

1 **COMMONWEALTH OF KENTUCKY**

2 BEFORE THE PUBLIC SERVICE COMMISSION

3
4 In the Matter of:

5 **APPLICATION OF SHELBY ENERGY)**
6 **COOPERATIVE, INC. FOR A CERTIFICATE OF) CASE NO.**
7 **PUBLIC CONVENIENCE AND NECESSITY FOR) 2010-00244**
8 **ITS 2010 ~ 2014 CONSTRUCTION WORK PLAN)**

9 RESPONSE OF

10 SHELBY ENERGY COOPERATIVE CORPORATION ("SEC") TO THE

11 "FIRST INFORMATION REQUEST OF COMMISSION STAFF TO SHELBY ENERGY COOP INC."

12 FOR COMMISSION'S ORDER 2010-00244

13 DATED OCTOBER 19, 2010

14
15
16 FILED: OCTOBER 29, 2010

17
18
19 Witnesses for All Response Contained Hereinafter:

20 Gary Grubbs, SEC/P&D Engineers, Inc.

21 David Graham, SEC

22 Keith Miller, SEC

23 Jason Ginn, SEC

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EXHIBIT A Following Page 8

EXHIBIT B Following EXHIBIT A

EXHIBIT C Following EXHIBIT B

EXHIBIT D Following EXHIBIT C

1 QUESTION 1: *Refer to Amendment 1. The reason for the amendment is the system-wide*
2 *implementation of Automated Metering Infrastructure (“AMI”).*

3 QUESTION 1a: *Refer to Table I-C-1 entitled “System Additions and Improvements Summary.”*
4 *Provide the new estimated cost that reflects Amendment 1 and explain how it was*
5 *derived.*

6 **RESPONSE 1a: The addition of an approved amendment (i.e. Amendment 1) does not**
7 **increase the total monetary amount of an approved RUS Construction Work**
8 **Plan (CWP). A project of \$100,000 and greater must have an RUS approved**
9 **amendment even though it does not affect the CWP or loan-fund amount**
10 **totals.**

11 QUESTION 1b: *Has Shelby Energy’s board of directors approved the proposed amendment? If*
12 *yes, provide a copy. If no, explain why not.*

13 **RESPONSE 1b: Yes. Attached as EXHIBIT A is our excerpt from the December 17, 2009 SEC**
14 **board of directors meeting approving the AMI project.**

15 QUESTION 1c: *Provide Shelby Energy’s feasibility study or analysis justifying the proposed AMI*
16 *system.*

17 **RESPONSE 1c: The feasibility of the AMI project was made using a break-even analysis; the**
18 **end result of said analysis is attached as EXHIBIT B. Said exhibit is an**
19 **output from the breakeven analysis which included numerous pertinent**
20 **variables each of which went through a sensitivity range to determine the**
21 **effects of changes to each variable and/or groups of variables.**

22 QUESTION 1d: *Has Shelby Energy made a decision on the AMI equipment to be purchased?*
23 *Provide the name of the manufacture, and explain why Shelby selected this*
24 *manufacture instead of another.*

25 **RESPONSE 1d: Yes. Shelby Energy’s AMI Team (“Team”), after careful and prudent**
26 **evaluation, recommended to the board of directors that the TWACS AMI**

1 system manufactured by Aclara be awarded the bid as system of choice. This
2 system provided the quickest "on demand" meter read and did not require
3 additional equipment to be added to the distribution lines. TWACS had better
4 distribution automation ("DA") and demand reduction ("DR") functionality
5 including in-home display capabilities. The Team evaluated many AMI
6 products, systems and manufacturers. The Team developed a vendor /
7 product criteria which eliminated several AMI vendors or their products.

8 Some of the Team's requirements for the AMI System were:

- 9 • Utilize proven technology
- 10 • Daily meter readings of all meters
- 11 • Time-of-Use ("TOU") metering capability
- 12 • Strong interface with existing SEDC billing/ accounting system
- 13 • No batteries required at end points to avoid maintenance issues
- 14 • Capability to read meters during distribution line "back-feeding"
- 15 • Able to accurately read / report end-of-line voltage
- 16 • Able to provide on demand the KW load on each meter
- 17 • Able to provide on demand the sub, circuit and phase of each meter
- 18 • Remotely disconnect / connect services
- 19 • Expandable for DA and DR
- 20 • Preferably to do business with a distributor/vendor that has had a
21 successful long term partnership with SEC
- 22 • Reliable communications from office to each meter

23 A list of vendors that the Team invited to present their AMI products were:
24 Tantalus, Elster, Cooper ("Cannon"), Landis & Gyr ("Hunt") and Aclara
25 ("TWACS"). Tantalus was eliminated after Team discussions due to battery
26 requirements for all meters and multiple antenna tower locations needed to

1 communicate to all meters. Elster was eliminated due to the lack of cell phone
2 coverage to the customer meter locations and the distance between customers
3 in certain areas. This left a list of three vendors (Hunt, Cannon & TWACS), all of
4 which utilized power-line-carrier ("PLC") technology to communicate with the
5 meters. PLC all but guarantees that communication to each meter will be
6 available when power is flowing to the meter. The power-line infrastructure is
7 the communication transmission medium used by PLC and thus will provide SEC
8 complete control over maintaining communication to/from each meter without
9 monthly recurring costs from third party communications companies. SEC's next
10 step was to request proposals from Kentucky suppliers of the said three
11 manufacturers :

- 12 • "NRTC" who is the distributor for Cooper Power Systems (Cannon)
- 13 • "Brownstown Electric Supply" who is the distributor for Landis & Gyr (Hunt
14 Technologies)
- 15 • "HD Supply" who is the distributor for Aclara (TWACS)

16 **QUESTION 1e:** *Identify all vendors considered by Shelby Energy to supply AMI equipment. Include*
17 *in your response a copy of any materials supplied by the vendors detailing the*
18 *specific equipment to be supplied, including its capabilities and features.*

19 **RESPONSE 1e:** **See RESPONSE 1f above. Attached as EXHIBIT C is a redacted copy of the**
20 **bids submitted by the three approved vendors. A separate Petition for**
21 **Confidentiality of this redacted information has been filed in this case.**
22 **Attached as EXHIBIT D is an additional informative document detailing the**
23 **capabilities of the selected TWACS AMI system.**

24 **QUESTION 1f:** *Provide a detailed description of the capabilities and features of the AMI equipment*
25 *selected. Indicate which features Shelby Energy plans to use and those it will not.*

1 **RESPONSE 1f: SEC plans to use the following TWACS AMI features immediately upon**
2 **installation completion:**

- 3 • **Single “on-request” meter readings (on-demand and/or scheduled)**
- 4 • **Multiple (grouped) “on-request” and/or “scheduled” meter readings**
- 5 • **“Ping” outage readings (check for outages)**
- 6 • **Interfaces with many Outage Management Systems**
- 7 • **Interfaces with many Computerized Information (Billing) Systems**
- 8 • **Billing reads (KWH and Demand)**
- 9 • **“Freeze” kWH readings at midnight**
- 10 • **On-request for verification, move-in / move-out and final bills**
- 11 • **Theft Monitoring**
- 12 • **Accurate up-to-date sub, feeder and phase circuit path data**
- 13 • **System load analysis**
- 14 • **Identify overloaded or under-utilized assets**
- 15 • **Customer Voltage Profiles**
- 16 • **Sub, feeder and phase load balancing**
- 17 • **Outage notification and outage restoration status**
- 18 • **Outages and "blink" counts to provide measurement of service quality**
- 19 • **Data on which to base “Outage Index” (reliability) calculations**
- 20 • **Eliminate un-necessary trips to customer reported non-utility outages**

21 **SEC plans to use the following TWACS AMI feature immediately upon installation**
22 **completion and with the addition, on an as needed per-meter basis, of an optional**
23 **disconnect / reconnect collar at an approximate cost of \$150 per location:**

- 24 • **Remote meter disconnect and/or reconnect**

25 **SEC plans to use the following TWACS AMI features in the future:**

- 26 • **Customer selectable billing date**

- 1 • **Consolidate multi-premise account bills**
- 2 • **Consumption monitoring of vacation homes/cabins**
- 3 • **Enable TOU, Demand Response, RTP Rates**
- 4 • **Web based customer data presentation**
- 5 • **Customer bill /usage pre-pay**

6 QUESTION 2: *Refer to Item 11 of the Application, which indicates that the annual cost of*
7 *operations of the Work Plan is \$1,440,000. Refer to the schedule entitled*
8 *“Anticipated Annual Cost of Operations after Completion of all CWP Projects” in the*
9 *tab labeled “Introduction.” Explain the discrepancy between the estimated cost of*
10 *operation of \$1,773,301 and the amount indicated at Item 11 of the Application.*

11 **RESPONSE 2: The amount indicated in Item 11 of the Application was made in error. The**
12 **amount of \$1,773,301 indicated in the schedule entitled “Anticipated Annual**
13 **Cost of Operations after Completion of all CWP Projects” is the correct**
14 **amount.**

15 QUESTION 3: *Refer to the tab “Data Resources,” III-B, page 3. Explain the reference to AMR in*
16 *the footnote referenced by an asterisk (*).*

17 **RESPONSE 3: The acronym AMI should have been used instead of AMR. The use of the**
18 **footnote was to explain the increased costs per meter in 2011 over historical**
19 **costs due to the fact that all new meters ordered beginning in 2010 will have**
20 **a communications module (TWACS module) included.**

21 QUESTION 4: *Refer to the tab “Executive Summary,” Shelby CWP: I-C, Page 3. Describe fully*
22 *the entry for “New Meters” in the amount of \$155,862.*

23 **RESPONSE 4: The amount for “New Meters” of \$155,862 as noted in the Shelby CWP (I-C,**
24 **Page 3) was obtained from the information found in the Shelby CWP (III-B,**
25 **Page 3). Adding the single-phase meter total of \$139,556 and three-phase**
26 **meter (LP) total of \$16,306 equals \$155,862 for all “New Meters”.**

1 QUESTION 5: *Refer to the tab "Study Guidelines," Shelby CWP: II-D, page 1. Provide an update*
2 *of the status of the items identified in the 2008 Operation & Maintenance Survey.*

3 RESPONSE 5: **Item (1): "A program is underway to remove telephone poles left next to**
4 **electric poles."** SEC compiled a list of old poles "left next to electric poles"
5 during its most recent system inspection and has been working with its
6 "joint-attachment" companies to hasten the removal of said poles. SEC has
7 become increasingly frustrated by the slow response of said joint attachment
8 companies and has decided to implement a more aggressive procedure
9 which may include a request for PSC assistance if needed.

10 **Item (2): "There were some shade tree problems noted in the right-of-way."**

11 SEC is continually seeking and implementing improvements to its Right-of-
12 Way ("ROW") Vegetation Maintenance ("VM") program. One recently
13 implemented addition to the ROW VM program is an incentive-based tree
14 removal program. The anticipated result of this program is for a reduction of
15 trees remaining in the ROW corridor.

16 **Item (3): "The report of idle services is being reconciled with billing records."**

17 Currently the percentage of said idle services is high as stated in the 2008
18 Operation and Maintenance Survey. The final number of idle services will be
19 determined in 2011 after completion of the AMI and mapping projects.
20 Completion of these projects will assist in providing an accurate count of idle
21 services and the correct number will be reported on the annual RUS Form 7 for
22 2011.

**AMI
Update**

David Graham presented and discussed the quote he received from TWACS for the Advanced Meter Infrastructure (AMI) system. The TWACS AMI total project cost estimate excluding annual maintenance fees is approximately \$2.6 million. There are six other co-ops using this system and there is a user's group from which Shelby may obtain support if needed. The plan is to have the system installed and operating no more than a year from the project initiation date. We will contract most of the work and this amount is included in the project cost estimate. Gary Grubbs with Patterson & Dewar Engineers explained how the system works. A radio wave is added to the power grid. Each meter recognizes the radio wave and transmits data back over the electric lines through the substation and then into the office. Gary presented a brochure on the AMR Justification Input Variables and answered questions from the board. This system

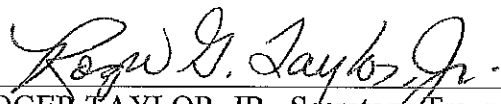
does more than read meters; it recognizes service is interrupted with blinks, outages and how much current is on each line, and could possibly assist in reducing line losses. The system is compatible with Smart Grid Technology. For example, it could connect with a house thermostat to allow remote control up or down as needed to help control peak load conditions. The AMI system itself is very secure from computer hackers. Any hacking would occur at the computer server level which will be protected by a firewall.

AMI will allow comparison between use as billed on the wholesale level and system-wide simultaneous meter readings. The AMI system projects a four-year payback. Stevens commented the payback period will probably be longer due to “saved” costs that will still be incurred (for example, staff labor costs). The AMI payback does not include customer satisfaction improvement. The electronic meters utilized in the AMI system are much more reliable than mechanical meters. For example, very small usage, such as digital clocks at night could be measured and billed by an electronic meter whereas such usage is not billed by the less accurate mechanical meter.

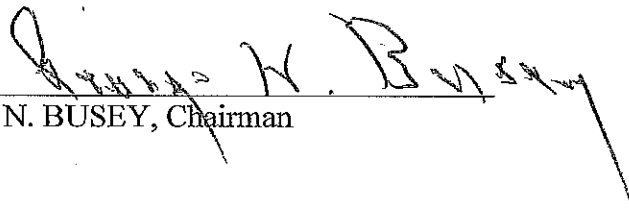
The ability to send out a bill the day after a meter is read electronically will reduce uncollectable accounts. AMI remote auto-disconnects will be much quicker than manual disconnects and again reduce write-offs.

Debbie recommended the Board accept the AMI project due to the significant cost savings over a relatively short number of years, industry trends, and probably a requirement for the future. Stevens questioned whether the installation cost is accurate. David replied that he thinks the estimated installation cost is on the high end; he believes the Co-op can probably negotiate a slight reduction in cost. Upon motion, duly seconded, the AMI project was accepted and approved as proposed.

There being no additional business, the meeting was adjourned.



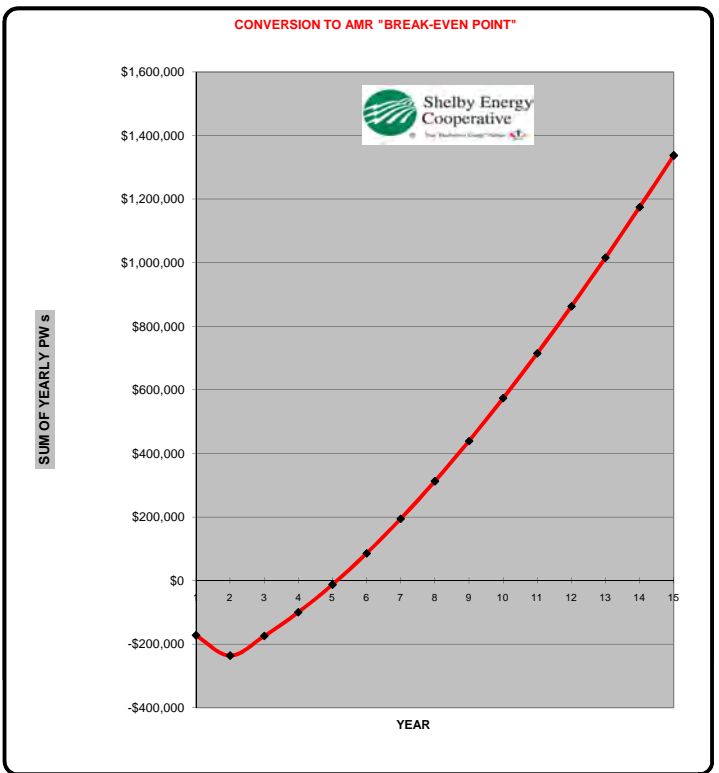
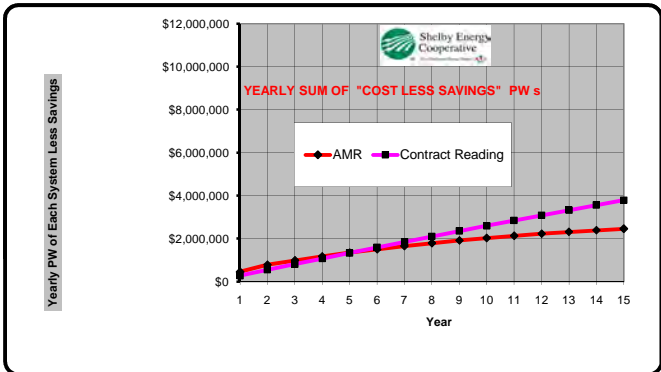
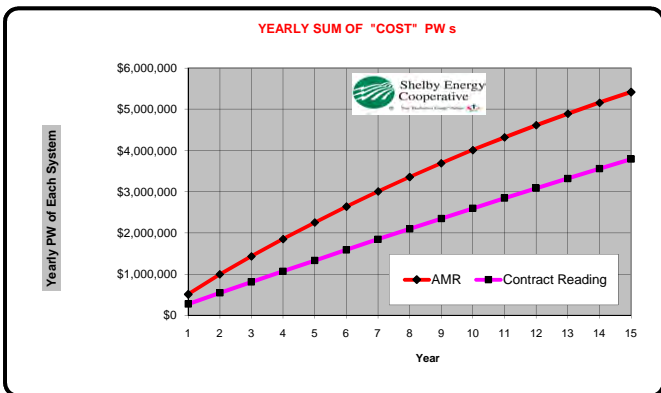
ROGER TAYLOR, JR., Secretary/Treasurer

Approved: 

GEORGE N. BUSEY, Chairman

Shelby Energy AMI Breakeven Analysis

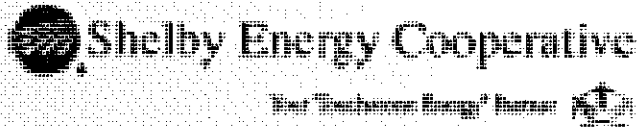
Present Worth Rate (%)	6.00%	year
Annual Fixed Charge (%)	13.85%	year
O & M Costs ~ AMR Meters (%)	1.00%	year
O & M Costs ~ Mechanical Meters(%)	2.00%	year
Inflation Rate ~ AMR Meters(%)	1.00%	year
Inflation Rate ~ Mechanical Meters(%)	3.00%	year
Meters ~ Residential	15,000	2008
Meters ~ Small Commercial	500	2008
Meter Reading Cost per Month per Meter	\$1.25	each
Inflation Rate ~ SEC Labor	4%	year
Growth in Meters	250	year
AMR Meter Cost ~ Residential (Avg)	\$99	each
AMR Meter Cost ~ Commercial (Avg)	\$450	each
Mechanical Meter Cost (Avg)	\$38	each
Energy Cost (\$/KWH)	\$0.06	each
Cost Reduction from Improved Outage Mgmt.	\$9,000	year
Annual Power Cost (energy only) (2008)	\$21,500,000	year
Cost to Oversee Contract Meter Reading	\$7,500	year
Energy Rate Increase (%)	3.00%	year
Additional Meter Tech for AMR	\$60,000	year
Meter Re-Reads (%)	1.70%	year
Contract Cost per Re-Read	\$20	each
Soft Disconnects / Reconnects (% of Meters)	5.00%	year
Contract Cost per Disconnect or Reconnect	\$30	each
Transformers with Avoided OL Damage	10	year
Cost of Replacing Failed Transformer	\$1,000	each
Line Loss due to Theft Deterrent (%)	0.30%	year
"Stopped" Meters (%)	0.35%	year
Cost to Replace & Bill for "Stopped" Meter	\$70.00	each
Inflation Rate ~ Contract Labor	2.40%	year
High-Bill Complaints (%)	3.00%	year
Cost of High-Bill Complaint Investigation (Avg)	\$200	each
Reduction in High-Bill Complaints (%)	50%	year
Voltage-Check Service Orders	50	year
Cost of Voltage-Check Service Order	\$200	each
Net Meter Plant (2007)	\$1,460,664	net
Cost Reduction of Eliminating PSC Voltage Rec.	\$2,000	year
No-Voltage Service Calls (No Problem Found)	60	year
Cost of No-Voltage Service Call	\$200	each
Reduction in No-Voltage Service Calls	70%	year
Cost to Read 49 Large Power Meters	\$6,000	year
AMR License Fee (AVG)	\$15,000	year
Cost to Replace Existing Meter With AMR Meter	\$12	each
Cost Associated with Meter Replacement	\$2.00	each
Cost for Sub Communication	\$55,200	10 Subs
Cost for Sub Make-Ready (Labor & Material)	\$55,510	10 Subs
Reduction of Line Losses for Ph Balancing, etc	0.30%	year
Evaluation Period	15	years
Beginning Year	2010	



SUM OF COSTS & SAVINGS ASSOCIATED WITH CONVERSION TO AMR METER READING											
Cost to Replace Meters with AMR Meters	Cost of AMI (TWACS & Sub Make-Ready)	Cost to Install AMR Meters for New Members	Cost of O&M Expenses	Cost of Annual Fixed Charges of AMR Equipment	Cost of Annual License & Maintenance Fees	Cost to Read Meters Until AMR is Operational	Cost for One Additional Metering Tech	Savings from Reduction of High Bill Complaints	Savings from Reduction of Stopped Meters	Savings from Avoidable KWH Energy Theft	Savings from Reduction in "No-Voltage" Calls
\$1,921,575	\$788,290	\$398,398	\$428,669	\$5,937,070	\$225,000	\$190,063	\$1,201,415	\$999,966	\$81,664	\$1,170,391	\$228,158

SUM OF COSTS & SAVINGS ASSOCIATED WITH CONVERSION TO AMR METER READING (continued)											
Savings from Avoidable Damaged Transformers	Savings from Soft Disconnects & Reconnects	Savings from Avoidable Meter Re-Reads	Savings from Reduction of Line Loss (Ph Balancing)	Savings from End of Line PSC Voltage Recordings	Savings from Improved Outage Management	Savings from not Admin. Contract Meter Reading	Costs	Savings	Total Annual Costs of AMR less Savings	Present Worth of Total Annual Costs	
\$190,132	\$420,383	\$95,287	\$1,101,429	\$38,026	\$171,119	\$142,599	\$7,982,217	\$4,639,154	\$3,343,064	\$2,453,955	

SUM OF COSTS ASSOCIATED WITH EXISTING CONTRACT METER READING										
Mechanical Meter Replacement (5% Year)	Cost of Meters for New Members Installations	Cost of O&M Expenses	Cost of Annual Fixed Charges of Metering Equipment	Cost to Read Large Commercial Meters	Cost to Read Residential & Commercial Meters				Total Annual Costs of Existing Meter Reading	Present Worth of Total Annual Costs
\$547,738	\$176,690	\$431,553	\$747,487	\$120,142	\$4,512,743				\$5,811,925	\$3,791,213



Request for Proposal for:

***Powerline Carrier
Advanced Metering
Infrastructure
(AMI)***

Proposal Response

Provided to:

Shelby Energy Cooperative

**Provided by
Aclara Power-Line Systems Inc.**

October 1, 2008



945 Hornet Drive
Hazelwood, MO
63042
www.AclaraTech.com

314.895.6400
314.895.6543 fax

October 1, 2008

David Graham
Shelby Energy Cooperative, Inc.
620 Old Finchville Road
Shelbyville, KY 40065

Dear Mr. Graham:

Aclara Power-Line Systems Inc. (Aclara PLS), in cooperation with HD Supply, is pleased to submit the following response to the Request for Proposal regarding Advanced Metering Infrastructure for Shelby Energy. We appreciate the insight you have presented and your plans for addressing some key challenges. Aclara PLS welcomes the opportunity to contribute to the success of these plans and is delighted to provide you with the information contained in the following response.

For over 20 years, Aclara PLS has provided two-way communications that offer Automatic Meter Reading (AMR) and load control systems primarily to the utility industry. Aclara PLS continues to make investments in the business to support new product development, increase internal research and development and provide additional resources to support our customers and their data collection and analysis requirements.

The TWACS system is a proven AMI solution:

- 14 Million endpoints sold to utilities throughout North America including PPL Electric Utilities, Florida Power and Light, Wisconsin Public Service, and Oncor
- Supports load control, demand response, multi-rate pricing structures, Home Area Networking, remote meter reading, remote connect/disconnect, outage and service reliability assessment, integration with back-office systems and pre-payment technologies
- Provides extremely flexible, modular approach to system design and enhancement allowing utilities to add functionality without replacing system components

Aclara PLS is confident the detailed information provided in the following proposal will not only meet, but also exceed, your expectations through the TWACS® System, a solution that ensures the best value.

We look forward to partnering with Shelby Energy to provide you with quality solutions through our capabilities, innovation, and commitment to customer satisfaction. We will measure our success by your success! If you have any questions, need further clarification, or additional information, please feel free to contact me by telephone at (847) 910-3530.

Sincerely,

William Baumann

William Baumann, Sales Director

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EXECUTIVE SUMMARY

With a vision of enhancing business practices, customer service, and overall customer satisfaction, Shelby Energy has defined plans to implement an Advanced Metering Infrastructure (AMI) solution for electric services. The goals of this AMI solution are to provide customers the benefits of a more efficient, effective, service-oriented business through safe and reliable electric services to customers. This project, when complete will provide Shelby Energy with the extended capabilities to provide accurate on-request reads, power reliability and outage assessment, analysis of consumer usage information, remote disconnect/reconnect, evaluation of the functionality of the system and accurate monthly billing.

AMI SYSTEM FUNCTIONALITY

The proposed solution is based on Aclara PLS' Two-Way Automatic Communications (TWACS[®]) power line communication technology. For over 20 years, the TWACS solution has operated transparently on an electric utility's existing distribution power lines in a reliable and fully bi-directional manner. The TWACS architecture provides both advanced meter reading and load control functionality, and is in operation at hundreds of utilities, including utilities that Shelby Energy would look upon as peers.

The TWACS System

The proven reliability of the TWACS system reduces the business risks associated with third-party communications systems and eliminates the need for additional dedicated endpoint communication infrastructure. By leveraging the Shelby Energy's existing power delivery infrastructure, the TWACS system offers the advantages of cost-efficiency, reliability and simplicity for complete territory coverage. The TWACS system does not require network communications components outside of the Shelby Energy's distribution substations. Furthermore, as new customers are added to the Shelby Energy System, no additional infrastructure is required to maintain full communication coverage unless new substations, busses, or feeders are added to the distribution system.

Aclara PLS' TWACS System offers multiple capabilities through a proven industry-leading technology. Each AMI endpoint has advanced functionality inherent in its design; some of these capabilities are:

- Interval Data—15, 30 and 60 minute interval data (frequency depends on the module)
- Outage information
- Load profiling information
- Demand data
- On-request reads
- Power quality data

Executive Summary

Shelby Energy Cooperative, Inc. (Shelby Energy)
 RFP Response—AMI System
 Aclara Power-Line Systems Inc. (Aclara PLS)
 October 1, 2008

- Tamper data
- Downloadable firmware

Aclara PLS also offers additional products which can be used as “add-ons” to extend the capabilities of the TWACS system. Some of these products include:


- Disconnect Switch Interbase (DSI) (separate collar remote disconnect/reconnect option)
- In-Home Display for passive demand response
- Prepayment solutions
- Load Control solutions

Aclara PLS is constantly reviewing our product offerings to provide our customers with the latest and most current capabilities. When developing new products, Aclara PLS focuses on system compatibility as well as the product’s functionality and feature set. By doing this, Aclara PLS ensures that all of our products are backward-compatible. Shelby Energy does not need to worry about planned obsolescence if they choose a TWACS solution. Some of the products and additional functionality scheduled for release in the near future include:

- Integrated Disconnect (under the glass remote disconnect/reconnect solution)
- Two-way Communicating Capacitor Control Switch
- Enhanced Power Quality Data
- Additional security features

TWACS Benefits to Shelby Energy

Aclara PLS’ mission is to define solutions that provide positive benefits that favorably impact how the utility performs many of its processes. Aclara PLS offers numerous cost benefits to Shelby Energy through the TWACS system. The following table lists many of the benefits of the TWACS system.

Differentiator	Benefits to the Shelby Energy
<p>Secure Communication Technology—The TWACS technology operates over the utility’s power distribution circuits, without alteration and under the Shelby Energy’s complete control.</p>	
<p>High Performance Communication System—The TWACS solution offers a high performance communication system, able to obtain a reading directly from an individual meter in seconds and to retrieve hourly interval data from more than 30,000 meters per substation bus.</p>	
<p>A Non-Intrusive Communication System—The TWACS system operates transparently on the 60 Hz power line, that neither generates interference nor degrades the quality of power delivered to the Shelby Energy’s customers.</p>	

The information contained herein is proprietary and confidential to Aclara Technologies and shall not be released or disclosed to any third party without prior written approval.

Executive Summary

Shelby Energy Cooperative, Inc. (Shelby Energy)
 RFP Response—AMI System
 Aclara Power-Line Systems Inc. (Aclara PLS)
 October 1, 2008

Differentiator	Benefits to the Shelby Energy
<p>Length of Experience—Aclara PLS has been providing AMI and Load Control solutions for over 20 years, more years of experience with fixed-network solutions than other supplier. Badger Meter also has over 20 years experience providing Water meter reads through the ORION system</p>	
<p>Proven Technology—Both the TWACS and ORION systems are proven to work reliably, have been shown to have less risk for obsolescence, and be highly scalable. While the original technology that drives Aclara PLS' success is the same at a fundamental level as that deployed 20 years ago, Aclara PLS has developed continual, backward-compatible upgrades to bandwidth, functionality, etc., creating new value for both new and existing utility customers.</p>	
<p>Low Number of Infrastructure Components—Because we utilize the utility's existing power line infrastructure to communicate data, the TWACS solution does not require repeaters, line conditioning devices or other equipment to transmit data. As a result, the TWACS solution offers lower maintenance costs due to fewer component failure risks</p>	
<p>Scalability—The TWACS solution offers the added benefit of assisting utilities as they grow. For a utility serving a rapidly growing area, the ability to expand the AMI system with little or no additional equipment is both economical and expeditious. The TWACS solution automatically provides AMI data to new construction, as long as no new substations or feeders are included in the construction.</p>	
<p>Expandable Solution—The TWACS / ORION solution offers flexible design to enable additional functionality, equipment and system functions to the system without degradation of the communications bandwidth.</p>	
<p>Tailored Services—Aclara PLS offers standard technical support service options that can be added to the chosen technical support services level to create a technical support plan that is tailored to the needs of the customer</p>	
<p>No Environmental Barriers—Because the TWACS utilizes a utility's existing power line infrastructure for communications, new construction or tree limbs will not inhibit the functionality of the system.</p>	

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THE TWACS SYSTEM

The Two-Way Automatic Communication System – TWACS – is a fixed network communication system for consumption data retrieval over electric power lines. The TWACS system provides proven solutions focused on supporting accurate data collection for billing, forecasting and response management. These systems have been deployed at over 260 customers across North America. The TWACS system will provide Shelby Energy with a comprehensive set of energy use data for both residential and commercial customers.

The TWACS system is a fixed network, utility communication system. Running at a centralized location, the TWACS operating software communicates with end points, such as meters, by way of existing power lines. The TWACS system allows full two-way access to and from the consumer's meter, providing communication and control features for Shelby Energy.

The TWACS system architecture consists of three levels of components:

- Master Station TWACS operating software: TWACS Net Server (TNS)
- Substation Communications Equipment (SCE)
- Endpoints or modules integrated within electric meter. This is the level at which the meter transponder resides.

The following diagram shows the TWACS System architecture:

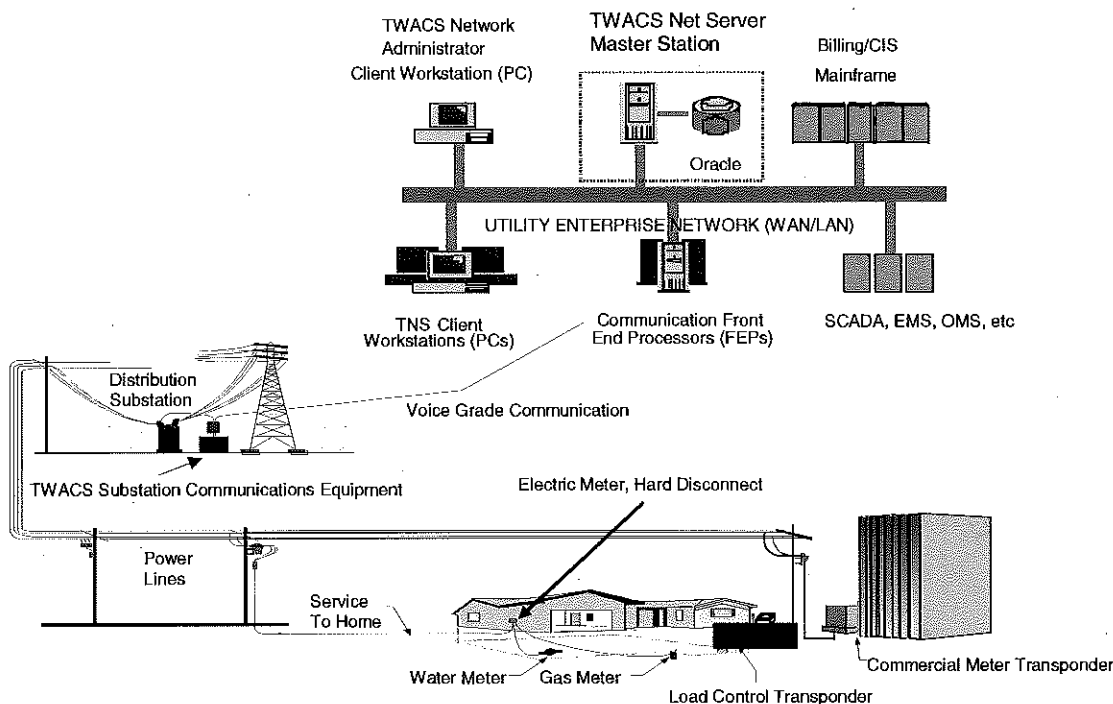


Figure 1: TWACS System Architecture

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TWACS NET SERVER MASTER STATION

The TWACS Net Server (TNS) is the heart of the TWACS system. TNS interfaces the TNS Operator and other users to the TWACS system. While configuration options vary depending on the complexity established by the number of users and substations managed, the basic TNS configuration involves a server and some form of communications links connecting TNS to the substation.

- Oracle database server—The oracle database server is responsible for managing the meter and meter-related databases.
- TNS application server—The TNS application server is responsible for running the TNS programs and providing an interface for communications.
- Communication server—The communication server is responsible for interacting with communications facilities like dialups or dedicated-line facilities to connect to the substation equipment.

