Abner
EXHIBIT 8	Weighted Vendor Evaluation Matrix

8. Applicant is requesting relief from annual periodic testing of meters [807 KAR 5:041 Section 15] for the duration of this project as all meters in the Applicant's service territory will be changed and tested. Meter testing will resume in January 2021.

WHEREFORE, Applicant asks that the Public Service Commission of the Commonwealth of Kentucky issue a Certificate of Public Convenience and Necessity authorizing the applicant to install an AMI system.

COMMONWEALTH OF KENTUCKY

COUNTY OF KNOX,

Ted Hampton, after first being duly sworn, deposes and says: that he is the President and Chief Executive Officer of Cumberland Valley Electric, Inc., duly organized and doing business under the Rural Electric Cooperative Act of the Commonwealth of Kentucky: That he has read the foregoing Application and knows the contents thereof: That the same is true of his knowledge except as to such matters as are therein stated on information or belief, and as to those matters he believes it to be true.

This 29 day of January, 2018 CUMBERLAND VALLEY ELECTRIC, INC.

Ted Hampton, President & CEO

Subscribed and sworn to before me by Ted Hampton, this 29 of January, 2018

Notary Public, Kentucky State-at Large

My Commission Expires: 4-11-2018

W. Patrick Hauser
P.O. Box 1900
Barbourville, Kentucky 40906
606-546-3811
phauser@barbourville.com
Attorney for Cumberland Valley Electric, Inc.

By: _____
W. Patrick Hauser

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PUBLIC SERVICE COMMISSION

COMMONWEALTH OF KENTUCKY
BEFORE THE
KENTUCKY PUBLIC SERVICE COMMISSION

IN THE MATTER OF:

THE APPLICATION OF CUMBERLAND VALLEY ELECTRIC, INC. FOR COMMISSION APPROVAL FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY TO INSTALL AN ADVANCED METERING INFRASTRUCTURE (AMI) SYSTEM PURSUANT TO KRS 807 KAR 5:001 AND KRS 278.020	))))))	CASE No. 2018 - 00056

CUMBERLAND VALLEY ELECTRIC, INC.'S MOTION FOR CONFIDENTIAL TREATMENT OF CERTAIN INFORMATION CONTAINED IN THE INCLUDED APPLICATION FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY

Comes now Cumberland Valley Electric, Inc. (hereinafter "Cumberland Valley"), and respectfully requests, pursuant to 807 KAR 5:001, Section 13 and KRS 61.878, that the Public Service Commission of Kentucky grant confidential treatment to certain information that Cumberland Valley is simultaneously filing as part of its application for a Certificate of Public convenience and Necessity. The information Cumberland Valley seeks to protect is confidential and hereinafter referred to as the "Confidential Information."

1. Pursuant to 807 KAR 5:001, Section 13, a single copy in a separate envelope with the Confidential Information highlighted in yellow, is being filed with this motion along with ten (1) copies with the Confidential Information redacted.

2. The Confidential Information, if openly disclosed, could permit an unfair advantage to competitors of Cumberland Valley and/or the Vendor, which in this case is Silver Spring Networks ("Silver Spring") partnering with National Rural Telecommunications Cooperative (NRTC").

3. The information which has been marked for confidential treatment involves competitively bid products and services which could be bid again in the future,

and therefore Confidential Information could be used by competitors to the detriment of Cumberland Valley and Silver Spring. Cumberland Valley and Silver Spring have agreed to keep pricing for products and services confidential.

4. The time period for which the material should be considered confidential is ten (10) years from the date of this motion. This should allow sufficient time for the prices to become outdated and no longer a detriment to Cumberland Valley or Silver Spring.

For the aforementioned reasons, Cumberland Valley believes the Confidential Information is entitled to confidential treatment. However, if the Commission disagrees with Cumberland Valley that this information should be treated as confidential, then Cumberland Valley requests the Commission to hold an informal conference regarding this issue.

CUMBERLAND VALLEY ELECTRIC, INC.

By: Ted Hampton
TED HAMPTON,
President and CEO

Subscribed, sworn to, and acknowledged before me by **Ted Hampton**, as President and CEO for Cumberland Valley Electric, Inc. on behalf of said Corporation the 29 day of January 2018.

Karen Dale Miller
Notary Public, Kentucky State At Large

My Commission Expires: 4-11-2018

W. PATRICK HAUSER
Attorney at Law
P.O. Box 1900
Barbourville, KY 40906
Phone: 606-546-3811
Fax: 606-546-3050
Email: phauser@barbourville.com
Attorney for Cumberland Valley Electric, Inc.

Commonwealth of Kentucky
Alison Lundergan Grimes, Secretary of State

Alison Lundergan Grimes
Secretary of State
P. O. Box 718
Frankfort, KY 40602-0718
(502) 564-3490
http://www.sos.ky.gov

Certificate of Existence

Authentication number: 197831
Visit https://app.sos.ky.gov/ftshow/certvalidate.aspx to authenticate this certificate.

I, Alison Lundergan Grimes, Secretary of State of the Commonwealth of Kentucky, do hereby certify that according to the records in the Office of the Secretary of State,

CUMBERLAND VALLEY ELECTRIC, INC.

is a corporation duly incorporated and existing under KRS Chapter 14A and KRS Chapter 272, whose date of incorporation is July 12, 1940 and whose period of duration is perpetual.

I further certify that all fees and penalties owed to the Secretary of State have been paid; that Articles of Dissolution have not been filed; and that the most recent annual report required by KRS 14A.6-010 has been delivered to the Secretary of State.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my Official Seal at Frankfort, Kentucky, this 8th day of January, 2018, in the 226th year of the Commonwealth.

COMMONWEALTH OF KENTUCKY
OFFICE OF SECRETARY OF STATE

Alison Lundergan Grimes

Alison Lundergan Grimes
Secretary of State
Commonwealth of Kentucky
197831/0012671

Applicant AMI Background, Vendor Assessment and Vendor Choice

Applicant AMI Background

Cumberland Valley Electric, Inc. ("Cumberland Valley") initiated the transition from a member read cooperative to an Automated Meter Reading ("AMR") system in 1997. Cumberland Valley chose Landis & Gyr's (Formerly Hunt Technologies) TS1 system, a one-way communication Power Line Carrier ("PLC") technology. In 2004 Cumberland Valley started the migration process to Landis & Gyr's TS2 system, the next generation of Landis & Gyr's PLC technology. The TS2 system was an advancement in metering technology that allowed for two-way communication, enabling the ability to remotely disconnect and reconnect meters. The benefits of two-way communications was a driving factor behind the migration to Landis & Gyr's TS2 system. Cumberland Valley is currently fully deployed with Landis & Gyr's TS2 system.

During the spring of 2016, Cumberland Valley became aware that Landis & Gyr's support for the TS2 system would most likely be ending sometime around the year 2020. Cumberland Valley was beginning to have significant issues in procuring new TS2 equipment, with lead times stretching out to 40 weeks. In one case, Cumberland Valley had to borrow TS2 equipment from a neighboring cooperative to replace equipment that had failed. This was done while Cumberland Valley waited on the replacement to ship from the manufacturer. The significant wait times indicated to Cumberland Valley that Landis & Gyr was moving its focus away from TS2 toward its RF Gridstream product. Cumberland Valley began the process of investigating its options for a new AMI system.

Vendor Assessment

Cumberland Valley's staff invested 16 months researching and assessing various AMI solutions. After multiple conversations with other electric utilities and vendors, it was determined that Cumberland Valley would focus on Radio Frequency ("RF") solutions. This decision was supported by two factors; the lack of product development in PLC technology and the majority of vendors would not quote PLC systems. The one quote Cumberland Valley did receive for a PLC system was deemed cost prohibitive.

Cumberland Valley met with six different AMI vendors over a period of several months. The six vendors were Aclara, Elster, Landis & Gyr, Sensus,Tantalus and Silver Spring Networks ("Silver Spring") partnering with National Rural Telecommunications Cooperative ("NRTC"). Each vendor presented their AMI solution and answered all of Cumberland Valley's questions. Once all the vendors had made their presentations and provided initial propagation studies Cumberland Valley began visiting and calling other electric utilities to gain feedback from various AMI vendor customers.

Cumberland Valley's staff developed a Request for Proposal (RFP) that was responded to by six different AMI vendors. The issue date of the RFP was June 26, 2017 and each proposal had to be delivered back to Cumberland Valley by August 7, 2017. A list of essential specifications was included within the RFP that all vendors had to meet:

- 100% Coverage of service territory (all meters are active on RF network)
- 99.9% delivery of billing determinants every 72 hours
- 95% of all meters must report back following an on-demand request
- System is a RF AMI solution (RF Mesh, Point to Multipoint RF, etc.) with two-way communication
- Meters must be Landis & Gyr, Itron, Aclara, or Elster
- Able to integrate with National Information Solution Cooperative ("NISC") systems
- Capable of sending and receiving DNP3 communication to control down line devices

Cumberland Valley reviewed each proposal and asked follow up questions. The list of six proposals was reduced to three based on system features and cost. Cumberland Valley's staff then developed a weighted vendor evaluation matrix with the goal of using an impartial method to evaluate the three remaining AMI vendors. A copy of the evaluation matrix is attached to this application as Exhibit 8.

Vendor Choice

The AMI vendors were thoroughly evaluated and Cumberland Valley chose Silver Spring Networks partnering with NRTC. NRTC was founded in 1986 by electric cooperatives, the national Rural Electric Cooperative Association (NRECA) and the National Rural Utilities

Cooperative Finance Corporation (CFC). NRTC serves more than 1,500 rural utilities and affiliates in 48 states and helps electric and telephone members bring all the advantages of today's evolving technology to rural America. The Silver Spring system will provide two-way, real-time data communications network to monitor and control Cumberland Valley's electric meters using its SilverLink AMI Platform. Silver Spring's system is an end-to-end WAN/LAN communications system that can utilize dual-band mesh, allowing for simultaneous use of 900MHz and 2.4GHz bands. This system will allow Cumberland Valley to leverage its applications of advanced metering, outage management, power quality monitoring, load control and distribution automation more effectively by providing central control and monitoring throughout the service territory. This will also allow for future expansion and applications that will benefit Cumberland Valley's members.

Description of Silver Spring's AMI Technology

The Silver Spring system is a mesh peer-to-peer network. Enabling each endpoint and device to communicate and relay information within the network. Data is transmitted across the network utilizing dual-band mesh supporting simultaneous use of the 900MHz and 2.4GHz bands. The architecture of a peer-to-peer mesh network allows for extended coverage and improves the reliability of the network. A mesh network also allows for "self-healing" of communication paths in the event of equipment failure. The dynamic routing of data to use the most efficient path to communicate to the access point makes for a more robust and resilient communication system.

The data to and from each meter is routed over the mesh network via the most efficient communication path to an access point. Each access point is connected either by Ethernet or Cellular via secure Virtual Private Network (VPN) back to the Silver Spring software application.

Key Features Include:

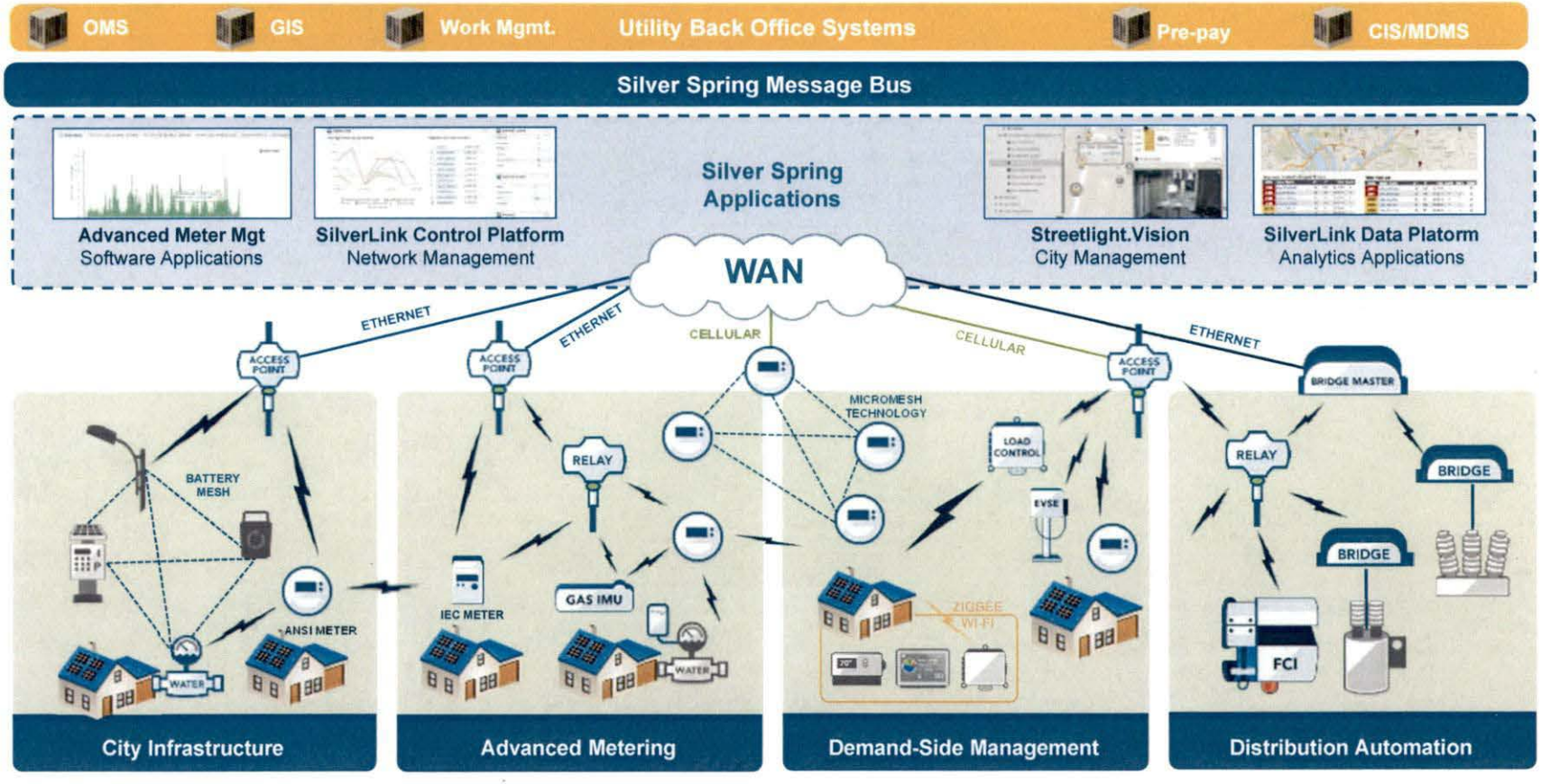
- Proven across over 27 million endpoints globally
- Supports multiple applications (e.g. distribution automation, streetlights, demand response) on the same network
- Over 125 hardware and software ecosystem partners
- Data platform to enable analytics applications
- Dynamic routing, self-healing network
- True wireless, peer-to-peer mesh network
- Cellular and mesh transport options
- Standards based network (IPv6)
- Over the air firmware upgrades
- Support for low power applications (e.g. grid and environmental sensors)
- Backwards compatible
- End-to-end and multi-layered security
- Flexible meter compatibility

- Support for 5-minute interval data
- Industry leading networking speed, and memory

Refer to the following pages for examples of:

*Please disregard any references to Aclara's network or head end solutions, Cumberland Valley will only be using Aclara for the meter. Silver Spring will provide all network infrastructure, software and network interface cards contained within the meter.

