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January 23, 2015

FEDERAL EXPRESS

Mr. Jeff DeRouen
Public Service Commission
211 Sower Boulevard
Frankfort, Kentucky 40601

Re: Kenergy Corp.
Case No. 2014-0376

Dear Mr. DeRouen:

Enclosed you will find Kenergy's Responses to Second Data Requests of Commission Staff (original plus 10 copies) in the above referenced matter.

Your assistance in this matter is appreciated.

Very truly yours,

DORSEY, GRAY, NORMENT & HOPGOOD

By

J. Christopher Hopgood
Counsel for Kenergy Corp.

JCH/cds
Encls.

COMMONWEALTH OFKENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

IN THE MATTER OF:

THE APPLICATION OF KENERGY CORP.	)	**CASE NO. 2014-00376**
FOR AN ORDER ISSUING A CERTIFICATE	)	
OF PUBLIC CONVENIENCE AND	)	
NECESSITY	)	

KENERGY CORP.'S RESPONSES TO COMMISSION STAFF'S SECOND REQUEST FOR INFORMATION

KENERGY CORP. ("Kenergy") submits the attached Responses to Commission Staff's Second Request for Information.

DORSEY, GRAY, NORMENT & HOPGOOD
318 Second Street
Henderson, KY 42420
Telephone (270) 826-3965
Telefax (270) 826-6672
Attorneys for Kenergy Corp.

By _____
J. Christopher Hopgood
chopgood@dkgnlaw.com

CERTIFICATE OF SERVICE

I hereby certify that the foregoing original plus ten copies was served by mailing the original to the Kentucky Public Service Commission, 211 Sower Blvd., Frankfort, KY 40602 by Federal Express on this 23rd day of January, 2015.

_____
Counsel for Kenergy Corp.

KENERGY CORP.
RESPONSE TO COMMISSION STAFF'S
SECOND REQUEST FOR INFORMATION

CASE NO. 2014-00376

Item 2) a. Provide the estimated undepreciated balance of the metering equipment to be retired.

RESPONSE:

The estimated undepreciated balance of the metering equipment to be retired is $3,304,363 as of December 31, 2014.

b. Explain how those remaining balances are to be handled.

RESPONSE:

If the Commission approves Kenergy's AMI project in this case and issues a certificate of convenience and necessity, then Kenergy will request approval from RUS and the Commission to establish a regulatory asset for the undepreciated balance of metering equipment plus removal cost. Kenergy will request that this regulatory asset be amortized over a 10-year period.

WITNESS: Steve Thompson

KENERGY CORP.
RESPONSE TO COMMISSION STAFF'S
SECOND REQUEST FOR INFORMATION

CASE NO. 2014-00376

Item 3) Refer to Kenergy's response to Item 4.f. of Commission Staff's Initial Request for Information. Response 4.f. states that "[m]anufacturer literature states that the meter and module selected have a 20 year life design."

a. Justify Kenergy's proposal to depreciate the equipment over a 15-year period.

RESPONSE:

The 15-year depreciation period proposed by Kenergy is a useful life estimate based on industry standards and has been confirmed in previous distribution co-op cases before the Commission. The 15-year depreciation period also takes into account obsolescence and removal cost, and properly matches the write-off of AMI assets over their expected life in the field rather than their theoretical life design. Based on Kenergy's experience, removal costs have been higher than salvage value, resulting in negative net salvage at the end of assets' lives.

b. Provide the anticipated depreciation rate.

RESPONSE:

The anticipated depreciation rate is 6.67% per year or 0.56% per month.

WITNESS: Steve Thompson

CASE NO. 2014-00376
VERIFICATION

I hereby verify that the response to Commission Staff's Second Request for Information Item 1 in the above case is true and correct to the best of my knowledge and belief.

John Newland

STATE OF KENTUCKY

COUNTY OF Henderson

The foregoing was signed, acknowledged and sworn to before me by JOHN NEWLAND, this 22nd day of January, 2015

My commission expires November 7, 2017

"OFFICIAL SEAL"
ANGELA J. KURTZ
Notary Public, State of Kentucky
My Commission Expires 11/07/2017
Notary ID 500474

Notary Public, State of Kentucky at Large

(seal)

CASE NO. 2014-00376
VERIFICATION

I hereby verify that the response to Commission Staff's Second Request for Information Items 2 and 3in the above case is true and correct to the best of my knowledge and belief.

Steve Thompson

Steve Thompson

STATE OF KENTUCKY

COUNTY OF Daviess

The foregoing was signed, acknowledged and sworn to before me by STEVE THOMPSON, this 20th day of January, 2015

My commission expires 5-24-2015

Debra J. Hayden

Notary Public, State of Kentucky at Large

(seal)

New Product Introduction : E650 S4x

E650 S4x

CORE Product Features beyond S4e

- OTA Firmware Upgrades
- More than **4X** the RAM, ROM and NVM of S4e
- Ease of AMI Integration – similar to Focus AX
- High Speed Optical Communications – 38.4K Baud vs 9.6K for S4e
- Reactive, TOU and Load Profile is STANDARD on EVERY S4x Meter
- ANSI C12.19 Rev 2008 (Pending Tables and other advantages)

E650 S4x

Landis+Gyr

SIGNIFICANTLY Expanded Energy Measurement

- Full 4-Quadrant Energy Meter – Wh, VAh, VARh
- EACH energy metric has Total, Delivered, Received, Quadrant 1, Quadrant 2, Quadrant 3 and Quadrant 4 summation registers
- Support for TWO alternate VARh calculation methods (Integral and Phasor-RMS)
- **Thirty-Five** different energy summations simultaneously calculated