Often times, TNS is configured with a bank of modems allowing the TNS server to dial out and connect with substations. A minimal base-level TNS server configuration involves a Windows 2003 server running three applications:

TNS Advanced Configuration

In larger deployments of TWACS, the basic TNS configuration may not provide the optimum level of performance. It is possible to improve system performance, if necessary, by segregating the functions of the TNS system so that the Oracle database server, TNS application server, and communication server run on separate processing machines.

In advanced configurations, like the one shown on the right, the computers take on more distinct roles. In the advanced configuration detailed in the graphic, the TNS application server is the TNS master station. Although the TNS user stations can perform functions in the TWACS system, all of the commands and responses would flow through the TNS application server to the substation, as it is the TNS master station in this configuration.

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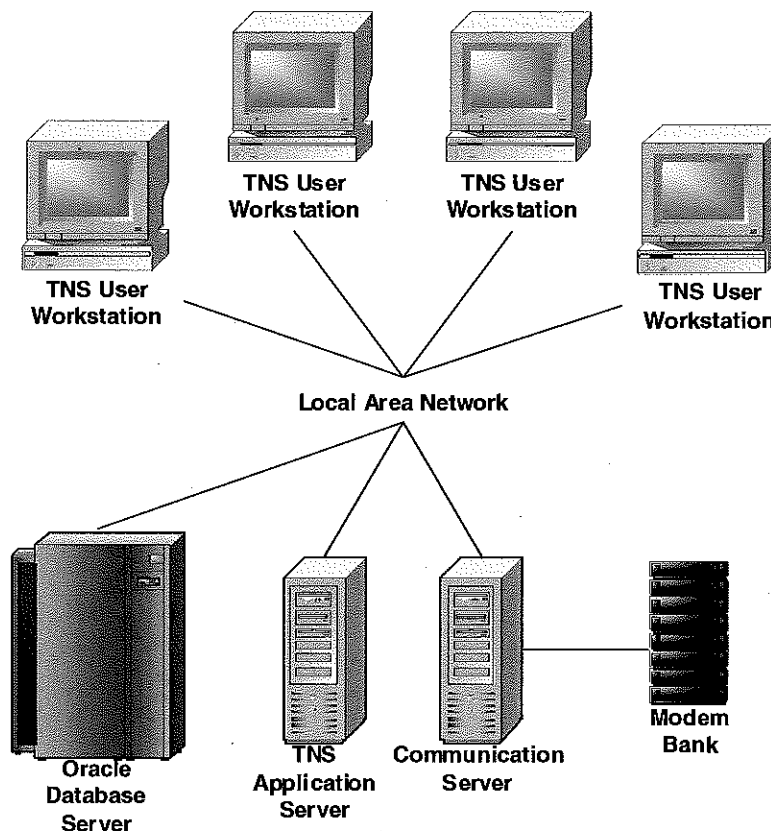


Figure 2: TWACS System Configuration

SYSTEM SOFTWARE

The TWACS Net Server (TNS) software provides utility companies with a user interface to manage two-way communications with their meters. Aclara PLS developed TNS around a database manager called Oracle. The TWACS solution operates with the Master Station Windows 2003 and XP operating systems on end users' workstations. It does not need to be installed on the individual workstations that are part of Shelby Energy's network.

In addition to the software required to operate the TWACS system, Aclara PLS offers additional software products to enhance the functionality of the system and support Shelby Energy's overall goals for the system.

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Software—The software for the TWACS Net Server (TNS) along with our add-on functionality software provide the brains behind the system.	
TWACS Net Server (TNS) software and Master Station (Required)	The TNS Master Station is installed in the utility's data center, or another location identified by the company. The exact hardware and software configuration is flexible and requires discussion with the utility to define the specific requirements properly. Generally, the TNS Master Station consists of a single server, or may comprise multiple servers (i.e. application, database and multiple communication servers) depending on system size.
OPTIMUM™ (Optional)	The OPTIMUM software is an application that enables real-time or near real-time integration with other utility applications. OPTIMUM is MultiSpeak 3.0 compliant. Several common systems have certified the OPTIMUM integration software including NISC, SEDC, and Milsoft and is currently being tested by many other applications for certification as an integration API.
PROASYS™ (Optional)	Aclara PLS' Power Reliability Outage Assessment System (PROASYS™) software application further enhances the outage and power restoration verification features of the TWACS system. With PROASYS the utility will be able to identify customer power status, voltage and power reliability and offers the ability to monitor these functions routinely, even when there are no outages. The application also provides restoration verification and can assist the utility in reducing unnecessary field visits.

SUBSTATION COMMUNICATIONS EQUIPMENT (SCE)

The SCE is located inside the substation yard and is composed of multiple pieces of specialized equipment, each housed in separate enclosures. Each piece of equipment is referred to as a unit. The number of units required to make up the SCE at a given site depends on the substation size and configuration, and on the type of inbound detection performed (e.g., bus/feeder, phase/neutral).

The Substation Communications Equipment, or SCE, enables the TNS Master Station and the TWACS endpoints to communicate over the utility's power lines. Although the SCE is partially comprised of familiar power system components, it provides a communication function. TWACS SCE equipment is required in every substation that Aclara wishes to enable for TWACS communication purposes. The substation communication equipment is comprised of four key components:

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Substation Communications Equipment (SCE)—The SCE is the communications hub for the TWACS system. Installed at the substation, the SCE provides the communication connections between the TWACS modules and the master station.	
Control Receiver Unit (CRU) <i>(Required)</i>	This device performs the actual communications management function. It is a small rack of equipment that can be installed in the substation control building or in an outdoor enclosure. One CRU is generally required per substation. It will accept either AC or station battery power.
Outbound Modulation Unit (OMU) <i>(Required)</i>	The OMU comprises the power electronics that transform the information from the CRU into an outbound modulated signal. This equipment is installed in an aluminum outdoor-rated enclosure mounted onto, or adjacent to, the MTU. One OMU is required per independent substation bus section, up to approximately 40 MVA.
Modulation Transformer Unit (MTU) <i>(Required)</i>	This is a modified conventional pad-mounted distribution transformer that transforms the OMU signal up to the distribution voltage for placement onto the distribution system. One MTU is required per independent substation bus, up to approximately 40 MVA. Aclara PLS does not manufacture MTUs. It has been our experience that customers find it easier and less expensive to purchase their TWACS-ready MTUs directly through the MTU manufacturers. Aclara PLS can help the Shelby Energy to identify the best sources and with appropriate MTU sizing for the substations.
Inbound Pickup Unit (IPU) <i>(Required)</i>	This device is connected to the existing feeder metering, or bus metering, CT circuit and provides the inbound signal from the meters, or other devices, to the CRU for processing.
Multiple Input Receiver Assembly (MIRA) <i>(Optional / Recommended)</i>	When concurrent phase communications are utilized (e.g. overlapping TWACS communication on all three electrical phases), the MIRA acts as a multiple process receiver that increases the maximum number of transactions that can be performed at once, and hence, overall system capacity. MIRA increases the rate that meters can be added to, and addressed in, the TWACS system. The MIRA also reduces the bandwidth required for searching and querying meters and allows the use of all six channels through advanced-notch filtering technology.

SCE installation

The SCE installation is both straightforward and flexible. Since the TWACS SCE is installed completely within the confines of the utility's substation environment, Aclara PLS' current customers have performed this work themselves, or via preferred contractors. Therefore, Aclara PLS has not been generally involved in the actual installation of this equipment, other than providing technical support.

The traditional method of installing the equipment required the MTU be mounted on a concrete or fiberglass pad. The other Aclara PLS equipment was then installed on a pedestal adjacent to the MTU. In order to provide a more cost-effective solution, Aclara PLS worked with leading transformer manufacturers to create a special transformer that serves as the MTU with special hardware, which mounts the CRU and OMU on to the MTU. The figure on the left illustrates the small, self-contained installation that can be easily installed by Shelby Energy personnel or

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trained substation construction resources. The figure on the right illustrates an alternative installation method for the MTU using less expensive single-phase “cans”.

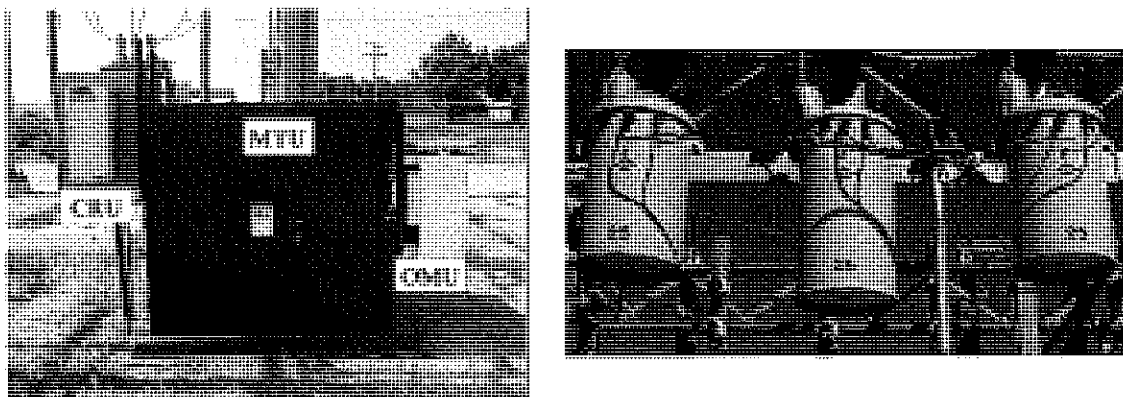


Figure 3: Integrated MTU Installation (left) and Aerial Installation with single phase transformers (right)

The following figure provides a typical configuration for a typical single-bus, four circuit substation, showing a high-level view of the TWACS Substation Communications Equipment. Each substation typically requires one CRU, one OMU and one MTU.

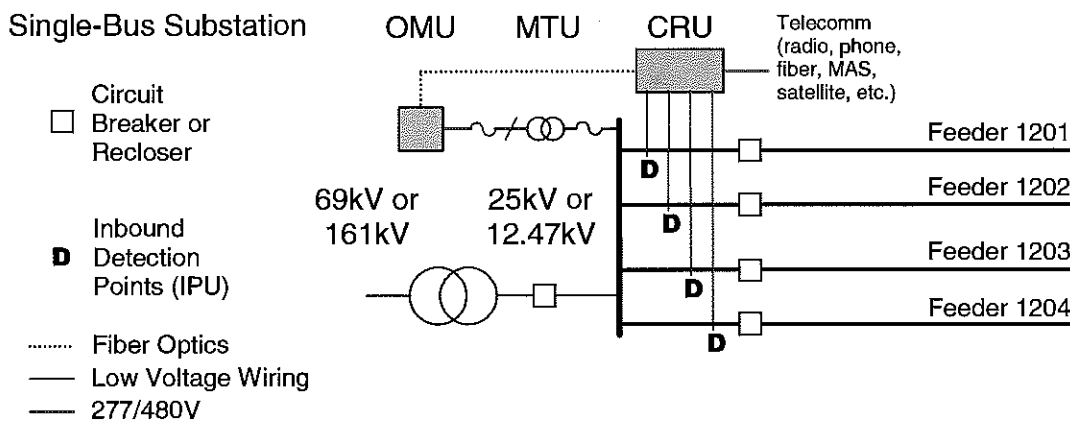


Figure 4: SCE Installation in Standard Distribution Substation

The figure above considers a single bus substation with one OMU/MTU. Additional OMUs/MTUs are required in substations with more than one bus, or for buses with a base rating higher than approximately 40 MVA (O.A.). However, a single CRU can support multiple OMUs/MTUs. Aclara PLS and Shelby Energy will jointly define the utility’s substation communications equipment requirements.

Aclara PLS provides the CRU, OMU and IPU components, while the utility generally purchases the MTU units. This allows Shelby Energy to incorporate any standard transformer specifications and to use its purchasing power to obtain best pricing. Installation costs vary depending on Shelby Energy’s substation design standards, how the MTU is connected to the bus structure, the location of the CRU (indoor or outdoor), and Shelby Energy’s own construction practices and prevailing labor rates. The experience of Aclara PLS’ utility customers is that the equipment installation is straightforward and requires no special skill sets beyond those normally found in substation construction personnel.

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System Maintenance

A major advantage of the TWACS system is its extremely low maintenance requirements. All the communications equipment resides with the utility's substations, which are easily accessible and under Shelby Energy's complete control. The substation communications equipment is designed to operate in the harsh physical and electrical conditions of an operating high voltage electric substation without experiencing any adverse effects. Other than periodic visual inspections that can be performed in conjunction with routine substation inspections, there is no required SCE equipment maintenance. The TWACS field equipment contains no moving parts or other wear-out mechanisms, unless one substation component, the Control and Receiving Unit (CRU), is installed outdoors. In this case, there is an integral air-conditioner that may require periodic maintenance.

ENDPOINTS

The TWACS system includes components on the customer's premise that allow the utility to gather information and perform activities relating to the customer's electrical service. These endpoints include the TWACS UMT module, Demand Response Unit, and the Load Control Transponder.

Endpoints—The Endpoints collect and transmit data from the meter and provide communications to the customer.

Universal Metering Transponder (UMT) with Multiport Capability (Required)

Note: The Meter Module is required for the TWACS system to operate. Aclara PLS offers other lower-functioning AMR modules but recommends the UMT. Information about these other modules is available on request.

The Universal Metering Transponder (UMT) provides direct access to the registers of solid-state meters that calculate values beyond kWh, such as calibrated line voltage and/or power quality metrics. The UMT provides the greatest functionality and flexibility for both single phase and polyphase meters including:

- Finer resolution metering information—35 days of 15-minute load profile capability, without the need for “mass memory”;
- TOU—If the electronic meter supports TOU, the UMT leverages the intelligence of the electronic meter, and provides TOU billing determinants (read directly from the meter's memory);
- Improved voltage accuracy measurement—Provides high resolution voltage measurements, where supported by the host meter;
- Outage Information—Provides date and time stamping of outage information and the capture of a quantity of outage events in meter module for later download to the utility;
- Programmable selection of approximately 16 - 32 meter registers for appropriate meters—Allows the utility access to the various registers that will support individual meter unique functionality including power quality information.
- Consumption Data including forward, reverse, net and secure. These include mappable registers and history storage at the module.
- Demand Data including 15-minute peak, 30-minute peak, 60-minute peak, fixed block, and rolling block.

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	<ul style="list-style-type: none"> • Interval data including 15-, 30-, and 60-minute data, with one or two channels of data, and history storage at the module. • Voltage data pulled from the meter registers and transmitted through the TWACS system • Momentary and sustained interruptions • Downloadable firmware • Multiport Capabilities <p>The electric meters currently supported by the UMT are:</p> <ul style="list-style-type: none"> • L+G FOCUS AL • GE's I-210+ (energy only) • Elster A3 Alpha • GE kV2c <p>Aclara is currently working with Landis+Gyr and GE to develop UMT modules that will support the FOCUS AX-SD and the I-210+SD integrated disconnect meters. The UMT for the FOCUS AX-SD is currently in field testing and is anticipated for release early in Q4 2008. Aclara anticipates the UMT for the GE I-210+SD will be released Q2/Q3 2008.</p>
<p>Load Control Transponder (LCT) <i>(Optional)</i></p>	<p>The LCT is a two-way load control device featuring two relays, one 30A normally closed relay suitable for controlling water heaters or other heating loads, and one 3A 24V relay, suitable for interrupting the control circuit to HVAC equipment or other auxiliary control relays. The LCT cycles these appliances, or controls them for the entire period (as determined by the utility), under remote control of the TNS Master Station. Each relay has an independent cycling strategy to provide significant flexibility in the application of load control programs.</p>
<p>Demand Response Unit (DRU) <i>(Optional)</i></p>	<p>The DRU is the next generation of the TWACS Load Control products. This updated load control device will provide the same functionality as the LCT but also offers intelligent algorithms capable of determining whether a device selected for a control event is operating at the time of the event. If the product is not operating at the time of the event, the DRU will notify the TNS and will not perform the control functions at that time. Aclara anticipates that the DRU will be released in Q4 of 2008.</p>
<p>Capacitor Switching Transponder (CST) <i>(Optional)</i></p>	<p>The Capacitor Switching Transponder (CST) is a product currently in field testing that will automate capacitor banks with two-way controls, providing the Shelby Energy with control, valuable information and savings. The Shelby Energy will be able to administer capacitor banks across any service area and actively manage grid reliability and efficiency by controlling circuit voltage and reducing system losses due to VAR flow. Aclara PLS anticipates this product to be released Q4 2008.</p>

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TWACS COMMUNICATIONS

The complete communications pathway for a TWACS command can be simplified into a four step process:

1. A command is initiated from the TNS Master Station which is delivered by the Backhaul/WAN to the TWACS-Enabled substation.
2. The command is communicated from the substation to the TWACS-enabled meter.
3. The TWACS-enabled meter packages the data requested and sends the package to the substation.
4. The TWACS-enabled substation then completes the two-way communication of meter data to the TNS master station.

The following diagram provides a graphical description of these four steps.

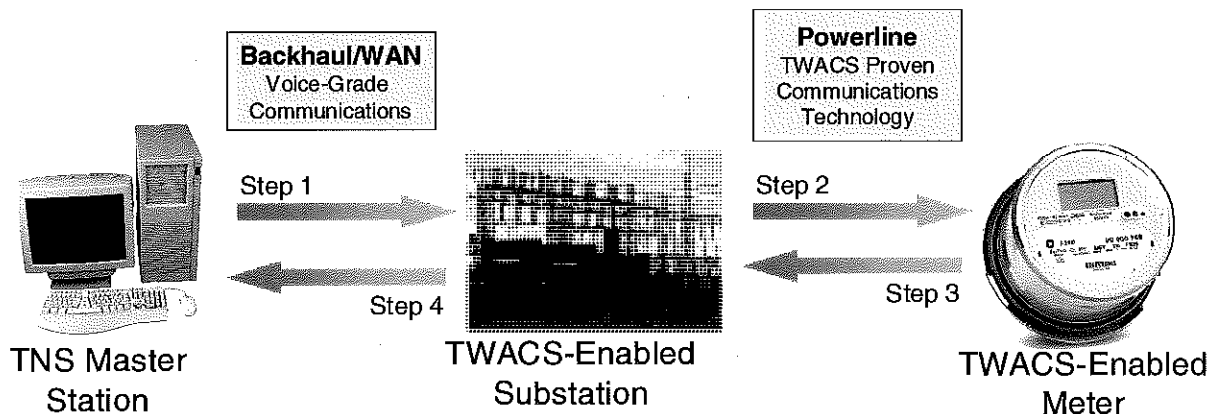


Figure 5: Four Steps of the TWACS communication system.

Endpoint to Substation Communications

The patented TWACS technique of power frequency modulation for two-way communication on the power line uses provides for inbound and outbound signals to communicate across the power lines without diminishing power quality.

Outbound signals (from the substation to the end device) are transmitted by modulating the 60Hz voltage wave shape near the zero crossover point, indicating binary ones and zeros simply by the location of the modulation (See Figure 6).

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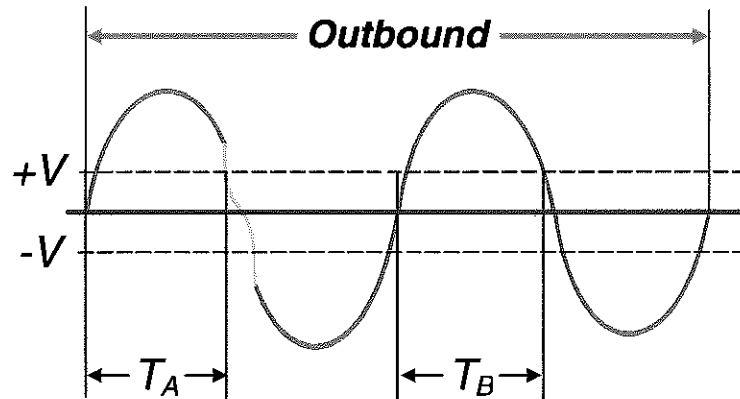


Figure 6: Outbound TWACS Signal on Voltage Waveform

Inbound signals (from the end user back to the substation) are created by producing a unique pattern of current pulses in the field devices and detecting those pulses at the substation (See Figure 7).

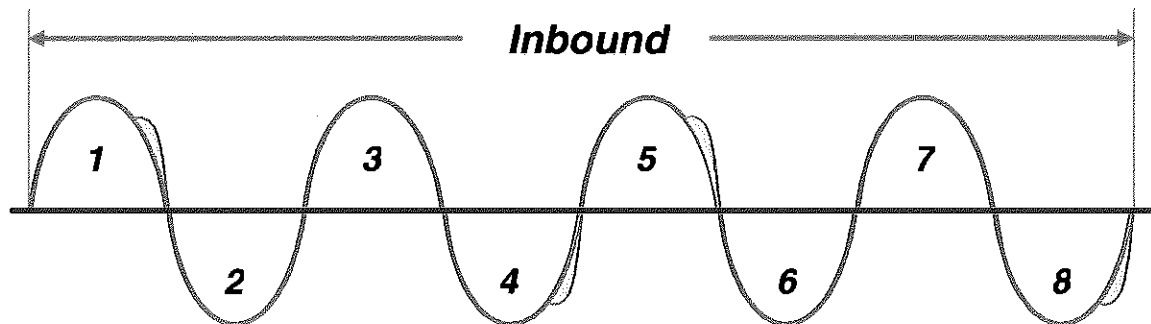


Figure 7: Inbound TWACS Signal on Current Waveform

TWACS Net Server to Substation Communication Link

Communication links back to TNS must be included within each the Shelby Energy substation where SCE equipment is installed. Only one link is required regardless of the amount of TWACS equipment installed in the substation. The choice of communication link between the substation and the Master Station is extremely flexible. It can be dedicated, or shared, 2-wire voice grade or 4-wire data circuit, fractional T1, frame relay, satellite, cellular, MAS radio, microwave, other wireless data or IP-addressable systems. This flexibility allows the utility to use a single WAN solution, or different solutions, to address the various options within its service territories. Cellular may be available and cost effective in urban areas, while satellite may be a good choice for ultra-rural or mountainous areas. Given the flexible requirements, the Shelby Energy can use most existing communication infrastructure to accommodate the Master Station to SCE communication. Baud rates of 9600 are typically recommended.

TWACS SYSTEM FUNCTIONALITY

All communication with customers' meters takes place from Shelby Energy's home office and is readily available. For example, a Customer Service Representative can perform an on-request meter read and in twenty seconds view the total consumption reading on the meter. By contrast, a billing

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read job typically completes in several hours but varies depending on the number of meters to be read.

Besides providing for Automatic Meter Reading, the TWACS system delivers many other capabilities including:

- Date and time stamped reads. All reads are date and time stamped regardless of the type of read.
- Daily consumption reads. Each day at a designated time the module with “freeze” the read that is the daily consumption read to be transmitted to the master station.
- TOU/Critical Peak Pricing using interval data. The variety of ways in which TWACS can support various pricing schemas allows utilities to monitor and bill for time-of-use tiered billing or maximum peak usage.
- Interval Data Reads. Depending on the meter, Shelby Energy can collect consumption data for every 24-hour, 60-, 30-, or 15-minute interval.
- Remote Service Connect/Disconnect. Remotely from Shelby Energy’s office, a Customer Service Representatives can disconnect or re-connect individually metered residential or small commercial services equipped with a plug-in, self-contained device that accepts the blades from the meter on the top side and inserts into a standard meter socket on the bottom.
- Outage Assessment and Restoration Monitoring. The TWACS system records outage counts in real-time for isolating trouble.
- Line-Voltage Monitoring. Customer Service Representatives have the ability to ping a meter for an almost instantaneous voltage check.
- Power Reliability. The TWACS system when combined with the Power Reliability and Outage Assessment System (PROasys), provides power reliability information supporting SAIFI, SAIDI, CAIDI and other indices for better system management.
- Local and Remote read capability. The TWACS system enables both remote reads and visual reads directly from the meter display.
- Collect Meter Register Data. The

Wisconsin Public Service—Case Study

The WPS AMI project consisted of approximately 800,000 TWACS electric and STAR® gas endpoints. WPS also has the Aclara Software Customer Presentment solution, Nertec and DENet AMR units that feed into their Universal Ops system. The WPS AMI project was deployed under budget.

WPS has experiences significant savings and benefits as a result of their TWACS deployment totaling over \$19 million per year. It took a little less than three years for WPS to identify the savings described above. The breakdown for this savings is shown in the following table.

Task	Annual Cost Savings
Meter reading cost savings	~12.5 million
TOU meter reading cost savings	~ 5.3 million
Estimated reading cost savings	~100,000
Billing process improvement	~300,000
Seasonal meter reading cost	~50,000
Outage Assessment savings	~60,000
Power Out Calls	~500,000
Summary billing (Consolidating Accounts)	~200,000

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TWACS UMT module can map to virtually any meter register to retrieve and transmit the data stored in the meter register.

- ⊗ Diagnostics. The UMT performs daily diagnostics which are reported to the master station. The UMT can also be mapped to the meter diagnostics registers to retrieve and transmit the data from those registers.
- ⊗ Demand Data Response. Some TWACS modules measure the amount of energy used in a given number of minutes and store the highest usage. The interval may be set to 15, 30, or 60 minutes. This capability includes a demand reset function for each module.
- ⊗ Tamper/Theft Detection. Customers who pirate electricity either disconnect the meter for a period of time or turn the meter to run in reverse. TWACS detects such tampering to reduce energy theft.

Daily Consumption Reads

The TWACS Universal Metering Transponder (UMT) performs a self-read at a utility designated time, with the default time set at midnight. These readings are stored in separate memory location with the date and time in which the readings were made. The master station receives these readings from the transponder each day.

Daily Demand Usage

Demand Metering for the UMT-R (for Single Phase Meters)

The UMT-R performs demand metering calculations using Forward Energy only (in Wh). Demand calculations are not performed for reverse energy flow.

Demand Calculation

The Maximum Demand Measurement is the highest demand measured over a specific period of time - typically over one billing cycle. It is primarily used for billing purposes and for stability analysis of the overall power system. The demand intervals supported by the UMT-R are 15 and 30 minutes and use the fixed and rolling block methods of calculation.

The Write UMT Registers command is used to change the demand interval duration from 15 (default) to 30 minutes if required. The interval value is stored in the Demand Configuration register.

At the end of each interval, the demand interval is compared to the Demand Maximum register. If higher, the demand interval overwrites the Demand Maximum register and the Demand Date/Time Maximum register. The demand interval is then cleared and the interval timer is restarted.

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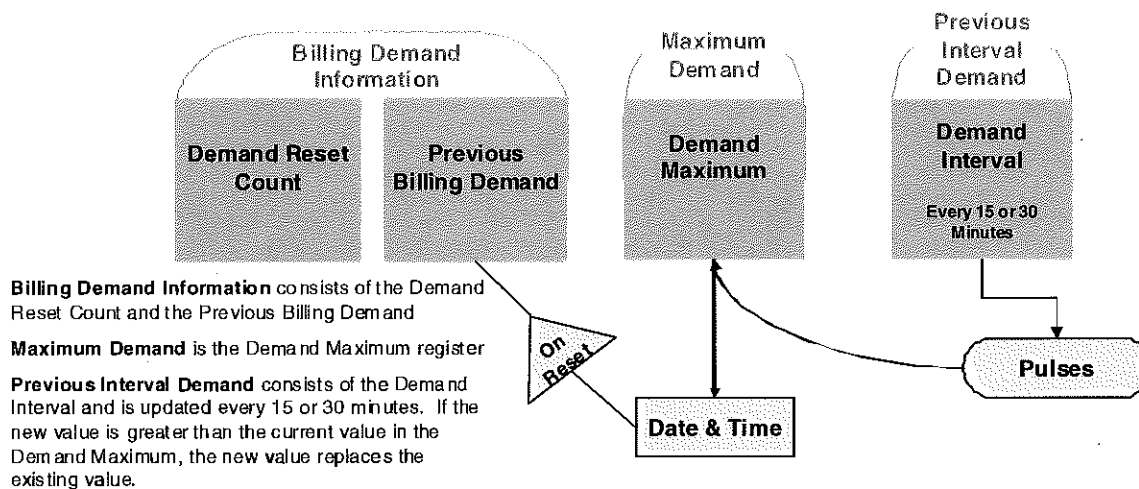


Figure 8: Demand Calculation Diagram

Fixed Block Demand Interval

The UMT-R offers the ability to collect Fixed Block Demand Intervals of data. A Fixed Block Demand interval is a customer-selected, modifiable period of time at the end of which the demand calculation is performed.

Rolling Block Demand Interval

The Rolling Block Demand interval has the “fixed” interval divided into a set number of subintervals. Instead of calculating demand at the end of each interval, the calculation is performed at the end of each subinterval, and totaled and averaged for the entire interval. Greater accuracy results and in some cases parameters such as maximum demand for an interval can change.

Demand Metering in the UMT-C (for Polyphase Meters)

The UMT-C-KV is configured to perform Demand Metering by reading demand-related values from the meter’s ANSI Standard Table 23 and 63. The UMT-C-KV can retrieve these values from the appropriately mapped meter registers. These locations can be mapped to any available Meter Map Register, except for Meter Map Register 1, and 3 through 7.

Time-of-Use

The TWACS solution supports time-of-use (TOU), Critical Peak Pricing (CPP) and Real-Time Pricing by collecting interval data from all participating meters so that the time at which consumption occurs is reflected in energy pricing. This functionality allows the greatest flexibility in rate design, as well as the ability to rapidly create new rates/tariffs from the interval data, without requiring a meter data retrieval change.

The system provides each day’s interval information to the utility by the following morning. This ensures the proper allocation of energy charges into the appropriate rate block, and also facilitates the communication of energy consumption and resulting costs to end users. The TWACS system can provide the information to end-use customers within a set timeframe,

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which allows them to associate their usage and resulting costs in a timely manner. The TWACS system provides the raw hourly interval data.

Through integration with a Meter Data Management System (MDMS), like Aclara Software's Energy Vision suite, this raw data can be used to calculate Time-of-use rates and other billing information.

Hourly Data

Hourly interval data can be acquired from all Aclara PLS residential and commercial AMI modules using a combination of intelligence in the module and in the network. The TWACS UMT module provides multi-channel interval data at a 15-, 30- or 60-minute resolution without the need for "mass memory" in the solid-state meter. The TWACS UMT module can also store up to 35 days of data in the module, depending on configuration.

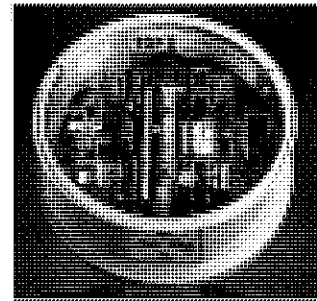
The TWACS network provides the time synchronization information to all modules in the system without the need for batteries, and the modules subdivide consumption into the appropriate resolution "bins" for later retrieval. This is a reliable approach, shown to scale up to 1 million plus meters.

Remote Disconnect/Reconnect

Aclara PLS' DSI, shown in Figure 9, is comprised of a collar, a Class 200 latching switch and a Aclara PLS transponder, all integrated together into a single cost effective unit. The DSI is a completely self-contained product that has integral TWACS communication capability, is uniquely addressable, and operates independently of the revenue meter.

Figure 9: Disconnect Switch Interbase (DSI)

The DSI uses the same proven and reliable TWACS communication to allow the Shelby Energy Cooperative to remotely connect or disconnect the customer, obtain confirmation of command operation, provide for status verification and allow for both supervised and directly controlled connection. A TWACS command to the transponder instructs the switch to open, de-energizing the premise immediately. This can be verified by checking the existence of, or lack of, load side voltage through TNS.



When the Shelby Energy determines that the premise is to be re-energized, an "arm" command is sent using the TWACS system, allowing the consumer to depress a reset button mounted on the collar, energizing the premise. In the case where a meter is inaccessible to the consumer (e.g., apartment or condominium), the Shelby Energy Cooperative can perform this step remotely after verifying that the premise is, in fact, prepared to be energized. The status of the connect/disconnect switch can be verified by checking for the existence of, or lack of load side voltage through TNS. Connects and disconnects can also be scheduled to take place at a future date/time.

The DSI provides a solution for CL200 240V and 208V (network) installations, including meters automated with a TWACS transponder and non-automated meters. The DSI supports 208V and 240V applications in meter form 2S, 25S and 12S 9 O'clock position.

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Distribution Power Quality Monitoring.

PROasys Power Reliability and Blink Count History

Using the Power Reliability and Outage Assessment System (PROasys), described in detail in the next section, Shelby Energy can identify potential problems with the power reliability. PROasys also reports the outage activity on each meter regarding "blinks" and "momentary or sustained" outages. TWACS modules can count outages as short as 5 cycles. Identifying feeders, or segments, with frequent or large outage counts enables a utility to proactively deal with momentary interruptions before they become a sustained outage (e.g., recloser lock-out). This feature enhances Shelby Energy's ability to analyze power delivery reliability and determine if, and where, maintenance is needed.