Silver Spring System Architecture



Aclara

Residential Electrical Metering

Advanced ANSI metering for the Smart Grid

Aclara's I-210 product line continues the tradition to bring innovative and flexible technology solutions that cover all your metering needs from basic electronic energy-only meters to highly-flexible smart metering solutions that provide advanced functionality to meet the evolving Smart Grid system needs.

Aclara's family of meters go beyond meeting your complex business challenges. The advanced, powerful and easy-to-use meters give you an extra edge in the energy business. You can look forward to realtime instrumentation, power quality monitoring and easy access to critical information. All these add up to give you higher productivity, improved efficiency and reduced energy costs.

KEY BENEFITS

- Reliable and accurate cash register for utilities
- AMR/AMI Plug-n-Play functionality
- Multiple communication technologies tied to AMI systems provide reliable data in a timely manner
- Smart metering functions such as Time of Use demand metering and service switch capabilities
- Demand side management through pre-payment and demand limiting features
- Advanced functions such as reactive measurement and, IEEE reliability indices measurement
- Robust meter security and standards compliance

COMMUNICATIONS

- Broad AMI/AMR Plug-n-Play options - RF Mesh, Power line carrier, Cellular, etc
- Allows interchangeability of AMR/AMI Plug-n-Play options
- Supports connectivity and integration with 3rd party communications solutions providers

Commercial and Industrial Meters

I-210+c

FULL FEATURED, SMART GRID ENABLED METERING

This is Aclara's flagship residential meter product, offering demand, load profile, TOU, service switch, and a full complement of communication options.

I-210+

VALUE PACKED SMART GRID FUNCTIONS

World class accuracy and reliability in a solid-state kWh meter platform package. Available with a service switch, as well as a wide array of communications options.

Residential Electrical Metering

Aclara

SMART CONFIGURATION

- Ability to customize advanced metering options to suit customer's needs
- Configure load profile, time of use and demand metering capabilities
- Versatile programming Softswitches allowing the selection of advanced functionality such as power quality measurement and reactive power measurement
- Service Switch option improves operational efficiency and addresses issues such as demand side management, remote repayment systems, and controlled outage restoration

RELIABILITY

- Robust revenue-grade watt-hour and demand meters
- Based on Aclara's cutting edge technology providing typical 0.2% accuracy, and reliability
- Enable utilities with tools to lower operational cost and provide accurate metering solutions

RELIABLE METERING

In this dynamic time of regulatory scrutiny and customer engagement, you can be assured of the product and the company behind the product. We have ANSI and ISO certified labs to ensure that our product design and manufacturing processes yield a robust product every time.

Our testing procedures go well beyond the ANSI and IEC requirements for which we design to, including some of the most aggressive internal standards in the market place today. We now have included world-class Radio Frequency (RF) communications expertise to ensure that our meter products are hardened to withstand even the harshest of RF environments without sacrificing the quality or integrity of the metrology or the communications technology.

ACCURATE & DEPENDABLE

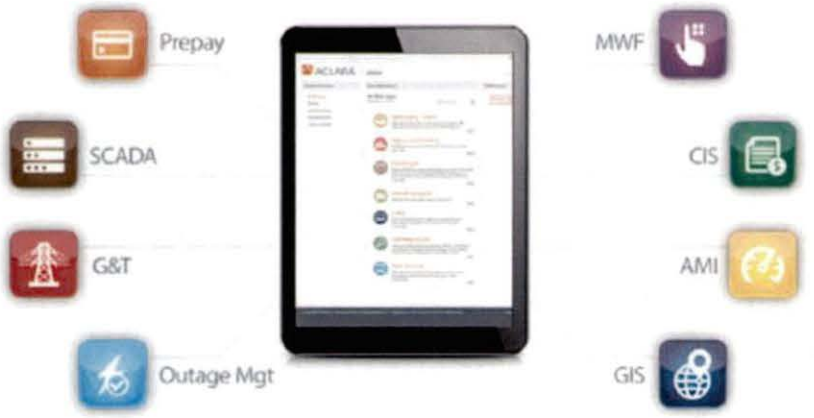
Typically measured at +/- 0.2%, the Aclara I-210 family of meters provides best-inclass capabilities for accuracy. Combined with the low starting watts, the utility can have confidence in the metered value and measured electricity usage.

INTEGRITY OF SUPPLY

Having a partner that can provide assurance in supply is critical when a utility begins a mass deployment of meters. Aclara's process focus and rigor around supply chain excellence minimizes the risk to the utility, giving them confidence to manage installation crews and provide accurate scheduling to customers.

BROAD COMMUNICATIONS SUPPORT

The I-210 family has been designed to allow for the interchangeability of AMR/AMI modules and cover the broadest range of possible AMI communication technologies including RF Mesh, Cellular, Power Line and Ethernet. Modules can be added at the Aclara factory, after the fact, or replaced with another compatible module if the meter is redeployed.



ACLARA'S iiDEAS® OPERATIONAL DATA MANAGEMENT PLATFORM

iiDEAS integrates head-end and meter data management into one unified application. lideas aggregates AMI meter data with existing utility applications and offers a single, customizable interface for personnel to access the critical data they need to better manage their distribution infrastructure, optimize operations and improve service reliability.

AMI meter data is significantly enhanced by the aggregation of data from such systems as GIS, OMS, CIS and SCADA. iiDEAS uses standard interfaces such as MultiSpeak and CIM to integrate with these systems. iiDEAS also provides a range of advanced analytics including loss analysis, transformer analysis, voltage analysis and fault detection and localization.

Residential Electrical Metering

Aclara

Full featured, Smart Grid Meter

I-210+c

SMART GRID ENABLED, CONSUMER FRIENDLY METERING

Aclara's most advanced residential electricity metering product line, the I-210+c, delivers Smart Grid capability for today and the future. Derived from our industry leading commercial and industrial product line, the kV2c, the I-210+c benefits from our advanced metrology capability and lessons learned from over 10 years of solid state metering design. All the way down to the advanced microprocessor, the I-210+c contains much of the advanced polyphase functionality that Aclara has been known for. We have also added capability that makes the I-210+c the referenced residential product line in the industry.

CAPABILITY

Designed for today's dynamic rate structures, the I-210+c provides capability for demand, load profile, and TOU recording, along with a number of other power quality and demand response related functions. Configurable to support various metering quantities, this meter supports delivered (+), received (-), and net metering for distributed generation.

ADVANCED FUNCTIONALITY

With the addition of the fully rated 200 amp service switch, the meter is capable of pre-payment metering without all the historical cost associated with card readers or other legacy pre-payment technology. Load limiting and emergency conservation modes set this meter apart when working in conjunction with a demand response program. Having the capability to be remotely configured, as well as being firmware upgradeable, this product serves today's needs, as well as tomorrow's evolving requirements.

COMMUNICATIONS

Designed to specifically accommodate the communications technology required to support a Smart Grid, the I-210+c has the same electrical and mechanical interface as our I-210+ platform, making communications interchangeable and interoperable between these two residential metering platforms.

FEATURES & BENEFITS

- Customize advanced metering options through SoftSwitches
- AMR/AMI Plug-n-Play designed to accommodate: -
  Radio Frequency Mesh (RF Mesh)
  - Radio Frequency Point-to-Multipoint
  - Cellular communications
  - Ethernet
- Advanced functionality such as:
  time-of-use, insensitive demand, load profile recording, event logging, voltage sag/swell recording
- Typical accuracy: within +/- 0.2%
- Service Switch to improve operational efficiency and address issues such as:
  - Demand side management
  - Remote prepayment systems
  - Controlled outage restoration
- Low starting watts; capture energy consumption at levels typically not registered by electromechanical meters
- Low burden, which minimizes utility system losses
- Patented tamper algorithm to detect tamper-by-meter inversion
- Meets or exceeds ANSI C12.1, C12.10, C12.20, C37.90.1 and and UL 2735

AMR/AMI PLUG AND PLAY COMMUNICATIONS

Multiple communication options on the I-210+c allows greater customer choice. Ideally optimized for RF Mesh, PLC, 3G/4G point-to-point communication technologies, the I-210+c can cover a wide variety of communication scenarios.

I-210+c

Utility Communication
- Radio Frequency Mesh (RF Mesh),
- Power Line Communications (PLC),
- Cellular Communications
- Ethernet

Utility Monitoring & Control Center

Aclara

Value packed, Smart Grid Meter

I-210+

LOAD MANAGEMENT

The I-210+ is one of the most popular single phase meters among US utilities for residential metering installations. Equipped with a fully-rated 200A service switch, this meter platform is ideal to provide basic load management functionality.

RELIABILITY

The I-210+ has enjoyed tremendous success in the marketplace for smart meters, with over 10 million units shipped since 2009. This product is the industry benchmark for quality and reliability, having passed both internal and external validation tests for billing accuracy. At Aclara, we have an unprecedented testing and validation process to ensure that our products are robust and exceed the industry standard ANSI requirements.

We have substantial expertise in wireless communications and the testing that is required to ensure that our meters perform flawlessly, even in the harshest of radio frequency (RF) environments.

COMMUNICATIONS

The I-210+ has the same electrical and mechanical interface as our I-210+c platform, designed to specifically accommodate Smart Grid communications technology, making communications interchangeable and interoperable between these two residential metering platforms. Multiple RF Mesh and PLC communication technologies are supported with a newly updated power supply.

FEATURES & BENEFITS

- AMR/AMI Plug and Play designed to accommodate: RF Mesh, RF Point-to-Multipoint, PLC, Ethernet
- Typical accuracy: within +/-0.2%
- Service Switch to improve efficiency and address:
  - demand side management
  - remote prepayment systems
  - controlled outage restoration
- Low starting watts; capture energy consumption at levels
- typically not registered by electromechanical meters
- Low burden, which minimizes utility system losses
- Meet or exceeds ANSI C12.1, C12.10, C12.20, C37.90.1

Factory Integrated Communication Options for I-210+ and I-210+c Meters

AMI Technologies	Type	I210+	I210+c
Aclara TWACS	PLC	•	
Aclara Synergize® RF	RF P2MP	•	
Itron Single ERT HP (54-56ESS)	1-way RF AMR	•	
Itron Triple ERT HP (57ESS)	1-way RF AMR		•
Itron EVDO & HSPA	Cellular (3G)		•
Sensus Flexnet™	RF P2MP		•[1]
Silver Springs Networks© NIC 410	RF Mesh		•[1]
Silver Springs Networks© NIC 510	RF Mesh		•[1]
Silver Springs Networks© MicroAP	Cellular & RF Mesh		•[1]
Trilliant RPMA	RF P2MP	•	•[1]
Trilliant SecureMesh™	RF Mesh	•	•

Note 1 : Optional UL Certified Meter

Full featured, Secure Metering Software

MeterMate

SMART GRID ENABLED, CONSUMER FRIENDLY METERING

Aclara's innovative MeterMate™ software suite enables meter administrators to easily configure and manage Aclara meters. Each software component in the MeterMate suite is optimized to address the different aspects of a meter's lifecycle. MeterMate program creation software enables the user to effortlessly configure the meter's basic and advanced functionality, ranging from creating a simple demand program and setting up the meter display to configuring the meter's I/O and alerts. With MeterMate reading and programming software, a user can read, program and perform real-time instrumentation and power quality monitoring on a meter, via a variety of different communication methods such as local OPTOCOM, remote telephone, RS-232/485 and IP communications.

The MeterMate software also supports many functions such as:

- Analysis of load profile data
- Firmware upgrades
- Exporting of meter data to the MV-90 HHF format
- Configuration for automatic remote meter reading
- Direct table reads
- Conversion of meter configuration to an XML file format for AMI over-the-air configuration
- Comparison of a configuration from the database to a configured meter
- Opening and closing the meter service switch
- Importing and exporting of load profile data, event log data, configurations and security codes

FEATURES & BENEFITS

- One software suite to configure and read from the Aclara portfolio of meters: kV family, I-210 family and SGM3xxx family
- Supports the ANSI C12.19 communication protocol
- Multiple methods to communicate with meters: USB & RS232 OPTOCOM, RS485, Modem
- Modular configuration workflow that enable the reuse of frequently used configuration settings and measurements
- Various reports to display information for meter management, auditing, billing and monitoring power quality
- Command line interface and batch-control enabling automated and scheduled meter operations
- Configurable role-based access control security

Residential Meter Selector

<table>
<tr><th></th><th>Product Characteristics</th><th>I-210+ Basic Energy</th><th>I-120+c</th></tr>
<tr><td>1</td><td>Meter Functionality</td><td>· Real Energy Consumption Management</td><td>· Real Energy Consumption Management
· Reactive Energy Consumption Measurement
· Apparent Energy Consumption Measurement
· Voltage Measurement (Min, Avg, Max)
· Sag/Swell Measurement
· Outage Count and Duration</td></tr>
<tr><td>2</td><td>ANSI Models</td><td><table><tr><th>FORM</th><th>CLASS</th><th>VOLTS</th></tr><tr><td>1S</td><td>100</td><td>120 & 240</td></tr><tr><td>2S</td><td>200 & 320</td><td>240</td></tr><tr><td>3S & 3CS</td><td>20</td><td>120 & 240</td></tr><tr><td>4S</td><td>20</td><td>240</td></tr><tr><td>12S</td><td>200 & 320</td><td>120 & 240</td></tr><tr><td>25S</td><td>200 & 320</td><td>120 & 240</td></tr></table></td><td><table><tr><th>FORM</th><th>CLASS</th><th>VOLTS</th></tr><tr><td>1S</td><td>100</td><td>120 & 240</td></tr><tr><td>2S</td><td>200 & 320</td><td>240</td></tr><tr><td>3S & 3CS</td><td>20</td><td>120 & 240</td></tr><tr><td>4S</td><td>20</td><td>240</td></tr><tr><td>12S</td><td>200 & 320</td><td>120 & 240</td></tr><tr><td>25S</td><td>200 & 320</td><td>120 & 240</td></tr></table></td></tr>
<tr><td>3</td><td>Soft-Switches to upgrade meter function</td><td>· Optional Softswitches can be loaded in the factory or by the user to activate advanced functions
O — Activates communication capability with AMR/AMI modules
S2 — AMI/AMR calculated demand displayed on meter LCD
V2 — Simple Voltage Event monitor in addition to a display of RMS momentary voltage on the 3 lower LCD digits</td><td>· Optional Soft-switches can be loaded in the factory or by the user to activate advanced functions
A2 — Activates communication capability with AMR/AMI modules
E2 — Activates Event Log Recording (up to 200 Events)
K2 — Activates Reactive/Apparent Energy Consumption recording
N2 — Activates Demand
Q2 — Activates Instrument Recording
R2 — Activates LP recording (up to 4 channels)
T2 — Activates TOU recording
V2 — Activates Sag/Swell monitor and recording</td></tr>
<tr><td>4</td><td>AMR Interface