E650 S4x

Landis+Gyr

SIGNIFICANTLY Expanded Demand Measurements

- Total, Delivered & Received kW, kVA, kVAR maximum demands
- Support for TWO alternate VAR calculation methods (Integral and Phasor-RMS)
- **Fifteen** different Demand metrics simultaneously calculated
- **Twenty** different Coincident Demand and Power Factor metrics simultaneously calculated
- **Twelve** Self-Reads – allows year record of monthly Summations, Max Demands, Coincident Demands and Power Factors

E650 S4x

Landis+Gyr

Superior Tamper Detection and Security

- Cover removal switch – to detect physical tamper
- Tilt/vibration sensor to detect meter insertion & removal
- Magnetic Tamper Detection via Hall Effect Sensor
- Optical Port Lockout Feature – with Gridstream communications

E650 S4x

Landis+Gyr

Other KEY Features beyond S4e

- True Three-Phase Power Supply (Hardware Option - Time of Purchase)
- Last LCD readings displayed with power removed - requires battery
- Temperature Sensing – Same as Focus AX/SD
- Dedicated Voltage Logging – Same as on Focus AX

E650 S4x

Landis+Gyr

Load profile Comparison with S4e

S4e Load Profile Capacity

- 128K memory
- 15 Channels
- Single Structure

E650 S4x Load Profile

Landis+Gyr

S4x Load Profile Capacity

- 256K Standard, can be expanded to 1 Meg at time of purchase OR later with a Softkey upgrade
- Two Separate Load Profile structures available with 16 channels each. Each Load Profile has an independent selectable interval.
- Dual LP structure is an option on 256K *or* 1 Meg memory configuration; choose at time of purchase OR can be added with Softkey upgrade
- 32 bit load profile data – No need to worry about interval overflow so no scale factor required

E650 S4x

Landis+Gyr

Register and Load Profile Data Stored in Engineering Units

- ALL Energy data stored in "milli" units such as mWh, mVAh, etc.
- ALL Demand data stored in "milli" units such as mW, mVA, etc.
- Diagnostic values like voltages, currents, frequency and temperature stored in "micro" units.
- This results in better resolution of data.
- Traditional Pulse Constants are still used for external output and testing purposes

E650 S4x

Landis+Gyr

Extensive Events Flagging…

Here are the familiar events that are offered in the S4e:

Primary Power Down
Primary Power Up
Time Changed (old time)
Time Changed (new time)
Reset List Pointers
Update List Pointers
History Log Cleared
Daily Savings Time On
Daylight Savings Time Off
Test Mode Stopped
Test Mode Started

E650 S4x

Landis+Gyr

Here are the Events offered in the E650 S4x:

- Authentication Enabled
- Log On Failure
- **Voltage Sag or Swell**
- **Temperature Threshold Exceeded**
- Excessive Leading Current
- Enter/Exit Real Time Rate
- Cold Start
- Unauthorized Request
- Meter Flash
- Meter Rom Verification
- Enter Factory Mode
- Expected Sequence Number
- Actual Sequence Number
- Alert Occurred
- **Cover Was Installed**
- **Cover Was Removed**

E650 S4x

Landis+Gyr

Here are the Events offered in the E650 S4x continued:

- Line Frequency Range Adjust Error
- New Firmware Received
- Standby Exit
- Meter FW Image Verification
- Meter Upgrade
- **Tilt Detection**
- VHoldUP Low
- Flash Pointer Corruption
- L5AMR Security is Disabled
- L5AMR Security is Enabled
- Disable OPT L5AMR Security port LOCKOUT via MFG Procedure 19
- Disable OPT demotion via MFG Procedure 22
- Power Down Cover
- Power Down Magnet
- Power Down Unknown

E650 S4x

Landis+Gyr

Here are the Events offered in the E650 S4x even more:

- **Pending Table Activated**
- Pending Table Activation Cleared
- Test Mode Started
- Test Mode Stopped
- Meter is reprogrammed
- Meter Configuration Error
- Nonvolatile Memory failure detected
- Clock error detected
- Meter Programmed
- Communication Terminated Normally
- Communication Terminated Abnormally
- Reset List Pointers
- Update List Pointers
- History Log Cleared
- History Log Updated
- Event Log Cleared
- Event Log Updated

E650 S4x

Landis+Gyr

Here are the Events offered in the E650 S4x (still more):

- Low battery detected
- Demand overload detected
- **Tamper attempt detected**
- Power Down
- Power Up
- Time Changed – old time
- Time Changed – new time
- Meter Accessed for Read
- Demand Reset Occurred
- Self Read Occurred
- DST On
- DST Off
- Season Change
- Rate Change
- Holiday Change
- Tier Switch Change

E650 S4x Development Timeline

Landis+Gyr

- S-Base Forms – Available Now
- A-base Forms – Available Now
- K-base Forms – Available March 2015
- RS-232, RS-485, Ethernet – Projected 2015