TWACS PROASYS(TM) - [Blink History for Meter Number 93215054]

File View Window Help

Meter: Premises:
Cust Acct: Serial Num:

From	To	Num Blinks	Elapsed Time	Total Blinks
17-Sep-2007 3:12:59 AM	18-Sep-2007 3:04:30 AM	0	0 Days 23:51:32	22
16-Sep-2007 3:05:47 AM	17-Sep-2007 3:12:59 AM	0	1 Day 0:07:11	22
15-Sep-2007 3:12:44 AM	16-Sep-2007 3:05:47 AM	0	0 Days 23:53:03	22
14-Sep-2007 3:02:39 AM	15-Sep-2007 3:12:44 AM	0	1 Day 0:10:05	22
13-Sep-2007 3:03:08 AM	14-Sep-2007 3:02:39 AM	0	0 Days 23:59:30	22
12-Sep-2007 3:05:37 AM	13-Sep-2007 3:03:08 AM	0	0 Days 23:57:31	22
11-Sep-2007 3:11:39 AM	12-Sep-2007 3:05:37 AM	0	0 Days 23:53:59	22
10-Sep-2007 3:05:41 AM	11-Sep-2007 3:11:39 AM	0	1 Day 0:05:57	22
9-Sep-2007 3:11:28 AM	10-Sep-2007 3:05:41 AM	0	0 Days 23:54:13	22
8-Sep-2007 3:01:48 AM	9-Sep-2007 3:11:28 AM	0	1 Day 0:09:40	22
7-Sep-2007 3:04:21 AM	8-Sep-2007 3:01:48 AM	0	0 Days 23:57:27	22
5-Sep-2007 3:04:52 AM	7-Sep-2007 3:04:21 AM	0	1 Day 23:59:29	22
4-Sep-2007 3:12:32 AM	5-Sep-2007 3:04:52 AM	0	0 Days 23:52:20	22
3-Sep-2007 3:01:17 AM	4-Sep-2007 3:12:32 AM	0	1 Day 0:11:15	22
2-Sep-2007 3:11:13 AM	3-Sep-2007 3:01:17 AM	0	0 Days 23:50:04	22
1-Sep-2007 3:11:11 AM	2-Sep-2007 3:11:13 AM	0	1 Day 0:00:02	22
31-Aug-2007 3:11:09 AM	1-Sep-2007 3:11:11 AM	0	1 Day 0:00:02	22
30-Aug-2007 3:03:01 AM	31-Aug-2007 3:11:09 AM	0	1 Day 0:08:08	22
29-Aug-2007 3:11:39 AM	30-Aug-2007 3:03:01 AM	0	0 Days 23:51:22	22
28-Aug-2007 3:07:17 AM	29-Aug-2007 3:11:39 AM	0	1 Day 0:04:22	22
27-Aug-2007 3:00:50 AM	28-Aug-2007 3:07:17 AM	0	1 Day 0:06:27	22
26-Aug-2007 3:12:11 AM	27-Aug-2007 3:00:50 AM	0	0 Days 23:49:39	22
25-Aug-2007 3:02:19 AM	26-Aug-2007 3:12:11 AM	0	1 Day 0:09:52	22
24-Aug-2007 3:04:09 AM	25-Aug-2007 3:02:19 AM	0	0 Days 23:58:10	22
--	24-Aug-2007 3:04:09 AM	--	--	22

Status History Voltage History

Ready NUM

start TWACS PROASYS(TM) 4:26 PM

Blink Count Indications of Future Problems

Outage monitoring can be done through the use of the TWACS blink count tracking. Intermittent problems in service can be very difficult to troubleshoot and can be a sign of more major problems to come.

As an example, equipment intermittently failing or tree limbs brushing against power lines may cause a temporary power failure that the customer sees as a blink in their electricity. The customer may not report a minor outage such as this. The TWACS system will see these blinks

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and track them as part of its blink count. Since the meter reports the blink count, the focus on the problem is narrowed to the locations that share the problem. This forewarning might be used to summon tree service personnel focusing on specific neighborhoods and customer locations for trouble, hence narrowing the focus of where major trouble is likely to show. Using this blink count feature of the TWACS system effectively has the potential to save the utility major expenses associated with line repair, not to mention the potential of saving the life of an unfortunate person who could be caught in the wrong place at the wrong time if a power line falls due to the weight of a tree limb.

The UMT-R module for residential single phase meters return line voltage with the accuracy provided by the solid-state meter, typically 1% or better.

Outage Detection

The TWACS network provides a uniquely efficient tool to assist Shelby Energy in determining the scope of outages and supporting restoration efforts. Since the TWACS communications between the substation equipment and the automated meters operates over the power line, the existence or absence of substation-to-meter communications can be used to infer outage status, or confirm customer restoration. This capability is obtained with no additional equipment at the meter beyond the standard TWACS module.

When one of Shelby Energy's customers loses power, the TWACS transponder in the meter will not be able to respond to regularly scheduled automatic meter reads, or to on-request queries. If the consumer notifies Shelby Energy that they are out of power, a utility operator can use an immediate, real-time command, a "Ping", to confirm if the power is in service (if the transponder responds), or support the consumer's claim of non-service (if the transponder does not respond). The TWACS network can then be used to query other meter transponders on the same distribution transformer to determine if it is a single customer problem, or a larger outage.

Once an outage event is confirmed, the operator can send additional TWACS commands to meters in strategic locations along the distribution network, to determine the scope of an outage event. Once the outage scope is understood, the appropriate utility crew can be dispatched to the affected protective device, or problem area, with significantly more information than only customer calls can provide. This improves outage response and can be coupled with a Voice Response Unit (VRU / IVR), or other system, to communicate more detailed information to customers.

Historically, there has been no easy method of confirming power restoration other than physically visiting each meter or calling each customer. The TWACS system enables utilities to confirm restoration remotely without disturbing customers or expending additional time and money in the field verifying meters are energized through the pinging feature.

Aclara PLS' Power Reliability Outage Assessment System (PROasys™) software application further enhances the outage and power restoration verification features of the TWACS system. With PROasys, Shelby Energy will be able to identify customer power status, voltage and power reliability and offers the ability to monitor these functions routinely, even when there are no outages. The application also provides restoration verification and can assist Shelby Energy in reducing unnecessary field visits. The combined power of the TWACS system, PROasys, and

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Shelby Energy's outage management application provides many benefits to utilities and their customers. Some of these benefits include:

- Operational cost savings
- Fewer unnecessary field service calls
- Better data for scheduling preventive maintenance
- Fewer outage events
- Remote verification of power restoration
- Enhanced customer satisfaction
- Reduced duration of outages
- Rapid response to verified outages
- Enhanced customer support
- Improved service reliability
- More efficient and effective outage responses
- Enhanced system maintenance
- Better data for scheduling maintenance
- Fewer outage events

PROasys Remote Outage Detection and Verification

PROasys leverages the power of the TWACS AMI capabilities to provide better power reliability and outage data through regular polling or "pinging" of the endpoints. PROasys will help Shelby Energy identify metering devices that are not communicating with the master station as well as identify the scope and location of the outage. If the Traverse Network function is enabled, selected devices are checked and the network is examined upstream and downstream from the selected devices to find and to determine the extent of the outage event. Once a device is found to be offline, the program checks upstream devices until a meter responds. Based on the extent of the system that was not reached, the program provides the scope of the meters inferred to be offline. Outage assessment jobs can be scheduled on demand, or at regularly scheduled intervals, to pro-actively detect power outages.

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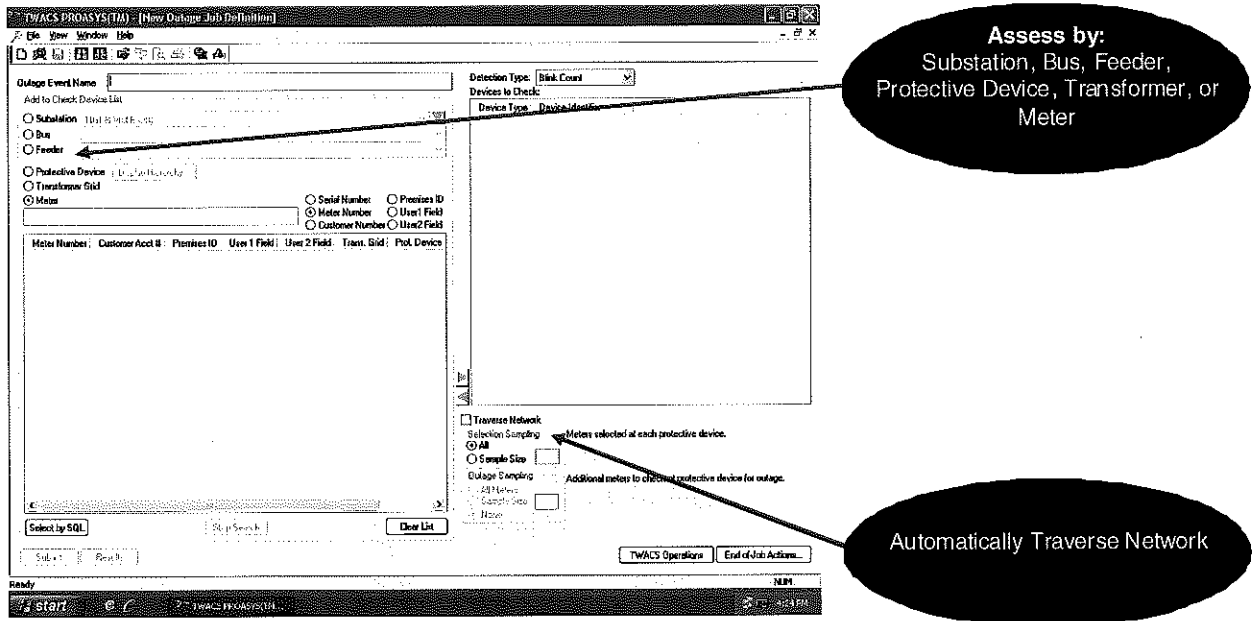


Figure 10: New Outage Job Definition Screenshot

When PROasys discovers an outage while interrogating meters, the application immediately notifies the system operator via email, or pager. Upon notification, a utility operator can ping select a protective device, or service transformer, to randomly sample associated meters, or check specific meters. The following diagram shows how the random sample of associated meters or of a protective device provides information about a reported outage.

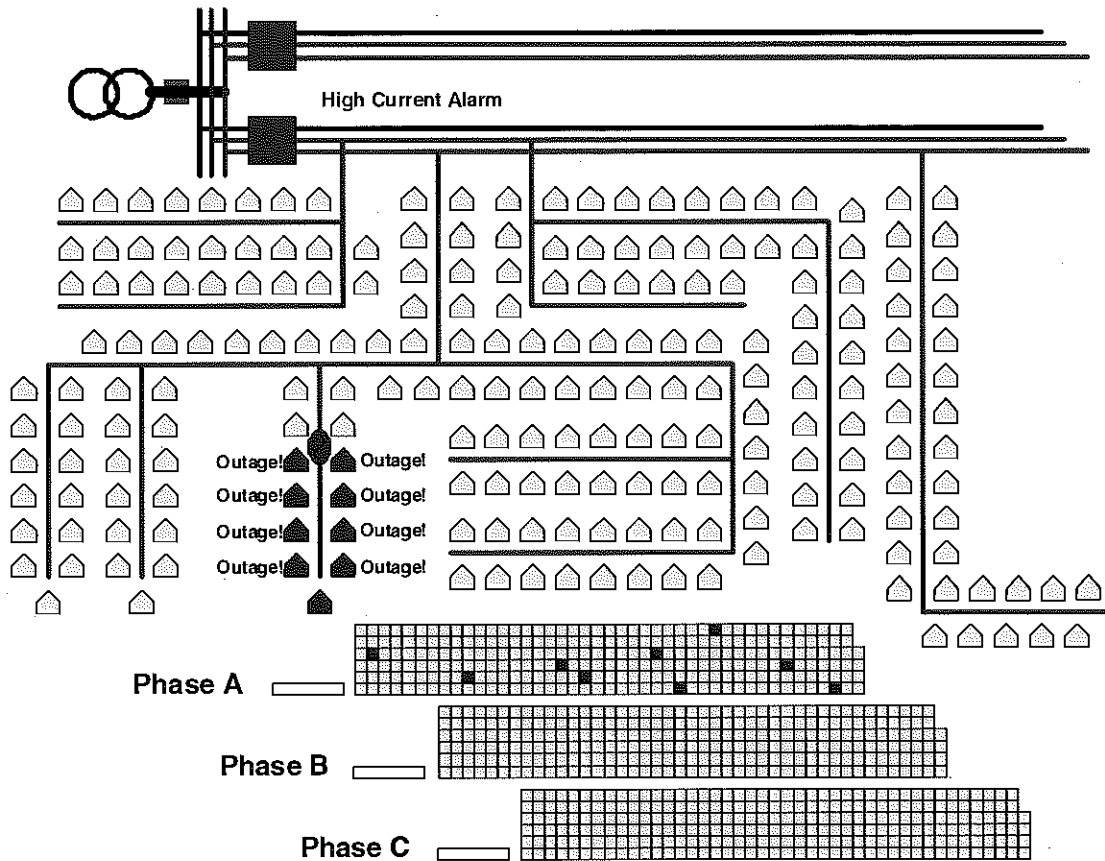


Figure 11: PROasys sampling can find outage scope through the sampling feature

Sample size is user defined and can be configured separately for each outage analysis. Furthermore, the operator could select the substation, bus section, or feeder options at scheduled intervals, to check all available protective devices associated with the selected apparatus or check random devices to determine whether the station, bus or feeder is energized.

Once an outage verification job is created, it can be run once, or repeated at selected intervals. When an outage detection job is complete, the resulting information is displayed in hierarchical format and as a list; it can also be mapped. The ability to enable hierarchical format, or geospatial map display, is dependent on the required electrical connectivity, or location information, being part of the TWACS Net Server database. The list can also be exported to a comma delimited file format for further analysis.

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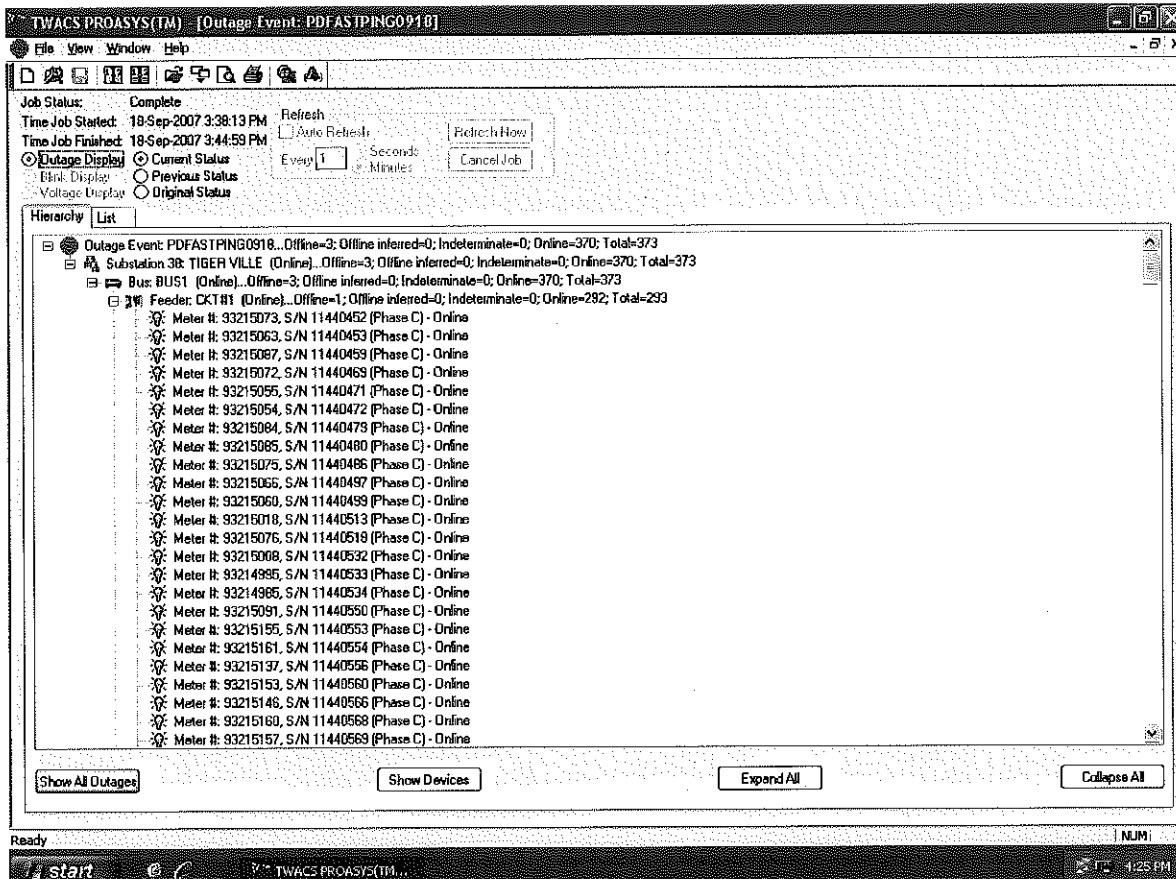


Figure 12: Outage Event Report in Hierarchical Format

PROasys Remote Restoration Detection

Using the monitoring capabilities of the PROasys application, the Shelby Energy will be able to reduce outage duration by providing spot verification of customer outage restoration. This information is helpful as field crews work to restore power and enables the utility to manage outage events more efficiently.

PROasys Efficiency

PROasys offers the ability to send a “standard” ping or a “fast” ping. The standard ping is a three (3) byte message with no payload used by the TWACS system to confirm a meter is “talking.” Leveraging this capability the PROasys application enhances this feature offering a one (1) byte ping (fast ping) for more rapid results. The fast ping will provide data more rapidly (as many as 1,400 meters per minute) for more meters than a standard ping (460 meters per minute). This real-time notification capability enhances the speed and efficiency with which utilities address outage events and provides valuable information to CSR’s addressing customer concerns.

PROasys Outage Event Window

The Outage Event window enables you to view the results of a PROASYS job and provides several display options. The Outage Event window displays the following job information:

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- Name of the Outage Event
- Status of the job (from the Outage Event window)
- Time the job started (from the Select Outage Event window)
- Time the job finished (from the Select Outage Event window) - This field will be blank if the job is still running.

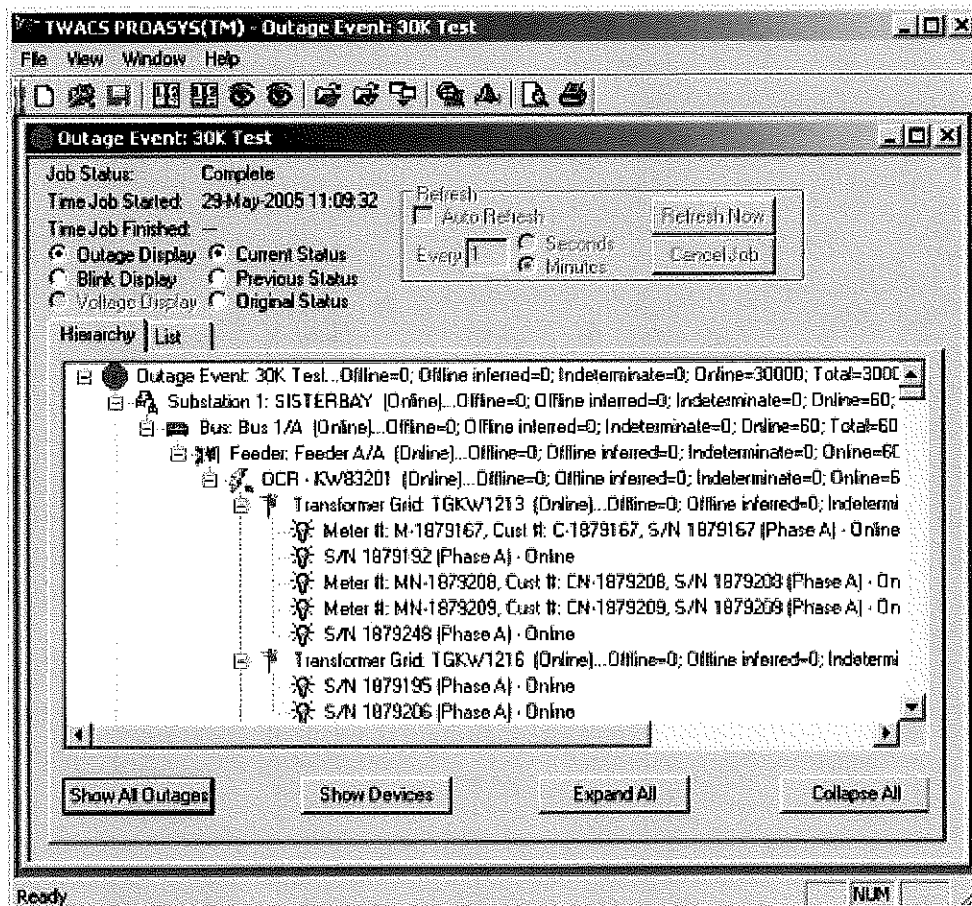


Figure 13: Outage Event Screen

Display Options

The Outage Event window enables you to view by three job status options:

- Outage Display—This option shows the outage information organized by the search criteria entered in the New Outage Job Definition window.
- Blink Display—This option shows the blink count information. Blink count is the number of outages from a customer's location. It is the number of times a transponder experiences loss of power for more than five cycles (ten half cycles). Each Blink Display screen includes a color code chart for use when viewing the Hierarchy display. The colors indicate the number of blink counts from below 0.50 per day to over 5.00 per day.

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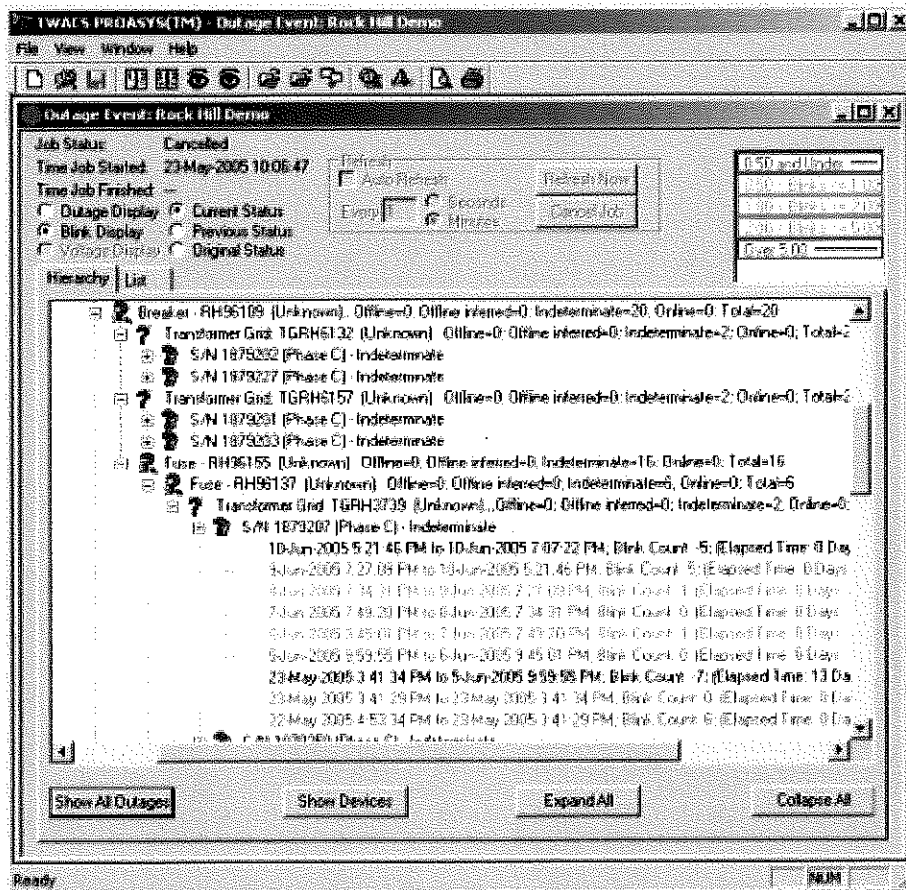


Figure 14: Blink Display

- Voltage Display—This option shows the voltage information. Each Voltage Display screen includes a color code chart for use when viewing the Hierarchy display. The colors indicate the range of voltage from below 95% to over 110% nominal. If a nominal voltage has not been defined for a given type and model or for an individual meter, the text appears in black. For three-phase meters, the voltage displayed and color are based on the phase A voltage.

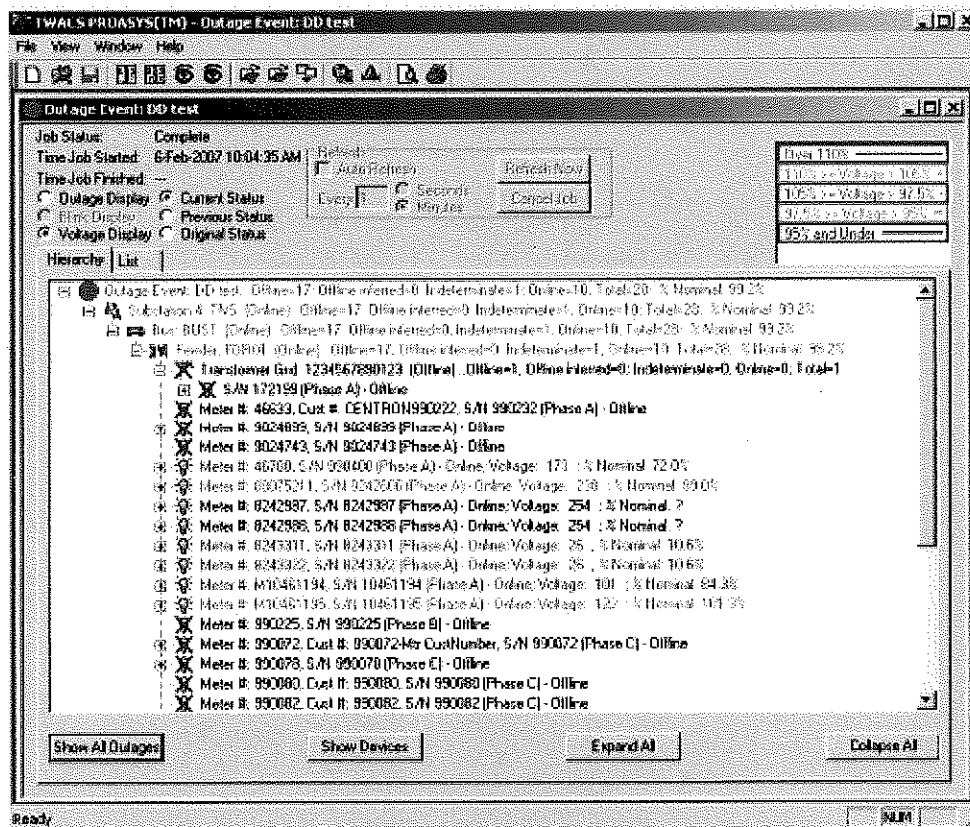


Figure 15: Voltage Display

The Outage Event window enables you to change the display by:

- Hierarchy—The Hierarchy display allows the Shelby Energy to view outages by expanding and collapsing the data according to the desired device in the network hierarchy. Hierarchy is the default display on the Outage Event window. The Hierarchy display has four viewing options.
 - Show All Outages
 - Show Devices
 - Expand all
 - Collapse All
- List—The List display on the Outage Event window displays the resulting Outage information in a list view.
- Map—The Map Display allows the utility to see the locations of the meters selected to review the outage, voltage, blink or other information noted through the system. The map information is read from optional tables containing data for the X/Y coordinates for each meter, transformer grid, and substation. The mapping capability is not required to run the software. The Map display on the Outage Event window graphically displays the results of the Outage check if map information is available for your selection.

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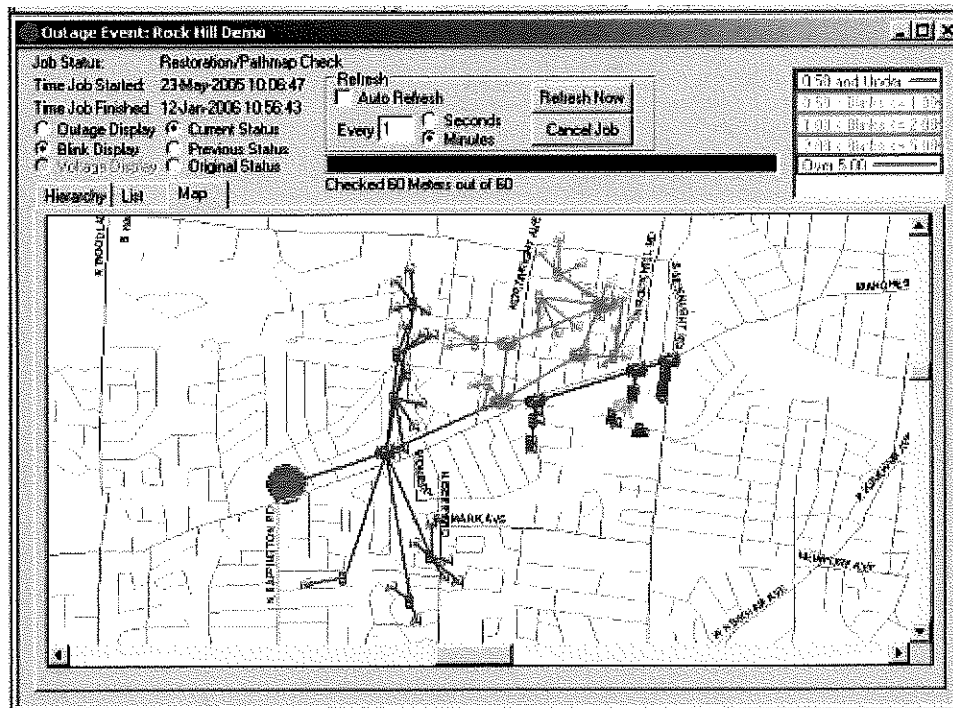


Figure 16: Map Display

Submitting a Restoration Check

Once PROasys has discovered that an Outage event has occurred, and to what extent, the restoration check feature enables you to monitor the Outage event and the status of the efforts to restore power. You can submit multiple restoration checks for a single Outage job.

You perform a restoration check by right-clicking on a device listed in the Hierarchy view and selecting Submit Restoration Check. The check will apply to the selection plus any devices connected to the selection downstream in the network hierarchy. The selections that you chose for a restoration check will be highlighted in green. A status bar may appear before the Submitted message displays, depending on the extent of the restoration check.

Default Email Notifications

Leave the check boxes blank if you do not want to receive email notifications. Select one or more of the check boxes to receive specified email notifications. The available notifications include:

- Job Complete
- Blink Alarm raised for any meter
- Any Meter is Offline
- Any Device is Offline (Protective Device, Transformer Grid, etc.)
- Any Meter is in an Indeterminate State
- Any Device is in an Indeterminate State
- Meter Voltage out of tolerance

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- Device Voltage out of tolerance
- Meter Phase imbalance
- Device Phase imbalance

Integration

The TWACS system and PROasys application have been integrated with a number of third-party software solutions using either flat file interfaces or Aclara PLS' OPTIMUM real-time integration software application. These providers include:

- dataVoice International (Legacy serial interface)
- UAI (Legacy serial interface) (In testing with OPTIMUM)
- MilSoft Dispatch (certified)
- NISC (certified)
- CRC (In Testing)
- C3Ilex (Not formally certified)

Meter Installation and Programming

The Aclara PLS transponder's unique serial number and user-specific configurations are programmed at the transponder manufacturing facility. Shelby Energy will receive a listing of the TWACS serial numbers of transponders (e.g., modules) delivered to them.

TWACS UMT modules are integrated with the underlying meter at the meter manufacturer, prior to shipping. During this process, the meter and module are programmed to provide the functionality required by Shelby Energy. Because the UMT modules are integrated under the glass with the meter, the TWACS-enabled meters are installed using the recommended processes defined by the meter manufacturer.

There is no field programming required for TWACS electric AMI modules. In fact, certain characteristics of the TWACS modules can be remotely programmed after installation. These include TWACS communication related quantities such as two-way addresses for all Aclara PLS devices. For some solid-state meters, register assignments, TOU switch-point schedules and other attributes can be remotely changed; however this is not required when TOU/ CPP data is created from collected interval data.

Once a meter is installed the meter must be searched into the system. The TNS uses the unique serial number of each module for identification when the meter is searched into the system. This process can be programmed into the TNS prior to the installation of the meter. Once this command is initiated, the TNS will locate the meter and perform the first or baseline read of the meter.

Backfeed a Circuit without Loss of Billing Data or Ability to Read Meter

When initially searching meters into the database, TNS records the signaling path between the substation and the meter. Many things happen to change that path, such as switching a section of feeder to a different substation temporarily for load balancing or repair operations, or to rebalance loads on feeders on the same substation.

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Understanding alternate pathmaps requires knowledge of the relationships between the physical distribution plant and the alternate paths over which power, and thus the signal to the meter, might travel. With this knowledge, decisions on what kinds of activities should result in the activation of a TNS pre-planned alternate path search, as well as which activities which should trigger an ad-hoc search, can be made.

As soon as personnel throw the switches, the TNS Operator can instruct TNS to search the relocated meters into the system again, using an alternate pathmap search. TNS will find a new signaling path to those meters.

TNS maintains a record of the old path and the new path in its alternate path tables. As TNS reads meters during normally scheduled reads, TNS uses the original path first. At the end of the read cycle, TNS will re-search meters not "heard", using the alternate path, if either of the Search options (Normal Search or Grouped Search) is selected when setting up the meter reads.

When the rearrangement is complete and the switches return to their normal configuration, meter reading will proceed normally with no intervention on the part of TNS personnel. TNS will quickly find the path to the changed meters because TNS maintained the original pathmap in the Path History table.

Local and Remote Reading

All TWACS enabled meters provide the ability to be read locally through the meter display or remotely through the TWACS system. The TWACS UMT module does not block or hinder the functionality of the meter display. In most solid state meters, the display is capable of showing consumption and demand data. The TWACS system cannot send billing information to the meter but if the meter has the capability, the meter display can be configured to show the information for billing, allowing customers to read the meter locally while on the phone with a customer service representative who can be performing an on-request read at the same time. This ability assists CSRs and customers in confirming the billing information they are provided and confirming the readings of the meters.

Voltage Readings

The UMT-R module for residential single phase meters return line voltage with the accuracy provided by the solid-state meter, typically 1% or better, and requires the PROasys software capability for analysis. The UMT-C obtains 3 phase voltage data every 5 minutes from the underlying meter. Voltage resolution is within 2 volts.

When the master station detects a voltage anomaly it can read and obtain "full meter accuracy" (by reading all the mapped register values) from the meter via the UMT-C. These values are obtained using the Meter Map Registers and reading the pre-defined Meter Data Registers.

PROasys Remote Voltage Detection

The PROASYS application will also monitor and report line voltage right to the customer meter. This capability provides data that can be used both during an outage event and for analysis of the system. This data offers utilities valuable information in defining the scope of an outage as well as analysis of outages during and after the event.

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Reliability Indices (SAIFI, SAIDI, CAIDI)

The UMT registers capture interruption data in the listed categories that can be used to calculate distribution reliability indices as specified in IEEE Std.1366, 2003 Edition, IEEE Guide for Electric Power Distribution Reliability Indices – a standard for power reliability within distribution systems, substations, circuits, and defined regions.

The UMT captures power interruption data as follows:

- Time stamped sustained interruption data.
- Time stamped momentary interruption data.
- Time stamped momentary interruption event data.
- Momentary interruption data.
- Sustained Interruption data. associated Distribution Reliability Indices.