(Factory enabled or installed by customer)</td><td>· Quadrature Pulse
· SPI Format-1 data
· SPI Format-2 data
· PSEM Communications</td><td>· PSEM Communications</td></tr>
<tr><td>5</td><td>Energy Accumulation</td><td>· Must specify at time of order either:
- Delivered only
- Delivered + Received
- Delivered – Received
- Received only
· Customer can change selection later using MeterMate</td><td>· Specified at time of order for factory programmed meters or configured by the customer using MeterMate. Any two or four of the following energy measurements can be selected:
- Delivered only kWh
- Received only kWh
- Delivered + received kWh
- Delivered – received kWh
- Lagging only kvarh; requires K2 Soft-switch
- Leading only kvarh; requires K2 Soft-switch
- Lagging + Leading kvarh; requires K2 Soft-switch
- Lagging - Leading kvarh; requires K2 Soft-switch
- Phasor apparent VAh; requires K2 Soft-switch</td></tr>
<tr><td>6</td><td>Cycle Insensitive Demand</td><td>· Not available</td><td>Requires T2 & N2 Soft-switches to be enabled
· Provides an alternative method for calculating the maximum demand in meters equipped with one-way AMR system.
· The meter maintains the daily maximum demands and the two peaks for the period.
· Demand is calculated using the programmed method (Block, rolling or thermal).
· The daily maximum demands are stored in a circular queue.
· Each entry in the circular queue contains a date</td></tr>
<tr><td>7</td><td>Power Quality</td><td>· With V2 Softswitch enabled, provides a count of Sag/Swell Events. Value and duration thresholds are programmable</td><td>· With Q2 and R2 Softswitches enabled, Min, Max and Average Voltage recording is possible.
· With V2 Softswitch enabled, provides counts and magnitude recording of Sag/Swell Events with date and time stamped. Value and duration thresholds are programmable. This Sag/Swell Event Log is separate from the Event Log recording provided by the E2 Softswitch.
· With E2, R2 and T2 Softswitches enabled, recording of sustained and total outage counts and duration is possible to permit calculation of IEEE Reliability indices.</td></tr>
<tr><td>8</td><td>Back-up power</td><td>· Not available</td><td>Back-up power is used to maintain the meter clock during outages. If the R2 or T2 softswitch is required, one of the following back-up power options must be selected.
· Battery
· Supercap
· Batteryless operation. For batteryless operation, the AMI system must be able to re- synchronize the meter clock after a power outage</td></tr>
<tr><td>9</td><td>Service Switch

(provide remote controllable disconnection and reconnection of electrical service for residential applications)</td><td>· A switching device intended to provide remote controllable disconnection and reconnection of electrical service for residential applications.
· Factory installed option, specify at time of order.
· Full functionality requires two-way AMI module.
· Switch is installed under standard size cover.
· Typical applications include:
Remote disconnect and reconnect of service.
- Energy conservation demand limiting.
- Demand limiting as an alternative to service disconnection.
- Prepayment metering.
- Outage management/restoration.
Note: Energy conservation demand limiting and prepayment metering functionalities are not available on forms 12S and 25S.</td><td>· A switching device intended to provide remote controllable disconnection and reconnection of electrical service for residential applications.
· Factory installed option, specify at time of order.
· Full functionality requires two-way AMI module.
· Switch is installed under standard size cover.
· Typical applications include:
- Remote disconnect and reconnect of service.
- Energy conservation demand limiting.
- Demand limiting as an alternative to service disconnection.
- Prepayment metering.
- Outage management/restoration.</td></tr>
</table>

Aclara

Technical Specifications

I-210+c

Basic Functions

Single Phase Demand Meter
- Energy management, 4 quantities
- Demand, block or rolling demand
- Fundamental plus harmonic measurements
- Bi-directional energy measurements

Load Profile recording
Time of Use Billing Measures
Four Energy options (Delivered, Received, Delivered+Received, Delivered - Received)
Tamper detect capability
Broad communication module options
Network applications
Models available for 120 or 240 volt CL 20, CL 100, 200, CL 320 applications.
50 or 60 Hz operation

Optional Functions

Factory integrated Service Switch Capability

Soft-Switch Functions

- The Alternate Communication Soft-switch allows a communication option option board to communication with the meter

E_2 Soft-switch
- The Event Log Soft-switch allows the meter to track the most recent 200 events. Use MeterMate™ Program Manager, Diagnostics Editor, to select the event types to be logged and how many occurences should be tracked, up to a maximum of 200 events. Date and time stamps are included on logged events for Demand/LP or TOU meters

K_2 Soft-switch

The kVA and kvar Soft-switch adds kVA(h) and kva(h) measurement capability

N_2 Soft-switch
- The Demand (N_2) Soft-switch adds billing demand calculations.

Q_2 Soft-switch

The Instrumentation Measurements Soft-switch enables
- Voltage (L-N): VA (max, min store) for summations, demand, and load profile recording
- RMS voltage measurement for reading and display
- Low potential caution
- Temperature (max, min/avg) load profile recording

T_2 Soft-switch

The time-of-use soft-switch enables TYOU operation
- Up to four TOU periods and four Seasons
- Up to three daily rate schedule types and one holiday schedule
- Up to 80 TOU schedule set points
- Up to 50 programmable dates
- Holidays, season changes, Daylight Savings Time (DST), self-read, and demand reset
- Perpetual calendar handles most dates
- Up to two billing and two demand measures per TOU period
- Self-read actions on specified dates, with o4r without a demand reset

V2 Soft-switch
- The voltage Soft-switch activates Sag/Swell monitor and recording

Accuracy

Typical Accuracy: Within +/- 0.2%
Starting Watts: 12W @ 240V, 6W @ 120V
Typical Watt Loss: 0.7 Watts

Rating

Voltage: 120V -240V
Current: Class 100, Class 200, Class 320, Class 20
Frequency: 50 or 60 Hz

Cover Options

Polycarbonate over with molded sunshield
- Plain cover without RESET or "D" ring
- With Optocom "D" ring
- With RESET latch and "D" ring

Operation Range

Voltage: +/- 20%
Operates over a broad temperaure range (-40C through +85C under the cover)

Available Models

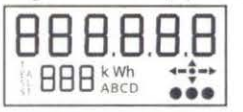
ANSI Form 1S, 2S, 3S, 4S, 12S, 25S
CL20, CL100, CL200, CL320

Applicable Standards

Performance meets or exceeds industry standards
ANSI C12.19
ANSI C12.1
ANSI C12.10
ANSI C12.20
ANSI C37.90.1
UL 2735

LCD Display

6 large charaters to display the main programmed metering quantities



Weights and Dimensions

Dimensions
6.94 in. Max

5.25 in. Max

Approximate Weight

Meters with service disconnect
- Individual meter 2.0 - 2.4 lbs
- 4 meter pack 9.0 - 10.6 lbs
- Pallet (120 meters) 285 - 340 lbs

Meters without service disconnect
- Individual meter 1.3 - 1.7 lbs
- 4 meter pack 6.2 - 7.8 lbs
- Pallet (120 meters) 200 - 255 lbs

I-210+

Basic Functions

Basic function as electronic single phase Revenue Meter
Four energy options (delivered, received, delivered+received, delivered -received)
Tamper detect capability
Broad communication module options
Network applications
Models available for 120 or 240 volt CL 20, CL 100, 200, CL 320 applications.
50 or 60 Hz operation

Optional Functions

Factory integrated Service Switch Capability

Soft-Switch Functions

AMR/AMI Communications (AMR/AMI Interface formats include quadrature pulse, PSEM, SPI Format-1 data, SPI Format-2 Data)
Display AMR calculated Demand value shown on the lower 3 LCD digits
Simple Voltage Event monitoring in addition to RMS momentary voltage display

Rating

Voltage: 120V - 240V
Current: Class 100, Class 200, Class 320, Class 20
Frequency: 50 or 60 Hz

Cover Options

Polycarbonate cover with molded sunshield
- Plain cover without RESET or "D" ring
- With Optocom "D" ring

Operating Range

Voltage +/- 20%
Operates over a broad temperature range (-40C through +85C under the cover)

Available Models

ANSI Form 1S, 2S, 3S, 4S, 12S, 25S
CL20, CL100, CL200, CL320

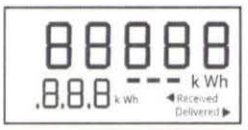
Applicable Standards

Performance meets or exceeds industry standards ANSI C12.1
ANSI C12.10
ANSI C12.20
ANSI C37.90.1

Technical Specifications

I-210+ (cont'd)

Soft-Switch Functions
5 large characters to display the billing quantities



Weights and Dimensions
Dimensions 6.94 in. Max

Approximate Weight	
Meters with service disconnect	
- Individual meter	2.0 - 2.4 lbs
- 4 meter pack	9.0 - 10.6 lbs
- Pallet (120 meters)	285 - 340 lbs
Meters without service disconnect	
- Individual meter	1.3 - 1.7 lbs
- 4 meter pack	6.2 - 7.8 lbs
- Pallet (120 meters)	200 - 255 lbs

Aclara

Commercial & Industrial Electricity

Versatile Metering for Demanding Applications

Aclara's kV2c meter family is designed for revenue class metering in commercial and industrial applications. The kV2c meter moves beyond revenue metering to real time instrumentation, true power quality monitoring and real cost of service measurements. Whether you are metering the simplest energy rate or collecting critical quality of service and load analysis information on a polyphase or a single phase circuit, there is a kV2c meter configuration to meet your needs.

The Aclara kV2c meter family is one of the most widely accepted ANSI® commercial and industrial meters with over 2 million units deployed in the field since its introduction. The robust revenue-grade meter design is based on Aclara's cutting edge technology that provides high accuracy and reliability.

The Aclara kV2c product family includes 2 models to provide the ultimate in flexibility and customer choice, including a polyphase product available for 600V applications.

Each Aclara kV2c delivers

EACH ACLARA kV2c DELIVERS COMMUNICATIONS

- AMI/AMR options including RF, Power Line Carrier, Cellular Networks, Ethernet
- Allows interchangeability of AMR/AMI plug & play options
- Supports connectivity and integration with 3rd party communications solutions providers Smart Configuration

SMART CONFIGURATION

- Customize advanced metering options to suit customer needs
- Versatile programming softswitches allowing the selection of advanced functionality such as expanded recording features, harmonic analysis, time of use, load profile, and power quality measures.
- Options available to provide totalization capability, pulse outputs, telephone modem, and RS-232/485 communications
- Tamper detection tools and installation verification capabilities to automatically catch errors, wiring changes, tampering, and billing issues.

RELIABILITY

- Robust revenue-grade watt-hour and demand meter with advanced recording options.
- Based on Aclara's high-quality technology, providing 0.2% accuracy and reliability.
- Provide utilities with tools to lower operational cost and provide accurate metering solutions

Commercial and Industrial Meters

kV2c

SOLUTIONS FOR THE MOST DEMANDING APPLICATIONS

Offering the required revenue grade metering functionality and advanced power quality monitoring for polyphase metering

kV2c+

AMI/AMR COMMUNICATION FOR EXTREME CONDITIONS

Ideal for extremely harsh environments, building on our kV2c design and includes a more robust power supply and suitability for 600V applications

Commercial & Industrial Electricity Metering

Aclara

RELIABLE METERING

In this dynamic time of regulatory scrutiny and customer engagement, you can be assured of the product and the company behind the product. We have ANSI and ISO certified labs to ensure that our product design and manufacturing processes yield a robust product.

Our testing procedures go well beyond the ANSI and IEC requirements for which we design to, including some of the most aggressive internal standards. We now have included world-class Radio Frequency (RF) communications expertise to ensure that our meter products are hardened to withstand even the harshest of RF environments without sacrificing the quality or integrity of the metrology or the communications technology.

ACCURATE & DEPENDABLE

With an accuracy class of 0.2%, the Aclara KV2 family of meters provides outstanding capabilities for accuracy. Combined with the low starting watts, the utility can have confidence in the metered value and measured electricity usage.

INTEGRITY OF SUPPLY

Having a partner that can provide assurance in supply is critical when a utility begins a mass deployment of meters. Aclara's process focus and rigor around supply chain excellence minimizes the risk to the utility, giving them confidence to manage installation crews and provide accurate scheduling to customers.

BROAD COMMUNICATIONS SUPPORT

The KV2 family has been designed to allow for the interchangeability of AMR/AMI modules and cover the broadest range of possible AMI communication technologies including RF Mesh, Cellular, Power Line and Ethernet. Modules can be added at the Aclara factory, after the fact, or replaced with another compatible module if the meter is redeployed

ACLARA'S iiDEAS® OPERATIONAL DATA MANAGEMENT PLATFORM

iiDEAS integrates head-end and meter data management into one unified application. iiDEAS aggregates AMI meter data with existing utility applications and offers a single, customizable interface for personnel to access the critical data they need to better manage their distribution infrastructure, optimize operations and improve service reliability.

AMI meter data is significantly enhanced by the aggregation of data from such systems as GIS, OMS, CIS and SCADA iiDEAS uses standard interfaces such as MultiSpeak and CIM to integrate with these systems. iiDEAS also provides a range of advanced analytics including loss analysis, transformer analysis, voltage analysis and fault detection and localization.

Aclara

kV2c

Solutions for the Most Demanding Applications

Aclara's most advanced electricity metering product, the kV2c, delivers world class capability around revenue metering and protection, power quality, and cost of service measurements. Designed around a Aclara proprietary data acquisition chip, this product outperforms the market in relation to sampling and data analytics capability.

VERSATILITY

The kV2c meter family is a versatile metering platform for commercial and industrial applications. The kV2c meter offers easy and powerful functional upgrades with a unique combination of softswitches and option boards to meet your metering needs in a rapidly evolving smart metering space. The kV2c starts as a bi-directional, coincident demand meter with five demand measures, real-time pricing, and real time data monitoring.

Softswitches are available to add such functions as TOU, transformer and line loss compensation, power factor, 4 quadrant measurements, instrument transformer correction, and increased recording channels. For a full description of available firmware enhancements, see the attached product specification table.

POWER QUALITY

The kV2c meter offers advanced power quality tools to measure compliance to power quality agreements or gather data to help set power quality requirements. These tools include:

- Programmable sag and swell monitor that logs voltage sag and swell duration down to one cycle, minimum or maximum voltage, coincident current, and date and time of occurrence.
- Voltage and Current THD per phase, TDD (Total Demand Distortion), Distortion Power Factor, Displacement Power Factor, Distortion kVA, and Distortion kVAh (all recordable).
- Harmonic analysis (MeterMate 5.00 and above) plots odd and even harmonic magnitudes and phase angles).
- Programmable diagnostics for voltage imbalance, distortion, current imbalance, reversed polarity, high neutral current. These events may be logged, set an alert, and initiate a call-in.

INVENTORY MANAGEMENT

The kV2c wide range voltage power supply (120V to 480V) combined with the FitzallTM feature enables a significant meter inventory reduction while covering all applications. Fitzall is a Aclara exclusive tool for commercial and industrial electronic meter inventory reduction, which allows two meter forms, 9S for transformer rated and 16S for self-contained to meter any service type.

FEATURES & BENEFITS

- AMR/AMI Plug and Play designed to accommodate: RF, PLC, Cellular (GPRS/CDMA), Ethernet (See attached table for currently offered factory integrated solutions)
- Complete range of S-base and A-base forms
- 4-quadrant industrial or substation measures
- Powerful functional upgrades provide 4-channel 64 kb, 20-channel 192 kB, or 20-channel 384 kB recording for voltage, current, energy, apparent power, reactive power, distortion power, power factor, THD, TDD, DPF.
- Per phase AC instrumentation (amps, volts, and frequency)

INSTALLATION VERIFICATION AND TAMPER DETECTION

The Site Genie™ Monitor provides a simple, automatic way to catch errors, tampering and wiring changes before billing problems occur. Site Genie also provides the phasor information and diagnostics needed to fix the problems it finds.

COST OF SERVICE MEASUREMENTS

Knowing what it costs to serve a site is a key piece of competitive information for both Generation and Distribution utilities. With modern loads, measuring energy and power factor isn't enough. The kV2c family of meters will simultaneously measure all of the components of service cost (real & reactive - with and without harmonics, distortion, and vector apparent power).