E650 S4x COM Solutions Timeline

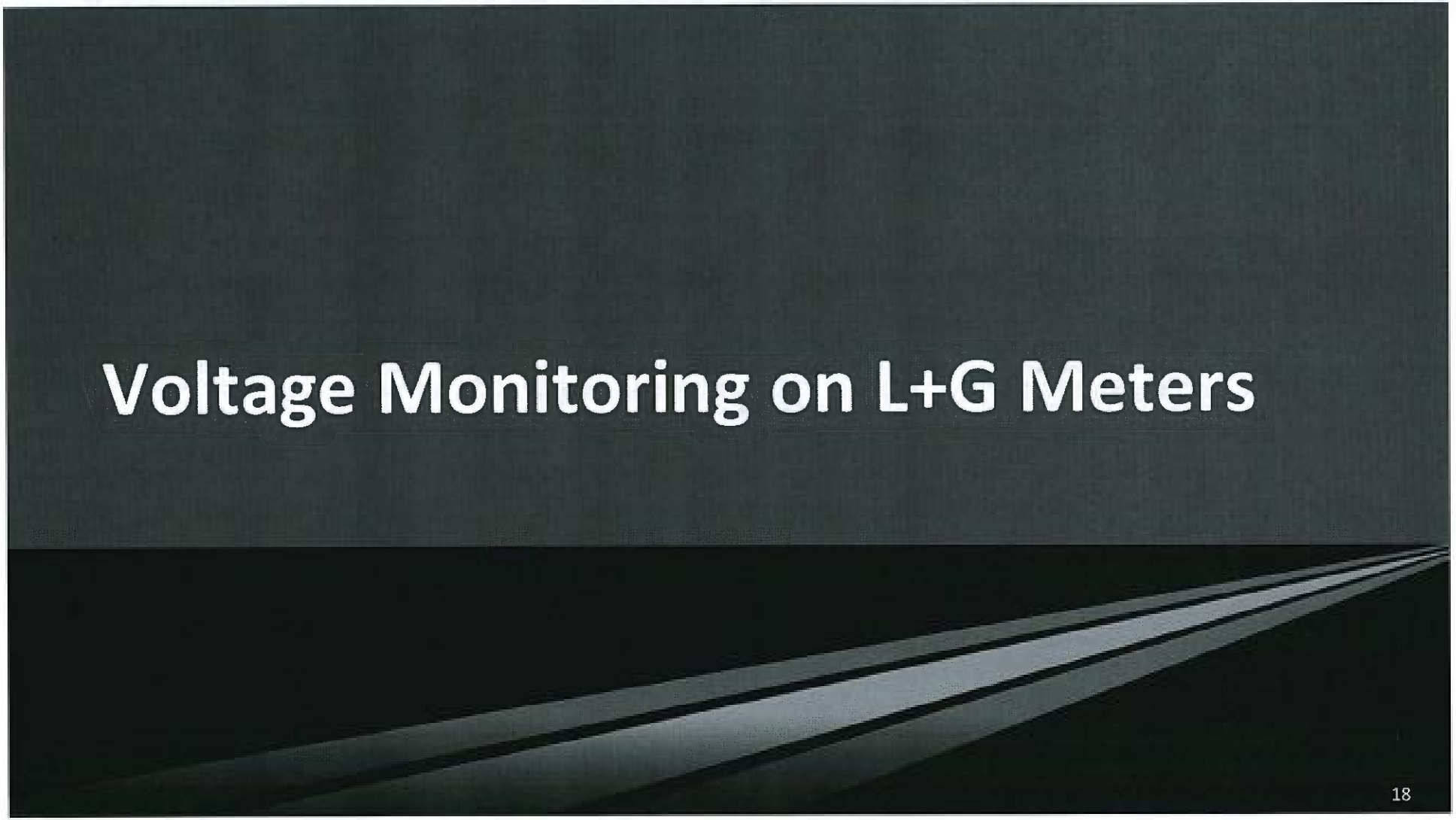
Landis+Gyr

- Gridstream RF Series 4 – July 2014
- Gridstream RF Series 5 – Dec 2014
- Gridstream Cellular – Dec 2014
- Gridstream PLX PLC – By end of 2015
- SSN NIC 410 – March 2015
- Aclara PLC – 2015?
- Aclara Metrum Cellular - 2015

E650 S4x Sales Resources

Landis+Gyr

- Sales Powerpoint – On e-Portal
- V+ Pricing is Available
- C+I Overview Sheet – Available (Maggie)
- Product Sheet – August w/ Gridstream RF
- Samples – Can be purchased now


Voltage Monitoring on L+G Meters
18

Instantaneous Voltage Readings

Landis+Gyr

Focus AXe and S4x

- Instantaneous per phase voltage readings
- Updated 4 to 5 times per second (4 Axe; 5 S4x)
- Can be read as often as desired by an communications option supported by that meter type

Voltage in Load Profile

Landis+Gyr

Focus AXe and S4x

- Can record the per phase voltage in an interval channel
- On a three phase meter up to three channels can be used to record voltage
- Value is not a snapshot but an average value over the length of the interval

Voltage Sag and Swell

Landis+Gyr

Focus AXe and S4x

- Independent sag and swell thresholds in percentage can be set to trigger these two alarms
- Sag and swell are monitored from the Instantaneous voltage readings so are updated 4 to 5 times per second.
- Up to six load profile channels can be allocated for voltage sag and swell for a three phase meter
- Intervals will contain the number of times a sag or swell occurred during that interval

Voltage Sag and Swell

Landis+Gyr

Focus AXe and S4x

- There is an optional Event that can be triggered by a voltage sag or swell
- Time stamped and stored in Event Log.