IEEE Standard.1366 defined Distribution Reliability Indices are:

- System Average Interruption Frequency Index (SAIFI)
- System Average Interruption Duration Index (SAIDI)
- Customer Average Interruption Duration Index (CAIDI)
- Customer Average Interruption Frequency Index (CAIFI)
- Customer Total Average Interruption Duration Index (CTAIDI)
- Average Service Availability Index (ASAI)
- Average system interruption duration index (ASIDI)
- Average system interruption frequency index (ASIFI)
- Customers Experiencing Multiple Interruptions (CEMIn)
- Momentary Average Interruption Frequency Index (MAIFI)
- Momentary Average Interruption Event Frequency Index (MAIFIE)
- Customers Experiencing Multiple Sustained Interruptions and Momentary Interruption Events (CEMSMIn)

The TWACS system enables the utility to detect outage counts and collect availability information in real-time, thus helping to isolate trouble and avert more major failures. The following are a few examples of customer problems that might occur.

Read Meter Registers

The TWACS UMT module (for single phase or polyphase meters) has the ability to map to virtually any meter register to retrieve and transmit the data to the master station. There is a relationship between the registers in the meter, the registers in the meter transponder, and meter reading requirements for a rate class. TNS personnel in the utility create the relationship by programming the meters and selecting the appropriate registers in TNS. Once the relationship is established in the TNS, the UMT can retrieve and transmit the data saved by the meter in that register.

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Meter and Module Diagnostics

Each endpoint performs a diagnostic test daily to ensure the module is functioning correctly. The proposed commercial meter modules can map to the diagnostic registers that are available in the host electric meter. These meters perform internal self-tests as well as providing wiring/site installation diagnostics.

If a diagnostic error occurs, a diagnostic flag is set in the TWACS message header and returned with every transmission. On receipt of this flag, TWACS Net Server (TNS) schedules the retrieval of the specific diagnostic registers. This data is available through TNS and can be exported to work management systems.

The UMT-C transponders can read the status registers of the host electronic meters in which they are integrated. These meters have the ability to report incorrect polarities, voltage/current phase mis-wiring, and correct phase angle orientation.

Other meter-generated diagnostics available in the meter registers, to which the TWACS module has access, can be retrieved. The TWACS transponders set an error flag, which is sent with the daily readings. TNS reads the status flags incorporated with the reads, and requests the meter's status register from the transponder. The system then reports the error to the utility. If the utility chooses to map the phase voltages or currents measurement by the meter into corresponding registers in the UMT-C or CMT, then the system can retrieve these values at the accuracy and resolution of the underlying meter.

Demand Reset

UMT-R Demand Reset (for Single Phase meters)

Automatically, at the end of each billing period or at any time on request, the Demand Reset command instructs the UMT-R to execute a Demand Reset. This operation resets the value of the Demand Maximum to zero; but only if the 12-Hour Demand Reset Lockout Timer is inactive.

The 12-Hour Demand Reset Lockout Timer prevents an unwanted demand reset when the UMT-R receives a retry. The timer is nonvolatile and is inactive at power-up. If a Demand Reset Lockout is in effect, a demand reset will not occur. Data from the latest demand reset will be returned in the response. Since the demand measurement may correspond to the utility's billing system, the Demand Reset command ensures the integrity of the customer's bill.

Billing Cycle Self-Read with Demand Reset

To provide increased flexibility and accuracy to the collection of billing values function, the UMT-R performs automatic capture of billing variables. The UMT-R performs a self-read with demand reset on the scheduled billing cycle day. At the scheduled cycle date and the shift time (normally configured for midnight), the module runs the Automatic Shift/Reset Procedure. This process stores consumption and demand data, and performs a demand reset. This procedure is initiated according to the billing cycle date parameter in the Set/Retrieve Billing Parameters command. The serial date is set and stored in the Billing Cycle Date register. When the endpoint current date is equal to or greater than the stored date, and at the time specified by Daily Consumption Shift Time register, the Automatic Shift/Reset Procedure is initiated by the module.

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If the Billing Cycle Date occurs in the past, the Automatic Shift/Reset Procedure is immediately performed by the module when this command is received.

UMT-C Demand Reset (for Polyphase meters)

The Demand Reset command instructs the UMT-C to execute a Demand Reset. This operation updates Meter Data registers, but only if the 255-minute Endpoint Demand Lockout Time is expired. The lockout period is based on the Time/Date Stamp of the last Demand Reset.

When a Demand Reset command is issued, the UMT-C checks for the presence of a lockout condition and if none exists:

- Updates the Meter Data Registers
- Sends the meter a Demand Reset command
- Shifts the newly populated Meter Data Registers to the Historical Data Billing Shift registers
- The actual date and time of this shift is captured in Actual Shift/Reset Timestamp register

The 255-minute Endpoint Demand Lockout Time prevents an unwanted demand reset when the UMT-C receives a Demand Reset retry. The timer is nonvolatile and evaluates the 255-minute lockout at power-up. If a Endpoint Demand Lockout is in effect, a demand reset will not occur. If a shorter lockout time is selected for the UMT-C, the 255-minute lockout time supersedes the shorter value.

The Demand Reset and shift must occur simultaneously, and a Demand Reset can't occur until 255 minutes after the Time/Date Stamp stored for the last Demand Reset. Therefore it is possible that a shift may be delayed by the 255-minute Endpoint Demand Lockout.

Since the demand measurement may correspond to the utility's billing system, the Demand Reset command ensures the integrity of the customer's bill. Billing Cycle Read with Demand Reset When there is a valid date in the Billing Cycle Date register, the same procedure as described in the Demand Reset paragraph automatically executes on the prescribed date and at the time specified in the Meter Daily Shift Time register.

When solid-state multifunctional meters are used, the demand is calculated as specified by the utility defined meter program (if applicable in the chosen meter) displayed by the meter, and retrieved by the TWACS module. The system reads and resets the meter's demand in a high integrity sequence to guard against multiple resets and lost data. This results in the demand value displayed on the meter being the same value as delivered to the billing system, avoiding disputes that can arise when demand is calculated separately from the meter. Other demand features of the meter (cumulative, reset count, date/time) are fully operable and accessible via the TWACS system. This includes all polyphase meters supported by the TWACS system. For meters that are equipped and programmed for TOU, demand can be retrieved for each TOU tier. For meters with reactive measurement capability (e.g., kVAR or kVA), this data can also be retrieved using the TWACS system.

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Tamper Information

The TWACS system can detect meter tampering. Customers who pirate electricity generally do so by either disconnecting the meter for a period of time or turning the meter to run in reverse. Both of these actions are illegal but can be difficult to prove without the TWACS system. TWACS transponders report three items that can indicate tampering:

- No pulses in 24 hours—This indicator identifies if the meter has not recorded energy use in a 24-hour period. In the case of this indicator, the TWACS system allows the utility to track nuisance no pulse indications from barns, light poles, vacation homes, etc., by documenting special fields that allow you to identify customers for whom a no usage would be normal.
- Reverse rotation—This indicator identifies if the meter has run in reverse. A customer may reverse the feeds on the meter causing the meter to run in the opposite direction, thus reducing the customer's usage and bill. The TWACS transponders on the meter can detect this condition, report the theft attempt, and bill for the pulses in the reverse direction. Reverse energy, or "reverse rotation", is monitored continuously by the transponder. When reverse rotation is detected a "reverse rotation indicator" is set. This indicator is checked every time the transponder is read. A positive reverse rotation indication will generate a revenue protection message unless a co-generation flag has been set for the meter in the TNS database. Additionally, the magnitude of reverse energy flow is captured separately in the module and can be retrieved at any time. This value can form the basis for revenue recovery once the Shelby Energy has established the required evidence to support recovery.
- Blink count— When the meter loses power, the transponder in the meter tracks the outage through the blink count. If a customer is intermittently bypassing the power throughout the billing cycle to avoid detection, the TWACS system records the blink count and provides an indication of what is happening. PROASYS tool to retrieve outage counts from all meters and screen these for patterns. The outage counter responds to even brief interruptions (10 milliseconds) of power, so removing a meter from the socket to tamper would be detected and captured by this feature. Therefore, the utility can compare counters from meters that are served from the same portion of the distribution system to detect anomalies. If the counter at a particular premise increments multiple times, potentially as the consumer tampers with the meter, this will be discernable when compared with other premises where the counter(s) have not incremented. Gaps in interval data can also indicate time periods during which the meter was out of the socket, presumably due to tampering.

Another tamper monitoring mechanism is included as part of the Consumption Monitoring Application within TNS. In this application, the Shelby Energy establishes "usage alert thresholds" associated to individual meters. Business rules will interpret data supplied by the utility's customer information system to set usage alert profiles for each meter. For example, "Disconnected Electric Meter," "Lighting meter," and "Restaurant" could be profiles. Alternatively, a user can manually set the usage alert profile for a meter.

- Each usage alert profile consists of one or more "usage alert checks". Each check consists of up to four tests applied to a meter's recent usage history:

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- Identify meters where the current day's daily usage is greater than or less than a specified value.
- Identify meters that had a reduction or increase of x% in daily usage, comparing the most recent y days with the previous z days.
- Identify meters with outages within the past x days. These outages may be ignored if they correlate with other meters on the same transformer or isolating device since this would likely be a power outage, rather than a tampering event.
- Identify meters with a "24 hours with no pulses" indication within the past x days.

The user also establishes a "severity" for each usage alert check, to help prioritize the messages that are generated when the check fails. The user also has the option to assign each usage alert check to a calendar. For example, the user may not want to check for no usage during the summer for certain gas meters, or during the winter for an electric meter dedicated to a swimming pool pump.

Each morning, a process will run the alert check(s) specified by each meter's usage alert profile. Failed checks will generate messages. The user can view all meters that have had revenue protection messages for a specific date range. For each meter with messages, the user can view the actual messages, recent readings, outages, and alarm flags. After investigation, the user can update the meter's usage alert profile and add the meter to the revenue protection watch list.

Taken together, this series of tamper detection measures provide an excellent substitution for the present "eyes in the field" represented by the utility's meter readers. With the tools provided by the TWACS solution, the Shelby Energy should be able to determine the most likely sites where tampering occurs and the times of day during which activities occur. Armed with this data, the Shelby Energy is empowered to catch possible tampering "in the act" and to capture evidence that may be required for any subsequent prosecution and revenue recovery proceedings.

Incremental Deployment and Expansion

Aclara PLS designed the TWACS system to be a modular system to enable growth and expansion as a utility's service territory grows or as new products are added to the system. The TWACS architecture is inherently scalable. Aclara PLS utility customer experience has proven that the system can be deployed and operated for installations as small as a few thousand meters to projects in excess of a million. The TNS Master Station is designed to handle the expected data and processing requirements of the system as installed. However, with simple hardware upgrades, it can be expanded to accommodate normal system growth, or step increases, in coverage and design. The equipment installed in the utility's substations comprises an independent paralleled architecture that can be expanded through the simple installation of substation equipment in each additional substation added to the system. And of course, the TWACS transponder family of products provides unlimited endpoint scalability.

The key to planning a TWACS deployment is to understand the order in which the system components need to be installed. As noted earlier, the TWACS system is a three tiered system. These three tiers determine the "order" in which the system is deployed. The first step is to install the master station. Aclara PLS will load the master station software onto the servers purchased by Shelby Energy. Once the software is loaded, the servers are shipped to the utility

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to be installed at Shelby Energy's designated office. The TWACS master station resides behind Shelby Energy's firewall and as part of the utility computer systems network. Once the master station server is installed, the Substation Communications Equipment (SCE) are installed. Finally, once the SCE are installed, the Endpoints can be installed. This process can be modified to enable a more cohesive and rapid deployment by staging the installation of endpoints based on the completion of each substation's SCE installation.

The modular nature of the TWACS system enables utilities to add to their systems, whether by service territory growth or new program development (such as adding load control functionality), without having to replace the system.

Meter Reading Performance and Accuracy

Broad experience shows success will be excellent with the proposed system. The TWACS system is a very reliable and functional system capable of providing daily reads with a high success rate. In fact, many of our customers experience successful reads at rates higher than 99.5%.

The system automatically generates multiple read attempts when communications appear to be disrupted. Through this inherent capability, the system will be able to identify potential problems with a meter or even potential problems within the power system such as outages. If a module continues not to respond, the system will flag that module to allow Shelby Energy the ability to see that the meter is not responding and will provide an error code which identifies the issue with that module.

Performance measurements must be calculated based on the real performance of the system by factoring out causes which do not stem from the TWACS technology, such as

- Power outages during a TWACS message
- Modules which may have failed but have not yet been replaced
- Back-haul communication outages
- Path switches which occur just before the end of an hour and have not been restored before the hour ends
- Database entry errors
- Human errors in operating or maintaining the system, etc.
- Meters that are not actually installed but are included in the database

Customer Experience: PPL Electric Utilities
 The PPL AMI project consisted of 1.4 million meters in a 10,000 square mile 5 region service area. All meters and a total of 116 substations were installed in less than 26 months. PPL uses the TWACS system to read all meters daily and consistently attains success rates above 98.5% for hourly interval data and on-request (on demand) reads and over 99.5% for monthly billing data. PPL has integrated their TWACS system with their Aclara MDW and their billing system.

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Aclara PLS Support Services

A key aspect of Aclara PLS' strength, and the success that Aclara PLS' utility customers have experienced in deploying the TWACS system, is the high level of customer service Aclara PLS provides. This is important since a utility deploying an AMI system must take on these roles for those AMI providers which do not provide this level of service. This could add complexity and increase both risk and cost for those utilities. The scope of support services include the following activities:

Deployment Support

Aclara PLS will assign an overall project manager (PM) to act as the key executive contact and have overall responsibility for Aclara PLS' activities. The PM also handles logistics support, including the coordination and delivery of the appropriate types and quantities of meter transponders to Shelby Energy, its designated retrofit contractor, or the meter manufacturers. Other resources are responsible for general field services support, including system initialization, substation start-up, training, etc.

One objective of this team is to assure that the TWACS system meets the critical functions and services required by Shelby Energy. Shelby Energy, or its agent, is expected to handle most day-to-day situations including backhaul circuit, substation hardware failures and general system operation including system operation, database maintenance and back up issues.

Shelby Energy will have responsibility to operate the system and deliver the data. Normal TWACS operational issues will be handled by the support team, or via Aclara PLS' call center and technical support services group. Normal customer care support hours are 6:30 am to 6 pm Central Time, Monday through Friday, excluding holidays. Support includes assistance with normal use of the software to obtain data in accordance with specifications agreed to by Aclara PLS and the utility, and correction of software non-conformities. Aclara PLS offers optional premium level service, with support personnel on call during non-business hours to support critical billing issues related to the TNS Master Station application, hardware and software.

One goal of the Aclara PLS deployment support activities described above is to prepare Shelby Energy to operate and maintain the TWACS system. Once the initial system deployment is completed, Aclara PLS' role transitions into stable long-term support.

Post-installation Support

Aclara PLS has a dedicated and knowledgeable technical support and customer care organization whose function is to provide excellent customer service to Aclara PLS' customer base. Aclara PLS operates a call center to handle routine customer calls, or to route more complex calls to the appropriate specialist. For lower priority needs, the Customer Portal on Aclara PLS' website and TWACS email support can be helpful. Some of these resources will also be involved in the initial deployment of the system at Shelby Energy and will be knowledgeable of the installation.

Aclara PLS strives to provide a high level of support for all its customers. Technical Support personnel are available to assist Shelby Energy with TWACS software, SCE, or endpoint related questions or problems. If the problem is quality related or manufacturing issues, personnel from these departments will address the issue. Internal Aclara PLS systems will ensure all queries by

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Shelby Energy are dealt with in an appropriate time period. The choice of support service tier level will define parameters such as hours available and response time window.

Service Levels for Technical Support

The following descriptions provide a summary of the three levels of support: Standard, Enhanced and Premium.

Standard

Aclara's Standard Support services include firmware and software upgrades, telephonic support, access to the customer portal and emailed notifications for business-related service advisories.

Full descriptions are provided below:

- Customers will receive all applicable firmware upgrades for the hardware.
- Customers will receive all applicable TWACS Server software upgrades and service packs.
- Aclara will provide toll-free telephonic technical support between the hours of 6:30am-6pm Central Time (CST) Monday-Friday, except Aclara PLS holidays.
- Aclara will contact the customer and begin working on the issue ticket within two business days (16 business hours).
- Aclara PLS will provide customer telephonic support and training for two (2) designated customer contacts
- Scheduled telephone support for installation of TNS software upgrades
- Customers will receive individual user names/passwords to technical side of the TWACS web-site (customer portal).
- Customers will receive emails of Aclara PLS business-related service advisories

Enhanced

Aclara's Enhanced Support services include firmware and software upgrades, discounts on certain hardware repair or replacements, telephonic support, issue management reports, on-site labor rate discounts, follow-up training and access to the customer portal and emailed notifications for business-related service advisories. Full descriptions are provided below:

- When an estimate of repair is given from Service & Repair for Out of Warranty SCE/RCE equipment, Aclara PLS will reduce the cost of the estimate by 10%.
- If a firmware upgrade is required on an SCE board, the board can be sent to Aclara PLS. Aclara PLS will have the firmware upgraded and send the board back to the customer within 5 business days.
- Customers will receive all applicable firmware upgrades for the hardware.
- Customers will receive all applicable TWACS Server software upgrades and service packs.
- Aclara will provide toll-free telephonic technical support between the hours of 6:30am-6pm Central Time (CST) Monday-Friday, except Aclara PLS holidays.

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- Aclara will contact the customer and begin working on the issue ticket within one business day (8 business hours).
- Aclara PLS will provide customer telephonic support and training for five (5) designated customer contacts
- Customers will be able to schedule telephone support for installation of TNS software upgrades
- Customers will receive individual user names/passwords to technical side of the TWACS web-site (customer portal)
- Customers will receive emails of Aclara PLS business-related service advisories
- A Ticket Activity Report will be sent to the customer on a quarterly basis
- Aclara will provide a 25% discount on labor rates on up to 2 day Aclara PLS support service on-site visit.
- Aclara will provide follow-up TWACS training (in St. Louis) which may be refresher courses or full new-hire training for customer designated contacts, as appropriate.

Premium

Aclara's Premium Support services include firmware and software upgrades, telephonic support, access to the customer portal and emailed notifications for business-related service advisories. Full descriptions are provided below:

- If SCE equipment (under warranty) fails in the field, replacement equipment will be shipped to the customer within two (2) business days.
- When an estimate of repair is given from Service & Repair for Out of Warranty SCE/RCE equipment, Aclara PLS will reduce the cost of the estimate by 10%.
- If a firmware upgrade is required on an SCE board, the board can be sent to Aclara PLS. Aclara PLS will have the firmware upgraded and send the board back to the customer within 5 business days.
- Customers will receive all applicable firmware upgrades for the hardware.
- Customers will receive all applicable TWACS Server software upgrades and service packs.
- Customers receive toll-free telephonic technical support between 6:30am to 6pm, then on-call technical support after 6pm and before 6:30am Central Time (CST) 24-hours a day/7 days a week/365 days a year.
- Technical Support will contact the customer within 4 hours and begin working on the ticket.
- Aclara PLS will provide telephone support and Aclara PLS training for seven (7) customer designated contacts
- Customers will be able to schedule telephone support for installation of TNS software upgrades.
- Customers will receive individual user names/passwords to technical side of the TWACS web-site (TWACS customer portal)

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- Customers will receive emails of Aclara PLS business-related service advisories
- A Ticket Activity Report will be sent each month to the customer.
- Aclara will offer 25% discount on labor rates on up to 5 day Aclara PLS on-site support service visit.
- Aclara will provide follow-up TWACS training (in St. Louis) refresher class or for new hire(s) for the seven (7) designated contacts.

System Training

Aclara PLS has extensive training provisions for users of the TWACS system. Aclara PLS can provide on-site training for Shelby Energy users in conjunction with TWACS system initialization and start-up. Aclara PLS also provides group classroom training at Aclara PLS' facility in St. Louis, Missouri. Shelby Energy may prefer a train-the-trainer approach to some or all of the courses. Standard classroom training offered at present includes:

- Substation Communication Equipment Maintenance
- TWACS Net Server Basic Operations
- TWACS Net Server Advanced Operations and Configuration
- Electromechanical Meter Retrofit Training

Additional information about the Training Aclara PLS provides has been provided in Exhibit A.

Warranty Information

The TWACS system software (as well as the PROasys and OPTIMUM software) is warranted for 12 months and the warranty for the hardware is for 18 months from date of shipping to customer. Aclara is open to discussing an extended warranty, including terms, conditions and costs, if desired. Aclara PLS has provided our exact standard warranty language in our sample contract provided as Exhibit B. We have also included copies of our Support Services Agreement in Exhibit C and our Software License Agreement in Exhibit D.

References

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Exhibits

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EXHIBITS

- Exhibit A—Training Course Descriptions
- Exhibit B—Sample Master Agreement
- Exhibit C—Sample Support Services Agreement
- Exhibit D—Software License Agreement



Customer Training Agenda for 2008

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Aclara is committed to improving the technical training courses and 2008 will see many new changes: Regional Training Classes, new training facility, and new training courses. 2008 training will incorporate existing material into different classes and add new training material to reflect new products. Watch the Customer Portal for new training opportunities.


Our PROASYS™ WebEx training has been very successful. This 2 hour interactive training experience is for anyone who would like to learn how to operate the PROASYS program. (See fee information below.) The first class is free for customers who have purchased PROASYS.

The Online Registration has successfully been used for the last year. When registering for a class the attendee is requested to identify which of the following applies: Premium Level Support Service Agreement, Enhanced Level Support Service Agreement, New Customer prior to the 15 month anniversary of the contract date, or Other. Be sure to correctly identify your utility's status; You may verify your status by contacting CARE.

Enhanced and Premium Level Support Service Agreements contain provisions for 3 people to attend training at no additional cost each year the Support Service Agreement is in effect.

New customers who have not yet reached 15 months after the contract date have eight training seats provided as part of the purchase contract. After 8 training seats have been used, the utility will need to purchase any additional training.

Following are the off-site training prices as of October 1, 2007:

Training Class	Cost per Class
TNS Basic (five days)	
TNS Advanced (four days)	
SCE and Meter Integration (three days)	
Load Control (one day after TNS Advanced)	
PROASYS™ WebEx class (two hours)	
TWACS OC WebEx class (two hours)	
Off-site training per day for 8 attendees or less	
Off-site training for greater than 8 attendees (cost per person per day)	



Customer Training Agenda for 2008

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Aclara presents the TWACS® System Customer Training agenda for 2008. This training covers three different parts of the TWACS System: TWACS Net Server (TNS), Substation Communications Equipment (SCE), and Meter Integration for residential and commercial meters. Each class listed is conducted at our St. Louis headquarters office. Training at a customer's site is available upon request. Talk with your Program Manager concerning availability and cost.

TNS Training program is divided into three courses: Basic, Advanced and Load Control

TNS Basic training is a hands-on five-day learning experience designed for Billing Administrators, Customer Engineers, Customer Service Representative Managers, Substation and Transmission Engineers, TNS Operators and TWACS Project Managers. It is recommended that this course be attended prior to TWACS installation.

The course covers the following subjects:

- TWACS System
 - Applications
 - User Roles
 - Design
- TNS System Design
- Automatic Meter Reading
 - Receiving Meters
 - Understanding Substation Communication and Architecture
 - Adding Substations to TNS
 - Searching Meters into TNS
 - Batch Searching Meters into TNS
 - Dealing with Failed Searches
 - Reading Residential Meters
- TNS Server Basic Maintenance
 - Server Startup and Shutdown
 - Client Setup



Customer Training Agenda for 2008

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TNS Advanced training is a hands-on four-day learning experience designed for Billing Administrators, Customer Engineers, Customer Service Representative Managers, Substation and Transmission Engineers, TNS Operators and TWACS® Project Managers. Prerequisites for this training course are TNS Basic and a minimum of six months experience operating the TWACS system.

The course covers the following subjects:

- Reading Mapped-Register Meters (Commercial and some Residential Meters)
- Alternate Path Maps
- Function Group (Two Way) Addressing
- TNS Service Disconnect/Connect Manager
 - BLP
 - Aclara Disconnect Service Interbase (DSI)
- Fraud and Theft Prevention Applications
- Test Communication Tool
- Troubleshooting Substation to Meters
- Using the SCE Logs
- Consumption and Substation Traffic Monitoring

Load Control training is a single day of training immediately following TNS Advanced. It will be scheduled for the Friday following each TNS Advanced class. All Load Control features will be covered in detail in this 8 hour class.

NOTE 1: TNS updates will be added to the TNS Basic and Advanced training classes as they become available.

NOTE 2: The most recent version of the TNS Operational Process Guide is used for TNS training.

NOTE 3: TWACS Operations Center (OC) will be taught in conjunction with Oracle forms during the TNS Basic class.



Customer Training Agenda for 2008

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SCE Training class is designed for anyone involved in TWACS® system operations, maintenance, or troubleshooting. The class covers the SCE equipment from the hardware and functional perspectives, as well as the interaction between the various SCE components. It is recommended that this course be attended prior to TWACS installation. The course covers the following subjects:

- SCE Principles and Philosophy
 - Substation Communication Equipment (SCE)
 - Modulation Transformer Unit
 - Transient Suppression Capacitor (TSC)
 - Outbound Modulation Unit (OMU)
 - Control & Receiving Unit (CRU)
 - Inbound Pickup Units (IPUs)
 - How It's All Connected
 - Notification Logs
 - Troubleshooting
 - Substation Test Set (STS)
- Phase Rotation

Meter Integration training (a "hands-on" training program) covers integrating the IMT, EMT, UMT and CMT transponder modules and meters. The course is designed for anyone involved in the process of adding Aclara transponder modules to existing meters. Each class involves IMT, EMT, UMT and CMT integration.

IMT, EMT, UMT

- Meter Integration Documentation
- Physical integration (IMT, EMT, & UMT)
- Test Software
- Integration test equipment
- Field returns
- Module testing
- Meter Shop Tool System
- SRTU, PIA, and PRTU operation

CMT

- CMT Familiarization Review
 - CMT integration process (Vectron, S4E, Sentinel meters)



Customer Training Agenda for 2008

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ACLARA Technical Training Schedule Lambert Pointe – St. Louis, MO

Month	Date	Training Class	Location
January	12/31-1/4	Holiday	
	8-10	SCE	STL LP-2
	11	PROASYS™	WebEx
	14-18	TNS Basic	STL LP-1
	21-25		
	28-31	TNS Advanced	STL LP-1
February	2/1	Load Control	STL LP-1
	5-7	Integration	STL LP-2
	8	PROASYS	WebEx
	12-14	SCE	STL LP-2
	18-22	TNS Basic	STL LP-1
	25-29		
March	4-6	SCE	STL LP-2
	5	TWACS OC	WebEx
	7	PROASYS	WebEx
	10-14	TNS Basic	STL LP-1
	12	TWACS OC	WebEx
	17-20	TNS Advanced	STL LP-1
	19	TWACS OC	WebEx
	21	Load Control	STL LP-1
	24-28		
April	3/31-4/4	TNS Basic	STL LP-1
	2	TWACS OC	WebEx
	8-10	Integration	STL LP-2
	14-18	Reserved – Users Group	STL LP-1
	22-24	SCE	STL LP-2
	23	TWACS OC	WebEx
May	4/28-5/2	TNS Basic	STL LP-1
	6-8	SCE	STL LP-2
	7	TWACS OC	WebEx
	9	PROASYS	WebEx
	12-15	TNS Advanced	STL LP-1
	16	Load Control	STL LP-1
	20-22	Integration	STL LP-2
21	TWACS OC	WebEx	
	26-30	Holiday	
June	2-6		
	10-12	SCE	STL LP-2
	13	PROASYS	WebEx
	16-19	TNS Advanced	STL LP-1
	20	Load Control	STL LP-1
	23-27	TNS Basic	STL LP-1
	30-7/4	Holiday	
July	7-11		
	15-17	SCE	STL LP-2
	18	PROASYS	WebEx
	21-25	TNS Basic	STL LP-1
	28-8/1		



Customer Training Agenda for 2008

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August	4-8 12-14 18-21 22 26-28 29	TNS Basic Integration TNS Advanced Load Control SCE PROASYS	STL LP-1 STL LP-2 STL LP-1 STL LP-1 STL LP-2 WebEx
September	1-5 9-11 12 15-19 22-26	Holiday SCE PROASYS TNS Basic	STL LP-2 WebEx STL LP-1
October	9/29-10/2 3 7-9 10 13-17 20-23 24 28-30	TNS Advanced Load Control Integration PROASYS TNS Basic TNS Advanced Load Control SCE	STL LP-1 STL LP-1 STL LP-2 WebEx STL LP-1 STL LP-1 STL LP-1 STL LP-2
November	3-7 11-13 14 17-20 21 24-28	TNS Basic SCE PROASYS TNS: Advanced Load Control Holiday	STL LP-1 STL LP-2 WebEx STL LP-1 STL LP-1
December	1-5 9-11 12 15-19 22-26 29-1/2	TNS Basic Integration PROASYS Holiday Holiday	STL LP-1 STL LP-2 WebEx

NOTES:

- 1 Aclara's Lambert Pointe Training Center in St. Louis has two dedicated training rooms. These are designated as STL LP-1 and STL LP-2.
- 2 Classes in bold are full. Those listed in blue are new classes, and those listed in green are WebEx classes. Dates listed in red are holidays.
- 3 St. Louis classes are on a first come, first serve basis. Class size is limited to 17 attendees for STL LP-1 and 9 attendees for STL LP-2.
- 4 Minimum class size is 6 attendees.
- 5 Contact the Technical Training Department to schedule an off-site class.
- 6 The registration cutoff date is two weeks prior to the first day of class. Classes are subject to cancellation due to insufficient enrollment.
- 7 WebEx classes are limited to the first 10 registrants
- 8 WebEx classes start at 10am.



Customer Training Agenda for 2008

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Training registration and/or cancellation must be submitted via online portal. An email confirming your seat(s) in the class, a map of Aclara's location, hotel information will be sent to the address you provided during registration. Two weeks prior to class, a Customer Care representative will call to confirm your attendance.

For more information, please contact:

Aclara Customer Care

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Fax: (314) 895-6406

E-mail: care@AclaraTech.com

Website: AclaraTech.com

Aclara Power-Line Systems, Inc.

601 Lambert Pointe Dr.

Hazelwood, MO 63042-2697

MASTER AGREEMENT

This Master Agreement is made and entered into as of the date last signed (the "Effective Date) by and between:

Aclara Power-Line Systems Inc. a Missouri corporation
945 Hornet Drive
Hazelwood, MO 63042
(Referred to herein as "ACLARA")

and

(Referred to herein as ("Purchaser"))

Collectively, ACLARA and Purchaser may be referred to as "Parties."

Whereas, ACLARA has developed a proprietary power line communication system comprised of equipment and software (the "TWACS® Technology System") that provides for two way communication with electric, gas and water meters and other devices; and

Whereas, Purchaser desires to acquire from ACLARA a TWACS Technology System to be utilized by Purchaser for the automated meter reading of residential, industrial and commercial electric meters and for other purposes;

Now, Therefore, in consideration of the mutual covenants set forth herein, and intending to be legally bound, the Parties agree as follows:

1. **Definitions.** The following words and phrases shall have the following meanings for the purposes of this Master Agreement.
 - a) "**Master Agreement**" means this document and the following Exhibits all of which are attached hereto and made a part hereof, and any amendments, modifications or supplements thereto or attachments incorporated therein:
 - i) Exhibit A—Product Deliverables
 - ii) Exhibit B—List of Deliverables, Pricing and Delivery Dates
 - iii) Exhibit C—Software License Agreement

- b) "Deliverables" mean the Equipment, Software and Services listed on Exhibit B—List of Deliverables, Pricing and Delivery Dates from among those described on Exhibit A—Product Deliverables.
- c) "Commercially Reasonable Efforts" means taking all such steps and performing in such a manner as a well managed company would undertake where it was acting in a determined, prudent and reasonable manner.
- d) "Confirmed Transponder Failure" shall mean that a failure of a transponder shall be deemed to have occurred when the transponder in question is powered from an external power source (other than the meter) and the communication failure is confirmed through the use of ACLARA's Meter Shop Test Tool via the Remote Test Set or Remote Test Unit and that such failure is the result of a breach of the warranties set forth in Section 12, below. The transponder may remain installed in the meter for testing.
- e) "Contract Manufacturers" means those entities that manufacture proprietary ACLARA designed transponders, substation control equipment and other equipment.
- f) "ACLARA Licensed Software" shall have the meaning as it is defined in Exhibit C—Software License Agreement.
- g) "ACLARA Personnel" means all employees of ACLARA, ACLARA's subcontractors and their employees, or any other personnel assigned by ACLARA to provide work pursuant to this Master Agreement. ACLARA Personnel shall not include any Purchaser Personnel.
- h) "Delivery" means, in the case of Equipment purchased hereunder, the loading of the equipment on the means of transport of the carrier selected by ACLARA pursuant to Article 9, below. "Delivery" means, in the case of Services provided hereunder, the periodic performance of such Services as described herein.
- i) "Equipment" means that equipment described on Exhibit B—List of Deliverables, Pricing and Delivery Dates that is manufactured by ACLARA or by a Contract Manufacturer. "Equipment" shall not include equipment manufactured by a third party not a Contract Manufacturer, purchased by ACLARA and re-sold pursuant to this Master Agreement.
- j) "Project Schedule" shall mean the schedule developed in accordance with Article 3, below.

- k) "Purchaser Personnel" means all employees of Purchaser, Purchaser's subcontractors and their employees, or any other persons or entities assigned by Purchaser to provide materials, services or labor in furtherance of Purchaser's installation, deployment and use of Purchaser's TWACS Technology System. Purchaser Personnel shall not include any ACLARA Personnel.
- l) "Services" shall mean those services to be performed by ACLARA as described in herein.
- m) "Third Party Licensed Software" shall have the meaning as it is defined in Exhibit C—Software License Agreement.
- n) "Work" means all obligations, duties and responsibilities of the Parties necessary to be performed by them in order to accomplish all of their respective obligations under this Master Agreement.

2. Work.

Upon the effective date of this Master Agreement, ACLARA shall provide all necessary equipment, software, management, supervision, materials, tools, supplies, facilities and resources necessary to perform its Work in accordance with the terms of this Master Agreement. Upon the effective date of this Master Agreement, Purchaser shall provide all necessary management, supervision, resources and materials required (but not to be supplied by ACLARA hereunder) to perform its Work in accordance with the terms of this Master Agreement.

3. Project Schedule.

ACLARA and Purchaser shall meet as expeditiously as possible after the execution of this Agreement to discuss the Start Up Checklist or Project Schedule and related matters ("the kickoff meeting"). Program Managers from ACLARA and Purchaser are responsible for monitoring the Start Up Checklist or Project Schedule so that the delivery dates shown on Exhibit B are met.