COMMUNICATIONS

The kV2c meter family offers a wide range of AMI communication technologies including RF Mesh, Cellular, Power Line Carrier and Ethernet to support your Smart Grid applications. Additionally, the kV2c family provides "KYZ" and other I/O options to support local energy management solutions typically found in commercial and industrial facilities. The kV2c has a standard AMI interface that allows the capability to transmit all metering data available at the meter through the AMI communication network. See the attached table for a complete listing of AMI technologies that are currently offered as a factory integrated solution into the kV2c meter family.

kV2c+

AMI/AMR Communication for Extreme Conditions

The kV2c+ comes equipped with a more robust power supply to accommodate the additional power requirements of today's AMI communications. This model is also available with a 57 – 120V auto-ranging power supply for low voltage applications or a 600V power supply for 3-phase 3-wire 600 volt distribution applications

RELIABILITY

The kV2c+ Revenue Guard option board powers the meter even when the A phase voltage is lost; any available line-to-line or line-to-neutral voltage will be used. Revenue Guard Plus softswitch enhances Revenue Guard. It preserves billing integrity when a phase voltage is lost on a 4 wire wye service by converting the 3 element meter to "2 ½" element operation. Even with a lost phase voltage, Revenue Guard Plus provides accurate revenue metering.

FEATURES & BENEFITS

- The kV2c+ offers the following features & benefits in addition to those offered with the kV2c:
  - Enhanced power supply to support a variety of AMI technology
  - 57-120V auto-ranging power supply for low voltage applications
  - Ability to serve 600V applications
  - Revenue Guard option preserves billing integrity when a phase voltage is lost
  - Available in Switchboard form (Z base)

MeterMate

Full featured, Secure Metering Software

Aclara's innovative MeterMate™ software suite enables meter administrators to easily configure Aclara's meter family. Each software component in the MeterMate suite is optimized to address the different aspects of a meter's life cycle. MeterMate program creation software enables the user to effortlessly configure the meter's basic and advanced functionality, ranging from creating a simple demand program to setting up the meter display to configuring the meter's I/O and alerts. With MeterMate reading and programming software, MM Comm, a user can read, program and perform real-time instrumentation and power quality monitoring on a meter, via a variety of different communication methods: local OPTOCOM™, remote telephone, RS-232/485 and IP communications.

The MeterMate software also supports many functions such as:

- Analysis of load profile data
- Firmware upgrades
- Exporting of meter data to the MV-90 HHF format
- Configuration for automatic remote meter reading
- Direct table reads
- Conversion of meter configuration to an XML file format for AMI over-the-air configuration
- Comparison of a configuration from the database to a configured meter
- Opening and closing the meter service switch
- Importing and exporting of load profile data, event log data, configurations and security codes

FEATURES & BENEFITS

- One software suite to configure and read from the Aclara portfolio of meters: kV family, I-210 family and SGM3xxx family
- Supports the ANSI C12.19 communication protocol
- Multiple methods to communicate with meters: USB & RS232 OPTOCOM, RS485, Modem
- Modular configuration workflow that enable the reuse of frequently used configuration settings and measurements
- Various reports to display information for meter management, auditing, billing and monitoring power quality
- Command line interface and batch-control enabling automated and scheduled meter operations
- Configurable role-based access control security

AMI Integrations

FACTORY INTEGRATED COMMUNICATION OPTIONS FOR kV2c/kV2c+

Aclara's kV2c and kV2c+ meters are integrated with a wide variety of AMI communication modules. Aclara is constantly seeking to provide diverse solutions suitable for each customer's AMI needs. The following table summarizes current factory installed communication options.

AMI Technologies	Type	kV2c		kV2c+	
		120-480V	120-480V EPS	120-480V	600V
Aclara® (UMT-C)	PLC	X			
Aclara Analog Modem	Telephone (landline)	X		X	X
Aclara RSX	RS232 or RS485	X		X	X
Aclara Metrum Cellular	4G LTE cellular		X		
Aclara Synergize RF	RF P2MP		X		
Itron EVDO	Cellular		X		
Itron (53ESS ERT®)	RF (AMR), 900 MHz	X		X	X
L+G Gridstream (Command Center)	RF Mesh, 900MHz		X		
Sensus (FlexNet®)	RF (Tower based)	X			X
Silver Springs Networks® NIC	RF Mesh, 900 MHz		X		
Trilliant RPMA	RF P2MP		X		
Trilliant (SecureMesh™)	RF Mesh, 2.4 GHz		X		

Technical Specifications

General	
Multifunction Meter	• Revenue Meter • AC Instrumentation • Communications
Accuracy	• ±0.2% at standard test points for energy and demand (typical) • Meets ANSI C12.20 Class 0.2
Ratings	• Voltage: 120 to 480 volts. kV2c+ options: – 57-1230 volts – 600 volts • Current: Class 20, Class 200, Class 320 • Frequency: 50 or 60 Hz
Operating Range	• Voltage: 120-480V (+10/ -20%) • With Enhanced Power Supply: 120-480V (+10/ -20%) • Frequency: rated (5%) • Temperature -40°C to 85 C°
Mechanical Design	• Durable one piece LEXAN™ cover • Rugged single action reset lever • Magnetic switch activates Alternates Alternate and Site Genie displays

Available Forms	
S-base	CL20: 3S, 4S, 9S, 36S, 46S, 56S CL200: 1S, 2S, 12S, 16S CL320: 2S, 12S, 16S
A-base	CL20: 10A, 36A, 45A, 48A CL150: 13A, 16A
Z-base*	CL20: 3Z, 9Z, 36Z, 45Z

Basic Functions	
No Softswitches	• Simple Demand Meter • Rolling Demand Meter • Exponential Demand Meter • Coincident Demand Meter • Bi-directional Meter • Site and Tamper Monitoring • Communicating Meter • Wiring Analyzer

The kV2c with no softswitches is a bi-directional coincident demand meter	
Accumulators	5 for measurements
Measures	Wh Delivered, Received, Net, or Total (with or without harmonics) and Frequency
Coincident	2 values for each demand from demand list
Power Quality	Diagnostics and Cautions, momentary values
Monitoring	Site Genie, Cautions (8), Diagnostics, Errors
Real Data	Voltage, Current, and Frequency
Recording	Self Reads recording
Display	75 Items
Data	Prior Reset
Logging	# Outages, # Demand Resets, # Programmed, # Comm sessions
RTPs	Real-time price available if I/O board or AMI module present

Multifunction Meter	
With Softswitches	• kVA, kvar Demand Meter • Q-Hour Meter • "Real-Time-Pricing" • TOU Meter • Interruptible Rate Meter • 20-Channel Recorder • Current Recorder • Power Quality Meter • Sag and Swell Monitor • 200-Event Power Quality Log • Real Time Multifunction Instrument • Phasor Meter • Loss and Accuracy Compensation • 4-Channel Recorder • Voltage Recorder • Totalizing Meter • Bi-directional Meter

Technical Specifications (continued)

Softswitches Add	
B Switch	By Quadrant measurements
C Switch	Call in on Outage (Modem)
E Switch	500 Event log
G Switch*	Revenue Guard Plus
H Switch	Expanded Flash Memory (20-channel, 384 kB)
I Switch	Instrument Transformer Correction
K Switch	kVA – Power Factor, kvar and kVA measures
L Switch	Transformer Loss Compensation
M Switch	Expanded Measures – per phase measurement
N Switch	Demand Measures
Q Switch	Power Quality Measures
R Switch	Basic Recording (4-channel, 64 KB)
T Switch	Time of Use)
V Switch	Fast Voltage Event Monitor and Log (sag and swell, 1 to 65k cycles)
W Switch	Waveform Capture (70 samples sets – 6 measures per set – V & I per phase))
X Switch	Expanded Recording (20 channel, 192 kB))
Z Switch	Totalization

Recording
• No option board required since recording is a softswitch-enabled function. However, a battery is reuired to maintain time during power outages.
• Activating recording adds time stamping to the meter's logs (adding TOU is an alternative way to add time stamping).
• Recording memory is configurable; the number of channels and length of channels is programmable.
• Adding recording also adds 12 self reads
• No Load Profile (R or X) Softswitch is required for Self Reads
Types of Recording • Load Profile • Data: – Maximum value in interval – Minimum value in interval – End of interval value

R Switch (Basic Recording, 64 kB)

Basic Recording – 4 Channels of data
Days of Recording by Interval and Channels (4 Ch).

	1 Ch	2 Ch	3 Ch	4 Ch
1 Min	14.6	7.3	5.5	4.0
5 Min	73.0	36.7	27.3	20.0
15 Min	219.0	110.0	82.0	60.0
30 Min	438.0	220.0	164.0	120.0
60 Min	876.0	440.0	328.0	240.0

X Switch (Additional Recording, 192 kB)

Expanded Recording – 4 Channels of data
Days of Recording by Interval and Channels (20 Ch).

	1 Ch	5 Ch	10 Ch	20 Ch
1 Min	43.8	10.2	5.1	2.6
5 Min	219.0	51.0	25.3	13.0
15 Min	675.0	153.0	76.0	39.0
30 Min	1314.0	306.0	152.0	78.0
60 Min	2628.0	612.0	304.0	156.0

H Switch (Additional Recording, 384 kB)

Expanded Recording – 20 Channels of data
Days of Recording by Interval and Channels (20 Ch).

	1 Ch	5 Ch	10 Ch	20 Ch
1 Min	87.6	20.4	10.3	5.2
5 Min	438.0	102.0	50.6	26.0
15 Min	1350.0	306.0	152.0	78.0
30 Min	2628.0	612.0	304.0	156.0
60 Min	5256.0	1224.0	608.0	312.0

Option Board	
SIO – Simple I/O	• 2 Form C Outputs • RTP Input • 1 Form A Output
MIO – Multifunction I/O Board	• 2 Form C Outputs. Outputs programmable as: – Pulse Data – Load Control – Diagnostic and Caution Alerts – EOI • 4 Form A or C Inputs for recording and Totalization • 6 Form A Outputs • RTP Input
T1 – Telephone Modem	• Call in during outage with C Softswitch and battery • Communications up to 2400B • Suitable for outdoor installation • Wide temperature range -20 to +75C • Line sharing, up to 5 T1 modems on a phone line • MV90 compatible • 3 phone numbers • Supports on-line read data with MeterMates • Call-in and call-out windows
RSX – Serial Communications Board	• RS-232 communications to 9600B • External modems or wireless modems • Simple Serial/RS-232 drive for devices within 50 feet • Simple Serial/RS-485 drive for devices within 3500 feet
Revenue Guard Board*	• Preserves billing integrity when A-Phase voltage is lost*

Security Log
• Total number of outages
• Cumulative power outage duration
• Date & Time of last demand reset (TOU only)
• Total number of times programmed
• Date & Time of last RTP
• Total number of RTP activations
• Date & Time of last programmed
• ID of last programmer
• Date & Time last calibrated
• ID of last calibrator
• Total number of OPTOCOM communications
• Date & Time of OPTOCOM communication
• Number of EEPROM reads and writes

Aclara

Technical Specifications (continued)

Display	
• Alphanumeric display	
• Programmable labels (3)	
• Blinking block disk analog	
• Arrows show energy flow direction and lagging or leading Quadergy	
• Separate indicator for each phase voltage	
• Active TOU rate indicator	
• Three to six digits for demand and energy displays with zero to four digits after the decimal	
• 70 displayable items from items from list of over 910 possible items including current billing period, previous period and previous season data, previous Self Reads	
• Programmable display time	
• Programmable 3-digit display identifiers	
• Programmable display order	
Disk Analog Scroll	• Boxes represent 60%, 70%, 80%, 90% positions • At 100% all boxes turn off
Display Mode	• Normal • Test • Cautions and Errors
Test Mode	• Programmable time out • Test switch under cover • Special test mode displays • Watthour accumulation • Prior subinterval demand • Max demand since entering the test • Time remaining in subinterval • Instantaneous demand • Test pulses available from OPTOCOM port except when communicating
Types of Recording	• Load Profile • Data – Maximum value in interval – Minimum value in interval – End of interval valuel

Site Genie
Alerts and Diagnostics: • Polarity, cross phase, reverse flow • Phase voltage alert • Inactive phase current • Phase angle alert • Distortion alert (Total, A, B, C) • High neutral current • High Demand • Over and Under Voltage
Phasor Information:: • VRMS per phase • IRMS per phase • Voltage phase angles • Current phase angle • Numbert of EEPROM reads and writes

Service Determination
Meter Automatically determines service by sensing voltage phase angles at Power Up (After any outage) and 10 Minutes after Power Up. It can also be programmed to check service: • Daily (programmable) • Service Error displayed if wired improperly • After demand reset (programmable) • Optional service determination at demand reset\
•kV2c can be programmed to a fixed Service using Fitzall

Option Board	
Alerts and Counters	• Distortion alert with counter • High neutral current alert with counter • High demand alert • DC detection alert • Over voltage alert with counter • Outage counter • Date & time of last outage (TOU or recording) • Power factor alert • Under voltage alert with counter
Instantaneous Measures	• Per Phase Voltage • V&I Phase Angles • Reactive power • Distortion power factor (D/U) • Per Phase Current • Active power • Power factor
Cumulative Measures	• Distortion kVAh (with k Switch) • Cumulative power outage duration
Advance Power Quality	• Voltage, Current, Frequency, THD, TDD, DPF Recorded as Min, Max, average (V2h or I2h) or end-of-interval (4 or 20 channels)
Distortion – Real Time and Cumulative Measures*	• Distortion kVA and kVAh • Distoration Power Factor (DPF) = Distortion Power/Apparent Power per phase and total • Total Demand Distortion (TDD) = Total Harmonic Current / Rated Maximum Current per phase • Total Harmonic Distortion (THD) - Current and Voltage per phase
Instrumentation – Real Time measures	• Frequency • RMS Voltage (L-N) or (L-L) primary or secondary • Fundamental per phase voltage, current, and phase angles
Voltage Monitor	• Softswitch enabled • Two types of events independently monitored • Voltage Sags per phase • Voltage Swells per phase • Programmable Magnitude and duration thresholds • 0 to 100% in 1% steps (separate sag and swell thresholds) • 1 to 65 k cycles • Event ends when all phases within threshold • Reference voltage automatically determined or programmed
Voltage Event Log	• Separate Sag and Swell event counters • Date and Time • RMS coincident current • Max (Swells) or Min (Sags) RMS cycle voltage for each phase • Duration in cycles • 200 events in log
Waveform Capture	• 70 sample sets in memory @ 60 Hz • 32/5.2 samples per cycle • 54.2 sample sets per cycle • Each sample set includes 3 voltage and 3 current samples (Phases A, B, and C) • Waveform data used for harmonic analysis by MeterMate • Data capture initiated by local or remote read

Technical Specifications (continued)

Diagnostics and Cautions
• Diagnostic 1 – Polarity, Cross Phase, Reverse Energy Flow
• Diagnostic 2 – Voltage Imbalance
• Diagnostic 3 – Inactive Phase Current
• Diagnostic 4 – Phase Angle Alert
• Diagnostic 5 – High Distortion, DC detection
• Diagnostic 6 – Under Voltage, Phase A
• Diagnostic 7 – Over Voltage, Phase A
• Diagnostic 8 – High Neutral Current
• Caution 000400 – Under Voltage
• Caution 000400 – Demand Overload
• Caution 000400 – Leading kvarh
• Programmable duration before activation – 5 seconds to 14 minutes