Voltage Log

Landis+Gyr

Focus AXe and S4x

- This is a continuous running log, separate from load profile and dedicated to voltage recording
- Records daily min, max and average voltage per phase
- Can be configured for an averaging interval period of 5 to 60 minutes
- Log records the time stamp for the min and max voltages during the day
- Stores a minimum of 60 days of min, max and average voltage per phase

2nd Load Profile – Instrument Recorder

Landis+Gyr

S4x Only

- Second Load Profile recorder is ideal for recording voltage
- Allows voltage, which is non-billing, to be recorded at a different interval length for voltage monitoring purposes.
- Can choose shorter intervals like one minute of five minute for better granularity of interval average voltage readings
- This feature combines with the storage in engineering units to make the S4x ideally suited for precise voltage monitoring.

Voltage Related Diagnostics

Landis+Gyr

Focus AXe and S4x

- **Voltage Polarity and Cross-phase** diagnostic check for proper phase relationships and incorrect polarity of voltages
- **Phase Voltage Deviation** check verifies loss of phase voltage, incorrect phase voltage or incorrect VT ratio by detecting differences between phase voltage magnitudes.
- **Voltage Imbalance Detect** compares the voltage of each phase with the other phases. If the ratio of any voltage phase to the average of all voltages exceeds a user defined threshold, this flag is tripped. **(S4x ONLY)**

Thank you

Landis+Gyr

manage energy better

Product Specification and Schedule Sheet

FOCUS AX

E330 FOCUS AX • E350 FOCUS AX-SD Single Phase • E330 FOCUS AX Polyphase

The FOCUS family of meters featuring advanced residential metering and light commercial applications.

The FOCUS® AX platform features a single circuit board design, mounted at the front of the meter, allows room for modular advanced metering communications or a KYZ option output board. Fewer parts and connectors throughout the board design increase reliability and contribute to better overall end point performance. Highly accurate load performance and the use of a field-proven Digital Multiplication Measurement Technique ensure reliability and dependability during the entire life of the FOCUS AX meter.

The Next Generation of Advanced Residential Metering

The FOCUS AX-SD is an advanced meter platform with features that rival any meter in its class. With available service disconnect integrated into the meter base, utilities can take advantage of the 200 Amp relay to disconnect power or limit service remotely using an advanced metering technology or manually at the meter. The combinations of FOCUS Service Disconnect base module and powerful AX register provides a flexible system that supports a variety of connect/disconnect and service-limiting applications.

Economical and Reliable Option for Light Commercial Applications

The FOCUS AX Polyphase meter provides a cost-efficient alternative for light commercial metering applications that do not require all of the functionally of the S4e meter. The FOCUS AX Polyphase meter contains a 120V to 277V auto-ranging power supply suitable for both 277/480V, 4W, WYE and 240/480V 4-wire Delta Services. As an addition to the FOCUS family of meters, the AX Polyphase brings the same proven solid-state performance utilities have come to expect from FOCUS meters, in an economical and AMI-ready platform for commercial and industrial applications.

Key Benefits

- Digital Multiplication Measurement Technique
- Non-volatile memory
- Designed for a 20+ year life
- Meets or exceeds industry and ANSI standards
- Uses ANSI protocol (between meter and communication device)
- 6 digit LCD and 3 Alpha ID
- Selectable meter multiplier up to 240 (1200:5 CT)

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www.landisgyr.com 765.742.1001

Specifications

General Specifications	Active Energy "kWh-kW" meter	
	Digital Multiplication Measurement Technique	
	Non-Volatile Memory	
	Designed for 20+ years life	
	Meets ANSI standards for performance	
	Utilizes ANSI protocol (between meter and AMI device)	
	9 digit LCD	
	Display scroll sequence programmable (factory or end user)	
	Configuration port – cover does not have to be removed or optional ANSI C12.18 optical port available	
Operating Temperature	-40C to +85C under cover	
Operating Voltage	80% to 115% of Vn	
Frequency	60Hz +/- 5%	
Humidity	5% to 95% relative humidity, non condensing	
Voltage Burden	≤ 1.9W Max	
Load Performance Accuracy	Accuracy Class 0.5% – typical accuracy 0.2%	
	Exception: Form 36S 0.5%	
Display Options	Energy Metrics: +kWh, -kWh, Net kWh, and added kWh (Security)	
	Metric Energy Display Format – 4x1, 4x10, 5x1, 5x10, 6x1 or 6x10	
	Time of Use and Demand Billing	
AMI Platform	Modular or Integrated	
Selectable Meter Multiplier	Up to 4096 as result of PT ratio • CT ratio	
Applicable Standards	ANSI C12.1 for electric meters	
	ANSI C12.10 for physical aspects of watt hour meters	
	ANSI C12.18 Protocol specifications for ANSI Type 2 Optical Port	
	ANSI C12.19 Utility Industry End Device Data Tables	
	ANSI C12.20 for electricity meters, 0.2 and 0.5 accuracy classes	
	CAN3-C17-M84 Canadian specifications for approval of type of electricity meters	
Service Disconnect	10,000 operations at full rated current (disconnect/connect)	
Landis+Gyr Communication	FOCUS AX Single Phase	2 Way Gridstream RF
		2 Way Gridstream PLC
	FOCUS AX-SD	2 Way Gridstream RF
		2 Way Gridstream PLC
	FOCUS AX Polyphase	2 Way Gridstream RF
Third Party Communication	FOCUS AX Single Phase	Aclara STAR Network - RF
		Aclara TWACS Technology - PLC
		Sensus 2 Way RF Flex Net
		Silver Spring 2 Way RF Mesh
		Trilliant 2 Way SecureMesh
	FOCUS AX-SD	Aclara STAR Network – RF
		Aclara TWACS Technology – PLC
		Sensus Flex Net
		Silver Spring Network 2 Way RF Mesh
		Trilliant 2 Way SecureMesh
	FOCUS AX Polyphase	Aclara STAR Network – RF
		Aclara TWACS Technology – PLC
		Metrum CDMA/1xRTT and GSM/GPRS under glass
		Sensus Flex Net
		Silver Spring 2 Way RF Mesh
		Trilliant 2 Way SecureMesh