4. Term.

The term of this Master Agreement shall become effective on the date first above written and shall continue in full force and effect (unless earlier terminated in accordance with this Master Agreement) until the Work has been accomplished. Notwithstanding such termination, certain rights and obligations arising under this Master Agreement, including, but not limited to, those contained in Exhibit C—Software License Agreement shall survive the termination of this Master Agreement. The term of this Master Agreement may be extended by mutual agreement of the Parties.

The Parties acknowledge that Purchaser may desire to purchase additional equipment following the Expiration of this Agreement. In such case, any such purchases shall be at such prices and delivery shall occur on such dates as the Parties may then agree. All other terms and conditions contained in this Master Agreement shall apply to such Purchases.

5. Time for Performance.

- a) ACLARA shall use Commercially Reasonable Efforts to deliver the Equipment and Software and provide the Services within the times set forth on Exhibit B. Purchaser understands and agrees that the ability of ACLARA to make such deliveries and provide such Service within such times is dependent upon the timely issuance of Purchase Orders (if required) and timely performance of Purchaser's Work by Purchaser Personnel and Purchaser agrees that it will use Commercially Reasonable Efforts to cause Purchaser Personnel to perform their respective obligations in a timely fashion and to cooperate with ACLARA in scheduling their respective Work.
- b) Neither Party shall be liable to the other for failure or delay in performance of a required obligation if such failure or delay is caused by an act or omission of the other Party or such Party's Personnel.
- c) Neither Party shall be liable to the other for failure or delay in performance of a required obligation if such failure or delay is caused by delays in shipment, delivery or taking receipt of any items sold hereunder, or loss or damage thereto, acts of God, acts of the other Party, acts of civil, regulatory or military authority, U.S. Governmental restrictions or embargoes, war, terrorism, riot, fires, strikes, flood, epidemics, quarantine, restrictions, default or delay by supplier, breakdown in manufacturing facilities, machinery or equipment, delays in transportation or difficulties in obtaining necessary materials, labor or manufacturing facilities due to such causes, or any other cause beyond a Party's reasonable control. In the event of such occurrence, performance shall be suspended to the extent made necessary by such forces, and the time for performance shall be extended by a period equal to the time of delay. Upon the occurrence of such an event the Party whose performance is adversely affected shall promptly notify the other Party of the nature and extent of the occurrence and the anticipated period of delay in performance. Any Party so adversely affected shall use all Commercially Reasonable Efforts to minimize the extent of the delay in performance. No event of Force Majeure shall apply to any obligation by either Party to pay money.
- d) If either Party causes a delay not otherwise excused hereunder in the progress of the Work, such Party shall use Commercially Reasonable

Efforts (all without additional cost to the other Party) to complete its Work within the times set forth on the Project Schedule.

6. Purchase, Sale and License. Purchaser agrees to purchase the Equipment and Services and license the ACLARA Licensed Software and the Third Party Licensed Software from ACLARA and ACLARA agrees to sell to Purchaser the Equipment and Services and to license the ACLARA Licensed Software and the Third Party Licensed Software at the prices and in the quantities set forth on Exhibit B and on the terms and conditions set forth in this Master Agreement.
7. Purchaser's Responsibilities.
 - a) Purchaser shall perform those tasks and assume those responsibilities specified herein and as set forth in this Master Agreement.
 - b) Purchaser shall provide ACLARA Personnel with such access to Purchaser's property and Personnel as may be necessary for ACLARA to perform its Work.
 - c) Purchaser shall devote sufficient time and resources, including qualified personnel, to perform its Work in accordance with this Master Agreement.
 - d) Purchaser agrees that it shall insure that Purchaser Personnel cooperate with ACLARA in the timely and efficient performance of ACLARA's and Purchaser's respective obligations under this Master Agreement.
8. Invoicing and Payment
 - a) Equipment. ACLARA shall invoice for the equipment listed on Exhibit B at the prices on Exhibit B upon Delivery.
 - b) Services. ACLARA shall invoice for the Services listed on Exhibit B at the prices on Exhibit B upon a monthly basis or as otherwise provided in Exhibit B.
 - c) Software License Fees. ACLARA shall invoice for the Software License listed on Exhibit B at the prices on Exhibit B upon installation of the Licensed Software. Typically at the time the TWACS Net Server (TNS) master Station is shipped.
 - d) Payment. Purchaser shall pay ACLARA invoices within thirty (30) days of the date thereof. Any amounts not paid when due shall bear interest at the lesser of 1 ½% per month or the highest amount permitted by law until paid.

9. Title, Risk of Loss and Insurance. Equipment is sold CPT Destination (Carriage Paid To Destination as defined in accordance with INCOTERMS 2000). Title to and Risk of Loss of Equipment shall pass to Purchaser upon the loading of the Equipment on the means of transport of the carrier selected by ACLARA. Carriage shall be arranged for by ACLARA on usual terms for Purchaser's account and risk. ACLARA shall have no responsibility to arrange or pay for insurance against loss, damage or destruction occurring after loading of Equipment.
10. Sales and Use Taxes. ACLARA shall invoice to Purchaser any applicable state, county or local sales or use taxes applicable to the Work. If Purchaser should determine that all or part of the Work is not subject to such taxes, then in such case, Purchaser shall provide to ACLARA a Sales and Use Tax Exemption Certificate.
11. Substitution. ACLARA shall have the right to substitute an item of Equipment for an item specified on Exhibit B provided that such substituted item is, in fact, functionally equivalent to the specified item. In the event of any such substitution, ACLARA shall give Purchaser prompt written notice of its intention to make a substitution which notice shall set forth the reason(s) for such substitution and shall contain a statement that the substituted item is functionally equivalent to the specified item.
12. Warranties. In connection with the Deliverables, ACLARA makes the following warranties:
- a) Equipment. ACLARA warrants that with respect to the Equipment sold hereunder;
- i) It will be free from defects in material and workmanship;
- ii) It will meet ACLARA's specifications as set forth in Exhibit A—Product Deliverables.

In the event a breach of a warranty set forth above occurs on or before eighteen months from Delivery (the "Warranty Period"), upon prompt written notice of such breach and confirmation that the Equipment has been stored, integrated, installed, operated and maintained in accordance with recommendations of ACLARA and standard industry practice and in the case of a transponder, it has suffered a Confirmed Transponder Failure, ACLARA agrees to correct the nonconformity by, at ACLARA's option, repairing any defective part or replacing same. The liability of ACLARA to Purchaser for any breach of the above warranties shall not in any event exceed the lesser of ACLARA's cost to replace the Equipment or ACLARA's cost of correcting defects in the Equipment as herein provided, and upon the expiration of the warranty period, all such liability shall terminate. The above warranty shall not include any liability or responsibility for the expenses of

labor, transportation, installation, removal from the line or service or any other expenses that may be incurred by Purchaser. The cost of packing and transporting to ACLARA any of the material and equipment provided by ACLARA hereunder that fail to conform to the above warranty shall be borne by Purchaser. ACLARA shall package and ship, at ACLARA's expense and at no cost to Purchaser, the repaired or replacement items of material and equipment to Purchaser.

ACLARA makes no warranties with respect to any equipment sold under the terms of this Master Agreement that was not manufactured by ACLARA or its Contract Manufacturers. ACLARA shall pass on to Purchaser any warranty of the manufacturer or supplier of such equipment.

b) Software. ACLARA warrants, with respect to the software licensed under Exhibit C—Software License Agreement that:

i) With respect to Third Party Licensed Software:

- (1) Any applicable third Party license fees have been paid;
- (2) Purchaser's use thereof shall be at no additional cost to Purchaser;
- (3) Purchaser's use thereof shall only be subject to the terms of Exhibit C—Software License Agreement and this Master Agreement.

ACLARA expressly disclaims any other warranties with respect to Third Party Licensed Software and shall have no warranty obligations with respect to such Software.

ii) With respect to ACLARA Licensed Software and any updates or upgrades thereto provided to Purchaser:

- (1) ACLARA is the owner of the ACLARA Licensed Software and has the right and authority to license the ACLARA Licensed Software to Purchaser;
- (2) Purchaser's use of the ACLARA Licensed Software shall only be subject to the terms of Exhibit C—Software License Agreement and this Master Agreement; and
- (3) The ACLARA Licensed Software will operate substantially in accordance with the Documentation licensed by ACLARA pursuant to the terms of Exhibit C—Software License Agreement.

In the event of a breach of a warranty set forth above relating to software occurs prior to twelve months from installation of the ACLARA Licensed Software, ACLARA shall, at its sole cost and expense, perform such work as is necessary to promptly remedy the breach.

- c) Services. With respect to Services to be performed by ACLARA under this Master Agreement, ACLARA warrants that the Services shall be performed in a professional, competent and timely manner by ACLARA Personnel appropriately qualified and trained to perform such Services. In the event of a breach of the foregoing warranty relating to Services occurs within twelve months from the date of the providing of such Services, ACLARA shall, at its sole cost and expense, re-perform such Services.

No warranty under any provision of this Master Agreement is made with respect to software or equipment items that have not been created or manufactured by ACLARA or its Contract Manufacturers, such being subject only to the warranties made by their respective creators or manufacturers. ACLARA shall not be responsible or liable for unauthorized modifications, alterations, misapplications, or repairs made to the equipment and/or software by Purchaser Personnel or persons other than ACLARA Personnel, or for damage thereto caused by negligence, accidents or use by Purchaser Personnel or persons other than ACLARA Personnel in violation of any provision of this Master Agreement.

THE WARRANTIES SET FORTH IN THIS MASTER AGREEMENT ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PURPOSE.

13. Indemnity. For the purpose of this Article 13 only, "Purchaser Parties" shall mean Purchaser, its directors, officers, agents and employees, contractors and subcontractors (other than ACLARA), assignees, subsidiaries and affiliates, and each of them; "ACLARA Parties" shall mean ACLARA, its directors, officers, agents and employees, contractors and subcontractors at any tier, and the subcontractor's directors, officers, agents and employees, and each of them; and "Claims" shall mean claims, demands, suits or causes of action. The Parties obligations under this Article 13 shall not be limited to their respective insurance coverage.

- a) General Indemnity. ACLARA shall indemnify Purchaser Parties for any and all loss or liability, including the costs of settlements, judgments, damages and direct expense including reasonable attorney's fees, costs and expenses arising from Claims, whether based on statute or regulation or on theories of contract, tort, strict liability, or otherwise, which are brought against one or more Purchaser Parties by or on behalf of persons

other than Purchaser Parties involving injuries or damages to persons or property arising from or in any manner relating to negligent acts or omissions of ACLARA Parties under this Master Agreement provided that (a) Purchaser promptly notifies ACLARA in writing of such claims; (b) Purchaser fully cooperates with ACLARA in assisting in the defense or settlement of such claims; and (c) ACLARA has the sole right to conduct the defense of such claim or to settle such claim. ACLARA shall defend at its own expense, with counsel of its choosing, but reasonably acceptable to Purchaser, any suit or action brought against Purchaser Parties based upon such Claims. Further, provided that Purchaser promptly notifies ACLARA in writing of any alleged violations described below, ACLARA shall also indemnify Purchaser Parties for any and all loss or liability for fines, fees or penalties for violations of any statutes, regulations, rules, ordinances, codes or standards applicable to the Work arising from or relating to acts or omissions of ACLARA Parties. ACLARA's obligations under this Article 13 a) shall be reduced to the extent of the negligence, gross negligence or willful misconduct of Purchaser Parties.

Purchaser shall indemnify ACLARA Parties for any and all loss or liability, including the costs of settlements, judgments, damages and direct expense including reasonable attorney's fees, costs and expenses from Claims, at law or in equity, whether based on statute or regulation or on theories of contract, tort, strict liability, or otherwise, which are brought by or on behalf of persons other than ACLARA Parties for injuries or damages to persons or property arising from or in any manner relating to acts or omissions of Purchaser Parties under this Master Agreement provided that (a) ACLARA promptly notifies Purchaser in writing of such claims; (b) ACLARA fully cooperates with Purchaser in assisting in the defense or settlement of such claims; and (c) Purchaser has the sole right to conduct the defense of such claim or to settle such claim. Purchaser shall defend at its own expense, with counsel of its choosing, but reasonably acceptable to ACLARA, any suit or action brought against ACLARA Parties based upon such Claims. Further, provided that ACLARA promptly notifies Purchaser in writing of any alleged violations described below, Purchaser shall also indemnify ACLARA Parties for any and all loss or liability for fines, fees or penalties for violations of any statutes, regulations, rules, ordinances, codes or standards applicable to the Work arising from or relating to acts or omissions of Purchaser Parties. Purchaser's obligations under this Article 13 a) shall be reduced to the extent of the negligence, gross negligence or willful misconduct of ACLARA Parties.

- b) Intellectual Property Indemnity. ACLARA shall defend, indemnify, save and hold harmless Purchaser from and against any claims, losses, damages, fees, costs and expenses incurred by Purchaser arising out of or in connection with a third party's claim of infringement or alleged

infringement of any United States patent, copyright, trademark, trade or business secret, service mark or any other proprietary right based solely on the use or design of any Equipment furnished or the ACLARA Licensed Software licensed hereunder and used by Purchaser strictly in accordance with the terms of this Master Agreement provided that (a) in the case of ACLARA Licensed Software, it is the latest released version of the ACLARA Licensed Software; (b) Purchaser promptly notifies ACLARA in writing of such claims; (c) Purchaser fully cooperates with ACLARA in assisting in the defense or settlement of such claims; and (d) ACLARA has the sole right to conduct the defense of such claim or to settle such claim. In addition, in the event any such Equipment furnished or ACLARA Licensed Software licensed hereunder are held in such suit to be infringing or misappropriating or their use by Purchaser is enjoined or limited in any manner, or ACLARA believes that such holding or enjoining is likely, ACLARA shall at its expense: (a) procure for Purchaser the right to continue use of such Equipment or ACLARA Licensed Software, or (b) replace or modify the same with an equivalent non-infringing product with functionality substantially similar to the product it is replacing. Notwithstanding the foregoing, ACLARA shall not be liable for any claim based on the combination or use of the Equipment or ACLARA Licensed Software with any other equipment or software not supplied or authorized by ACLARA, or any claim based on Purchaser's possession or use of any altered version of the Equipment or ACLARA Licensed Software unless such alteration has been performed or expressly authorized by ACLARA.

14. Confidentiality. Licensee agrees that the Licensed Software, the Documentation and all related information (collectively, the "Information") constitutes confidential and proprietary information of ACLARA and as such, such information is deemed to be Company Private and Confidential. Licensee agrees as a condition of this license agreement to keep the Information confidential and not to disclose any of the Information in any manner whatsoever except that the Information may be disclosed to those of its officers, employees and agents who have a business need to know the Information for the sole purpose of operation of the TWACS® System. Licensee agrees to ensure that all persons who have access to the Information are informed of the confidential nature of the Information and directed to comply with the terms of this provision. Licensee's obligations with respect to non-disclosure of the Information will survive the termination of this Agreement.
15. Publicity. Neither Party shall, without the express written consent of the other Party, disclose any information or make any news release, advertisement, or public communication regarding this Master Agreement. Notwithstanding the foregoing, nothing in this Master Agreement shall prevent either Party from making such public disclosures as it, in its sole judgment,

may deem appropriate to satisfy such Party's (or such Party's Parent's) obligations under any applicable law or requirement of any stock exchange.

16. Insurance. In the event that ACLARA's obligations hereunder require or contemplate performance of Services by ACLARA's employees, or persons under contract to ACLARA, to be done on Purchaser's property, or property of Purchaser's customers, ACLARA agrees that all such work shall be done as an independent contractor and that the persons doing such work shall not be considered employees of the Purchaser. Further, in such event, ACLARA shall maintain

- a) general liability insurance on a one million dollar (\$1,000,000), per occurrence basis; and
- b) statutory workers compensation insurance.

Purchaser shall be named an additional insured or loss payee as its interest may appear on the policy referred to in a, above.

17. Termination for Convenience. Purchaser reserves the right, at any time, to terminate this Master Agreement, or any portion of the Work, for its sole convenience. Any such termination shall be effected by delivery of a written notice of termination to ACLARA specifying the extent to which the Master Agreement and related Work have been terminated and the date upon which the termination shall be effective. The date of the effective date of termination shall be no earlier than 30 days from the receipt of the notice of termination by ACLARA. Upon receipt of such notice, ACLARA, shall in good faith and using all Commercially Reasonable Efforts, stop all work hereunder, and shall promptly take steps to cancel existing orders, contracts and subcontracts relating to the Work. In the event of such termination, ACLARA shall be entitled to receive:

- a) the contract price due ACLARA for the Work performed, the equipment delivered, the Software licensed and the Services performed;
- b) the contract price for Equipment manufactured but not delivered prior to the effective date of termination if Purchaser desires to purchase such Equipment;
- c) all costs reasonably incurred by ACLARA prior to the effective date of termination including, but not limited to, labor, materials and overhead not covered under (a) or (b), above;
- d) the reasonable cost of termination reasonably incurred by ACLARA in accordance with Purchaser's termination notice which costs shall include the reasonable cost incurred by ACLARA in preparing any termination settlement proposal; and

- e) Fifteen percent (15%) of the amounts payable under (c) and (d), above.

No costs incurred after the effective date of the notice of termination shall be treated as a reimbursable cost unless it relates to performing the portion of the work not terminated, or taking measures reasonably required to comply with Purchaser's notice of termination in a prudent and business-like manner.

18. Termination for Cause. Purchaser may terminate this Master Agreement upon delivery to ACLARA of a written notice of termination. Such notice of termination shall be given to ACLARA at least ten (10) days prior to the effective date of such termination. Such notice of termination may be given for any one of the following reasons:

- a) If ACLARA shall become insolvent, commit any act of bankruptcy, make a general assignment for the benefit of creditors, or becomes the subject of any proceeding commenced under any statute or law for the relief of debtors; or
- b) if a receiver, trustee or liquidator of any property or income of ACLARA is appointed; or
- c) if ACLARA
 - i) defaults in any material manner in the performance of ACLARA's obligations under any of the terms, provisions, conditions or covenants contained in this Master Agreement and
 - ii) further fails within thirty (30) days after written notice thereof from Purchaser to take reasonable steps to remedy such default.

Purchaser shall be permitted to pursue any and all rights and remedies available hereunder or at law or in equity without terminating this Master Agreement for cause. In the event of termination for cause by Purchaser, ACLARA shall be paid only the portion of the compensation related to Work performed prior to the effective date of termination. ACLARA shall also be subject to any claim Purchaser may have against ACLARA under other provisions of this Master Agreement, or as a matter of law.

ACLARA may also terminate this Master Agreement upon delivery to Purchaser of a written notice of termination. Such notice of termination shall be given to Purchaser at least ten (10) days prior to the effective date of such termination. Such notice of termination may be given for any one of the following reasons:

- a) If Purchaser shall become insolvent, commit any act of bankruptcy, make a general assignment for the benefit of creditors, or becomes the subject

- of any proceeding commenced under any statute or law for the relief of debtors; or
- b) if a receiver, trustee or liquidator of any property or income of Purchaser is appointed; or
 - c) if Purchaser
 - i) defaults in any material manner in the performance of Purchaser's obligations under any of the terms, provisions, conditions or covenants contained in this Master Agreement and
 - ii) further fails within thirty (30) days after written notice thereof from ACLARA to take reasonable steps to remedy such default.

Purchaser shall also be subject to any claim ACLARA may have against Purchaser under other provisions of this Master Agreement, or as a matter of law.

19. Assignment. Neither Party may assign its rights or obligations under this Master Agreement without the prior written consent of the other Party, provided however, that either Party may assign its rights (but not its obligations) under this Master Agreement to an Affiliate of such Party or to an entity acquiring all or substantially all of the assets of such Party without prior approval of the other Party. In such an event, the assigning Party shall provide the other Party with prompt written notice of such assignment. As used herein, "Affiliate" means a company which either owns or controls a Party or which such Party owns or controls directly or indirectly, or is under common control directly or indirectly with such Party through a common parent company.

20. Representations.

- a) ACLARA represents and warrants the following:
 - i) ACLARA has the authority to execute, deliver and perform its obligations under this Master Agreement;
 - ii) The execution of this Master Agreement by the individual listed on the signature page and the delivery and performance of this Master Agreement by ACLARA have been duly authorized by ACLARA; and
 - iii) ACLARA is an entity duly organized, validly existing and in good standing under the laws of the State of Missouri.
 - iv) With respect to Equipment sold hereunder, such Equipment will be free from any liens and encumbrances and when Delivered will be owned by Purchaser; and
 - v) With respect to the Licensed Software, ACLARA has the right to grant to Purchaser the rights intended to be granted under this Master Agreement and Exhibit C—Software License Agreement.

- b) Purchaser represents and warrants the following:

- i) Purchaser has the authority to execute, deliver and perform its obligations under this Master Agreement;
- ii) The execution of this Master Agreement by the individual listed on the signature page and the delivery and performance of this Master Agreement by Purchaser have been duly authorized by Purchaser; and
- iii) Purchaser is an entity duly organized, validly existing and in good standing under the laws of the State of _____.
- iv) Purchaser has obtained all required regulatory approvals to enter into and to perform its obligations under this Master Agreement.

21. Limitation of Liability. Notwithstanding anything contained herein to the contrary, the total aggregate liability of ACLARA to the Purchaser for any and all liability arising out of or in connection with the performance of this Master Agreement shall be limited to the aggregate sum of payments made by Purchaser to ACLARA under this Master Agreement. **In no case shall either Party be liable to the other Party for estimated loss of benefit, loss of profit, punitive, special, indirect or consequential damages.**

22. Notices. Any notices required or permitted hereunder shall be in writing and shall be deemed to be given sent by United States registered or certified mail, postage prepaid, to the respective Parties at the addresses shown below. Notices so given shall be deemed received three business days from the date of deposit in the U. S. Mails.

- a) If to ACLARA:
Contract Administration Manager
945 Hornet Drive
St. Louis, MO 63042

With a copy to:
General Counsel
ESCO Technologies Inc.
9900A Clayton Road
St. Louis, MO 63124-1186

- b) If to Purchaser:

23. Compliance with Laws. ACLARA shall comply with all applicable federal, state and local laws, and ordinances ("Laws") in the performance of its duties under this Master Agreement. Specifically:

a) Nondiscrimination and Employment Practices. In connection with the performance of this contract, the ACLARA agrees to become informed of and comply with all laws and/or regulations that are applicable to employment of ACLARA personnel performing under this Agreement. ACLARA further agrees that it will not discriminate on the basis of race, religion, color, sex, national origin, age or handicap and that it will become informed of and comply with all laws and/or regulations pertaining thereto.

b) EEO and Small Business Compliance Clauses. During performance under this Master Agreement, ACLARA agrees to comply with all applicable equal employment opportunity, small business, and affirmative action laws and regulations to which ACLARA is subject and agrees to execute and deliver such documents as may be required to effect or to evidence such compliance. All EEO and affirmative action laws and regulations required in agreements of this character are hereby incorporated by this reference, including provisions of 38 U.S.C. § 4212, Executive Order 11246, as amended, and any subsequent executive orders or other laws or regulations relating to equal opportunity for employment on government contracts.

24. Dispute Resolution. Both Parties agree to attempt to settle any dispute arising out of this Master Agreement through good faith consultations and negotiations. If those attempts fail, the parties agree that any disputes arising under, out of, or in relation to this Master Agreement shall be finally and conclusively determined by binding arbitration under the Commercial Arbitration Rules of the American Arbitration Association and the judgment on the award rendered by the arbitrator(s) may be entered in any court having jurisdiction thereof. The Parties agree that arbitration proceedings shall be held in St. Louis, Missouri.
25. Governing Law. This Master Agreement shall be governed by the laws of the State of Missouri.
26. Independent Contractor. ACLARA agrees to perform and provide the Work in connection with this Master Agreement as an independent contractor and not as a subcontractor, agent or employee or Purchaser, its parent, subsidiaries, or affiliates.
27. Entire Agreement. This Master Agreement constitutes the entire agreement between the parties with respect to the subject matter hereof. There are no oral agreements or representations or additional written materials that revise or supplement the terms of the Master Agreement. No modification, amendment, revisions or supplements to this Master Agreement shall be enforceable unless in writing, signed by both Purchaser and ACLARA.

IN WITNESS WHEREOF, the Parties have executed this Master Agreement as of the date first above written.

Aclara Power-Line Systems Inc.

By: _____
Name: _____
Title: _____
Date: _____

By: _____
Name: _____
Title: _____
Date: _____

SOFTWARE LICENSE AGREEMENT

This Software License Agreement is entered into this ____ day of _____, 2008 by and between:

Aclara Power-Line Systems Inc., a Missouri corporation
945 Hornet Drive
Hazelwood, MO 63042
(Referred to herein as "ACLARA ")

And

(Referred to herein as ("Licensee"))

Individually, ACLARA and Licensee may be referred to as "Party" and collectively as "Parties."

Whereas, the Parties have entered into a Master Agreement of even date under which ACLARA has agreed to sell and Licensee has agreed to purchase certain equipment and services;

Whereas, Licensee desires to obtain from ACLARA , and ACLARA desires to provide certain computer software and associated maintenance services as more fully described below:

NOW THEREFORE, in consideration of the mutual covenants contained herein and in the Master Agreement, and intending to be legally bound, the Parties agree as follows:

1. Definitions. The following words and phrases shall have the following meanings for the purposes of this Software License Agreement:
 - a. "Software License Agreement" means this document and the following Attachments all of which are attached hereto and made a part hereof, and any amendments, modifications or supplements thereto or attachments incorporated therein:
 - i. Attachment A. Attachment A is a listing of ACLARA Licensed Software, Third Party Licensed Software, Licensing Parameters, Third Party Software Not Licensed, and License Fees.
 - ii. Attachment B—Form of Support Services Agreement.
 - b. "ACLARA Licensed Software" means the software described on Attachment A as "ACLARA Software."

- c. "Delivery" shall mean the installation of the Software on the Licensee-provided Designated Equipment, or, if applicable, upon the Delivery of the Designated Equipment provided by ACLARA on which the Software is installed.
- d. "Designated Equipment" means the TWACS® Net Server Master Station or the Licensee's back-up computer equipment, and such additional equipment as Licensee may from time to time designate in writing, which such back-up equipment and such additional equipment shall meet the specifications of the TWACS Net Server Master Station.
- e. "Documentation" means basic, descriptive, training and instructive materials pertinent to the Licensed Software as described on Attachment A.
- f. "Licensed Software" means the ACLARA Licensed Software and the Third Party Licensed Software.
- g. "Licensee's TWACS Technology System" means the system comprised of the Equipment purchased by Licensee from ACLARA pursuant to the Master Agreement and the Licensed Software.
- h. "Licensing Parameters" means the number of CPUs, Seats, Meters and Utilities as set forth on Attachment A.
- i. "Master Agreement" means the agreement between the Parties of even date to which this Software License Agreement is attached as an Exhibit.
- j. "Object Code" means the instructions or statements comprising the Licensed Software expressed in machine readable language, being the machine level representations that actually cause the computer to execute instructions and operations.
- k. "Peripheral Programs" mean computer programs which do not include any logic or code of the Licensed Software and which use the output of the Licensed Software as input to another source.
- l. "Source Code" means a set of instructions expressed in non-machine human readable language from which the Licensed Software Object Code is derived.
- m. "Third Party Licensed Software" means the software described on the Attachment A as "Third Party Software—Included in this Software License Agreement."

2. Grants of License.

- a. Subject to the terms and conditions set forth herein, ACLARA hereby grants to Licensee, and Licensee accepts, a fully paid, non-exclusive, non-transferable, perpetual (subject to termination as set forth herein), Object Code license to use the Licensed Software on the Designated Equipment solely in connection with use by Licensee of Licensee's TWACS Technology System. Third Party Licensed Software is sublicensed by ACLARA to Licensee pursuant to sublicensing agreements with the respective third parties identified on Attachment A.
- b. Subject to the terms and conditions set forth herein, ACLARA hereby grants to Licensee, and Licensee accepts, a fully paid, non-exclusive, non-transferable, perpetual (subject to termination as set forth herein), license to use the Documentation solely in connection its use of the Licensed Software.

3. License Fee. Upon Delivery of the Licensed Software onto the Designated Equipment, ACLARA shall issue an invoice for the License Fee set forth on Attachment A. Such invoice shall be due and payable, without discount, within 30 days. The Licensee Fee is exclusive of all taxes imposed by any governmental agency based on Licensee's use or possession of the Licensed Software, including, but not limited to, state or local sales, use and personal property taxes, all of which shall be Licensee's sole responsibility.

4. Restrictions on Use. Licensee's use of the Licensed Software and Documentation is restricted and limited as follows:

- a. Licensing Parameters. Licensee use of the Licensed Software is restricted to the Licensing Parameters. Use of the Licensed Software outside the Licensing Parameters is subject to the express written consent of ACLARA and the payment of all required additional License Fees.
- b. Licensee's TWACS Technology System. Licensee's use of the Licensed Software and Documentation is restricted to Licensee's internal use solely in connection with Licensee's use of Licensee's TWACS Technology System. Licensee may not rent the Licensed Software or use the Licensed Software on a time share basis. This restriction is specifically applicable to any service or service bureau arrangement to which Licensee is, or may be, a party. Licensee shall not directly or indirectly, make the Licensed Software available to others.

- c. Alteration. Licensee's use of the Licensed Software is limited in that Licensee is prohibited from altering, attempting to reverse engineer, attempting to decompile, or creating or attempting to create a derivative work from the Licensed Software.
- d. Copies. Licensee's use of the Licensed Software is limited in that it may not copy the Licensed Software except for:
 - i. use in the Designated Equipment;
 - ii. for back-up purposes; and
 - iii. for archival purposes.

All such copies shall include any copyright notices appearing in the Licensed Software.

Licensee shall have the right to copy and to modify the Software Documentation to coordinate the Documentation with Licensee's own internal training and working procedures. ACLARA shall have no liability or obligation to Licensee with respect to any such modified Documentation and any additional costs incurred by ACLARA in the integration of maintenance changes caused by such modifications shall be reimbursed to ACLARA by Licensee.

- e. Compliance with Laws. Licensee's use of the Licensed Software is limited in that it must use the Licensed Software and the Documentation in accordance with all applicable laws and regulations of the United States and the States and localities in which the Licensed Software and Documentation is used.
- f. Use on Designated Equipment. Licensee's use of the Licensed Software is restricted to use on the Designated Equipment. Should Licensee desire to transfer the operation of the Licensed Software to a computer other than the Designated Equipment, Licensee shall notify ACLARA upon such transfer. Such computer must meet the specifications of the Designated Equipment. Upon such notification, such computer shall become the Designated Equipment. Under no circumstances may the Licensed Software be used for production purposes on other than the Designated Equipment.
- g. Temporary Use. Without notice to ACLARA, Licensee may temporarily transfer the operation of the Licensed Software to a back up computer if the Designated Equipment is inoperative due to malfunction, or during the performance of preventive maintenance, engineering changes or changes in features or model until the Designated Equipment is restored to operative status and processing of the data already entered into the back up computer is completed.

5. Ownership of Licensed Software and Documentation. ACLARA is the owner of the ACLARA Licensed Software and Documentation. The Third Party Licensed Software is owned by the third parties named on Attachment A. Upon the cessation of use of the Licensed Software by Licensee or upon the termination of this Software License Agreement as herein provided, Licensee shall promptly return to ACLARA all copies of the Licensed Software and Documentation or destroy same and provide to ACLARA a certificate of destruction in form and content satisfactory to ACLARA and executed by an officer of Licensee.
6. Warranty. ACLARA's warranties with respect to the Licensed Software are as set forth in the Master Agreement. **ACLARA MAKES NO WARRANTIES WITH RESPECT TO THE LICENSED SOFTWARE OTHER THAN THE WARRANTIES SET FORTH IN THE MASTER AGREEMENT.**
7. Term and Termination. The term of this Software License Agreement shall commence upon the installation of the Licensed Software in the Designated Equipment. Unless this Software License Agreement is terminated sooner as provided herein, this Software License Agreement shall remain in effect so long as Licensee continues to own and operate Licensee's TWACS Technology System and shall automatically and immediately terminate when that ceases to be the case for any reason. ACLARA may terminate this Software License Agreement
 - a. for any material breach or default by Licensee upon notice in writing to Licensee, specifying the breach or default by Licensee, and Licensee's failure to cure such breach or default within 30 days from the date of its receipt of such notice;
 - b. upon Licensee's ceasing to do business;
 - c. upon the dissolution of Licensee;
 - d. upon the filing of any petition for declaration of bankruptcy or insolvency by or against Licensee which is not withdrawn or dismissed within 30 days; or
 - e. upon the appointment of a receiver for Licensee.Licensee may terminate this Software License Agreement without cause at any time upon 30 days notice in writing to ACLARA.
8. Peripheral Programs. In order to make efficient use of the data generated by the Licensed Software, Licensee shall have the right to develop one or more

Peripheral Programs. ACLARA shall have no rights to or obligations with respect to Peripheral Programs.

9. TWACS Technology Support Services. ACLARA offers TWACS Technology Support Services to its Licensees. ACLARA's standard agreement for the provision of those services is set forth on Attachment B. Should Licensee desire TWACS Technology Support Services, such Services will be provided by ACLARA in accordance with Attachment B. The cost for support will be based upon ACLARA's standard charge in effect, which charge will be dependent upon Licensing Parameters then in effect and level of service selected by Licensee.
10. Third Party Beneficiaries. With respect to the owners or licensors of Third Party Licensed Software, such owners or licensors are third party beneficiaries of this Software License Agreement.
11. Confidentiality. Licensee agrees that the Licensed Software, the Documentation and all related information (collectively, the "Information") constitutes confidential and proprietary information of ACLARA and as such, such information is deemed to be Company Private and Confidential. Licensee agrees as a condition of this license agreement to keep the Information confidential and not to disclose any of the Information in any manner whatsoever except that the Information may be disclosed to those of its officers, employees and agents who have a business need to know the Information for the sole purpose of operation of the TWACS Technology System. Licensee agrees to ensure that all persons who have access to the Information are informed of the confidential nature of the Information and directed to comply with the terms of this provision. Licensee's obligations with respect to non-disclosure of the Information will survive the termination of this Agreement.
12. Indemnity. ACLARA's indemnity obligations relating to Intellectual Property are as set forth in the Master Agreement.
13. Limitation on Damages; Limitation of Liability. Limitations of damages and limitations on liability are set forth in the Master Agreement. Further, to the extent permitted under applicable law, no third party identified as a licensor of any software licensed hereunder shall be liable to Licensee for any damages, whether direct, indirect, incidental or consequential, arising from the use of sublicensed software of the third party by Licensee.
14. Uniform Computer Information Transactions Act. The Uniform Computer Information Transactions Act (the "Act"), including any law that incorporates substantially all of the provisions of the Act, however titled, shall not apply to this Software License Agreement.