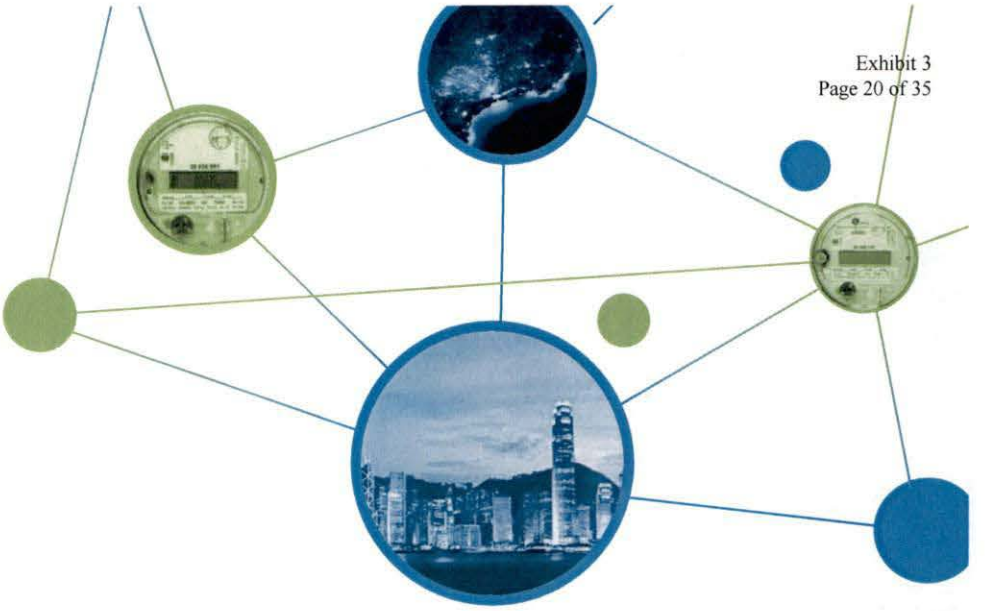
Diagnostics and Cautions
• Phasor Diagram of current circuit conditions (current and voltage magnitude phase angles, and phase rotation)
• 3 phase L-L and L-N RMS Voltage with and without harmonics
• RMS per phase and imputed neutral current with and without harmonics
• Frequency
• Power Factor with and without harmonics
• Current and Voltage THD per phase
• TDD (Harmonic current/Max. current) per phase
• Active, Reactive, Phasor, Distortion, Arithmetic Apparent and Vector Apparent Power with and without harmonics (also by quadrant and phase i.e., delivered, received, lagging, and leading; phase A, B, C). Unidirectional (delivered plus received or lagging plus leading) and detented measurement (delivered minus received or lagging minus leading)
• Automatic Service Detection, Installation Check, Circuit Monitoring and Tamper Detection – Circuit Diagnostics and Cautions
• ID of last programmer
• Date & time of last calibrated
• ID of last calibrator
• Total number of OPTOCOM communications
• Date & time of last OPTOCOM communication
• Number of EEPROM reads and writes

Measurement Choices
• Measure fundamental only or fundamental plus harmonics
• Demand measures
• kWh
• kvar (IEEE*)
• Q hour
• "Fuzzy" vars
• Demand calculations
• Maximum, cumulative, or continuously cumulative
• Block
• Rolling
• Exponential (thermal emulation)
• Intervals
• Active, Reactive, Phasor, Imaginary ("Fuzzy"), Arithmetic, and Vector Apparent Power with and without harmonics (also by quadrant and phase i.e., delivered, received, received, lagging, and leading)
• Thermal Demand emulation
• Q Hour Demand (note: not reactive)
• Coincident demands (up to 10)
• Average Power Factor (distortion and active power factors)
• Instantaneous, Block, Rolling (Sliding Window), Cumulative, and Continuously Cumulative demand by TOU period, season, present, and past billing period Demand intervals from 1 to 60 minutes
• Up to 20 values can be recorded with up to 4 totalized channels, including 4 external input channels for recording values from external devices) min, max, sampled, and interval count recording)
• High demand alert and end of demand interval output pulses

Diagnostics and Cautions
• ANSI C12.1 – Electricity metering
• ANSI C12.10 – Watt-hour meters
• ANSI C12.1e – Solid-state meters
• ANSI C12.18 – Protocol Specification for ANSI Type II optical ports
• ANSI C12.19 – Utility Industry End Device Data Tables
• ANSI C12.20 for 0.2 and 0.5 accuracy class meters
• FCC Class B emissions (Class A for kV2c+)
• ANSI C12.21 for Modem Communication

Aclara Technologies LLC is a world-class supplier of smart infrastructure solutions (SIS) to more than 800 water, gas, and electric utilities globally. Aclara SIS offerings include smart meters and other field devices, advanced metering infrastructure and software and services that enable utilities to predict and respond to conditions, leverage their distribution networks effectively and engage with their customers. Aclara Technologies LLC is owned by an affiliate of Sun Capital Partners.
Visit us at Aclara.com, phone 800 297 2728 or contact us at info@aclara.com and follow us on Twitter @AclaraSolutions.

Silver Spring NETWORKS



PRODUCT DATA SHEET

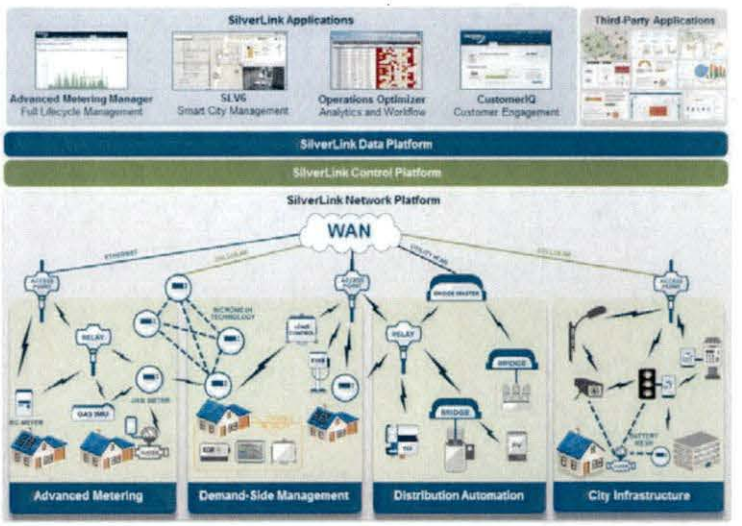
SILVER SPRING GEN5 NETWORK

AP 5.0 Cellular, AP 5.0 Ethernet

Leading utilities and cities have delivered breakthroughs in operational efficiency, customer service, and environmental sustainability by relying on Silver Spring's secure, reliable two-way connectivity to critical infrastructure. The Silver Spring Gen™5 network technology delivers the performance to continue the acceleration of critical infrastructure modernization initiatives. The AP 5 offers secure, flexible connectivity between the Silver Spring network and common wide area networks including Ethernet and cellular.

Flexible Communications for Diverse Applications and Environments

The Silver Spring Access Point 5 (AP 5) provides the central network resource for delivering data generated by endpoint devices at the network edge and IT/OT systems—enabling high-performance applications, network control, and monitoring. Its flexible communication features extend the reach and coverage of the network to thousands of customer sites, and its support for up to 5,000 endpoints per access point dramatically lowers costs. The AP 5 offers multiple paths to each endpoint device through sophisticated mesh network routing that ensures greater reliability and redundancy.



The high-performance AP 5 dynamically adapts to optimize speed and coverage to a variety of devices while securely and reliably delivering data for multiple applications.

INTEGRATION AND DEPLOYMENT SCENARIOS

Smart grid – The low latency and high-speed throughput of the AP 5 keeps pace with the high-performance devices and network infrastructure within the Silver Spring network. Redundancy, secure communications, and high reliability enable utilities to scale multi-application deployments rapidly while leveraging existing systems and reducing overall cost of ownership.

Smart city – The AP 5's flexibility and ease of installation facilitates the success of new city services such as traffic monitoring and smart parking. The proven multi-layer security of the AP 5 allows cities to rapidly deploy new applications and services while leveraging consistent policies and controls proven at scale.

FEATURES

Secure, reliable performance to enable the most demanding smart infrastructure applications

» Up to 2.4 Mbps data speeds

» 10 ms latency

» Open standards-based two-way communications and interfaces

» IPv6; IEEE 802.15.4g, Wi-SUN compliant

» Ethernet and cellular WAN options including 4G LTE

» Dynamically adaptive data rates to ensure maximum performance while ensuring backwards compatibility

» Integrated, open standards-based security

» Public key-based authentication and AES-256 encryption

» Increased system performance and data throughput

» 900 MHz and 2.4 GHz radios

» 32 MB RAM and 32 MB flash

Key Benefits

The AP 5 couples secure, reliable performance with open standards-based IPv6 communications to enable cities and utilities to cost-effectively integrate mission-critical control and monitoring processes.

Expanded opportunity for performance-intensive multi-application services

The AP 5's support for a data rate up to 2.4 Mbps and 10 ms latency enables cities and utilities to roll out new types of services and increase customer satisfaction with engaging applications. Gen5 also includes a dual-band mesh capability that nearly doubles network capacity, as devices can transmit and receive on the 900 MHz and 2.4 GHz bands simultaneously.

Comprehensive and cost-effective coverage of diverse territory

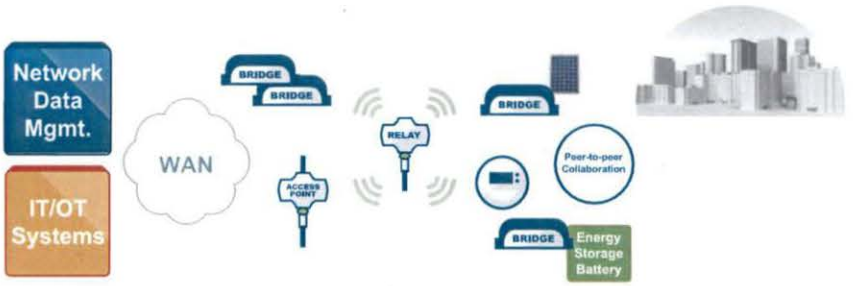
The AP 5 delivers cost-effective coverage while ensuring maximum overall system performance by dynamically adapting the data rate to optimize reliable information delivery over a long range in the most challenging environments.

Risk mitigation through proven, multi-layer security

Two-way communications remains protected from the increasingly hostile threat environment by building on Silver Spring's proven, multi-layer security that leverages built-in controls from the application to device layer.

Rapid time-to-value with flexible integration

The AP 5 can be deployed on a broad array of existing assets. Mounting kits are available for installing APs on distribution poles, streetlights, walls, and inside pad-mounted enclosures. Multiple external antenna options are available to further extend the AP 5's range and coverage levels.



The AP 5 delivers low latency and high data rates for the most demanding multi-application initiatives.

About Silver Spring Networks

Silver Spring Networks enables the Internet of Important Things™ by reliably and securely connecting things that matter. Cities, utilities, and companies on five continents use the company's cost-effective, high-performance IoT network and data platform to operate more efficiently, get greener, and enable innovative services that can improve the lives of millions of people. With more than 24 million devices delivered, Silver Spring provides a proven standards-based platform safeguarded with military grade security. Silver Spring Networks' customers include Baltimore Gas & Electric, CitiPower & Powercor, ComEd, Consolidated Edison, CPS Energy, Florida Power & Light, Pacific Gas & Electric, Pepco Holdings, and Singapore Power. Silver Spring has also deployed networks in Smart Cities including Copenhagen, Glasgow, Paris, Providence, and Stockholm. To learn more, visit www.ssni.com. Rev. 1/17/2017

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Silver Spring NETWORKS

www.silverspringnet.com

Specifications:

Communications	Data rate: 6.25 kbps to 2.4 Mbps Frequencies: 902-928 MHz and 2.4000-2.4835 GHz (USA) Frequencies: 870-875.6 MHz (EU, UAE) Spread spectrum technology: FHSS Modulation: FSK, O-QPSK, or OFDM – adaptive gear shifting Transmitter output: 900 MHz–30 dBm (1 W), 870 MHz (500 mW ERP), 2.4 GHz–(500 mW) Output impedance: 50 ohms WAN: Cellular, Ethernet, and Satellite Cellular — 4G LTE
Protocols/Security	Addressing: Internet Protocol version 6 (IPv6) Security: Secure Hash Algorithm 256 bit (SHA-256) and RSA-1024 or ECC-256 Encryption: Advanced Encryption Standard (AES-128 or AES-256)
Physical Interfaces	Antenna connectors: N Type, Female
Power	Power Input range: 96 to 277 VAC, 50 to 60 Hz
Environmental	Operating temperature: -30°C to +70°C (-22°F to +158°F) Humidity: 0% to 95%, non-condensing
Mechanical	Cellular/Ethernet: Dimensions: 35.0 cm (13.78") L x 21.1 cm (8.32") W x 9.2 cm (3.62") H Weight: 4.4 kg (9.8 lb) Enclosure: IP65, white, aluminum
Mounting Kit Options	Wooden pole Concrete pole Light pole Wall
Approvals	FCC: Part 15.247 Industry Canada: RSS-247 EU: ETSI EN 303 204
Memory	32 MB/32 MB Flash/RAM

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Power Consumption:

Ethernet AP	Idle 7.5 W	Max 12.1 W
Ethernet AP with Battery	Idle 7.5 W	Max 18.1 W
Cellular AP	Idle 9.8 W	Max 13.3 W
Cellular AP with Battery	Idle 9.8 W	Max 19.3 W

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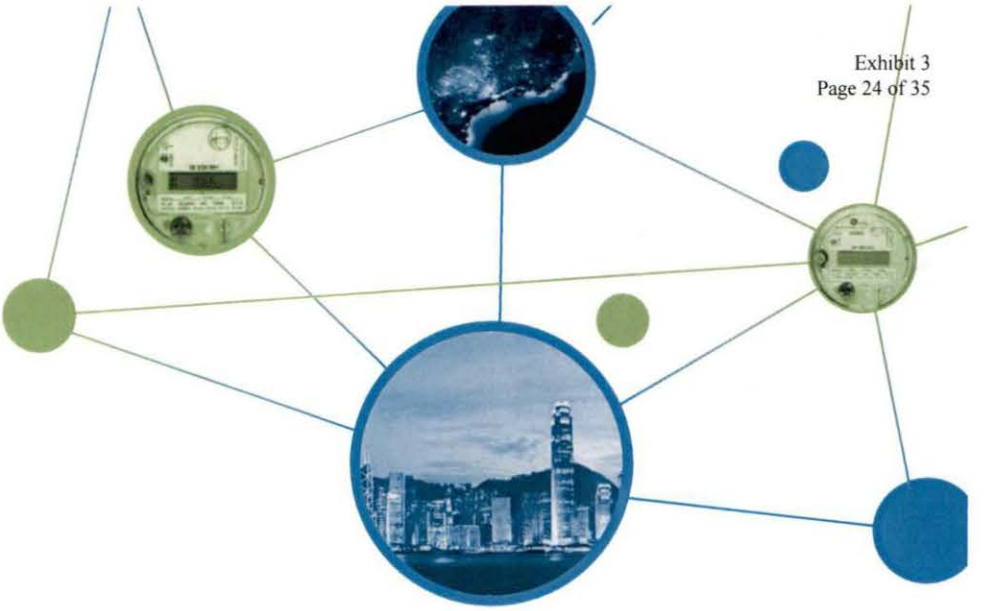


PRODUCT DATA SHEET

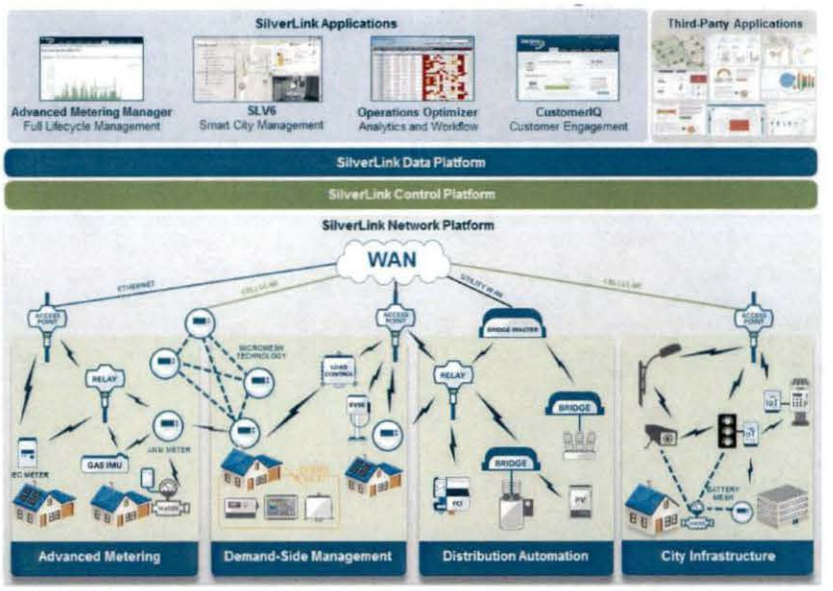
SILVER SPRING GEN5 NETWORK

Relay 5

Leading utilities and cities have delivered breakthroughs in operational efficiency, customer service and environmental sustainability by relying on Silver Spring's secure, reliable two-way connectivity to critical infrastructure. The Silver Spring Gen™5 network technology delivers the performance to continue the acceleration of critical infrastructure modernization initiatives. The Silver Spring Relay and Access Point work together to relay data from endpoints to IT/OT systems. The Relay 5 extends the network to cost effectively reach more device endpoints.