The FOCUS AX Single-phase meter is available in the following forms:

Form	Nominal Voltage	Current Class	Test Amps	Starting Load	Kh
1S	120V	CL 100	15.0	0.030 Amp (3.6W)	1.8
1S	240V	CL 200	30.0	0.050 Amp (12W)	7.2
2S	240V	CL 200	30.0 / 50.0	0.050 Amp (12W)	7.2
2SE	240V	CL 320	30.0 / 50.0	0.080 Amp (19.2W)	12.0
2K	240V	CL 480	30.0 / 50.0	0.120 Amp (28.8W)	14.4
3S	120V	CL 10 or 20	2.5	0.005 Amp (0.6W)	0.3
3S	240V	CL 10 or 20	2.5	0.005 Amp (0.6W)	0.6
4S	240V	CL 10 or 20	2.5	0.005 Amp (0.6W)	0.6

The FOCUS AX Service Disconnect meter is available in the following forms:

Form	Nominal Voltage	Current Class	Test Amps	Starting Load	Kh
1S	120V	CL 100	15.0	0.030 Amp (3.6W)	1.8
2S	240V	CL 200	30.0/50.0	0.050 Amp (12W)	7.2
12S	120V	CL 200	30.0/50.0	0.050 Amp (12W)	14.4
25S	120V	CL 200	30.0 / 50.0	0.050 Amp (12W)	14.4

The FOCUS AX Polyphase meter is available in the following forms:

Form	Nominal Voltage	Current Class	Test Amps	Starting Load	Kh
9S/8S	120V – 277V	CL 20	2.5	0.005 Amp (0.6W)	1.8
12S	120V – 277V	CL 200	30.0/50.0	0.050 Amp (12W)	14.4
12SE	120V – 277V	CL 320	50.0	0.080 Amp (19.2W)	14.4
16S	120V – 277V	CL 200	30.0/50.0	0.050 Amp (12W)	21.6
16SE	120V – 277V	CL 320	50.0	0.080 Amp (19.2W)	21.6
25S	120V – 277V	CL 200	30.0/50.0	0.050 Amp (12W)	14.4
25SE	120V – 277V	CL 320	50.0	0.080 Amp (19.2W)	14.4
36S (6S)	120V – 277V	CL 20	2.5	0.005 Amp (0.6W)	1.8
45S (5S)	120V – 277V	CL 20	2.5	0.005 Amp (0.6W)	1.2

FOCUS Single Phase/Polyphase:

Form	Net Lbs.	Single Pack Weight	Single Pack Dimensions	Four Pack Weight	Four Pack Dimensions	Pallet Weight	Pallet Dimensions
1S	1.8	2.7 lbs.	8 3/4" x 8 3/4" x 9"	9.5 lbs.	15 1/2" x 7" x 15 1/2"	350 lbs.	31" x 46" x 37"
2S(E)	1.9	2.8 lbs.	8 3/4" x 8 3/4" x 9"	9.6 lbs.	15 1/2" x 7" x 15 1/2"	350 lbs.	31" x 46" x 37"
2K	3.35	5.5 lbs.	12 9/16" x 12 9/16" x 9"	N/A	15 1/2" x 7" x 15 1/2"	195 lbs.*	31" x 46" x 37"
3S	1.8	2.7 lbs.	8 3/4" x 8 3/4" x 9"	9.5 lbs.	15 1/2" x 7" x 15 1/2"	350 lbs.	31" x 46" x 37"
4S	1.9	2.8 lbs.	8 3/4" x 8 3/4" x 9"	9.6 lbs.	15 1/2" x 7" x 15 1/2"	350 lbs.	31" x 46" x 37"
5S/45S	1.8	2.7 lbs.	8 3/4" x 8 3/4" x 9"	9.5 lbs.	15 1/2" x 7" x 15 1/2"	350 lbs.	31" x 46" x 37"
6S/36S	1.8	2.7 lbs.	8 3/4" x 8 3/4" x 9"	9.5 lbs.	15 1/2" x 7" x 15 1/2"	350 lbs.	31" x 46" x 37"
8S/9S	1.8	2.7 lbs.	8 3/4" x 8 3/4" x 9"	9.5 lbs.	15 1/2" x 7" x 15 1/2"	350 lbs.	31" x 46" x 37"
12S(E)	2.0	2.9 lbs.	8 3/4" x 8 3/4" x 9"	10.3 lbs.	15 1/2" x 7" x 15 1/2"	350 lbs.	31" x 46" x 37"
16S(E)	1.9	2.8 lbs.	8 3/4" x 8 3/4" x 9"	9.6 lbs.	15 1/2" x 7" x 15 1/2"	350 lbs.	31" x 46" x 37"
25S(E)	2.0	2.9 lbs.	8 3/4" x 8 3/4" x 9"	10.3 lbs.	15 1/2" x 7" x 15 1/2"	350 lbs.*	31" x 46" x 37"