- 15. Assignment. Neither Party may assign its rights or obligations under this Software License Agreement without the prior written consent of the other Party, provided however, that either Party may assign its rights (but not its obligations) under this Software License Agreement to an Affiliate of such Party or to an entity acquiring all or substantially all of the assets of such Party without prior approval of the other Party. In such an event, the assigning Party shall provide the other Party with prompt written notice of such assignment. As used herein, "Affiliate" means a company which either owns or controls a Party or which such Party owns or controls directly or indirectly, or is under common control directly or indirectly with such Party through a common parent company.
- 16. Notices. Notices required or permitted to be given under this Software License Agreement shall be given to the persons and in the manner provided in the Master Agreement.
- 17. Injunctive Relief. Licensee agrees that notwithstanding anything contained herein to the contrary, in the event of a breach by Licensee of the terms of this Software License Agreement, or if ACLARA has reasonable reason to believe that such a breach is imminent, ACLARA shall have the unequivocal right to seek and obtain timely injunctive relief against Licensee in order to protect ACLARA's rights in and to the Licensed Software.
- 18. Governing Law. This Software License Agreement shall be governed by the laws of the State of Missouri.

IN WITNESS WHEREOF, the Parties have executed this Software License Agreement as of the date first written above.

Aclara Power-Line Systems Inc.

By: _____
 Name: Bruce R. Clark
 Title: Vice President,
 Contracts & Procurement

By: _____
 Name: _____
 Title: _____

TWACS TECHNOLOGY SUPPORT SERVICES AGREEMENT

This Agreement is made this _____ day of _____, 2008 by and between Aclara Power-Line Systems Inc., a Missouri corporation (Supplier) having a principal place of business at 945 Hornet Drive, Hazelwood, Missouri, 63042, and _____ (Customer), having a principal place of business at _____.

1. DEFINITIONS

For the purposes of this Agreement, the following definitions shall apply:

1.1 Hardware

The TWACS® Technology equipment supplied by Supplier which includes TWACS Technology Substation Communication Equipment (SCE), Remote Communications Equipment (RCE) and Test Equipment.

1.2 Software

The TWACS Technology software program packages and firmware provided by Supplier, and listed in Attachment A to this Agreement.

1.3 System

The Hardware and Software identified in Sections 1.1 and 1.2 of this Agreement.

1.4 Commercial Software

Software program packages developed by others and used in support of the Software program package listed in Attachment A.

1.5 Renewal Period

Each of one or more consecutive twelve (12) month periods following the Initial Term of this Agreement.

1.6 Issue

A problem with the System identified by the Customer, which requires a response by the Supplier to resolve.

1.7 Severity Level

A designation of the effect of the Issue on the Customer's use of the System.

1.8 Designation of Severity Level

The Severity Level of an Issue is initially defined by the Customer and confirmed by the Supplier. Until the issue has been resolved, the Severity Level may be raised or lowered by mutual agreement between the Customer and Supplier. The three Severity Levels are:

Critical: Issue limits system functionality to an extent that the System is not providing reads for billing and the Customer must either delay billing or issue estimated bills; the system stopped functioning completely; or Customer personnel are waiting at substation for Supplier response.

Urgent: Issue limits System functionality, but reads are available for CIS. No workaround is available.

Problem: Issue limits System functionality, but a workaround has been identified.

1.9 Support Level

Level of maintenance and support service to be provided by the Supplier to the Customer.

1.10 TWACS® Technology System

The two-way automatic communication system provided by Supplier comprised of the Hardware and Software.

1.11 Update

A modification or addition that, when made or added to the Software or Commercial Software, establishes material conformity of the Software or the Commercial Software to its respective specification.

1.12 Enhancement

Any improvement, modification or addition that, when made or added to the Software or Commercial Software, changes its utility, efficiency, functional capability or application, but does not constitute solely a correction to a non-conformity to the specification.

2. TERM OF AGREEMENT

Subject to the termination provisions set forth below, this Agreement shall become effective (Effective Date) as of the date first set forth above and shall continue in full force and effect for an initial term (Initial Term) of one (1) year. Upon expiration of the Initial Term, this Agreement shall automatically renew for successive Renewal Periods, unless sooner terminated by either the Supplier or Customer as provided for in this Agreement.

3. SCOPE

3.1 Support Level

Three (3) Support Levels are available to Customer under this Agreement. Each level is identified and described in Attachment C (Support Levels) attached hereto and made a part hereof. Customer may, at its option, change the Support Level for any subsequent Renewal Period, provided Customer gives Supplier written notice of the requested change no less than sixty (60) days prior to the end of the Initial Term or then current Renewal Period.

3.2 Services Provided

Supplier shall provide maintenance and support services at the level selected by the Customer as designated in Attachment E.

3.3 Prioritization of Issues

Supplier will prioritize issues in the following order:

1. Critical severity issues identified by Customers with Premium Level Support.
2. Critical severity issues identified by Customers with Enhanced Level Support.
3. Critical severity issues identified by Customers with Standard Level Support.
4. Urgent severity issues identified by Customers with Premium Level Support.
5. Urgent severity issues identified by Customers with Enhanced Level Support.
6. Urgent severity issues identified by Customers with Standard Level Support.
7. Problem severity issues identified by Customers with Premium Level Support.
8. Problem severity issues identified by Customers with Enhanced Level Support.
9. Problem severity issues identified by Customers with Standard Level Support.

Issues within each of the categories will be prioritized based on the time each was received.

3.4 Response to Issues

The Supplier will provide verbal or written responses to issues identified by the Customer. Such responses shall be provided within the Maximum Issue Response Time based on the Support Level as defined in Attachment C (Support Levels).

3.5 Software and Commercial Updates.

Supplier shall provide Updates to the Software as they become available. In support of the Updates, Supplier shall provide updated Supplier-provided user technical documentation reflecting the Updates no later than thirty (30) days after receipt of Updates by Customer. Updated Supplier-provided user technical documentation that correct errors or other minor discrepancies will be provided when available.

At the option of the Supplier, periodic Software updates of the Commercial Software will be provided by Supplier without further charge, provided the following conditions are met:

1. The Update corrects a malfunction in the Commercial Software that affects the operation of the Software;
2. The Update has, in the opinion of the Supplier, corrected the TWACS Technology System identified malfunction(s) and has not created any additional malfunction(s); and
3. The Update is available to the Supplier. Customer is responsible for obtaining and installing the Update if the Commercial Software was not licensed to Customer by or through Supplier.
4. Updates to Supplier provided Commercial Software are specifically limited to the Commercial Software identified and set forth in Section B of Attachment A. Any associated hardware or hardware modifications required to support Updates of Commercial Software are not included under the terms of this Agreement.

Supplier shall offer Software Enhancements to Customer when they are generally made available to Supplier's other customers. Customer shall pay the associated fee for Software Enhancements only if they embody or include features or functionalities substantially different from those specified in the original contract requirements.

Supplier shall consider and evaluate the development of Enhancements for the specific use of Customer and shall respond to Customer's requests for Enhancements or other additional services pertaining to the Software, provided that such Enhancements or additional services shall be subject to a separate charge.

3.6 Hardware

Supplier will provide to Customer repair service for out-of-warranty Hardware in accordance with this section. Prior to shipment of the Hardware to a location designated by Supplier, Customer shall obtain a Return Material Authorization (RMA) number from Supplier as described below.

As part of the process of securing the Returned Material Authorization (RMA) number, the Customer shall provide Supplier with a complete description of the reported problem. Supplier will provide instructions to Customer describing the RMA process. The cost of labor, transportation, installation, removal from the line or service, and packing and transporting to Supplier any of the Hardware provided by Supplier hereunder shall be borne by Customer.

An Estimate of Repair (EOR) and delivery schedule will be prepared and submitted to the Customer by Supplier for each Hardware item returned for repair. Customer shall respond within thirty (30) days of the date of the EOR to either repair the item or return it to the Customer's facility. Hardware items not approved for repair shall be subject to a diagnostic charge. If no response to the EOR is received within sixty (60) days of the quotation date, the item will be returned to the Customer un-repaired.

Supplier will repair out-of-warranty Hardware items at the price provided in the EOR approved by Customer. Unless otherwise specified in EOR, Supplier will arrange for and pay freight and insurance charges and invoice Customer for such charges. Risk of loss of the Hardware shall pass to Customer upon delivery by Supplier to the Carrier

Repairs will be warranted for a period of ninety (90) days following the date of return shipment of the repaired item to Customer.

3.7 Service Limitations

The services defined in this Agreement are limited to the TWACS Technology System manufactured by Supplier or one of its authorized subcontract manufacturers.

Except as may otherwise be provided for in Attachment C, System Administration, Management and Training Services, repair of Hardware under warranty or Master Station computer equipment repair are not included as part of this Agreement.

Problem resolution and support shall be limited to the latest Software revision level supplied to Customer and currently supported by Supplier.

Costs incurred by Supplier while investigating problems that are the result of Customer's negligence or unauthorized modification of the Software, Hardware, or interfaces to the Equipment Configuration shall be invoiced to Customer on a time-and-material basis at Supplier's then current published Support Service Rates.

Unless provided for under the applicable Support Service Level, on-site service and other services identified as available at additional cost are not included in this Agreement. On-site and additional services are available and will be provided upon request. Pricing for these services are provided in Attachment B.

4. CUSTOMER RESPONSIBILITIES

4.1 Backups

Customer shall maintain a current backup copy of all Software and databases.

4.2 Notification of Issues

Customer shall provide Supplier with timely notification of any System issues via telephone or electronic mail (email).

4.3 Technical Staff

Customer shall be responsible for maintaining sufficient suitably trained technical staff to operate and maintain the System on a day-to-day basis, including backing up the software and report handling. Supplier training for designated contacts shall be made available to Customer.

4.4 Support for Problem Investigation

Customer shall support all reasonable requests by Supplier as may be required in problem investigation and resolution.

4.5 Maintain Current Software Version

Customer shall install new versions of defined Software within six (6) months of receipt thereof and shall maintain the required level of Commercial Software, if applicable, specified by Supplier for each release provided.

4.6 Designation of Point of Contact

Customer shall assign an individual or individuals to serve as the designated contact(s) for all communication with Supplier during Issue investigation and resolution. This contact shall be selected from among the designated contacts as specified by the Support Level (Attachment C).

5. SOFTWARE LICENSE

All Software or updates to Software provided by Supplier under this Agreement shall be subject to the Terms and Conditions of the Software License Agreement, including any amendments thereto, entered into by and between Supplier and Customer.

6. PAYMENT AND CHARGES

- 6.1 Pricing for each Support Level is detailed in Attachment D (Pricing of Services) to this Agreement.
- 6.2 The charge for the Service Level selected by the Customer and defined herein shall be at a rate as identified in Attachment E per calendar month during the Initial Term of this Agreement. The monthly rate shall not be subject to adjustment during the Initial Term. Thereafter, during any subsequent Renewal Period, the monthly rate shall be subject to adjustment at the commencement of each Renewal Period. Such adjustment shall not escalate at a rate in excess of four percent (4%) over each previous year.
- 6.3 Prices and charges stated herein are in U.S. dollars and are exclusive of Import Duties, Tariffs, Provincial, Federal, State, Municipal or other Government Excise, Sales, Use or like Taxes, all of which shall be Customer's responsibility.
- 6.4 In the event that any of the Charges remain unpaid for more than thirty (30) days after becoming due for payment, ACLARA shall be entitled to withdraw the System Services.
- 6.5 Charges for the services provided under this Agreement shall be invoiced monthly, one (1) month in advance, as of the first of the month. Supplier reserves the right to invoice for services on either a monthly or quarterly basis. Payment of all such invoices shall be due and payable within thirty (30) days of the date of invoice.
- 6.6 The Customer shall be invoiced for any partial month service, which may result from the effective date or date of termination of this Agreement, at a prorated monthly charge based upon a thirty (30) day month.
- 6.7 In the event that Customer terminates or elects not to renew this Agreement and subsequently wishes to reinstate it, in addition to paying Supplier's then current fees and charges, Customer shall also pay Supplier, a reinstatement charge. The reinstatement charge shall include a lump sum equal to the total fees and charges which would have been paid for the period of lapse had

the lapse not occurred: provided, however that if the lapse period is three (3) years or longer, Supplier shall have the option at its sole discretion to refuse to reinstate said Agreement

7. **TERMINATION**

- 7.1 This Agreement may be terminated by either party at any time by not less than sixty (60) days prior written notice.
- 7.2 Supplier shall have the right to terminate this Agreement at any time in the event of Customer's bankruptcy, insolvency, or any continuing non-payment for services in excess of thirty (30) days.
- 7.3 If either party shall at any time commit any breach of any covenant or agreement herein contained, and shall fail to remedy any such breach within thirty (30) days after the other party provides written notice specifying in reasonable detail such breach, the other party may, at its option, terminate this Agreement by prior notice in writing to such effect.
- 7.4 Supplier shall have the right to terminate or refuse support service if, in the Supplier's opinion, conditions at the equipment location represents a hazard to the safety or health of Supplier's personnel.

8. **WARRANTIES**

- 8.1 Supplier hereby warrants that it will use reasonable care and skill in the provision of the Services.
- 8.2 Except as expressly set out herein, all conditions and warranties, express or implied, statutory or otherwise (including but not limited to any concerning fitness for a particular purpose) are hereby excluded to the extent permitted by law.

9. **LIMITATION OF LIABILITY**

Supplier shall not be liable for any loss or damage to Customer's equipment, software or other property or injury or death to Customer's agents, employees, or customers arising in connection with the maintenance services provided by Supplier under this Agreement unless such loss, injury, death, or damage results solely from the gross negligence or willful acts of Supplier's officers or employees. **IN NO EVENT SHALL SUPPLIER BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL, PUNITIVE, OR EXEMPLARY DAMAGES WHETHER IN CONTRACT OR IN TORT, INCLUDING, WITHOUT LIMITATION, ANY COMMERCIAL LOSSES ARISING IN CONNECTION WITH PRODUCTS OR SERVICES PROVIDED UNDER THIS AGREEMENT OR OTHERWISE.**

10. **EXCUSABLE DELAYS**

Neither of the parties hereto shall be liable for damages or have the right to cancel for any delay or default in performing hereunder if such delay or default is caused by a condition beyond its reasonable control, including, but not limited to, Acts of God, governmental restriction, continuing domestic or international problems such as war or insurrections, strikes, fires, floods, work stoppage, embargoes, and/or lack of materials; provided, however, that either party hereto shall have the right to terminate this Agreement upon thirty (30) days prior written notice if either party is unable to fulfill its obligations

under this Agreement due to any of the above-mentioned causes and such inability continues for a period of three (3) months.

11. **ASSIGNMENT**

Except as provided for below, Supplier shall not assign this Agreement without the prior written approval of Customer, which approval shall not be unreasonably withheld. Supplier may assign this Agreement without prior notice or approval to any affiliate or to any acquirer of all or substantially all of Supplier's assets or business. Customer may not assign this Agreement without prior written approval of the Supplier, which approval shall not be unreasonably withheld.

12. **WAIVER**

No waiver of any term of this Agreement by either party shall be deemed to be a further or continuing waiver of any other term of this Agreement.

13. **GOVERNING LAW**

This Agreement shall be governed by the laws of the State of Missouri, U.S.A.

14. **SEVERABILITY**

In the event that any one or more of the provisions contained in this Agreement shall, for any reason, be held to be invalid, illegal or unenforceable, in any respect, such invalidity, illegality, or unenforceability shall not affect any other provision of this Agreement, and this Agreement shall be construed as if such invalid, illegal or unenforceable provision had never been contained herein.

15. **NOTICES AND ADDRESSES**

Any notices required under this Agreement shall be in writing, in the English language, and shall for all purposes be deemed to be fully given and received if sent by registered or certified mail, postage prepaid, to the respective parties at the following addresses:

Supplier: Contract Administration
 Aclara Power-Line Systems Inc.
 945 Hornet Drive
 Hazelwood, Missouri 63042

Customer:

Such addresses are subject to change by the respective parties upon written notice.

16. **ENTIRE AGREEMENT**

This Agreement, including Attachments A, B, C, D, and E contains the entire agreement between the parties hereto relating to the subject matter hereof and may not be changed or modified in any manner, orally or otherwise, except by a written amendment signed by a duly authorized officer of each of the parties hereto.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed on the respective dates set forth below.

Aclara Power-Line Systems Inc.

By: _____

Name: Bruce R. Clark

Title: Vice President, Contracts
and Procurement

Date: _____

By: _____

Name: _____

Title: _____

Date: _____

ACLARA POWER-LINE SYSTEMS INC.

Attachment A
To
TWACS Technology Support
Services Agreement

**SOFTWARE MAINTAINED UNDER
THIS AGREEMENT**

The Software Program Packages and Firmware maintained under this Agreement shall be those set forth below, including any subsequent releases issued during the term of this Agreement.

A. SUPPLIER SOFTWARE:

- ACLARA TWACS Technology TNS Master Station Software
- Substation Communication Equipment (SCE) Firmware
- _____
- _____
- _____
- _____
- _____
- _____

B. COMMERCIAL SOFTWARE

- SISCO ADLC Software
- Oracle Database Software
- _____
- _____
- _____

ACLARA POWER-LINE SYSTEMS INC.

Attachment B

To

TWACS Technology Support Services Agreement

SERVICE RATES

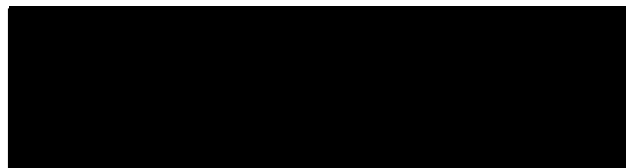
Customer Services supplied at additional cost will be provided in accordance with the following:

Technical Support Engineer (Rate/Hour)	Senior Engineer (Rate/Hour)	Software Engineer (Rate/Hour)
---	--------------------------------	----------------------------------

Standard Time

Overtime

Premium Time



NOTES:

1. The above rates are in US \$ and are subject to adjustment upon thirty (30) days notice.
2. Standard Time rates will, except as provided for under Note 8., apply to all person-hours expended during ACLARA 's normal eight (8) hour business day (7:15 a.m. - 4:00 p.m. Central Time), Monday through Friday, excluding ACLARA holidays.
3. Overtime rates will, except as provided for under Note 8., apply to all person-hours expended outside of ACLARA 's normal eight (8) hour business day, excluding Saturdays, Sundays and ACLARA holidays. For customers with Standard or Enhanced levels of Support Service Agreements, Technical Support outside the hours of 6:30AM until 6:00PM is subject to the availability of staff.
4. Premium rates will apply to Saturdays, Sundays, and ACLARA holidays. For customers with Standard or Enhanced levels of Support Service Agreements, Technical Support on Saturdays, Sundays and ACLARA holidays is subject to the availability of staff.
5. On-site service will be invoiced on a portal-to-portal basis - Not to exceed eight (8) travel hours. Travel portions of on-site service will be invoiced based upon Standard Time rates.
6. A minimum service charge of eight (8) hours will apply for On-Site support service to Customers located outside a 100 mile radius of the ACLARA St. Louis, Missouri office.
7. All ACLARA incurred expenses, which include, but are not limited to, airfare, lodging, meals, automobile rental, and test equipment shipment shall be invoiced to the customer at cost plus a 15% handling fee.
8. During On-Site Service, charges will be based upon Customer's normal eight (8) hour business day, Monday through Friday, excluding Saturdays, Sundays, and ACLARA holidays.

Effective Date: 01/22/08

ACLARA POWER-LINE SYSTEMS INC.

Attachment C
To TWACS Technology Support
Services Agreement

TWACS Technology Support Service Agreement	H: Hardware; S:Software; TS: Technical Support; TR: Training		
	Standard	Enhanced	*Premium

*Premium Level of Support Service shall be subject to a minimum number of customers electing service under this support level. Failure to attain the minimum number of customers may result in this service level being discontinued.
 **Does not apply to Out-of Warranty Equipment, Out of Production Equipment, and complete OMU & CRU Assemblies.
 ***ACLARA Senior Technical Training Specialist @ 1-800-297-2728 ext. 7399.

ACLARA POWER-LINE SYSTEMS INC.

Attachment D
To
TWACS Technology Support
Services Agreement

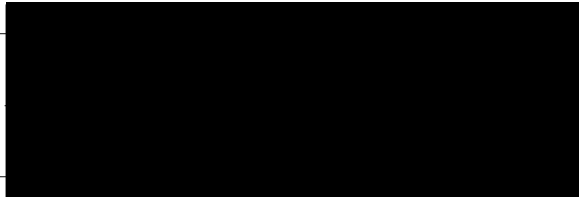
PRICING OF SUPPORT SERVICES

Pricing for the Maintenance and Support Services is calculated based on the cumulative Software License Fee paid by the Customer.

Standard Support Level

Enhanced Support Level

Premium Support Level



The annual rate shall not be subject to adjustment during the Initial Term. Thereafter, during any subsequent Renewal Period, the rate shall be subject to adjustment at the commencement of each Renewal Period. Such adjustment shall not escalate at a rate in excess of four percent (4%) over each previous year. Please refer to Section 6.2 for additional information.

ACLARA POWER-LINE SYSTEMS INC.

Attachment E

To

TWACS Technology Service
Level Agreement

SELECTED SUPPORT SERVICES

Customer: _____

Address: _____

Effective Date:

Price/ Yr: Standard: \$ _____ Enhanced: \$ _____ Premium: \$ _____

Selected Support Level (check one): Standard Enhanced Premium

Designated Contact Information
(Number determined by selected Support Level)

Name _____

Title _____

Address _____

Address _____

Telephone _____

Fax _____

Cellular Phone _____

Pager _____

Designated Contact Information
(Number determined by selected Support Level)

Name _____

Title _____

Address _____

Address _____

Telephone _____

Fax _____

Cellular Phone _____

Pager _____

Designated Contact Information
(Number determined by selected Support Level)

Name _____

Title _____

Address _____

Address _____

Telephone _____

Fax _____

Cellular Phone _____

Pager _____

Designated Contact Information
(Number determined by selected Support Level)

Name _____

Title _____

Address _____

Address _____

Telephone _____

Fax _____

Cellular Phone _____

Pager _____

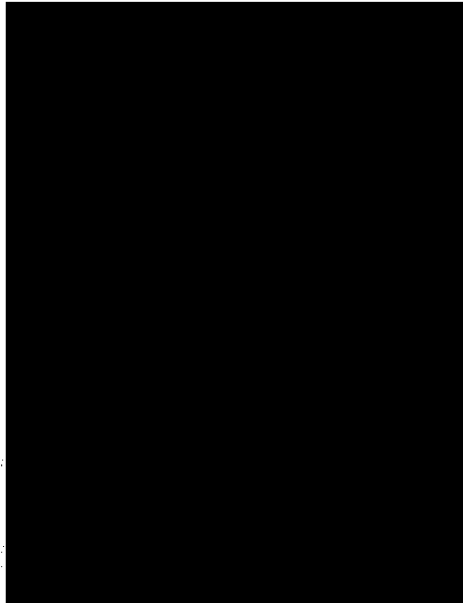


**SHELBY ENERGY AMI SOLUTION
TWACS by ACLARA
Presented by HD SUPPLY – UTILITIES
OCTOBER 1, 2008**

DESCRIPTION:	QTY	PRICE EACH	EXTENDED
SOFTWARE and HARDWARE:			
TNS Software package:			
TWACS Net Server Software	1	\$	
ProAsys Outage Software	1	\$	
Optimum Interface Software	1	\$	
TNS Hardware Package for up to 50,000 meters	1	\$	
Optimum Hardware Package	1	\$	
1 st Year Program Support & 4 Training classes	1	\$	
1 st Year Software Support	1	\$	
SUBSTATION EQUIPMENT:			
Control and Receiving Unit (Outdoor)	10	\$	
Outbound Modulating Unit (One per Bus)	11	\$	
HD Feeder Panel	2	\$	
Inbound Pickup Unit (One per Feeder)	36	\$	
MTU with Fused Switch 150KVA/7.2/14.4KV	10	\$	
MTU with Fused Switch 45KVA/14.4KV	1	\$	
Note: Transformers subject to CPI adder			
Fiber Cable (10M)	11	\$	
ELECTRIC METER MODULES:			
EMT-XM Module for Centron 240V FM2S	14,400	\$	
EMT-XM Module for Centron FM 3S & 4S	100	\$	
UMT-R-F Single Phase Module 240V FM2S	100	\$	
Poly Phase Module any form 120-480V L1	350	\$	
METERS:			
Centron Single Phase 2S CL 200 240V	14,500	\$	
Sentinel Three Phase Level 1	350	\$	
MISC. EQUIPMENT:			
Transformer Pad	11	\$	
Cutout 3 Phase w/CL Fuses	11	\$	
Shielded Cable 1,000Ft Roll	3	\$	
DSI Disconnect Collar	50	\$	

Start-Up Material

TNS Software	1	\$
TNS Hardware	1	\$
1st Year Program Support	1	\$
1st Year Software Support	1	\$
CRU	1	\$
OMU	1	\$
IPU	4	\$
MTU	1	\$
Fiber Cable	1	\$
EMT Module	500	\$
Centron Meters	500	\$
Transformer Pad	1	\$
Cutouts	1	\$
Shielded Cable	1	\$
Total		\$



OPTIONAL ITEMS:

LCT Load Control Transponder
IHD In Home Display
Recommended Spare Parts
STS Substation Test Set
PRTU Portable Test Set ✕
RSRTU Stationary Test Set
PIA Interface Adapter

1
1
1
1
1
1
1



YEARLY MAINTENANCE:

After first year:
Standard Support Level
Enhanced Support Level
Premium Support Level



Software Cost
Software Cost
Software Cost

**Shelby Energy Cooperative, Inc.
Request for Proposal
Advanced Metering Infrastructure System
Version 1.0, January 16, 2009**

CANNON

Cannon Technologies
A Business Unit of Cooper Power Systems
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The National Rural Telecommunications Cooperative (NRTC) is a licensed agent of Cooper/Cannon.

CANNON

January 16, 2009

Mr. David Graham

Shelby Energy Cooperative, Inc.
620 Old Finchville Rd
Shelbyville, KY 40065
(800) 292-6585
davidg@shelbyenergy.com

RE: Shelby Energy Cooperative: Request for Proposal

On behalf of NRTC and Cooper/Cannon, we sincerely thank you for the opportunity to provide this information to help you with your AMI System evaluation.

In the following proposal you will see that Cooper/Cannon provides truly advanced systems—speed, industry-leading functionality, a software package that enhances customer service and satisfaction, optimizes power quality, lowers expenditures, and improves the flow of information. Cooper/Cannon continues to offer the industry's fastest PLC system with the most intelligent meters—offering true distribution automation functionality allowing the system to not only benefit the metering and billing departments, but also engineering, operations, and planning. Our Yukon[®] advanced energy services platform is a powerful software suite that provides tools for Automated Meter Reading, Demand Response/Load Management, and other Distribution Automation functions such as Centralized Capacitor Bank Control and Substation Monitoring/SCADA—many tools, all on one easy-to-use platform. But our hardware and software strengths are only the beginning, the core of Cooper/Cannon and its solutions are its people—experienced, devoted, and friendly professionals who consistently offer the highest Technical Support and Customer Service to the energy solutions industry.

Our electric automation solutions—which are well-proven and in use at hundreds of North American utilities—have four key attractions to bring to your project:

- Fast, cost-effective, two-way power line carrier AMI/AMR technology, which will be particularly appropriate for the “long haul,” rural meters on the system as well as those in town.
- The industry's leading AMI/AMR functionality, including Distribution Automation and Power Quality tools in the meter.
- Complete integration with the industry's leading load management solutions via both PLC and wireless communications.
- The Yukon suite of easy-to-use software to unite all these solutions and integrate with a larger platform for system wide implementation.

The cornerstones of our solution are:

- **Speed** – Critical to processing information immediately and efficiently.
- **Accuracy** – Key to having useful data.
- **Functionality** – Necessary for a utility to improve its product and the manner in which it operates.

All of this translates into Flexibility – Allowing utilities to have the right system for today as well as tomorrow, a system that can grow with the utility well into the future.

We believe these qualities directly tie into the goals targeted by Shelby Energy and many other cooperatives:

- Improved meter reading performance and accuracy
- Reduced energy theft
- Procurement of a system that will grow with the cooperative

While Cooper/Cannon has experienced remarkable growth, especially in AMI Sales, our devotion to our customers is always in the forefront of the day to day. We will continue to provide systems to utilities of all size and classes, and provide all of them the same level of service. When one adds our extended relationship with NRTC, you can feel confident that our devotion to rural cooperative utilities will not change. As a part of Cooper Power Systems, we have continued to expand operations and offer a true automation platform pairing Cannon's versatile software platform and communication technologies with Cooper's intelligent distribution devices. The utility world will also see changes in the future, as we open all utilities up to a bright new world of solutions.

We appreciate your inclusion of Cannon and NRTC in your AMI evaluation and are at your service to explore the specifics of how our solutions will provide the "complete" Advanced Metering Infrastructure Shelby Energy Cooperative will choose to implement. This proposal is an offer to Shelby Energy to become a partner with Cooper/Cannon on a path towards success. Should you need any additional information, please contact Mark Davis, Steve Anderson or myself.

Sincerely,

Sincerely,

Steve Anderson

Utility Solutions Business Development Manager
National Rural Telecommunications Cooperative
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Lilburn, GA 30047
Direct: 404.806.7154
Email: sanderson@nrtc.coop
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1. Executive Summary

Cooper/Cannon presents a unique system, or more to the point, a unique opportunity to partner with a truly unique company.

For more than 20 years Cooper/Cannon has been a software engineering company. Delivering state-of-the art, easy-to-use Load Management software that could run on a PC, something that was a novel idea 20 years ago—now it's common practice. You'll still find that software is the foundation our solutions are built on today. We believe the strength and versatility of our Yukon platform is something that sets us apart from other AMI and LM vendors. We have countless users that began using Yukon for one aspect of their distribution system, that today use two, three or four of its core applications. Those users have thanked us for the versatility and foresight that we put into Yukon and for the effort we continue to put into the design of our platform.

What follows is an overview of why Cooper/Cannon is best suited to deliver your automation solution.

Experience – During the last few years, Cooper/Cannon has delivered systems to utilities such as Jackson Purchase Energy, Iowa Lakes Electric Cooperative, RushShelby Energy, Adams-Columbia Electric Cooperative, Harrison REMC, North East Mississippi EPA, Lane Electric Cooperative, Owen Electric Cooperative, Northeast Nebraska PPD, Cooke County Electric Cooperative, A&N Electric Cooperative, Pea River Electric Cooperative, and Southern Pine EPA. Cooper/Cannon's growth in AMI sales the last two years has been 87% and 43% respectively, specifically because your peers have recognized Cooper/Cannon's superior value proposition.

Total Platform Solution – The strength and versatility of our Yukon platform is something that sets us apart from all other AMI and LM vendors, twenty years of superior results. In addition, Cooper/Cannon offers cost-effective eSubstation Rural SCADA, Capacitor Bank Control, and Distribution Automation, leveraging your investment in hardware, software, IT, and training. This total platform approach presents Shelby Energy with a versatile solution that can grow with you, offering a Utility Automation platform for Shelby Energy's present and future.

Functionality & Flexibility – Our hardware designs are second-to-none. Industry-leading speed, the largest bandwidth, the most intelligent/highest functioning modules, hardware with the lowest installation costs and superior reliability, combined with lowest operating costs, resulting in a truly advanced system.

Features of our AMI Modules were specifically selected and designed to provide functionality focused on rural utilities with expansive service territories and long feeders. America's cooperatives need AMI features that address these requirements, resulting in solutions that work well for low-density areas. Cooper/Cannon's long list of power quality and engineering/operations data is focused on optimizing operations and efficiency for cooperative utilities, while allowing you to improve service to your member-owners. No-one can match Cooper/Cannon's speed or functionality, giving you total flexibility.

Easy – Cooper/Cannon's solution is made up of easy-to-use software and easy-to-install hardware. On top of that, we try to be the easiest company in the industry to do business with, and we invite you to ask our customers.

It Does the Job – The Cannon PLC AMI system will:

1. Improve the accuracy and reliability of Shelby Energy's billing readings.
2. Reduce energy theft on Shelby Energy's system.
3. Improve the reliability and quality of Shelby Energy's electrical product.
4. Improve customer service handling of issues concerning billing, blinking lights, dim lights, voltage stability, and customer move-in/move-outs, often in a single phone call, reducing cost, while improving utility efficiency and customer satisfaction.
5. Allow the utility to present usage information and flexible rates to Shelby Energy's members.
6. Allow for proper management of outages, both in verifying and pinpointing the location and extent of power outages before sending crews to the field and for verifying full power restoration quickly, before crews leave an area, without disturbing customers with inefficient phone calls.
7. Allow the utility the ability to perform remote disconnect/reconnect, lowering the utility's expense and increasing the safety of Shelby Energy personnel.
8. Allow for accurate voltage measurement and Engineering Analysis, improving management of critical assets such as voltage regulators, distribution transformers (sizing), and capacitor banks.
9. Provide fast, effective Load Control, with more load relief and a higher hit rate than other systems, which are just some of the reasons that **Cooper/Cannon is the leader in Load Management**, providing more devices to North America every year than all other vendors combined. These tools could be used in conjunction with energy conservation and energy-efficiency programs.
10. Allow measurement of blink and outage events for proper analysis of re-closer and breaker operations resulting in verified and optimized protection schemes.
11. Improve record-keeping and statistical analysis capabilities of Shelby Energy's staff.
12. Improve assessment of system losses and ultimately reduce them.
13. Allow Shelby Energy to target their maintenance and meter operations spending.
14. Improve operational efficiencies throughout Shelby Energy Cooperative.
15. Allow the utility to proactively prepare for future power provider contracts, removing uncertainties by having proper automation tools in place.