Extending Reach and Coverage for Cost-Effective Communications

The Relay 5 works with the AP 5 to deliver data generated by endpoint devices at the network edge and IT/OT systems—enabling high performance applications, network control and monitoring. Its flexible communication features extend the reach and coverage of the network. The Relay 5 provides multi-hop capability between Silver Spring-enabled endpoint devices and the AP 5 for seamless integration.



The Relay 5 in conjunction with the AP 5 extends the speed and coverage of the network to deliver high-capacity data securely and reliably from the edge devices to a variety of IT/OT systems.

INTEGRATION AND DEPLOYMENT SCENARIOS

Smart grid – The low latency and high-speed throughput of the Relay 5 keeps pace with the high performance devices and network infrastructure within the Silver Spring network. Redundancy, secure communications and high reliability enable utilities to scale multi-application deployments rapidly while leveraging existing systems and reducing overall cost of ownership.

Smart city – The Relay 5's flexibility and ease of installation facilitates the success of new city services such as traffic monitoring and smart parking. The proven multi-layer security of the Relay 5 allows cities to rapidly deploy new applications and services while leveraging consistent policies and controls proven at scale.

Features

Gen5-based networking technology with performance optimization

» Up to 2.4 Mbps data speeds

» 10 ms latency

» Open standards-based two-way communications and interfaces

» IPv6; IEEE 802.15.4g, Wi-SUN compliant

» Increased system performance and data throughput

» 900 MHz and 2.4 GHz radios

» 32 MB RAM and 32 MB flash

Key Benefits

The Relay 5 couples secure, reliable performance with open standards-based IPv6 communications to enable cities and utilities to cost effectively integrate mission-critical control and monitoring processes.

Expanded opportunity for performance intensive multi-application services

The Relay 5's support for a data rate up to 2.4 Mbps and 10 ms latency enables cities and utilities to roll out new services and increase customer satisfaction with engaging applications. Gen5 also includes a dual-band mesh capability that nearly doubles network capacity as devices can transmit and receive on both the 900 MHz and 2.4 GHz bands simultaneously.

Comprehensive and cost-effective coverage of diverse territory

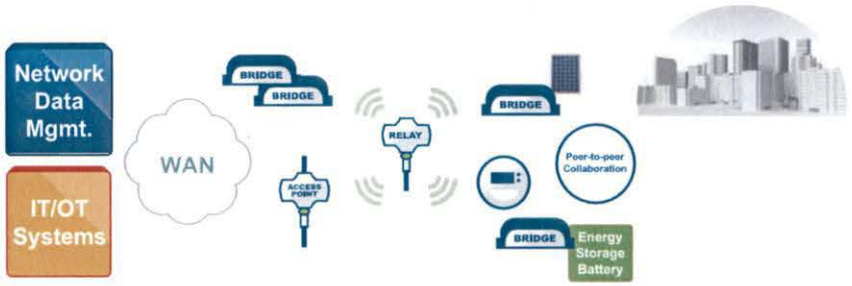
The Relay 5 delivers cost-effective coverage while ensuring maximum overall system performance by dynamically adapting the data rate to optimize reliable information delivery over a long range in the most challenging environments

Risk mitigation through proven, multi-layer security

Two-way communications remains protected from the increasingly hostile threat environment by building on Silver Spring's proven, multi-layer security that leverages built-in controls from the application-to-device layer.

Rapid time-to-value with flexible integration

The Relay 5 can be deployed on a broad array of existing assets. Mounting kits are available for installing relays on distribution poles, street lights, and walls, and inside pad-mounted enclosures.



The Relay 5 delivers the low latency and high data rates to enable the most demanding multi-application initiatives.

About Silver Spring Networks

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Specifications

Communications	Data rate: 6.25 kbps to 2.4 Mbps Frequencies: 902-928 MHz and 2.4000-2.4835 GHz (USA) Frequencies: 870-875.6 MHz (EU, UAE) Spread spectrum technology: FHSS Modulation: FSK, O-QPSK, or OFDM - adaptive gear shifting Transmitter output: 900 MHz - 1 W, 870 MHz – 500 mW ERP, 2.4 GHz – 500 mW Output impedance: 50 ohms
Protocols/Security	Addressing: Internet Protocol version 6 (IPv6) Security: Secure Hash Algorithm 256 bit (SHA-256) and RSA-1024 or ECC-256 Encryption: Advanced Encryption Standard (AES-128 or AES-256)
Physical Interfaces	Antenna connectors: N Type, Female
Power	Power Input range: 96 to 277 VAC, 50 to 60 Hz
Environmental	Operating temperature: -40°C to +85°C (-40°F to +185°F) Humidity: 0% to 95%, non-condensing
Mechanical	Dimensions: 35.0 cm (13.78") L x 21.1 cm (8.32") W x 9.2 cm (3.62") H Weight: 3.67 kgs (8.1 lbs) Enclosure: IP65, white, aluminum
Mounting Kit Options	Wooden pole Concrete pole Light pole Wall
Approvals	FCC: Part 15.247 Industry Canada: RSS-247 EU: ETSI EN 303 204
Memory	32 MB/32 MB Flash/RAM

Power Consumption:

Relay	Idle 4.8 W	Max 8.8 W
Relay with Battery	Idle 4.8 W	Max 14.8 W

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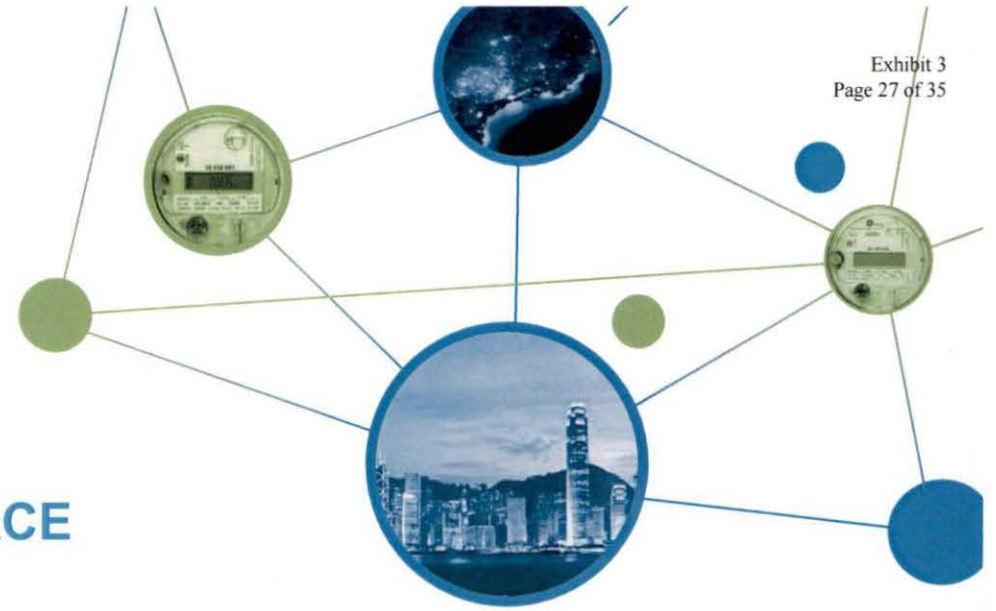


PRODUCT DATA SHEET

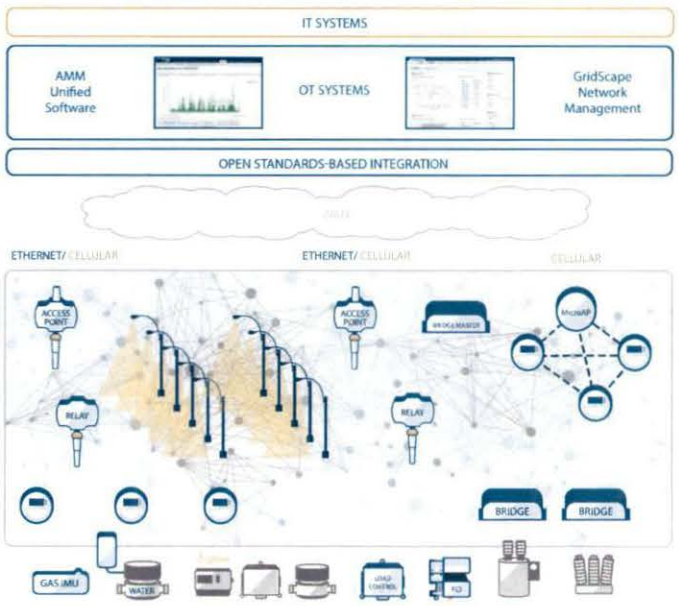
NETWORK INTERFACE CARD (NIC) FOR ELECTRICITY METERS

Smart Metering – The Foundation of the Smart Grid

The Silver Spring® platform combines network infrastructure, software, and services to enable a range of smart grid applications. Enabling two-way communications with modern electricity meters is fundamental to building the smart grid.

The Silver Spring network interface card (NIC) integrates under glass inside partners' electricity meters to provide wireless networking, both back to utility OT/IT systems and into the customer's home. The NIC easily installs inside these meters and leverages Silver Spring network devices to form a highly resilient mesh network for the utility. The resulting two-way communications network gives utilities greater efficiency, more reliable service delivery, improved customer satisfaction, and a scalable platform for advanced smart grid applications.

The NIC accesses demand, consumption, time-of-use and interval data, alarms, and power-quality information from the meter. Its two-way wireless functionality supports remote data acquisition, meter program management, and real-time alerts for meter tampering and outages.



The Silver Spring platform supports a range of smart grid applications on a single open standards-based network.

Two-Way Wireless Communications For Meters

» Offers one-watt transmitter to provide full, two-way wireless NAN communications
» Supports 2.4 GHz HAN communications
» Integrates with Silver Spring applications to support advanced metering and demand response
» Enables over-the-air firmware upgrades to reduce operational cost
» Provides multi-layer security and military-grade encryption to meet rigorous industry standards

Leading Reliability and Performance

With its full, one-watt transmitter, the Silver Spring NIC provides broad reach and robust connectivity in the Neighborhood or Field Area Network (NAN or FAN). In addition to supporting a 900 MHz radio for the NAN, the NIC also features an optional 2.4 GHz radio for the Home Area Network (HAN). This radio supports the ZigBee Smart Energy Profile specification to communicate with a wide range of smart devices within the home.

The NIC is available in a variety of models to support specific utility needs and geographic regions.

Features

- Full, two-way communications
- One-watt transmitter
- Frequency Hopping Spread Spectrum (FHSS)
- Multi-layer security and encryption
- Dynamic network discovery and self healing
- Scheduled and on-demand meter reads
- Alarm detection and clearing
- Network time management
- Continuous neighbor monitoring and route calculation
- Over-the-air firmware upgrades and meter programming
- Power outage and restoration notification
- Support for a wide range of meters and form factors

About Silver Spring Networks

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NIC SPECIFICATIONS

Gen 3 Product Family – General	
PLATFORM	Processor: SoC-based ARM 7 RAM: 4 MB Flash: 8 MB
NAN COMMUNICATIONS	Frequency: 902 – 928 MHz, 865-880MHz Protocol: IEEE 802.15.4g, Wi-SUN compliant Data rates: 100 kbps Spread spectrum: Frequency hopping Transmitter output: up to 30 dBm (1 W)[1] Receive sensitivity: -98 dBm for 10% PER
HAN COMMUNICATIONS	Frequency: 2400 – 2480 MHz Protocols: IEEE 802.15.4, ZigBee Smart Energy Profile 1.1 Date rate: 250 kbps Transmitter output: 20 to 23 dBm (100 to 200 mW)[1] Receive sensitivity: -97 dBm for 1% PER
PROTOCOLS/SECURITY	Addressing: IPv6 Encryption: Advanced Encryption Standard (AES-128 or AES-256) Security: Secure Hash Algorithm 256-bit (SHA-256) and RSA1024 or ECC-256 Key storage: Secure NVRAM with tamper detection and key erasure
ENVIRONMENTAL	Operating temperature: -40°C to +85°C (-40°F to +185°F) Humidity: 0% to 95%, non-condensing

[1] Radio TX output power varies in accordance with local country regulations. Please contact Silver Spring Networks for more information.

About Silver Spring Networks

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Silver Spring NETWORKS

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NIC SPECIFICATIONS Continued

Gen 3 Product Family – North America	
RADIO	Frequency: 902 – 928 MHz Approvals: FCC 15.247, Industry Canada RSS-210
INTERFACES	Meter: ANSI C12.18/C12.19, serial
SUPPORTED METERS	FGE I-210+[2] GE I-210+c[3] GE kV2c GE KV2ce Elster A3 ALPHA L+G E330 FOCUS® AX L+G E350 AX-SD Single Phase L+G E330 FOCUS AX Polyphase L+G E650 S4e

[2] indicates Measurement Canada approval.