Standard pallet size of 96 meters

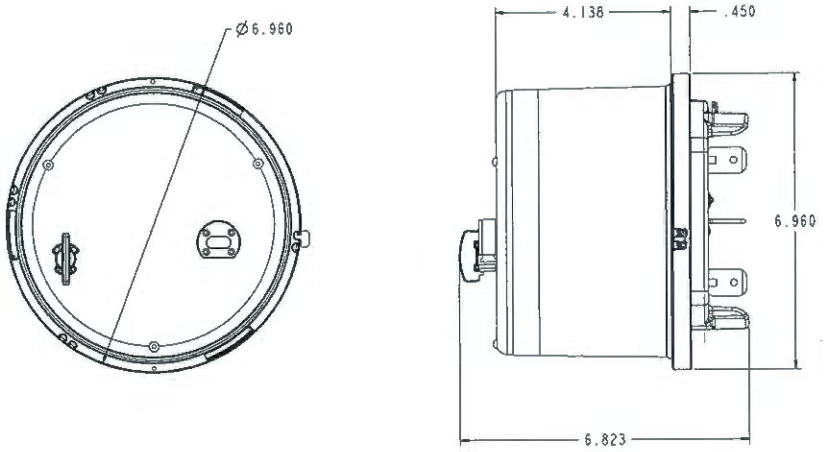
* Denotes alternate pallet size of 30 meters

FOCUS AX-SD:

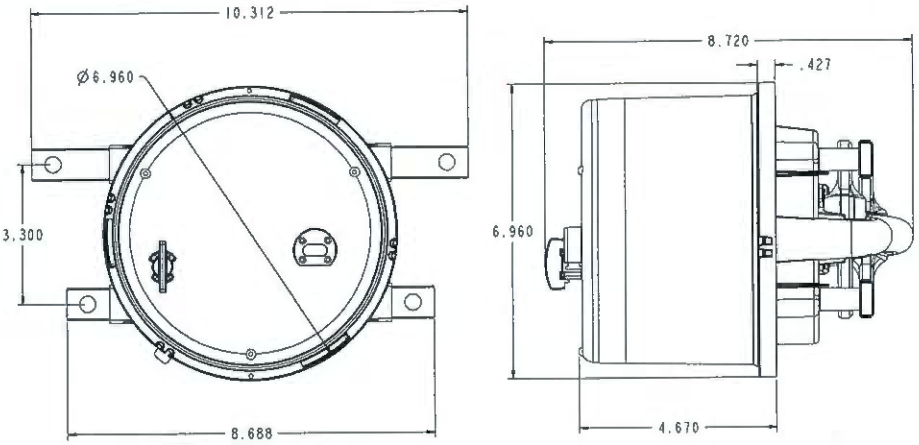
Form	Net Lbs.	Single Pack Weight	Single Pack Dimensions	Four Pack Weight	Four Pack Dimensions	Pallet Weight	Pallet Dimensions
1S	2.04	2.94 lbs.	8 3/4" x 8 3/4" x 9"	10.31 lbs.	15 1/2" x 7" x 15 1/2"	370 lbs.	31" x 46" x 37"
2S	2.04	2.94 lbs.	8 3/4" x 8 3/4" x 9"	10.31 lbs.	15 1/2" x 7" x 15 1/2"	370 lbs.	31" x 46" x 37"
12S	2.04	2.94 lbs.	8 3/4" x 8 3/4" x 9"	10.31 lbs.	15 1/2" x 7" x 15 1/2"	370 lbs.	31" x 46" x 37"
25S	2.04	2.94 lbs.	8 3/4" x 8 3/4" x 9"	10.31 lbs.	15 1/2" x 7" x 15 1/2"	370 lbs.	31" x 46" x 37"

Landis+Gyr
manage energy better

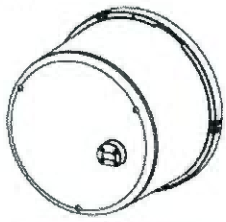
FOCUS AX S-Base



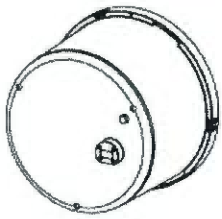
FOCUS AX K-Base



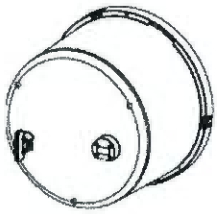
Cover Options



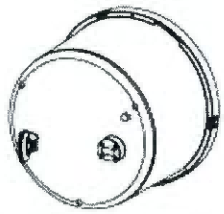
Optical Port Only



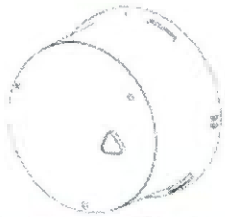
Optical Port/Reconnect Only



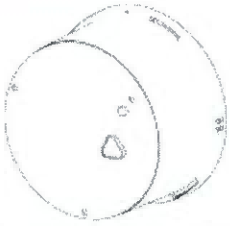
Optical Port/Reset (No Options)



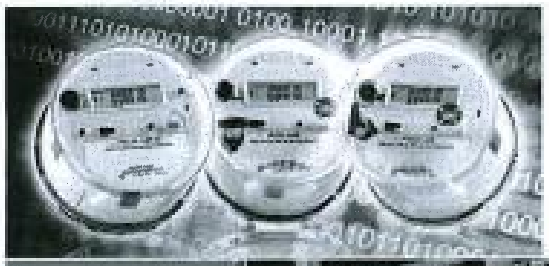
Optical Port/Reset/Reconnect Switch



Configuration Port Only



Configuration Port/Reconnect Only



Product Specification and Schedule Sheet FOCUS AX

With focus on customer satisfaction, we are committed to providing the best metering solution in terms of capability, technology and affordability. By utilizing our experience and technology with that of our strategic allies and development partners, we provide metering solutions that cover the range of utilities' residential and light commercial metering needs.