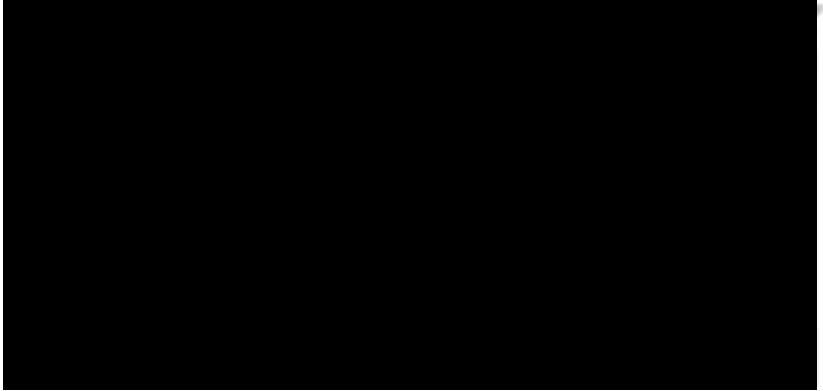



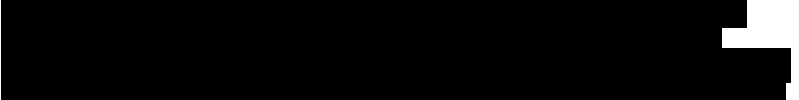
What makes Cooper/Cannon the company we are today is our people. We have employees who are dedicated to meeting the needs of our customers and doing what it takes to keep our customers happy. From the associate who just started to upper management, we all put our customers first and that is engrained in each employee from the day they start. This service-minded environment ensures Shelby Energy's AMI needs for a successful system will best be met by the Cooper/Cannon solution.

2. Response to Shelby Energy’s AMI Requirements

Cooper/Cannon has provided the following responses to the AMI Requirements provided by Shelby Energy Cooperative.

Requirement	Response
<ul style="list-style-type: none"> Daily usage readings of all meters including date and time stamp of reading. 	<p>[REDACTED]</p>
<ul style="list-style-type: none"> Daily demand usage and T-O-U data without the use of a T-O-U capable meter. 	<p>[REDACTED]</p>
<ul style="list-style-type: none"> Hourly Data. 	<p>[REDACTED]</p>
<ul style="list-style-type: none"> Support for advanced metering functions such as remote disconnect/reconnect, distribution power quality monitoring, and outage detection. 	<p>[REDACTED]</p>

	<p>of kW). If the set demand is exceeded for a one-minute period, the</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>
--	---

<p>(Continued) Example of Outage Report</p>	
<p>(Continued) Analysis of Outage Report</p>	
<ul style="list-style-type: none"> • Backfeed a circuit without loss of billing data or ability to read meter. 	<p>All Substation and route information is stored in the Master Station, thus</p> 
<ul style="list-style-type: none"> • Data to be displayed on a single phase meter to match the reading provided by the AMI module. 	
<ul style="list-style-type: none"> • Data to be sent to a single phase meter to be displayed on meter for billing purposes (e.g. demand reading) 	
<ul style="list-style-type: none"> • End of line voltage readings 	

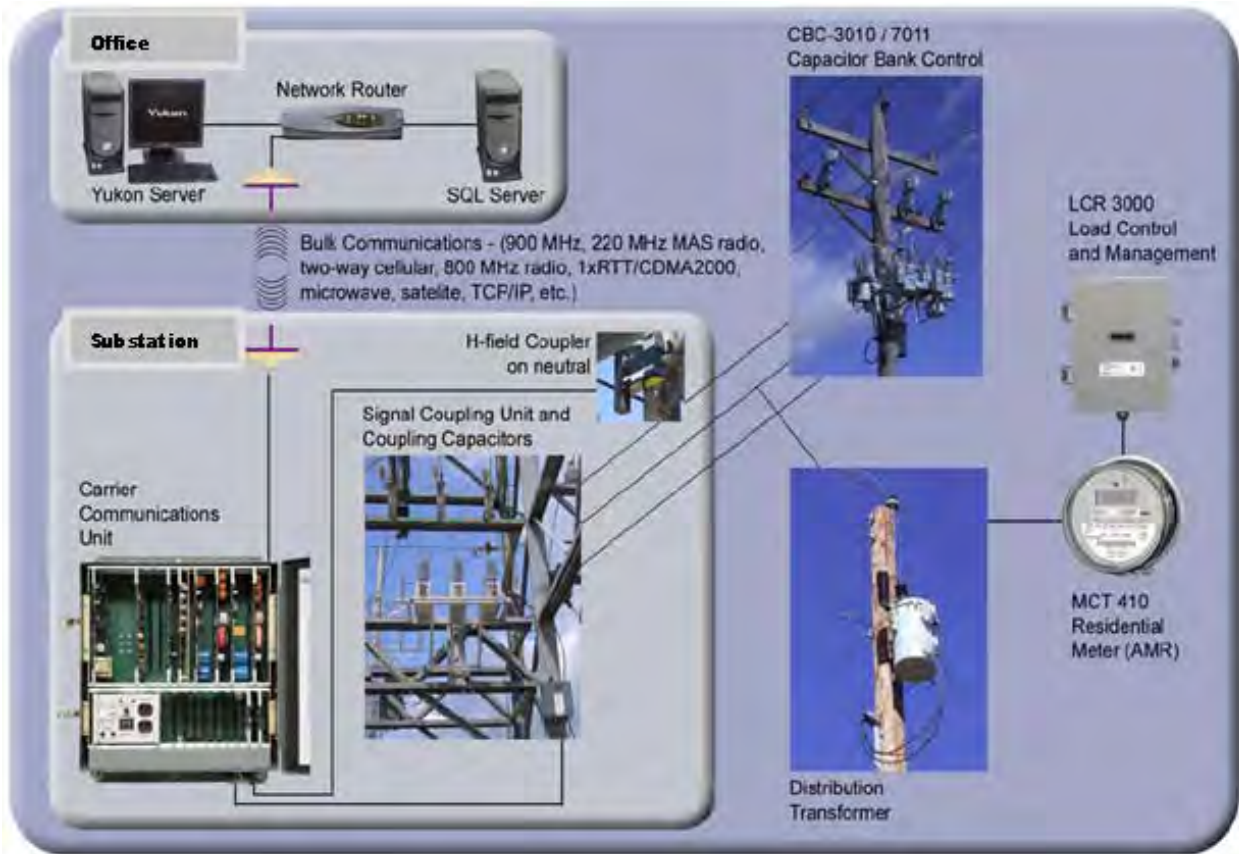
	<p>provide near real time End Of Line voltage monitoring. As Cooper/Cannon's</p> <p>[REDACTED]</p> <p>[REDACTED]</p>
<ul style="list-style-type: none"> Reliability indices (SAIFI, SAIDI, CAIDI) 	<p>[REDACTED]</p>
<p>The AMI system should additionally allow polyphase meters to:</p>	
<ul style="list-style-type: none"> Read any register programmed in meter. 	<p>[REDACTED]</p>
<ul style="list-style-type: none"> Access all diagnostic registers including site diagnostics, power quality diagnostics, health diagnostics, etc. 	<p>[REDACTED]</p>
<ul style="list-style-type: none"> Schedule remote demand resets after reading. 	<p>[REDACTED]</p>
<p>Please specify in detail the costs associated with this proposal including but not limited to hardware, software, substation equipment, office equipment, and training. Also specify what is not included (specify minimum requirements, if any) to complete the AMI project.</p> <p>(This proposal should at least include all additional hardware needed to complete the initial deployment of the AMI system.)</p>	<p>[REDACTED]</p> <p>[REDACTED]</p>
<p>Specify in detail the training needed for successful operation and deployment of</p>	<p>[REDACTED]</p>

the AMI system.	[REDACTED]
Provide detailed warranty information on all hardware, software, etc. A complete description of all warranty coverage shall be included in the proposal.	[REDACTED]
Provide information on availability and delivery schedule issues that may arise during scheduled deployment.	[REDACTED]
[REDACTED]	[REDACTED]

3. Cooper/Cannon’s Proposed Two-way AMI System

Cooper/Cannon’s approach combines the superior speed of our PLC with the most intelligent, most accurate meters in the industry to establish an Intelligent Distribution Management System (IDMS). Cooper/Cannon’s PLC meters not only store 600 days of 60-minute interval data at every meter, but they also provide 4 TOU buckets with individual peaks, measure the voltage at ± 1% accuracy, store 18 days of 15-minute voltage interval data, record the minimum and maximum voltage with time stamp, retain the last six outages with time, date, and duration (down to the cycle), and maintain a resettable blink counter with configurable outage classification. Cooper/Cannon’s PLC System will allow Shelby Energy to obtain any of the needed data within 3 to 6 seconds, enhancing customer service with one-call resolution, limiting outage time, including the operational overtime costs, allowing for engineering analysis of the distribution grid and improving operational efficiencies.

The following sections provide details on the AMI/AMR Hardware and Software solutions offered to Shelby Energy Cooperative.



Cannon Power Line Carrier (PLC) AMI Hardware

4. Metering and Control Transponders

Metering and Control Transponders (MCT), using two-way PLC communications, provide control and data gathering functions in substations and at all points on the distribution feeders. There is a family of MCT products for different applications:

- MCT-410iL – Integral single phase AMI device including a Sensus iCon meter
- MCT-410cL – Integral single phase AMI device including an Itron CENTRON meter.
- MCT-410D – 200 amp remote service disconnect/reconnect base for Form 2S CL200 MCT
- MCT-470 – Multi-protocol interface for digital polyphase meters and DNP 3.0-based distribution automation equipment.
- MCT-430A – Under-glass solution for Polyphase metering using an Elster AlphaPlus meter.
- MCT-430S4 – Under-glass solution for Polyphase metering using a Landis + Gyr S4e meter.
- MCT-430SL – Under-glass solution for Polyphase metering using an Itron SENTINEL meter.

4.1 Single-Phase Metering and Control Transponders

Metering and Control Transponders (MCT410), using two-way PLC communications, provide control and data gathering functions for all residential and commercial metering points on the distribution feeders. The MCT-410 is designed to replace a residential meter, and plugs into a standard meter socket. The MCT provides high speed (3 to 6 seconds) remote meter reading from customer or line locations using two-way PLC communications.

MCT 410iL ::



MCT 410cL ::



MCT Features:

- Two-way communications (3-6 seconds roundtrip)
- Downloadable function configuration from Yukon Software Platform
- On-site data storage (all values written to Non Volatile Memory)
- Unique and group addressing

- Remote meter reading
- Error Flag reporting
- Self-contained enclosure secured with standard meter seal
- Accuracy (all available meters are solid state meeting or exceeding ANSI C12.20 (Class 0.5))
- Internal real-time clock
- No battery (7-hour super capacitor that runs clock during outages, but never needs replacing)

Advanced MCT Features:

- Energy Usage
 - Cumulative Consumption
 - Daily Usage (24 hr period)
 - 93 days of Daily Usage stored in module
- kW Demand
 - Configurable to 5-, 15-, 30-, 60-minute intervals
- Peak kW Demand
 - With time and date
- Load Profile
 - Configurable to 5-, 15-, 30-, 60-minute intervals
 - Storing 600 days of hourly interval data
- Time Of Use
 - Four TOU period/buckets
 - kWh and Peak kW for each period/bucket
 - Downloadable schedules featuring weekdays, weekends, and holidays
 - ALL parameters remotely configurable
- Voltage Measurement
 - Highly Accurate (within $\pm 1\%$), regardless of meter vendor
 - Configurable to 5-, 15-, 30-, 60-minute intervals
 - Storing 18 days of 15-minute interval data
 - Minimum/maximum voltage with timestamp
 - Downloadable and Configurable Voltage Threshold violation flags
- Phase Identification
 - Using voltage adjustment algorithm
 - For distribution networks utilizing single-phase regulators
- Outage Information
 - Blink Count
 - With configurable duration
 - Outage Log
 - With time, date and duration down to the cycle of the last six outages
 - Interfaces to OMS
 - Combined with Cannon's speed, can quickly pinpoint outages after only one call
 - Verify full outage restoration before crews leave the area
- kWh freeze register
 - To freeze all, or a subset exactly at the billing date/time, regardless of the collection time

Additional MCT features:

- Remote Disconnect/Reconnect
 - All Cannon 2S CL200 meters are disconnect ready
- Demand limiting feature
 - Remotely configurable to tenths of kW
- Cycling feature
 - Cycle load on/off for configurable periods and rates
- "True status"

- Based on kW demand

MCT 410D ::



MCT 410D with MCT 410 meter::



- Additional inputs
 - From up to two sources so that electric, gas/propane and water consumption from one location can be obtained from one MCT. The external inputs can be from hardwire encoder sources such as Sensus, Badger, and Hersey. Wireless interfaces to these ancillary meters are also in development. To reduce communication time, one Master Station request will retrieve all three readings from one MCT.

4.2 Poly-Phase Metering and Control Transponders

Metering and Control Transponders (MCT430), using two-way PLC communications, provide control and data gathering functions in substations and at all points on the distribution feeders. The MCT-430 is an integrated AMI Module with a polyphase meter for commercial and industrial accounts. The MCT provides high speed (3 to 6 seconds) remote meter reading of C&I accounts using two-way Power Line Carrier.

MCT 430A ::



MCT 430S4 ::



MCT 430SL ::



MCT Features:

- Two-way communications (3-6 seconds roundtrip)
- Underglass solution
- 4 TOU rates
- Utilizes meter tables to obtain kW, kVAR (if enabled), kVA for each TOU Rate
- Access to per phase Voltages (if enabled)
- Remotely re-settable Peak Demand for each rate
- Full voltage auto-ranging models available (120-480 V for 430A and 430S4 models, 120-277 V for 430SL)
- Error Flag reporting
- Self-contained enclosure secured with standard meter seal
- Accuracy (all available meters are solid state meeting or exceeding ANSI C12.20 (Class 0.2))
- Retrofittable solution

4.3 Additional Interfaces

Cannon's MCT-470 is also available. This is a "universal" external device with interfaces to several popular polyphase meters, including:

- Elster AlphaPlus/A3
- Landis + Gyr S4/S4e
- GE kV/kV2c
- Itron SENTINEL
- KYZ pulses (4 inputs) for all other vendors

The MCT-470 can also be used as a PLC-based mini-RTU, allowing for remote Gen Set control/monitoring as well as Distribution Automation, interfacing to downline reclosers and voltage regulators with a DNP 3.0 interface.

This device contains:

- 1 RS-232 Serial interface for metering protocols/DNP 3.0 interfaces to downline DA equipment
 - This allows communication with multiple vendors of downline equipment and does not exclude non-Cooper Power Systems equipment
- 1 Current Loop interface for metering protocols (Elster/ABB)
- 4 KYZ inputs / 8 status inputs
- 2 Control outputs
- 4 selections for input power (120, 240, 277, 480V) the MCT-470 interface device need not be powered by same source as meter
- LEDs for troubleshooting

MCT 470 ::



4.4 Load Management Devices

Cooper/Cannon truly offers the most advanced load management systems on the market, with advanced protocols and control algorithms to provide demand side relief while minimizing customer inconvenience. Cooper/Cannon can utilize Power Line Carrier, 900 MHz Paging, VHF, FM/SCA, and Ripple communications mediums to communicate with Load Control devices of various types and configurations. What follows is a brief overview of our Load Management capabilities.

Cooper/Cannon provides more load management devices to North America every year than all other vendors combined. This is due to the technological superiority of the devices and easy-to-use software that provides proper control of loads ranging from water heaters and air conditioners to pool pumps and agricultural irrigation pivots. Cooper/Cannon's devices utilize our proprietary TrueCycle® technology to sense the duty-cycle of air conditioners, providing true load relief even on the over-sized air conditioning units being installed today—maximizing the utility's investment in Load Control tools. Results show that TrueCycle increases load reduction by 33% per point, creating incredible savings for the coop. Cooper/Cannon's devices also offer tools to the utility to provide dependable demand response and increased grid stability.

- **Groups** – Cooper/Cannon's LM is a highly flexible system and supports billions of group addresses in a manageable hierarchy as well as individually addressable switches. All addressing is remotely configurable from Yukon.
- **Cold Load Pickup** – All units have configurable cold load pick-up times for each individual relay/load, minimizing feeder inrush following sustained power outages.

- **Line Under Frequency Protection** – every device contains Line Under Frequency protection, taking all available loads offline within 12 cycles of a frequency event, and allowing for automated return once the situation has stabilized.
- **3 Individually Accessible Relays** – to allow individual control of up to three loads including Air Conditioners, Water Heaters, Pool Pumps, Heat Pumps, Dual Fuel, Resistive Heat, Irrigation Pumps
- **TrueCycle® Technology** – Uses the duty cycle to ensure proper load cycling regardless of A/C unit size, offering significantly higher load relief and dissolution of free-riders.
- **Communications Options** – In addition to PLC, Cooper/Cannon also supplies Load Control Receivers with 900 MHz FLEX paging, 150 MHz VHF paging, FM/SCA, and legacy Ripple systems.
- **Fast-Actuating** – Cannon’s PLC load management tools allow the utility to respond quickly to peak load events, shedding loads in under 1 second.
- **SCRAM Protection** – Cannon’s PLC load management system allows the utility to instantly respond to critical emergency loading situations, shedding ALL available loads in under 1 second.
- **Remote Configuration** – All configurable parameters are remotely downloadable.
- **Control Options** – Cooper/Cannon offers Load Cycling, Time Control, and On/Off options for a variety of flexible control choices to fit every load.
- **Propagation Tests** – Cooper/Cannon offers both LED and counter incrementation to validate signal propagation.
- **Fail-Safe Operation** – Cooper/Cannon’s devices continually perform self-monitoring, if any abnormality is detected, the loads are returned to their normal state preventing customer discomfort.
- **Data Logging** – Cooper/Cannon’s devices store 90 days of hourly compressor runtime and compressor shed time. In addition, Cooper/Cannon devices maintain a full communications log.
- **LEDs for Indication/Reporting** – Cooper/Cannon’s devices contain one LED per load relay for indication of control, a “good signal” LED to indicate the device is receiving valid communication messages, and an optical port allowing for field scanning of the device’s configuration and logs.
- **Real M&V** – Cooper/Cannon’s AMI Load Profile data (using true integrated demands for intervals of 5-, 15-, 30-, or 60-minutes) allows the utility to perform true M&V of Load Management activities.

LCR 3100 ::



5. Thermostat Devices

Though these devices are not yet PLC-enabled, they can be effectively coupled with other solutions available from Cooper/Cannon.

UtilityPRO™

The UtilityPRO demand response thermostat/In-Home Display is based on Honeywell's award-winning programmable thermostat. It is designed to serve as the backbone of a successful demand response program and provide full state-of-the-art functionality.



The UtilityPRO provides the following features and benefits:

- Two-piece design for easy installation
- Customer-friendly user interface
- Large, easy-to-read backlit touch screen display
- Easy on-site or web-base programming
- Cooper/Cannon's unmatched control to manage peak power demand and maintain customer comfort
- Accurate, precise temperature control ± 1 degree
- Adjustable heat and cool temperature limits
- Personalized in-home display
- Billing capabilities
- Compressor protection
- Flexible Communication options
 - 900 MHz FLEX Paging
 - VHF Paging (154 MHz POCSAG)
 - ZigBee interface to AMI Networks (available 2009)

6. Bulk Communications

Cooper/Cannon allows for a variety of flexible options for bulk communications between the Yukon Master Station and the Cannon PLC substation injection equipment.

Cooper/Cannon requires only 1200 BAUD communications, as the message structure is short, with low overhead. Cooper/Cannon's substation injection equipment can utilize dedicated serial channels or operate on IP networks. Most commonly, Cooper/Cannon's users operate equipment at 4800 BAUD.

Cooper/Cannon is bulk communication independent, and can utilize the following:

- Leased telephone lines
- 900 MHz radio
- 220 MHz radio
- Microwave
- Fiber
- Satellite
- Dialup telephone (not recommended)
- Radius Radio solutions
- Ethernet solutions

Ethernet solutions include:

- DSL
- Cable modem
- ISDN
- Frame relay
- WildBlue satellite internet
- MDS iNET Ethernet radio

7. Cannon PLC Substation Injection Equipment

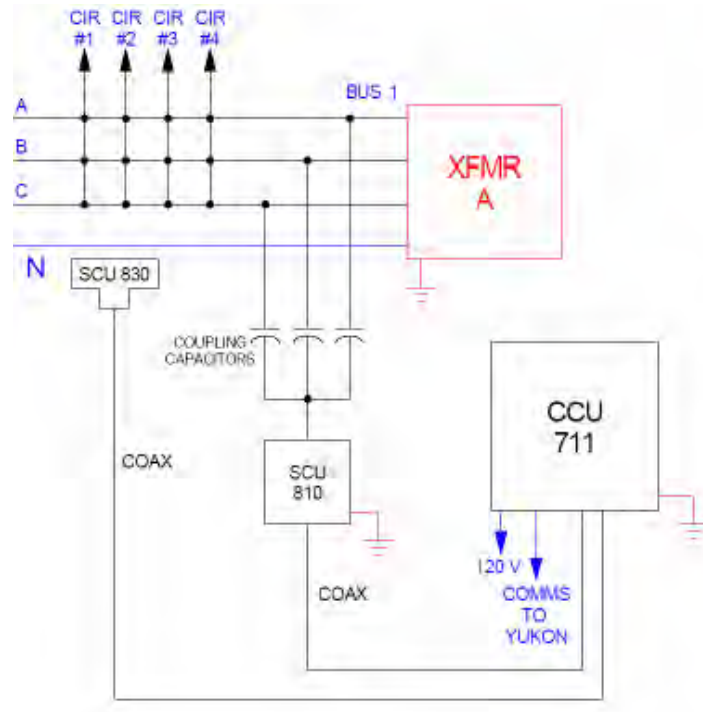
Power Line Carrier (PLC) communications allows one-way and two-way communications with any point on the distribution system (beyond the CCU). The Carrier Control Unit (CCU) is the PLC System interface between the bulk communications link and the Power Line Carrier (PLC) communications.

The CCU is tied to three phases of up to eight distribution primary injection points via Primary Coupling Assemblies consisting of Signal Coupling Units (SCU) and coupling capacitors (PCC). The power line carrier transmitter is provided with dual individually addressable power amplifiers for added reliability.

The remote units, metering transponders (MCTs), receive the carrier signals and, if interrogated, respond with a return message. The CCU receiver amplifies and demodulates the incoming signal to recover the data. The data is then returned to the Master Station via the bulk communication link.

Carrier Coupling Units are installed in the distribution substation. The CCUs are enclosed in watertight and dust tight NEMA type four cabinets with easy access for maintenance. Cabinets are not vented. The enclosure provides for frame mounting to reduce installation costs.

A schematic of Cooper/Cannon's Substation Equipment Connections



7.1 Power Line Carrier Description

The heart of Cooper/Cannon's PLC-based communications network is a Coherent Phase Shift Keying (CPSK) modulated asynchronous carrier signal that is imposed on the distribution system.

Selected carrier frequencies in the 9 to 15 kHz range are available. There are Cannon PLC Systems currently operating at 9.6 kHz and 12.5 kHz.

The multiple asynchronous frequencies allow signal isolation between nearby systems without expensive filters at the sub-transmission and transmission voltage levels. In addition, the carrier frequencies are selected to avoid harmonics of the 60 Hz power frequencies, minimizing the interference of noise from large motors, solid-state (thyristor and SCR) controls and other commercial and industrial equipment.

To meet data integrity requirements and to locate where communication errors occur, three data transmission techniques are used:

- Messages are transmitted with fixed bit patterns and assigned field structures to ensure reliable communications.
- A parity scheme protects the initial communication stage and increases transmission reliability.
- A six-bit cyclic BCH code protects the second communication stage, which allows verification of data accuracy at various points.

There is normal attenuation with the PLC signal that is affected by line impedance. The signal frequency range of 9 to 15 kHz was selected to reduce attenuation and also minimize high noise levels.

However, as with all communication systems, amplification of the signal level will be required if reliable communication is to be achieved for all applications. A repeater (signal amplifier) is available that will selectively amplify the signal on command from the Master Station and compensate for attenuation, noise and standing wave phenomena. Attenuation can also be reduced and signal strength improved by the use of Capacitor Blocking Units. Additional application information is in the System Technical Manual from Cooper/Cannon.

7.2 Power Line Carrier (PLC) Coupling

The PLC signal is generated and controlled by the Carrier Control Unit (CCU) and coupled to the distribution system by the Primary Coupling Assembly (PCA). The CCU signal output is transmitted to the Signal Coupling Units (SCU) of the PCA via coaxial cables. The SCU provides impedance matching and couples the signal through the Primary Coupling Capacitor (PCC) onto the distribution feeder or bus.

Capacitive coupling on a grounded wye distribution system is achieved by using one SCU-810 and three PCC connected to all three phases of the feeder. Coupling configurations for non-grounded distribution systems is achieved by using other combinations of PCCs and SCUs. Cooper/Cannon will offer assistance in configuring the PCA for optimum signal propagation.

Note that with Cooper/Cannon's unique Power Line Carrier system, capacitors are used rather than a transformer. This has many advantages:

- Small Footprint
 - Compact equipment, conveniently fitting in virtually any substation configuration or size
 - All necessary equipment for two substations can fit in the back of a single standard utility truck
- Lower Installation costs
 - Capacitors are easily mounted to the substation structure
 - Capacitors do not require expensive and labor intensive installation of concrete pads
 - Capacitors do not require high voltage underground labor

- Capacitors do not require environmental containment systems
- Cannon's control units can be mounted indoors or out and require no cooling equipment
- Cannon's substation injector can inject on up to eight substation transformer busses with a single Control Unit, keeping costs low on multi-bus substations
- Cannon's substation injection equipment can be completed by a crew of two in less than ½ a day
- Lower Operating costs
 - Capacitors have virtually no losses, unlike the losses associated with energizing transformer cores
 - Cannon's system design utilizes extremely low amounts of power both at the substation and at the meter, for a transformer-coupled system, these costs can be substantial over a twenty-year life-expectancy

7.3 Grounded Capacitors in the PLC Signal Path

If there are grounded capacitors in the PLC signal path, it is necessary that they be blocked to prevent the signal from being shunted to ground. It is also necessary to block delta connected capacitors. As part of its standard Bill of Material (BOM), Cooper/Cannon supplies Capacitor Blocking Units (CBUs).

For grounded dual-bushing capacitors on a grounded wye distribution system, one CBU is used for the entire bank, installed between the common neutral and pole ground. Single-bushing capacitors require additional considerations.

7.4 Repeater Application

As with other high-speed, high-bandwidth communication systems, repeaters are used to improve signal strength and overcome excessive noise or signal attenuation. Simply put, repeaters are used to allow higher frequencies, which, in turn, allow for higher speed and bandwidth. Cannon PLC Repeaters (RPTs) allow the use of power efficient modules while ensuring system reliability.

The repeater is omni-directional, boosting incoming and outgoing messages; and has a unique address for downloading routing codes from the Master Station. To maximize communication speed, repeaters have distributed intelligence to only regenerate messages that require signal-to-noise improvement rather than repeating all messages.

The repeater can either be pole mounted or placed in underground cabinets, and is coupled to the distribution feeder with either a Primary Coupling Assembly or Capacifomer single-phase coupler.

Cooper/Cannon is the only PLC vendor that has repeaters available, thus giving the utility a tool to overcome obstacles in transforming an electrical distribution system into a communications system. This allows utilities to be confident that they have the tools available to read even the most stubborn of meters.

7.5 Communication on De-Energized and Open Feeders

The PLC communication system, using CPSK asynchronous signaling, allows communications on de-energized feeders and around feeder open points.

The PLC signal is independent of the 60-hertz power so that a distribution feeder will serve as the communication media while it is de-energized. This, for example, can allow configuration of feeders by the Master Station operator as a DA function. To simplify this procedure, the Master Station database includes the various routes and zones that are needed.

Communicating around an open point is achieved by installing a coupling assembly (PCA) on both ends of the open point and connecting the two PCAs with a repeater. This provides a by-pass through the open point for the PLC signal and signal enhancement with the repeater. This serves as an economic advantage because the number of CCUs and associated telephone links are minimized and PLC communication continuity is achieved.

8. Test Equipment

Cannon has a variety of test equipment available to utilities, for both field and meter shop operation.

- **Portable Carrier Tester**

The PCT-751 is a combination of Cooper/Cannon's mini-CCU and the Meter-Minder software application running on a ruggedized PDA device. This can be used to provide a means of manually injecting carrier signal on a low-voltage line to manually perform a read of AMI devices or shed Load Control devices within a several block area.

- **Portable System Tester**

The PST can be combined with either the CCU or with the mini-CCU (also known as a CTT-751) as an alternative to the Master Station to test various pieces of injection hardware as well as perform a read of AMI devices or configuration or shed Load Control devices within a several block area. Often this is used with the CTT to provide diagnostic services in a meter shop.

- **dB Volt Meter**

The dB voltmeter is a signal strength meter used to measure Power Line Carrier signal to noise levels at CCUs, Repeaters or terminal/transponder sites. The unit is housed in a molded case with removable signal leads for measurement on 120/480 VAC lines. The meter on the dB voltmeter is calibrated to read signal or noise levels on a dB scale relative to 1 volt RMS from -60 to +20 dB. A selector switch can attenuate the signal by 20 or 40 db.

9. Yukon AMI Software Suite

This section of the overview will provide Shelby Energy example screen shots from Cooper/Cannon's Yukon Master Station Software. Note that screen shots from the Yukon Master Station Software user interface displays which are enabled in Cooper/Cannon's browser-based interface, which eliminates any need for client software to be loaded on individual computers at the utility. The view/edit permissions for each user are governed by the System Administrator who is authorized to program Yukon Master Station software's role-based security features.

What follows is a Yukon Master Station Software AMI module screen-shot tour:

The screen shot to the right provides a view of the browser-based Account Dashboard interface for Customer Service Representatives

Yukon's browser interface presents data for:

Energy-Related Stats

➔ Current, Previous, and Usage data

Demand-Related Stats

➔ Current, and Peak data

Voltage-Related Stats

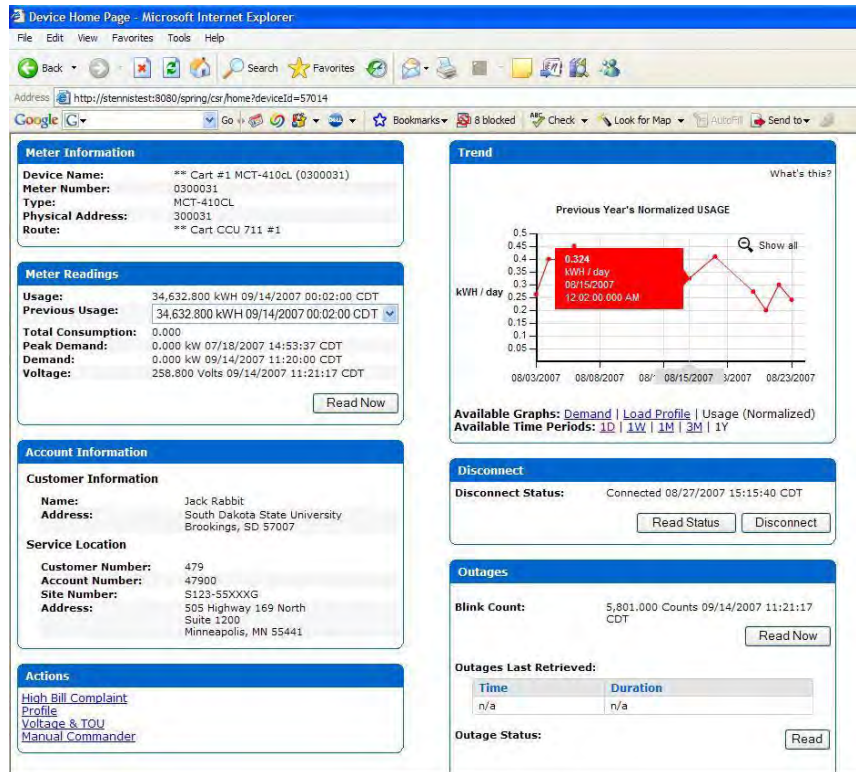
➔ Current, Minimum and Maximum data

Outage-Related Stats

➔ Instant Verification of Customer Reported Outages, Blink Counts, and Last 6 Blink Events

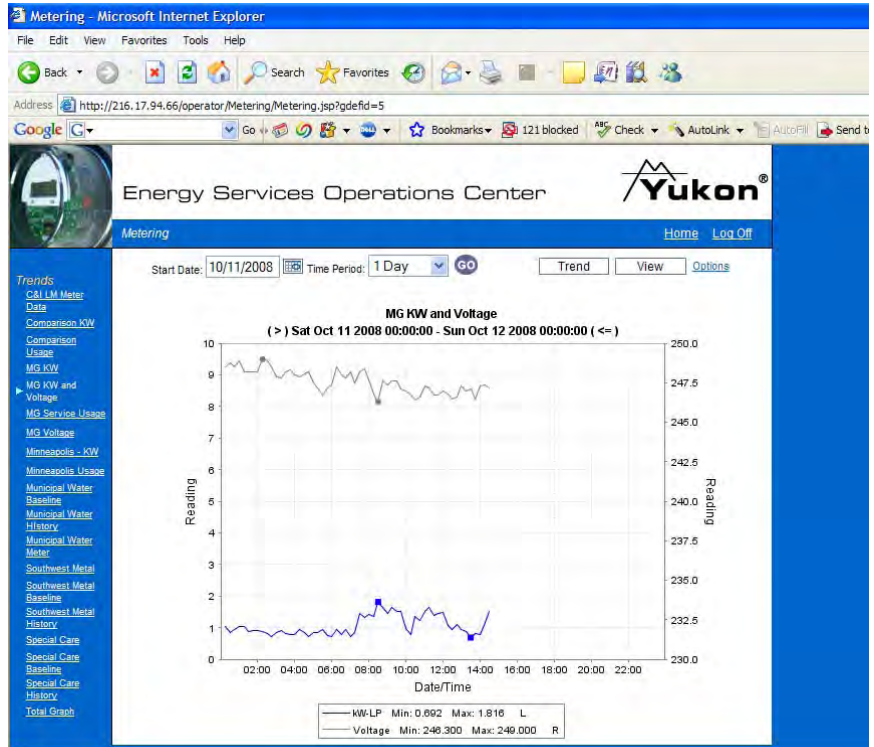
Disconnect-Related Status

➔ Connected or Disconnected



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The screen shot to the right provides a voltage and demand profile trend—the voltage profile activity information is featured in “grey,” scaled upon the right axis and the KW load profile is featured in “blue,” scaled along the left axis.



The screen shot to the right provides a view of the browser-based, meter-specific reporting module for meters.