[3] indicates UL certification

Gen 3 Product Family – Australia and New Zealand	
RADIO	Frequency: 915 – 928 MHz Approvals: ANZ/NZ 4268
INTERFACES	Meter: PACT, ANSI C12.18/C12.19, serial
SUPPORTED METERS	Secure i-Credit 500 Secure Sprint 200 Secure Premier L+G E350 – U1200 L+G E350 – U1300 L+G E350 – U3300 L+G E350 – U3350

About Silver Spring Networks

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Silver Spring NETWORKS

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NIC SPECIFICATIONS Continued

Gen 3 Product Family – Brazil	
RADIO	Frequency: 902 – 907 MHz, 915 – 928 MHz Approvals: ANATEL
INTERFACES	Meter: ANSI C12.18/C12.19, serial
SUPPORTED METERS	SNansen Spectrum K Elster A3

Gen 4 Product Family – General	
PLATFORM	Processor: SoC-based ARM 7 RAM: 4 MB Flash: 8 MB
NAN COMMUNICATIONS	Frequency: 902 – 928 MHz, 865 – 880 MHz Protocol: IEEE 802.15.4g, Wi-SUN compliant Data rates: 50 – 300 kbps Spread spectrum: Frequency hopping Transmitter output: up to 30 dBm (1 W)[1] Receive sensitivity: -101 dBm for 10% PER
HAN COMMUNICATIONS	Frequency: 2400 – 2480 MHz Protocols: IEEE 802.15.4, ZigBee Smart Energy Profile 1.1 Data rates: 250 kbps Transmitter output: 20 to 23 dBm (100 to 200 mW) Receive sensitivity: -97 dBm for 1% PER
PROTOCOLS/SECURITY	Addressing: IPv6 Encryption: Advanced Encryption Standard (AES-128 or AES-256) Security: Secure Hash Algorithm 256-bit (SHA-256) and RSA-1024 or ECC-256 Key storage: Secure NVRAM with tamper detection and key erasure
ENVIRONMENTAL	Operating temperature: -40°C to +85°C (-40°F to +185°F) Humidity: 0% to 95%, non-condensing

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NIC SPECIFICATIONS Continued

Gen 4 Product Family – North America	
RADIO	Frequency: 902 – 928 MHz Approvals: FCC 15.247, Industry Canada RSS-210
INTERFACES	Meter: ANSI C12.18/C12.19, serial
SUPPORTED METERS	Elster A3 ALPHA GE I-210+[2] GE I-210+c[23] GE kV2c[23] GE kV2ce Itron CENTRON II C12.19 L+G E330 FOCUS® AX L+G E330 FOCUS AX Polyphase L+G E331 FOCUS AXe L+G E350 AX-SD Single Phase L+G E351 FOCUS AXe-SD Tatung ETA Series (ETA-21S, ETA-31S, ETA-32S)

[2] indicates Measurement Canada approval.

[3] indicates UL certification

Gen 4 Product Family – Australia and New Zealand	
RADIO	Frequency: 915 – 928 MHz, 921 – 928 MHz Approvals: ANZ/NZ 4268
INTERFACES	Meter: ANSI C12.18/C12.19, serial
SUPPORTED METERS	L+G E350 – U1200 L+G E350 – U1300 L+G E350 – U3300 L+G E350 – U3350 L+G U3400 EDMI 7A EDMI 10D0

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NIC SPECIFICATIONS Continued

Gen 4 Product Family – Brazil	
RADIO	Frequency: 902 – 907 MHz, 915 – 928 MHz Approvals: ANATEL
INTERFACES	Meter: Serial, DLMS-COSEM
SUPPORTED METERS	Itron SL7000

Gen 4 Product Family – Asia Pacific	
RADIO	Frequency: 902 – 907 MHz, 915 – 928 MHz Approvals: ANATEL
INTERFACES	Meter: Serial, DLMS-COSEM
FREQUENCY RANGES	UMTS 800/850 Band VI/V, UMTS 900 Band VIII, UMTS 1800 Band III, UMTS 1900 Band II,UMTS 2100 Band I
SUPPORTED METERS	Secure i-Credit 510 Secure Sprint 210 EDMI 7B EDMI 10E WC EDMI 10E CT LT EDMI 10E CT HT Genus SKM145 Genus SKM345 Mirai 3PH CT-HT Mirai 3PH CT-LT Mirai 3PH WC Mirai MPA34D WC Mirai MPA33HT CT HT Mirai MPA34LT CT LT

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NIC SPECIFICATIONS Continued

Gen 5 Product Family – General	
PLATFORM	RAM and Flash: 8/8 MB; 16/16MB or 32/32 MB options
NAN COMMUNICATIONS	Frequency: 865–880 MHz , 902–928 MHz, 2400–2483.5 MHz Data rates: 6.25-2.4 Mbps Spread spectrum: FHSS Adaptive gear shifting: FSK, O-QPSK, OFDM Transmitter output: Up to 1 W
HAN COMMUNICATIONS	Frequency: 2400-2483.5 MHz Protocols: IEEE 802.15.4, ZigBee Smart Energy Profile 1.1 Data rates: 250 kbps Transmitter output: 10 to 23 dBm (10 to 200 mW)1
PROTOCOLS/SECURITY	Addressing: IPv6 Encryption: Advanced Encryption Standard (AES-128 or AES-256) Security: Secure Hash Algorithm 256-bit (SHA-256) and RSA-1024 or ECC-256 Key storage: Secure NVRAM with tamper detection and key erasure
ENVIRONMENTAL	Operating temperature: -40°C to +85°C (-40°F to +185°F) Humidity: 0% to 95%, non-condensing
MEMORY	8 MB/8 MB Flash/RAM » Options for 16MB /16MB or 32MB/32MB

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NIC SPECIFICATIONS Continued

Gen 5 Product Family – North America	
RADIO	Frequency: 902 – 928 MHz, 2400-2483.5 MHz Approvals: FCC 15.247, Industry Canada RSS-247
INTERFACES	Meter: ANSI C12.18/C12.19, Serial
SUPPORTED METERS	Aclara I-210+c[3] Aclara kV2c[3]

[3] Indicates UL certification

Gen 5 Product Family – Australia and Asia Pacific	
RADIO	Frequency: 915 – 928 MHz, 2400-2483.5 MHz Approvals: ANATEL
INTERFACES	ANSI C12.18/C12.19, Serial, DLMS-COSEM

Gen 5 Product Family – Brazil	
RADIO	Frequency: 902 – 907.5 MHz, 915 – 928 MHz, 2400-2483.5 MHz Approvals: ANATEL
INTERFACES	ANSI C12.18/C12.19, Serial, DLMS-COSEM

Gen 5 Product Family – Europe, Middle East, and Africa	
RADIO	Frequency: 870-875.6 MHz, 2400 – 2483.5 MHz Approvals: ERC/REC 70-03 Annex 2c, ETSI EN 303 204-2, ETSI EN 300 328, ETSI EN 301 489, EN 60950-1
INTERFACES	Meter: ANSI C12.18/C12.19, Serial, DLMS-COSEM

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nrtc
Member driven. Technology focused.

nrtc	**MASTER PURCHASE AND SERVICES AGREEMENT** **Exhibit A** **to Master Purchase and Services Agreement, dated as of the 15 th day of December, 2017, by and between National Rural Telecommunications Cooperative and Cumberland Valley Electric, Inc.** **Pricing**

1. General Pricing Notes Applicable to All Sections

Note 1.1: Pricing is fixed until 12/31/2019. All Equipment Unit Prices specified below will remain valid for any additional Equipment ordered above and beyond the quantities specified below until 12/31/2019.

Note 1.2: Prices are in USD.

Note 1.3: Standard warranties for Software and Firmware are 90 days from the delivery date and are included in the unit price. Standard warranty for Equipment is 18 months from the delivery date and is included in the unit price.

Note 1.4: Prices are exclusive of shipping, transit insurance, duties and taxes. Shipping terms are FOB Origin Prepaid and Add (for domestically manufactured equipment) and DAP Prepaid and Add (for equipment manufactured outside the United States).

Note 1.5: Payment Terms: Net thirty (30) days of invoice receipt in U.S. dollars.

Advanced Metering Infrastructure

2. Equipment

Endpoint Devices				
Item	**Catalog Number**	**Quantity**	**Sell**	**Member Price**
I-210+C 2S CL200 RD 240V TVEQR W/SSN 510	230-500660	[redacted]	[redacted]	[redacted]
I-210+C 2S CL200 RD 240V TVEQR W/SSN 510 MICROAP	230-605100	[redacted]	[redacted]	[redacted]
I-210+C 2S CL320 240V TVEQR W/SSN 510	230-500661	[redacted]	[redacted]	[redacted]
KV2C 2S CL320 480V TVEQR W/SSN 510	230-505450	[redacted]	[redacted]	[redacted]
I-210+C 3S CL20 120V TVEQR W/SSN 510	230-500662	[redacted]	[redacted]	[redacted]
I-210+C 4S CL20 240V TVEQR W/SSN 510	230-500663	[redacted]	[redacted]	[redacted]
KV2C 9S CL20 120-480V TVEQR W/SSNI 510	230-505451	[redacted]	[redacted]	[redacted]
KV2C 16S CL320 120-480V TVEQR W/SSNI 510	230-505452	[redacted]	[redacted]	[redacted]
Total				[redacted]

Note 2.1: Aclara Standard warranty (on metrology related performance) for 18 months from date of shipment included in price. If applicable , Aclara technical support fees for meter configuration, meter training, and other meter support will be charged at [redacted] per 8-hour day plus travel and living expenses (if required).

Note 2.2: Aclara: All kv2c meters include polycarbonate cover as standard offering equipped with D-ring on optical port, no demand reset on cover, no battery, with T,R,E,V,Q softswitches enabled. I-210+c 2S CL200 meter is equipped with a remote disconnect switch, 2-tone polycarbonate cover with D-ring on optical port, no test link, no demand reset on cover, no battery, with T2,R2,E2,V2,Q2 switches enabled.

Note 2.3: Aclara: Options pricing (add to meter prices):

a. Optional Battery for timekeeping during a power outage. Price Adder for I-210+c or kV2c meter is [redacted]
b. Optional Supercap for timekeeping during a power outage. Price adder on I-210+c is [redacted]
c. k2 switch for I-210+c is [redacted] k-switch for kV2c is [redacted]
d. SIO (kyz) module for kV2c meter is [redacted]
e. Option for UL Certification on kV2c, adder per each meter is [redacted]
f. Option for UL Certification on I-210+c, adder per each meter is [redacted]
g. Standard demand reset lever mounted on I-210+c and kv2c meter cover is [redacted]
h. Class 320 Adder for kv2C meter is [redacted]
i. Test link for SC I-210+c meter forms is [redacted]
j. Last gasp extended holdover function for I-210+c is [redacted]

Note 2.4: Aclara Technical notes and comments:

a. I-210+c meter meets ANSI 12.20 accuracy class 0.5.
b. kV2c meter meets ANSI 12.20 accuracy class 0.2 percent
c. Nominal operating voltage of either 120 or 240vac must be specified for I-210+c meters at time of order. A kV2c must be used for all singlephase 480v installations.
d. kV2c meter nominal operating voltage range is 120-480vac and is available in popular singlephase and polyphaser S-base meter forms.
e. kV2c meter forms include 1s, 2s, 3s, 4s, 9s, 12s, 16s, 36s, 45s, 56s.
f. I-210+c meter forms include 1s, 2s, 3s, 4s, 12s, 25s. Remote disconnect option available on I-210+c S-base cl100 and cl200 meters only. Remote disconnect option available on Forms 1s, 2s, 12s, 25s
g. I-210+c meter cannot be equipped with input/output (kyz or load control) option board. kV2c meter must be used in applications requiring I/O board.

Network Infrastructure Equipment & Tools				
Item	**Catalog Number**	**Quantity**		**Total (USD)**
FIELD SERVICE UNIT, 5.0, USA	240-005000	[redacted]	[redacted]	[redacted]
ACCESS POINT, SG, MOUNTING KIT, LIGHT POLE BATTERY MOUNT	200-037004	[redacted]	[redacted]	[redacted]
CABLE, AP 4.5, BACK UP BATTERY, 27 IN	202-450001	[redacted]	[redacted]	[redacted]
BACKUP BATTERY, AP4.5/5.0, 8AH	200-450009	[redacted]	[redacted]	[redacted]
CABLE, AP 4.5, 3-PIN POWER, R/A, 20 FT, 16 AWG	202-450010	[redacted]	[redacted]	[redacted]
ANTENNA, CELLULAR AP - 2G, 3G, 4G	201-000050	[redacted]	[redacted]	[redacted]
ANTENNA, DUAL BAND, 900MHZ, +2.4GHZ, 2.5/3.5DBI, N-MALE, OMNI	201-000007	[redacted]	[redacted]	[redacted]
ACCESS POINT 5.0, CELLULAR, VERIZON, USA	200-005000	[redacted]	[redacted]	[redacted]
ACCESS POINT 5.0, ETHERNET, USA	200-005001	[redacted]	[redacted]	[redacted]
RELAY 5.0, USA	210-005000	[redacted]	[redacted]	[redacted]
COMMUNICATION TESTER 6.X SOFTWARE	280-011019	[redacted]	[redacted]	[redacted]
COMMUNICATION TESTER MAINTENANCE (Annual (QTY*YR))	290-030001	[redacted]	[redacted]	[redacted]
Total				[redacted]

SPARE INVENTORY of Network Infrastructure Equipment & Tools (Recommended Operational Quantities)				
Item	**Catalog Number**	**Quantity**		**Total (USD)**
ACCESS POINT, SG, MOUNTING KIT, LIGHT POLE BATTERY MOUNT	200-037004	[redacted]	[redacted]	[redacted]
CABLE, AP 4.5, BACK UP BATTERY, 27 IN	202-450001	[redacted]	[redacted]	[redacted]
BACKUP BATTERY, AP4.5/5.0, 8AH	200-450009	[redacted]	[redacted]	[redacted]
CABLE, AP 4.5, 3-PIN POWER, R/A, 20 FT, 16 AWG	202-450010	[redacted]	[redacted]	[redacted]
ANTENNA, CELLULAR AP - 2G, 3G, 4G	201-000050	[redacted]	[redacted]	[redacted]
ANTENNA, DUAL BAND, 900MHZ, +2.4GHZ, 2.5/3.5DBI, N-MALE, OMNI	201-000007	[redacted]	[redacted]	[redacted]
ACCESS POINT 5.0, CELLULAR, VERIZON, USA	200-005000	[redacted]	[redacted]	[redacted]
ACCESS POINT 5.0, ETHERNET, USA	200-005001	[redacted]	[redacted]	[redacted]
RELAY 5.0, USA	210-005000	[redacted]	[redacted]	[redacted]
Total				[redacted]

Note 2.5: Annual tools Support Services Fee is 20% of the net Software License Fee for Communication Tester 6.X software, paid annually in advance. Pricing excludes laptop / PC required to run the Software tools.

3. **Professional Services**

Professional Services		
Service	**Catalog Number**	**Total (USD)**
FIELD NETWORK DESIGN	290-001005	[redacted]
INTEGRATION & CONFIGURATION	290-001022	[redacted]
NETWORK OPTIMIZATION	290-001014	[redacted]
SYSTEM TESTING	275-000009	[redacted]
NETWORK DEPLOYMENT SUPPORT	290-001006	[redacted]
PROJECT MANAGEMENT	275-000001	[redacted]
TRAINING - AMI TRAINING SUITE	275-000008	[redacted]
Total		[redacted]

Note 3.1: The invoicing schedule above assumes work begins promptly after the SOW Effective Date. Any changes to this schedule may cause a change in invoicing schedule.

Note 3.2: Travel and Living billed at cost plus 10%.