Landis+Gyr
manage energy better

2800 Duncan Road
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E330 FOCUS AX+E350 AX-SD Single Phase

The Next Generation of Advanced Residential Metering

The FOCUS® AX-SD is an advanced meter platform with features that rival any meter in its class. With available service disconnect integrated into the meter base, utilities can take advantage of the 200 Amp relay to disconnect power or limit service remotely using an advance metering technology or manually at the meter. The combination of the FOCUS Service Disconnect base module and powerful AX register provides a flexible system that supports a variety of connect/disconnect and service-limiting applications.

A single circuit board design, mounted at the front of the meter, allows room for modular advanced metering communications or a KYZ option output board. Fewer parts and connectors throughout the board design increase reliability and contribute to better overall endpoint performance. Highly accurate load performance and the use of a field-proven Digital Multiplication Measurement Technique ensure reliability and dependability during the entire life of the FOCUS meter.

Meter reconfiguration can be accomplished optically through the configuration port located on the front cover.

- Select from displayable positive, negative, net and added (security) metrics
- Change the displayed information, order or digits
- Configure a CT/PT meter multiplier to obtain a direct reading
- Preset or reset kWh

With a focus on customer satisfaction, we are committed to providing the best metering solution in terms of capability, technology and affordability. By utilizing our experience and technology with that of our strategic allies and development partners, we provide metering solutions that cover the range of utilities' residential metering needs.

Key Benefits

- Digital Multiplication Measurement technique
- Non-volatile memory
- Designed for a 20+ year life
- Meets or exceeds industry and ANSI standards
- Uses ANSI protocol (between meter and advanced metering device)
- 6 digit LCD and 3 Alpha ID
- Selectable meter multiplier
- Service limiter function
- Event log of 500+ entries
- 77 kb of load profile memory, 1–8 channels
- Advanced second generation over-the-air-flashable firmware

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Specifications

General Specifications	Active Energy "kWh-kW" meter	
	Digital Multiplication Measurement Technique	
	Non-Volatile Memory	
	Designed for 20+ years life	
	Meets ANSI standards for performance	
	Utilizes ANSI protocol (between meter and AMI device)	
	9-Digit LCD	
	Display scroll sequence programmable (factory or end user)	
	Configuration Port – cover does not have to be removed or optional ANSI C12.18 optical port available	
Operating Temperature	-40C to +85C under cover	
Nominal Voltage	120V or 240V	
Operating Voltage	80% to 115% of Vn	
Frequency	60Hz +/- 5%	
Humidity	5% to 95% relative humidity, non condensing	
Starting Load (Watts)	Class 20	0.005 Amp (0.6W)
	Class 100	0.030 Amp (3.6W)
	Class 200	0.050 Amp (12W)
	Class 320	0.080 Amp (19.2W)
	Class 480	0.120 Amp (28.8W)
Voltage Burden	≤ 1.9W Max	
Load Performance Accuracy	Accuracy Class 0.5% – typical accuracy 0.2%	
	Exception: Form 36S 0.5%	
Available Forms	Self-Contained	1S, 2S, 2SE, 12S, 25S
	Transformer Rated	3S, 4S
	K-Base	2K
Display Options	Energy Metrics: +kWh, -kWh, Net kWh, and added kWh (Security)	
	Metric Energy Display Format – 4x1, 4x10, 5x1, 5x10, 6x1 or 6x10	
	Time of Use and Demand Billing	
AMI Platform	Modular or Integrated	
Selectable Meter Multiplier	Up to 4096 as result of PT ratio • CT ratio	
Applicable Standards	ANSI C12.1 for electric meters	
	ANSI C12.10 for physical aspects of watt hour meters	
	ANSI C12.18 Protocol specifications for ANSI Type 2 Optical Port	
	ANSI C12.19 Utility Industry End Device Data Tables	
	ANSI C12.20 for electricity meters, 0.2 and 0.5 accuracy classes	
	CAN3-C17-M84 Canadian specifications for approval of type of electricity meters	
Service Disconnect	10,000 operations at full rated current (disconnect/connect) Available forms: 1S, 2S, 12S, 25S	

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Limited Warranties

Equipment Limited Warranty. Landis+Gyr will repair or replace (at Landis+Gyr's option) any Defective Equipment at no charge to Customer if such units materially fail to perform according to Landis+Gyr's specifications due to a Defect within thirty six (36) months of the shipment date (the "**Warranty Period**"), provided that such units are returned based on the following conditions: (i) Customer requests a return materials authorization form ("**RMA**") within sixty (60) days of identification of an issue and ships the Equipment within seven (7) days of an RMA from Landis+Gyr, (ii) returned freight prepaid to Landis+Gyr, (iii) only after a written RMA is provided by Landis+Gyr. Customer will remove and ship to Landis+Gyr at Customer's expense any such nonconforming Equipment and will reinstall the repaired or replaced Equipment at Customer's expense. Landis+Gyr will ship Equipment repaired or replaced under this warranty back to Customer at Landis+Gyr's expense. For Equipment returns where Landis+Gyr determines that there is no Defect found, the Customer may be charged a fee to fully cover reasonable Landis+Gyr expenses for the handling, processing and testing of such devices. "**Defect**" and "**Defective**" means a material failure of the Equipment to comply with the Equipment specifications during the Warranty Period. For Equipment that is found to be not under warranty, Landis+Gyr can attempt repairs based on current prevailing rates or ship the equipment back to the Customer. In the event units are repaired or replaced being determined under warranty, the repaired or replaced units shall be warranted for the longer of the remainder of the warranty period for the original equipment or six (6) months from shipment of the repaired or replacement equipment. Equipment maintenance fees shall not commence until after the applicable warranty period for each item of Equipment expires.

Basis for Landis+Gyr Life testing Acceleration factor

By Richard Timko
Hardware Quality Assurance Manager
Jan 13, 2015

Overview

Landis+Gyr conducts tests as part of our normal product qualification test plan to ensure that each product meets the industry expectations of life expectancy. These tests are intended to validate reliability calculations that are performed early in the development process. This report will explain the Reliability Models that we use to calculate Acceleration factors for our tests, the conditions for our tests, the duration of our tests, and the required results.

Reliability models

The Arrhenius Model is the basic model that predicts for failure modes that have a dependency on temperature. Most electronic component failure modes fall into this category. Metal corrosion, metal migration, material decomposition through chemical reaction are all accelerated at higher temperatures and reduced at lower temperatures. An extension of the Arrhenius model, the Eyring Model, includes terms for multiple stress mechanisms. A simplified version of the Eyring model, the Peck's model includes a term for humidity affect in addition to temperature. These are the stress factors that most likely result in failures of electronic components in the environment seen by meters and AMI network equipment.

The equation that Landis+Gyr uses in calculating reliability test Acceleration factors is $A = A_T \times A_H$ where A_T is the acceleration factor for Temperature and A_H is the acceleration factor for Humidity.

$$A_T = e^{\left(-\frac{Q}{K}\right)\left[\frac{1}{T_A}-\frac{1}{T_U}\right]} \qquad A_H = \left[\frac{RH_A}{RH_U}\right]^n$$

K- the Boltzman's constant (8.61×10^{-5})

T_A, T_U- Test Temperature and Use Temperature (in degrees Kelvin)

RH_A, RH_U- Test Relative Humidity and Use Relative Humidity (in percent)

Values to be Selected

There are 2 values in the equations that must be selected for evaluation of specific types of equipment and the expected failures. We consider the most likely parts to fail to be the complex electronics or Integrated Circuits. These include parts that have to deal with high voltages and surges such as power supply components and diodes to the very complex microprocessors and Digital to Analog circuits used to measure the Electricity usage, calculate the register values and manage the Radio communications. The predominant failure mechanism from aging is corrosion of metal layers on or in the parts.

Q- the activation energy for electronic component can vary from 0.6 to 0.9 electron volts in laboratory tests. Most component manufacturers use an activation energy between 0.7 and 0.9 in their analysis. Landis+Gyr uses 0.6 to be conservative. (0.6 electron volts)

n– the exponent on the humidity ratio can vary from 1 to 3 with 3 being the most commonly used value in the electronics industry.

Test Conditions

The components that we use in our meters and network equipment are built to temperature limits that are commonly referred to as industrial limits. This range for Integrated Circuits is 85C to -40C. Since we need to be able to operate the products at the test temperatures our ability to accelerate life is limited to 85C. We also want to incorporate an elevated humidity in the tests but we want to avoid condensing on or dripping on the circuits. Our Environmental Chambers can easily maintain 85%RH and not ever get into a condensing condition so that is the normal level that we utilize. So for reliability testing of electronic equipment our standard test conditions are 85C and 85%RH.

Operating Conditions

Electric meters, gas meters, control devices and Network equipment are all exposed to the outdoor environment in North America. The ambient conditions will range from about 50C to temperatures below the -40C where our electronics will stop functioning. We also have to take into account temperature rise from exposure to the sun, and internal temperature rise. The solar rise may be as much as 25C in climates near the tropics but even in these locations the maximum effect only lasts for a few hours per day, and only on the days that are not cloudy. The internal rise of our electric meters ranges from 10 to 15C at the top of the internal cover to about half that in the middle and very little rise at the bottom. The internal rise from the Current elements reaches 10C at about 150 amps in each leg of a 2S meter but it only about 1C up to 50 amps. When the internal temperature in the meter rises, the Relative Humidity in the meter decreases substantially.

The average ambient condition in Henderson, KY is about 12C (53F) and the average Relative Humidity is 70%.

The average internal temperature results in an increase of about 14C or a use temperature of 26C. With the 14C internal rise the internal humidity will drop substantially, to approximately 30%. In order to be conservative we will use 50% in our calculation.

Acceleration Factor

So going back to the Peck Model formulae we have defined the following values for determining the acceleration factors:

Activation energy: 0.6 electron volts
Humidity Ratio exponent: 3
Average use temperature (at the circuit board): 26C
Average use humidity (under the cover): 50%

Test Temperature: 85C
Test Humidty: 85%

This results in a test at 1000 hours equivalent to 26 years.