4. **Software SaaS**

PROD Environment				
Item	**Catalog Number**	**Quantity**		**Total (USD)**
CONTROL PLATFORM BASE SAAS SETUP FEE - PROD	298-000011	[redacted]	[redacted]	[redacted]
CONTROL PLATFORM BASE SAAS MONTHLY FEE - PROD	298-000012	[redacted]	[redacted]	[redacted]
AMM SAAS DEPLOYMENT FEE - PROD	290-001028	[redacted]	[redacted]	[redacted]
AMM SAAS MONTHLY FEE - PROD	290-001070	[redacted]	[redacted]	[redacted]
MPC SAAS SETUP FEE - PROD	290-020006	[redacted]	[redacted]	[redacted]
MPC SAAS MONTHLY FEE - PROD	290-020007	[redacted]	[redacted]	[redacted]
Total				[redacted]

Note 4.1: SaaS Monthly Fee includes hardware, software, and hosting for one PROD environment supporting up to 24,233 endpoints. Incremental endpoints will be charged at [redacted] per endpoint per year.

TEST Environment				
Item	Catalog Number	Quantity		Total (USD)
CONTROL PLATFORM BASE SAAS SETUP FEE - TEST	298-000021	[redacted]	[redacted]	[redacted]
CONTROL PLATFORM BASE SAAS MONTHLY FEE - TEST	298-000022	[redacted]	[redacted]	[redacted]
AMM SAAS DEPLOYMENT FEE - TEST	290-001031	[redacted]	[redacted]	[redacted]
AMM SAAS MONTHLY FEE - TEST	290-001073	[redacted]	[redacted]	[redacted]
MPC SAAS SETUP FEE - TEST	290-020019	[redacted]	[redacted]	[redacted]
MPC SAAS MONTHLY FEE - TEST	290-020020	[redacted]	[redacted]	[redacted]
Total				[redacted]

Note 4.2: SaaS Monthly Fee includes hardware, software, and hosting for one TEST environment supporting up to 1,000 endpoints.

TOTAL	[redacted]

Projected Benefits for Applicant and Its Members

Rate Structure: Every meter will be capable of supporting Time-of-Use rates, Net Metering, Critical Peak Pricing, and Real Time Pricing.

Member Access: Cumberland Valley's members will be able to log-in to NISC's Smart Hub to access their consumption data in real time via a web portal. Giving the members access to hourly usage data will allow members to make more informed decisions on energy usage.

Pre-Pay Metering: Members who are on Pre-Pay and let their balance run out will experience significantly faster reconnect times once they add money to their account. Currently using Landis and Gyr's TS2 system remote reconnect can take several hours, however with Silver Spring's solution reconnects can occur as quickly as 30 seconds.

Member Billing and Usage Questions: Real time data will allow Cumberland Valley's Member Service Representatives ("MSR") to better help answer billing or usage concerns and improve customer service. For example, MSR's can advise members on what time during the day their usage increased. This information empowers the member to adjust their usage and conserve energy.

Outage Reporting: Silver Spring's solution will improve outage response times by locating the cause of an outage faster. It will also verify whether all members have been restored when a repair is completed. This allows Cumberland Valley to identify "nested" outages before crews leave the area.

Cost-Savings Benefits: Silver Spring's solution will eliminate the need for manual reads for service connections and disconnections. Alerts for detection of tampering and unauthorized access to meters will be generated which will reduce the opportunity for energy theft.

Voltage Data: Having access to voltage information at the meter level will allow Cumberland Valley to identify trouble areas, such as low voltage or overloaded transformers on the system. This will greatly enhance Cumberland Valley's ability to address potential issues on our system before outages or customer complaints occur. Cumberland Valley also believes that better voltage information will have the potential to reduce line loss.

Distribution Automation: Silver Spring's will give Cumberland Valley the ability to communicate with various distribution equipment such as regulators, reclosers and fault indicators.

Borrower Designation KY57

AMENDMENT TO CURRENT APPROVED WORK PLAN

Work Plan Period: 2016-2019

Amendment: 2018-1

Project: 705

BACKGROUND INFORMATION:

Cumberland Valley Electric is currently using Landis+Gyr's TS2 AMI system for 2-way communications to meters for meter reading, remote connects/disconnects and for load control switches. This system is now considered obsolete by the Kentucky Public Service Commission, has not been sold by L+G in several years, and, according to L+G, will not likely be supported beyond 2020. Therefore, CVE began investigating AMI solutions and their vendors for replacement of the TS2 system in 2017. This investigation led to the release of an RFP to which six vendors responded with proposals. CVE's AMI team evaluated each proposal and selected an RF mesh network system from Silver Spring Networks. A request for a CPCN from the Kentucky PSC will be filed in January 2018. The project is expected to commence by mid-2018 and be completed in 2020.

PROPOSED CHANGES:

This project requires: replacement of CVE's current meter inventory consisting of approx. [redacted] single and polyphase meters at est. cost of [redacted]; installation of [redacted] pieces of network hardware, spare equipment and network testing tools at est. cost of [redacted]; professional services – network design, integration, configuration, optimization, testing, deployment support, project management and training at est. cost of [redacted]. The stated meter quantity and cost thereof will be covered by 740c code 601 loan funds which is in our current work plan. The other items of network infrastructure hardware and professional services are the subject of this Work Plan Amendment establishing code 705 in CVE's work plan.

REASON FOR CHANGES:

AMI system/equipment obsolescence and impending withdrawal of support for same.

METHOD OF FINANCING:

Estimated Cost	[redacted]	Loan Funds	[redacted]
		General Funds	$ 0
		Contributions in Aid	[redacted]

STATUS OF BORROWER'S ENVIRONMENTAL REPORT: n/a

REQUESTED BY: Ted Del Campton MDA DATE: January 16, 2018

APPROVED BY: Mike Norman per Mike Norman DATE: 01/17/2018

SUBJECT TO ER APPROVAL? YES NO X

COMMONWEALTH OF KENTUCKY
BEFORE THE
KENTUCKY PUBLIC SERVICE COMMISSION

IN THE MATTER OF:

THE APPLICATION OF CUMBERLAND VALLEY ELECTRIC, INC. FOR COMMISSION APPROVAL FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY TO INSTALL AN ADVANCED METERING INFRASTRUCTURE (AMI) SYSTEM PURSUANT TO KRS 807 KAR 5:001 AND KRS 278.020	)))))))	**CASE NO. 2018-** 00056

TESTIMONY OF MARK D. ABNER

Q1. Please state your name, business address and position at Cumberland Valley Electric, Inc. ("Cumberland Valley").

A. Mark Abner, 6219 North U.S. Hwy 25E, Gray, Kentucky, 40734. I am the Manager of Engineering.

Q2. What is your educational background?

A. I hold a Bachelor of Science in Electrical Engineering degree from the University of Kentucky College of Engineering.

Q3. What is your work experience?

A. I worked for approximately 15 years in service to Kentucky Utilities as a technical engineer in distribution engineering. Since 2005, I have served as Engineering Manager for Cumberland Valley Electric.

Q4. Have you previously submitted testimony before the Kentucky Public Service Commission?

A. Yes.

Q5. What is Cumberland Valley requesting in this case?

A. Cumberland Valley is requesting a Certificate of Public Convenience and Necessity to install an Advanced Metering Infrastructure system ("AMI").

Q6. Why is Cumberland Valley seeking the certificate?

A. Cumberland Valley has been advised by its current AMI vendor (Landis & Gyr) that support for its TS2 system will most likely be ending in 2020. Cumberland Valley is also concerned about its ability to procure replacement equipment for the TS2, currently some TS2 parts have a 40 week wait time. These two factors have created an urgency for Cumberland Valley to look at other systems for its AMI needs. The system Cumberland Valley chose in Silver Spring Networks will provide better customer service by having more detailed usage data for our members. It will also help with theft detection and allow for better monitoring of the health of our system through meter level voltage data. These benefits along with Cumberland Valley's concerns about its current TS2 system are the reasons for seeking of a Certificate of Public Convenience and Necessity.

Q7. How will Cumberland Valley pay for the AMI system?

A. Cumberland Valley will construct the proposed AMI project from general funds until such a time as new loan funds are needed. At that time Cumberland Valley will use RUS loan funds.

Q8. Has Cumberland Valley's Board approved the AMI project?

A. Yes, at the September 14, 2017 board meeting.

Q9. Explain the reasons behind Cumberland Valley's decision to use the Aclara I-210+C meter, given that Silver Spring's Network Interface Card ("NIC") will integrate with a wide range of meters.

A. The decision to select Aclara's I-210+C meter was based largely on two factors: The Aclara meter was the lowest cost option based on the two quotes received from Silver Spring/NRTC. Another determining factor was that the Aclara I-210+C also supports the latest generation of Silver Spring's technology. Furthermore, meter reliability is a major priority for Cumberland Valley and our metering personnel have been impressed with Aclara's commercial meter the KV2c.

Q10. Does this conclude your testimony?

A. Yes.

COMMONWEALTH OF KENTUCKY
BEFORE THE
KENTUCKY PUBLIC SERVICE COMMISSION

IN THE MATTER OF:

THE APPLICATION OF CUMBERLAND VALLEY ELECTRIC, INC. FOR COMMISSION APPROVAL FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY TO INSTALL AN ADVANCED METERING INFRASTRUCTURE (AMI) SYSTEM PURSUANT TO KRS 807 KAR 5:001 AND KRS 278.020	)))))))	**CASE NO. 2018-00056**

VERIFICATION OF MARK D. ABNER

I Mark D. Abner, Manager of Engineering at Cumberland Valley Electric, Inc. ("Cumberland Valley") hereby state that I have read the foregoing Testimony and that the statements contained therein are true and correct to the best of my knowledge and belief on this 29 day of January 2018.

Mark D Abner

Mark D. Abner, Manager of Engineering
Cumberland Valley Electric, Inc.

COMMONWEALTH OF KENTUCKY
COUNTY OF KNOX

The foregoing verification statement was SUBSCRIBED AND SWORN to before me by Mark D. Abner, Manager of Engineering at Cumberland Valley Electric, Inc., on this 29 day of January 2018.

Karen Dale Miller

Notary Public
My commission expires: 4-11-2018

Cumberlar y Electric
AMI Vendor Evaluation Matrix
August 16, 2017

	Requirement	Desired Level	1-3-9 Definition	Rating (1-9)		L&G Rating	Silver Spring Rating	Tantalus Rating		L&G Weighted	Silver Spring Weighted	Tantalus Weighted
	General											
1	10 Year Cost of System	Less than 5.75 Million dollars	1 (> $6 Mil.); 3 ($5.50 - $5.99 Mil.); 9 <$5 Mil.)	7.3		1	4	3		7.33	29.33	22.00
2	Recurring Costs	Less than $100,000 annually	1 (> $150K); 3 ($150K - $75K); 9 (<$50K)	7.3		4	6	7		29.33	44.00	51.33
3	Technical Support - Contact Accessibility	24 hour response time	1 (>24); 3 (12-24); 9 (<11:59)	7.7		6	7	5		46.00	53.67	38.33
4	Business Stability	Customer Base (qty/size) - Time in AMI Business	1 (<50/<.5M); 3 (51-75/1M); 9 (>75/>1M)	6.3		8	9	5		50.67	57.00	31.67
5	Flexibility for Future Grid Applications	Investment in R&D/ Historical commitment to platform	1 (systems older than 5 years unable to be upgraded); 3 (Systems older than 5 years upgradeable); 9 (systems older than 5 years upgradeable & Exceeds Expectations)	7.7		6	9	3		46.00	69.00	23.00
6	User Training	On-Site/Compare to RFP Requirements	1 (<RFP Requirements); 3 Meets RFP Requirements); 9 (Significatly > RFP Requrements)	5.7		3	3	3		17.00	17.00	17.00
7	Intergration Compatiblity	Able to intergrate with NISC products	1 (No); 3 (Yes); 9 (Yes & Exceeds)	6.3		3	6	6		19.00	38.00	38.00
8	Additional Revenue Stream Potential	System offers support for water and gas	1 (No); 3 (Yes); 9 (Yes & Exceeds)	2.7		3	3	4		8.00	8.00	10.67
9	Software Design/Features	Software is easy to use and offers a full feature set	1 (No); 3 (Yes); 9 (Yes & Exceeds)	6.7		5	7	6		33.33	46.67	40.00
10	Flexibility for Different Meter Vendors	2 different meter vendors can be used	1 (No); 3 (Yes); 9 (Yes & Exceeds)	6.0		5	9	3		30.00	54.00	18.00
	Hardware											
11	Meter & Module Lifecycle per Manuf.	10 years	1 (< 10 years); 3 (10-12 years); 9 (>12 year)	8.3		4	3	3		33.33	25.00	25.00
12	Hardware Warranty	1 year	1 (1 year or less); 3 (13 months - 3 yrs); 9 (> 3 years)	5.3		5	5	7		26.67	26.67	37.33
13	Storage Capability at the Meter	30 days/15 min intervals	1 (< 30 day/15 min intervals); 3 (Meets 44 days/15 min intervals); 9 (> 44 days/15 min intervals)	4.3		3	3	3		13.00	13.00	13.00
14	Equipment Available and Capable of Downline Control Through DNP3	Yes	1 (No); 3 (Yes); 9 (Yes & Exceeds)	5.7		3	3	3		17.00	17.00	17.00
15	Ability for Coop to Control Demand at Member Level (Demand Response)	Yes	1 (No); 3 (Yes); 9 (Yes & Exceeds)	3.7		3	3	3		11.00	11.00	11.00
16	System Allows Intermittent Shutoffs (Current Limiting)	Yes	1 (No); 3 (Yes); 9 (Yes & Exceeds)	4.7		3	3	3		14.00	14.00	14.00
	Reliability/Accuarcy											
17	Accuracy of Meter Data (All Parameters)	+/- .5 volts	1 (>.51); 3 (.50-0.24); 9 (<.0239)	7.7		3	3	3		23.00	23.00	23.00
18	Data Storage Inverals: kW, kWh, voltage, blinks, PF, KVA	15 min interval	1 (> 15 min intervals); 3 (15 min intervals); 9 (< 15 min intervals)	7.0		3	3	3		21.00	21.00	21.00
19	Response Time for On Demand Data Retrieval (including OMS/CIS interface)	15 sec minimum	1 (> 15 sec); 3 (15 sec - 10 sec); 9 (<9.99 sec.)	6.0		3	9	1		18.00	54.00	6.00
20	Per-Hop Latency	1 sec minimum	1 (> 1 sec); 3 (1 sec - .5 sec); 9 (< .5 sec)	5.3		3	9	1		16.00	48.00	5.33
21	Bandwidth devoted to AMI operations	15%	1 (> 15%); 3 (15% - 10%); 9 (< 10%)	6.0		3	9	1		18.00	54.00	6.00
	Data/Communication											
22	Data Security/Cyber Security	Yes	1 (No); 3 (Yes); 9 (Yes & Exceeds)	7.7		9	9	9		69.00	69.00	69.00
23	Auto-Detection of 0-usage (inoperable or out of Spec Meters)	Yes	1 (No); 3 (Yes); 9 (Yes & Exceeds)	6.3		3	3	3		19.00	19.00	19.00
24	Tamper Alerts	Yes	1 (No); 3 (Yes); 9 (Yes & Exceeds)	6.7		9	3	3		60.00	20.00	20.00
25	Total System Read Process Time	2 hours	1 (> 2hrs); 3 (1.5 - 2 hrs); 9 (< 1.49 hrs)	6.3		1	4	3		6.33	25.33	19.00
26	Battery Failure Alarm	Yes	1 (No); 3 (Yes); 9 (Yes & Exceeds)	5.0		3	3	3		15.00	15.00	15.00
	Totals									25.65	33.53	23.49