Reports	Start Date	Stop Date	Format
<input checked="" type="checkbox"/> Meter Reads	11/20/2005	11/20/2005	<input checked="" type="radio"/> PDF <input type="radio"/> CSV
<input type="checkbox"/> Meter Outages			
<input type="checkbox"/> Power Fail Data			
<input type="checkbox"/> Disconnected Data			
<input type="checkbox"/> Load Profile Setup Data			
<input type="checkbox"/> Load Profile Summary Data			

Options:

Meter Panel Status: Meter Panel, Secondary Panel

Order By: Device Name, Route Name, Meter Number

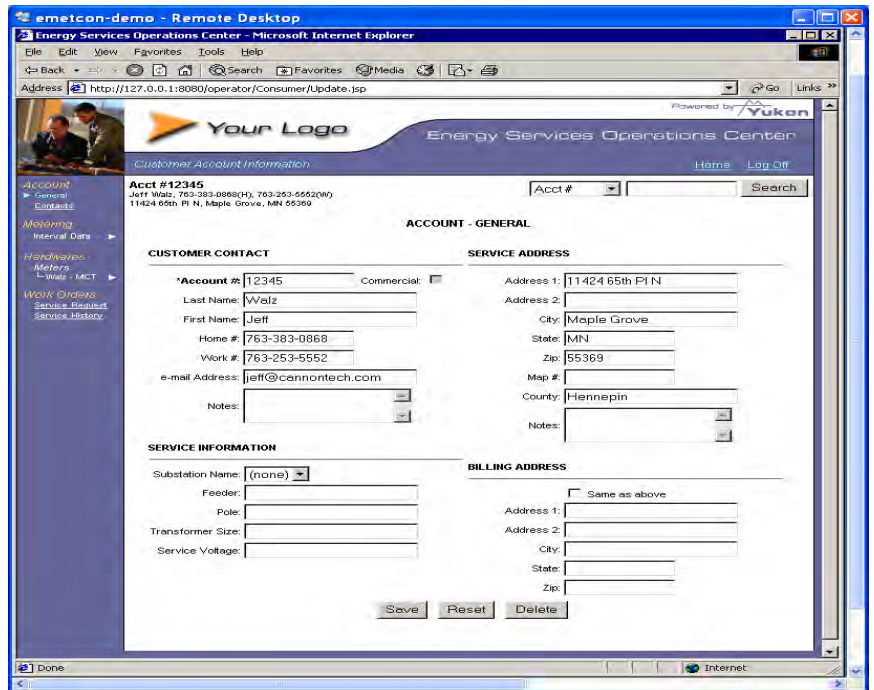
Filter: Meter Numbers

- 101015609
- 101015610
- 1010156107
- 1010156108
- 101015611
- 1010656
- 10271356
- 1234
- 1234

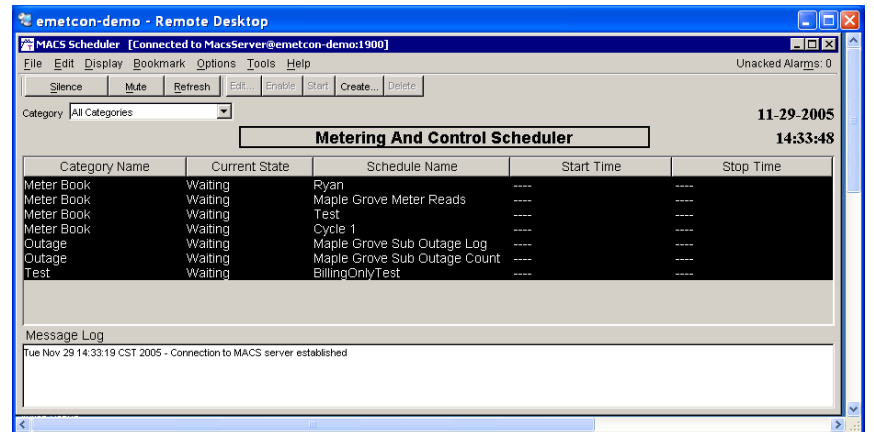
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The screen shot to the right provides only one of the many views available from the Yukon STARS interface. This view is the result of a targeted, meter-focused query. The meter profile information will display:

- Account Profile Information
- Meter Profile Information
- Hardware Tracking Information
- Work Order Tracking Information

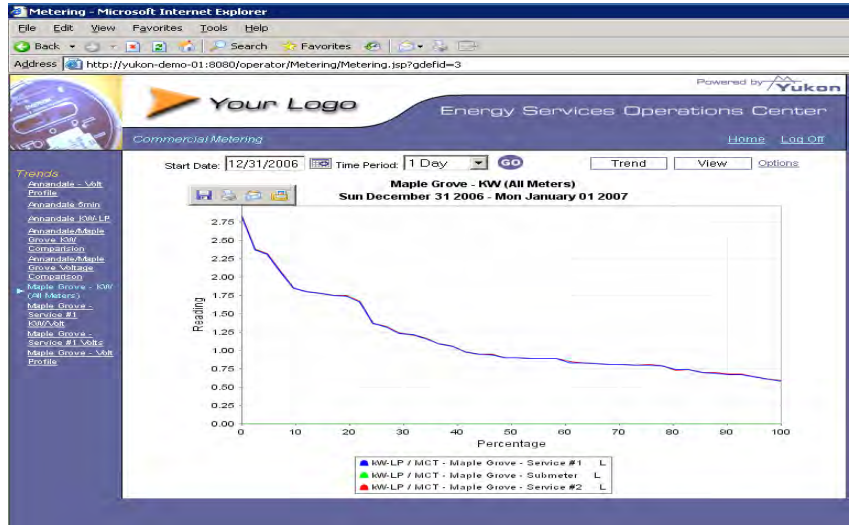


The screen shot to the right provides a view of the Meter Schedule Console. The operator can manually execute a defined schedule now or enter a specific date and time for execution. It is this console that is set to automatically read the utility's meters, daily or monthly.



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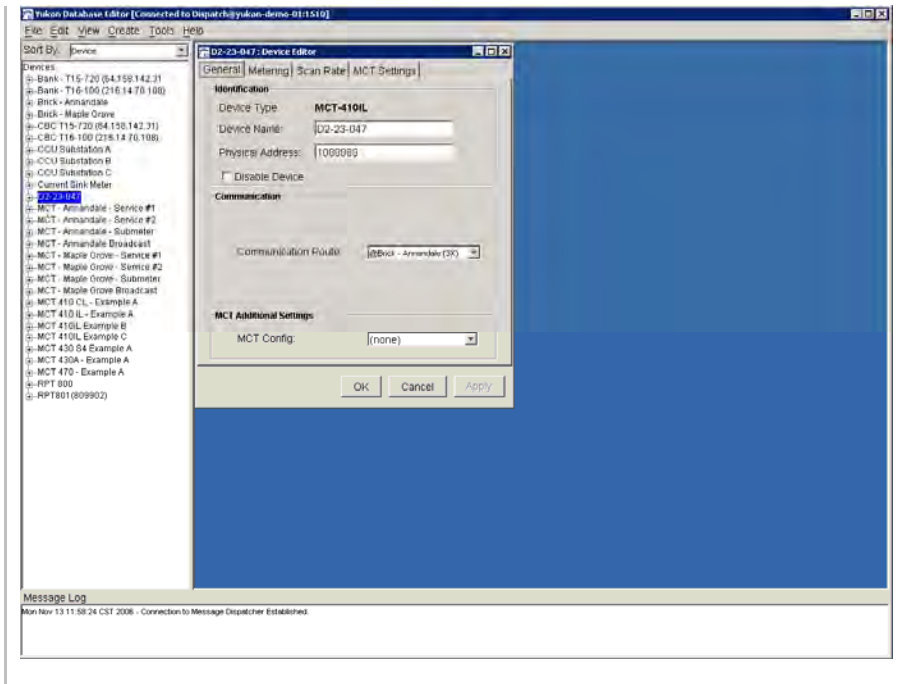
The screen shot to the right provides a view of the browser-based Graphing Application. The user can easily select any date range, graph-type (load duration graph shown), or export method (.pdf, .jpg, .png, or .csv).



The screen shot shown here shows just one method of generating billing files for import into a utility's billing system. These files can also be generated automatically by the automated metering scheduler.

The screenshot shows a web browser window displaying a 'BILLING' form. The browser title is 'Energy Services Operations Center - Microsoft Internet Explorer'. The address bar shows 'http://yukon-demo-01:8080/operator/Metering/Billing.jsp'. The page header includes 'Your Logo' and 'Energy Services Operations Center'. The form is titled 'BILLING' and contains the following fields and options: 'File Format' (dropdown menu set to 'SEDC'), 'Billing End Date' (text box with '01/01/2007'), 'Demand Days Previous' (text box with '30'), 'Energy Days Previous' (text box with '7'), 'Append to File' (checkbox, unchecked), 'Remove Multiplier' (checkbox, unchecked), 'Billing Group Type' (dropdown menu set to 'Collection Group'), and 'Billing Group' (dropdown menu with 'Annandale Book 1' selected). A 'Generate' button is located at the bottom right of the form.

The screen shot to the right provides a view of Yukon's Database Editor. The operator can make any changes to the database through this easy-to-use Windows java client.



9.1 Yukon—Cooper/Cannon's Multi-Faceted Software Platform

Cooper/Cannon has devoted substantial resources to create an enterprise class suite of software to address all the complex operations of a multi-faceted utility automation program—we call our software Yukon. Yukon and its capabilities are described in detail below, but in short, it addresses needs of dispatchers, system administrators, casual operations, customer service representatives, consumers, installers, and any other stakeholder in the system. Yukon provides access, management, security, redundancy and scalability to support any type of demand response or power factor management program and is designed for integration with utility systems. Yukon is widely used, rigorously tested and regularly updated. It is at the core of all of our solution offerings.

9.2 The Yukon Platform

The Cooper/Cannon's software system is a suite of programs for Advanced Metering Infrastructure, Demand Response, Capacitor Bank Control, Distribution Automation and data collection collectively named Yukon [see Figure 1, on the following page, Yukon platform]. Design emphasis has been placed on integration to other systems because of the needs of today's utility operations center. The Master Station is built to work as a stand-alone system or in concert with SCADA/EMS, CIS, Work Order Management, Inventory Control and Outage Management. The programs are inherently "two-way"—they gather and use data from real, pseudo, or calculated points. Electric utilities use Yukon to run commercial, industrial and residential Demand Response programs, control distributed generation, manage power factor, monitor critical equipment, and improve preventative maintenance practices.

The software is designed to be both simple to use and extensible to a very large system. Cooper/Cannon's personnel have extensive Demand Response implementation experience which allows them to offer start-up, training and support services geared to a Client's specific needs.

The software is designed as a generalized system for control and data acquisition. The specifics of the metering and control devices are kept separate from the business logic, making the system device independent. We have strong relationships with all major metering vendors, but we are allied with none in particular. Both directly and through the GE/Harris family of communications gateway products, Yukon supports intelligent electronic devices and integration with many different systems from billing to SCADA.

Figure 1 ::

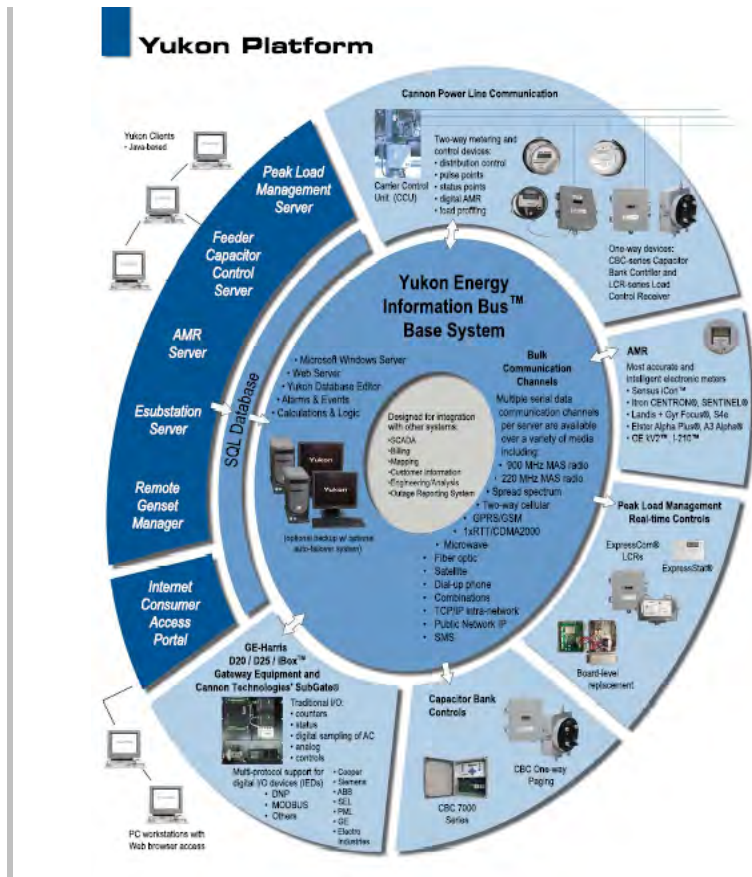
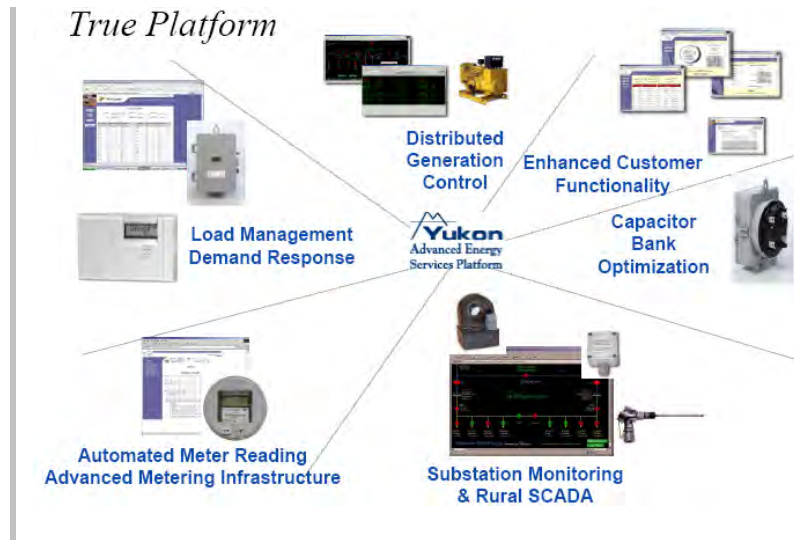


Figure 2 ::



9.3 Yukon Suites

- **AMI/AMR Suite (Included).** This is the suite of software we will use to provide all advertised functionality, including providing access, reporting, and exporting of metering data.
- **Demand Response Suite (Optional).** This suite of software executes programs and schedules defined by the utility, acting on real-time inputs in concert with time, day, and season to efficiently manage load and distributed generation.
- **Capacitor Control Suite (Optional).** Suite of software to control capacitors in an effort to maintain an optimal power factor by feeder, bus, or substation.
- **Esubstation Suite (Optional).** Cooper/Cannon's suite of software used to provide Substation Monitoring and SCADA.

There are three important subsets of the Yukon Platform that are used to make up the various suites:

- **Clients**
 - JAVA Clients
 - Browser-based Clients
- **Servers**
- **Consumer Web Access Module**

9.4 Yukon JAVA Clients

The following are the core Yukon client modules, each is a JAVA application used by utility personnel to create and manage the system.

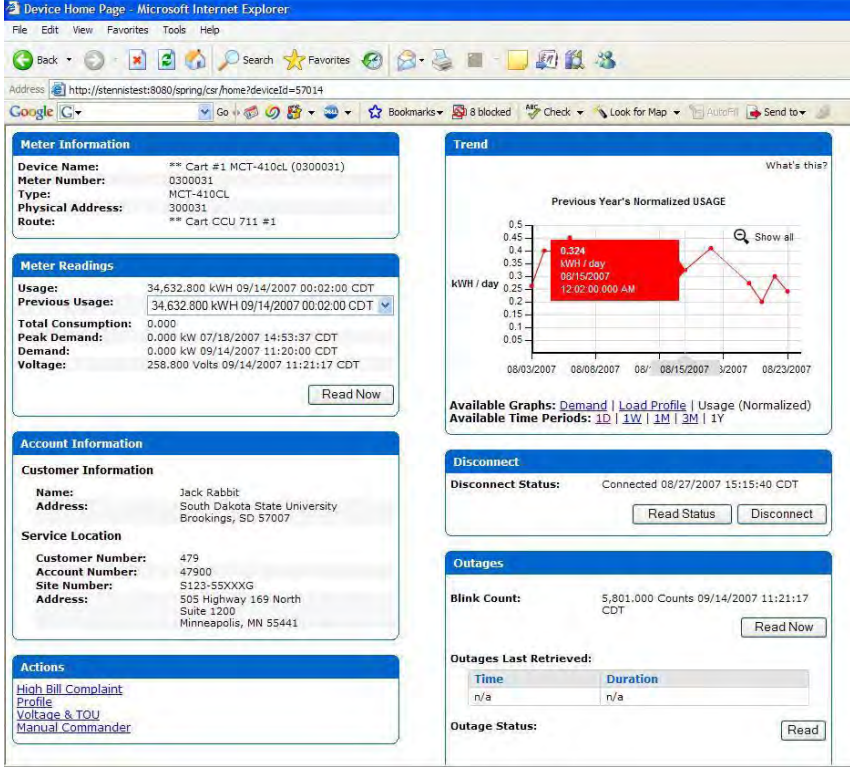
- **Yukon Database Editor.** The Yukon Database Editor is used to add, modify, or remove components from the Yukon Core System, for all Cooper/Cannon Solutions including AMI,

Demand Response, Load Management, Capacitor Bank Control, and System databases. The Core database defines all shared communication that is common throughout the system, while the Demand Response, Capacitor Bank Control and System databases are specific to Demand Response, Capacitor Bank Control, or System operations and equipment.

- **Yukon Tabular Data Console.** The Yukon Tabular Data Console is a client application used for managing displaying real-time data and for conducting control, interacting with schedules and strategies, etc. Users may view pre-designed displays and create their own displays (if privileges are enabled to do so) for:
 - AMI/AMR
 - Demand Response
 - Capacitor Control
 - Event/Alarms
 - Schedules
- **Yukon Scheduler.** The Yukon Scheduler allows users to create, edit, execute and view the status of Metering and Control schedules. It is here that meter cycles are setup to be read on their specific date and time. There is no limit to the number of meter cycles or schedules that can be utilized. This client interface can also be used to change the state of a schedule, including start, stop, enable, and disable, and to modify schedule information.
- **Yukon Trending.** The Yukon Trending module collects, aggregates, and displays real-time and historical data. This interface provides real-time graphical information which can be viewed as well as exported to .pdf, .jpeg, .html, .png, or to .csv in a tabular format. This application can be used to graph multiple points, including different color and symbol representation as well as multiple scaling axis.
- **Yukon Commander.** The Yukon Commander is used for interactive command processing. Commander allows the user to collect data from or send data to field devices. Users may also view results for troubleshooting or keeping in contact with the field.

9.5 Yukon Web Browser Clients

For easy and cost effective enterprise access, Yukon provides browser-based clients for various applications:

Application Type	Example Display
<p>Automated Meter Reading/Advanced Metering Infrastructure</p>	 <p>The screenshot shows a web browser window titled "Device Home Page - Microsoft Internet Explorer". The address bar shows "http://sternstest:8080/spring/csr/home?deviceId=57014". The page content is organized into several sections:</p> <ul style="list-style-type: none"> Meter Information: <ul style="list-style-type: none"> Device Name: ** Cart #1 MCT-410CL (0300031) Meter Number: 0300031 Type: MCT-410CL Physical Address: 300031 Route: ** Cart CCU 711 #1 Meter Readings: <ul style="list-style-type: none"> Usage: 34,632.800 kWh 09/14/2007 00:02:00 CDT Previous Usage: 34,632.800 kWh 09/14/2007 00:02:00 CDT Total Consumption: 0.000 Peak Demand: 0.000 kW 07/18/2007 14:53:37 CDT Demand: 0.000 kW 09/14/2007 11:20:00 CDT Voltage: 258.800 Volts 09/14/2007 11:21:17 CDT Account Information: <ul style="list-style-type: none"> Customer Information: <ul style="list-style-type: none"> Name: Jack Rabbit Address: South Dakota State University, Brookings, SD 57007 Service Location: <ul style="list-style-type: none"> Customer Number: 479 Account Number: 47900 Site Number: S123-55XXXXG Address: 505 Highway 169 North, Suite 1200, Minneapolis, MN 55441 Actions: <ul style="list-style-type: none"> High Bill Complaint Profile Voltage & TOU Manual Commander Trend: A line graph titled "Previous Year's Normalized Usage" showing kWh/day from 06/03/2007 to 08/23/2007. A red box highlights a peak of 0.324 kWh/day on 09/15/2007 at 12:02:00 AM. Disconnect: Disconnect Status: Connected 08/27/2007 15:15:40 CDT. Buttons: Read Status, Disconnect. Outages: Blink Count: 5,801,000 Counts 09/14/2007 11:21:17 CDT. Buttons: Read Now. Outages Last Retrieved: Table with columns Time and Duration, showing n/a for both. Outage Status: Button: Read.

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Demand Response/Load
Management

Consumer Energy Services

Account #7635957777
Nathan Berkeley
241 West Circle Drive
Minneapolis, MN 55391

THERMOSTAT - SCHEDULE

Weekday Saturday Sunday Apply settings to Saturday and Sunday

1) Select Cooling or Heating.
2) Slide thermometers to change start times.
3) Adjust your cooling or heating temperatures.
Click for hints and details.

Make temporary adjustments to your heating and cooling system [here](#).

Cooling Heating

72°F 62°F 78°F 78°F

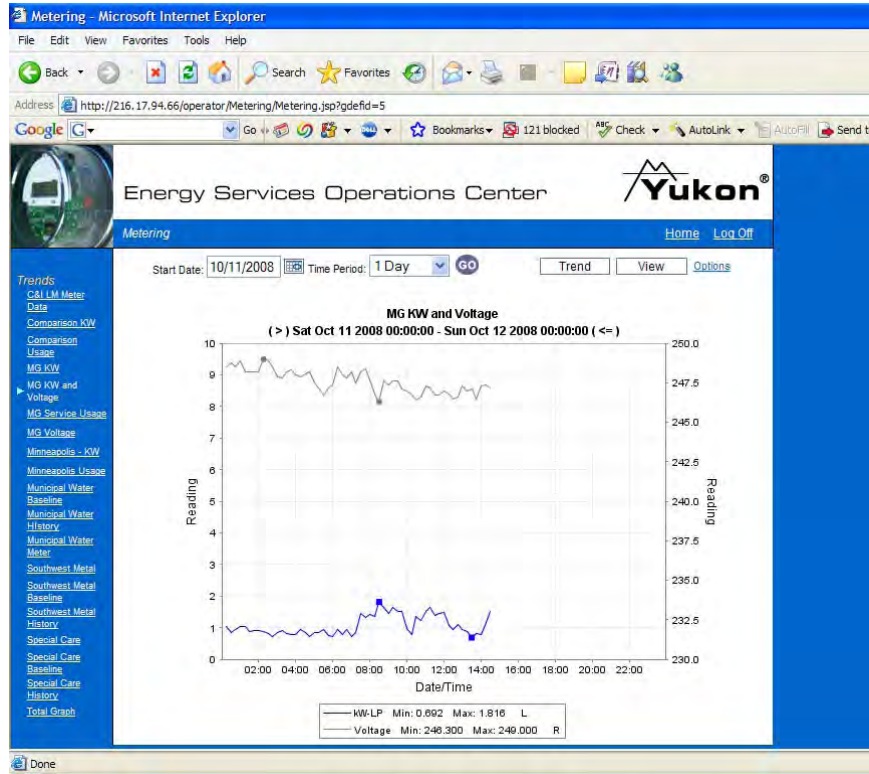
4.8¢ 7.5¢ 16.75¢ 7.5¢ 4.8¢

Wake (W)	Leave (L)	Return (R)	Sleep (S)
Start At: 06:10 AM	Start At: 08:10 AM	Start At: 03:10 PM	Start At: 10:00 PM
Temp: 72 °F	Temp: 62 °F	Temp: 78 °F	Temp: 78 °F

Mode: C F

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Trending/Data Viewing



Intelligent Capacitor Control

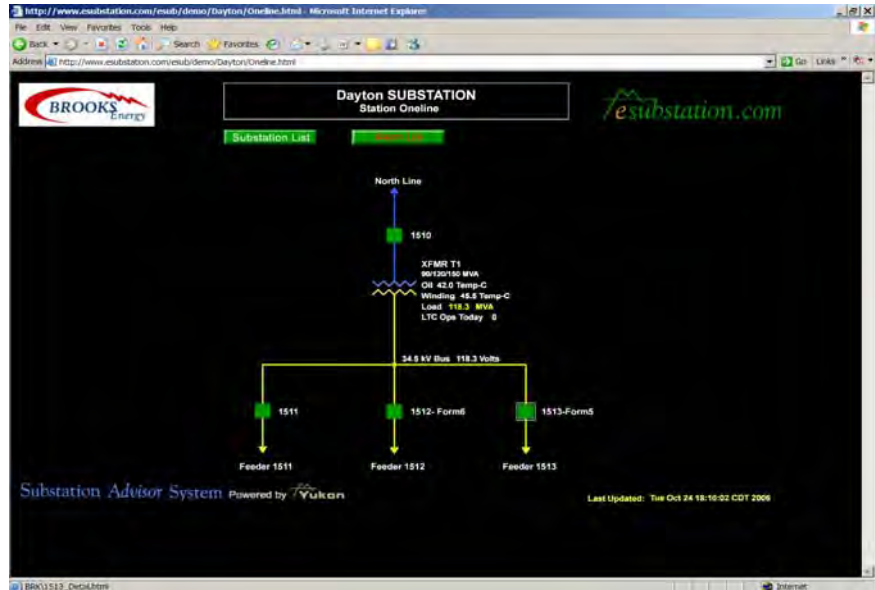
Substation	State	Target	VAR Load / Est.	Date/Time	PFactor / Est.	Watts	Daily / Max Ops
BusBar 142	ENABLED	58 to 358 OMPK	200.00 / 2400.00	07-13-2005 13:42:44	NA / NA	---	322 / NA

Feeder Name	State	Target	VAR Load / Est.	Date/Time	PFactor / Est.	Watts	Daily Ops
Feeder 124	ENABLED	58.0% Pk	0 / 900	07-13-2005 11:13:04	NA / NA	---	88
Feeder 135	ENABLED	67.0% Pk	300 / 2500	07-13-2005 19:40:43	NA / NA	---	120
Feeder 142	ENABLED	48.7% Pk	-109 / 2000	07-13-2005 11:09:37	NA / NA	---	114

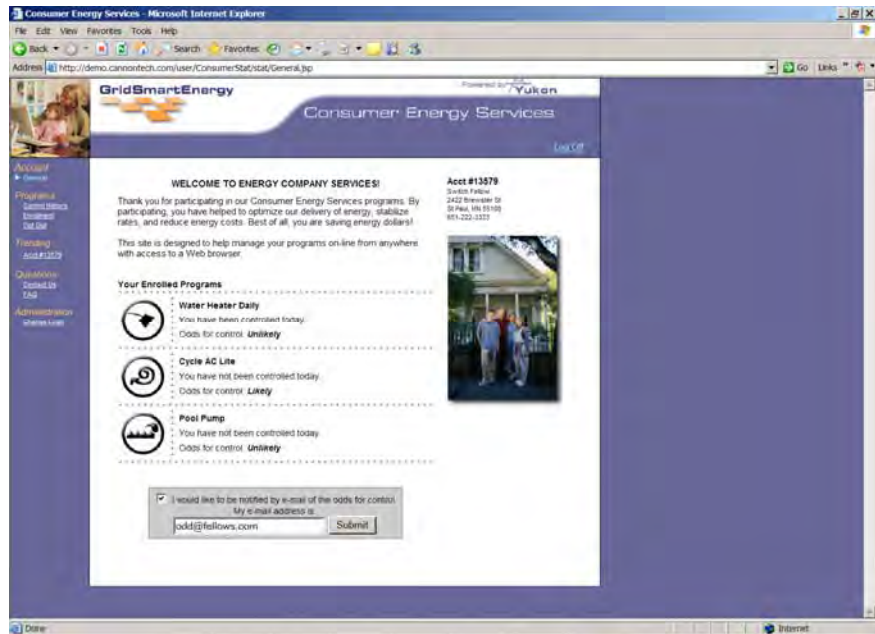
CD Name (Order)	State	Bank Address	Date/Time	Bank Size	Parent Feeder	Op Count
CapBank 110(11)	Online	Location 116	07-19-2005 10:34:21	1200	Feeder 124	0
CapBank 118(22)	Disabled	Location 116	07-18-2005 10:38:21	900	Feeder 124	0
CapBank 120(12)	Online	Location 120	---	1200	Feeder 124	0
CapBank 122(24)	Offline	Location 122	07-20-2005 09:52:15	600	Feeder 124	0
CapBank 125(11)	Offline	Location 125	07-20-2005 09:52:32	1000	Feeder 124	0

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SCADA Display



Consumer/Program Management



9.6 Yukon Servers

The key to the architecture of Yukon is a set of server programs which contain the business logic for various processes and which carry out specialized tasks. These events run as Windows Services, so they automatically start when the server starts regardless of whether or not a user logs on.

Client programs and browsers are do activities within the system; however, the server programs carry out the work of these activities. The servers can run together on a machine with clients in a simple “stand-alone mode” or can be distributed on dedicated servers to handle the processing loads of a large system.

- **Message Dispatcher.** This process allows for real-time interrogation and display of data contained in the system database. This makes the system fast and allows it to be setup in a distributed configuration.
- **Port Control.** The Port Control sub-system handles all communications with field devices.
- **Alarms & Events.** This sub-system controls all alarming and event-based reports.
- **Notification Server.** This process handles the task of distribution messages via email/text-message or IVR.
- **Metering and Control Scheduler (MACS).** MACS is a complete daily, monthly and yearly schedule controller. This service is used primarily to support AMI meter cycle schedules.
- **Consumer Web Access (Optional).** This service allows access to information for the utility’s customers. Data displayed can include load, voltage, energy usage, totalized usage, as well as any Load Control information (likelihood of control, program enrollment, control history, etc.)
- **Suite Services.** Processes that provide for interoperability of all other services to provide complete system solutions.
 - AMI/AMR
 - Demand Response/Load Management
 - Capacitor Bank Control
 - Esubstation/SCADA

10. Training & Project Management Overview

Cooper/Cannon prides itself in providing concise and effective training by tailoring the material and instruction to meet the specific needs of the utility. This includes training for utility personnel responsible for the installation and maintenance of the hardware installed in the field as well as training for the software system administrator(s), operators, and customer service representatives. The breadth of Cooper/Cannon's product offering drives the need to tailor the material based on the products and features implemented by the utility. Cooper/Cannon's Technical Services Group trains utility personnel at the utility office making use of the installed Yukon Master Station as a valuable tool in demonstrating detailed administration and operation of the system.

10.1 On-Site, Hands-On Training

A customized training program is designed for each utility implementation. A training program is designed to address the specific functional hardware/software requirements on the Utility's use of the system.

Cooper/Cannon offers a comprehensive training plan that will be tailored and customized to meet your needs. Proposed training classes are typically broken down as follows:

Cooper/Cannon recommends all initial training take place at the utility on its own system.

- **Yukon Operator training:** Two days of Administrative training, including topics such as database building, communications setup, PLC routing, metering scheduler, setting up graphs, configuration of browser-based interfaces, report generation, notification setup, theory of operations, background information, 3rd party interfaces, server maintenance, etc. Pre-requisites include use of Windows software. Skill sets including metering and IT understanding are helpful but not required.
- **Hardware training/installation assistance for field personnel:** Two-three, 2-hour classes in the field; Basic training following initial hardware install and detailed follow-up training upon full system implementation. This training happens during commissioning where details on all components are explained to necessary personnel. This includes things such as PLC connections, signal propagation, injector components, testing/commissioning tools, etc. There are no prerequisites for trainees, though backgrounds in line maintenance, substations, metering, communications, and/or electronics helpful.
- **Billing Administrators and Customer Service Rep training:** Two, 1-hour classes; Software Application training with focus on CSR browser interface, generation and reconciliation of billing files, and answering customer queries on high-bill and energy quality complaints using Yukon.

Additional training is available on request. In addition, Cooper/Cannon provides user training at its Annual Conference including presentations and training on wide range of topics from basic operation of system, advanced features, new products, including presentations by many of our users.

10.2 Project Management and On-Site Service

Project Management is key to successful implementations, thus Cooper/Cannon includes this line item on every system quotation. Upon receipt of Order, Cooper/Cannon assigns a three-member team of project management professionals:

- Primary Project Manager
- Secondary Project Manager
- Project Coordinator

This team will facilitate your project including project schedule, materials procurement, shipment scheduling, project commissioning, system training, acceptance training, etc. The Cooper/Cannon team prides itself on comprehensive system implementation working hand in hand with your implementation team.

10.3 Annual Conference

On an annual basis, Cooper/Cannon hosts a User Conference that provides Cooper/Cannon product users the opportunity to experience face-time with our Practice Area Leaders and Product Thought Leaders. Practice-specific and product-specific presentations and training sessions are scheduled throughout the conference on a wide range of topics:

- Basic system operations
- Advanced system operations
- New product unveilings
- Industry insights
- Industry trends

The annual conference typically last three days, with two of those three days devoted exclusively to training for both internal users as well as those that work in the field, typically including both beginner and advanced levels.

The annual Users Conference is also a time when several utilities are given a venue to share their personal Cooper/Cannon product experiences—so that other Cooper/Cannon product users can learn from and leverage their technology implementation strategies.

10.4 System Operating Guides

System and Operating Guides are provided for each implementation.

The Yukon Administrator's Guide: Features technical documentation describing Operator and CSR user interfaces, including basic device setup and user operation. All optional software modules are covered in the document. The Guide also contains a hardcopy of the most up-to-date technology technician notes from Cooper/Cannon's Engineering Services database.

The Yukon User's Guide: Features technical documentation describing setup, operation and maintenance of the software. All optional software modules are covered in the document. Database structure, communications configuration, troubleshooting and advanced integration options are discussed in a series of detailed appendices. The Guide also contains a hardcopy of

the most up-to-date technology technician notes from Cooper/Cannon's Engineering Services database.

The Yukon CSR Overview Guide: This guide provides information on Cooper/Cannon's Account Dashboard browser-based interface.

The Cannon PLC System Manual: Features technical documentation describing setup, operation and maintenance of the hardware. All optional hardware devices are covered in the document. Communications and installation are presented in detail.

11. List of Deliverables

Cooper/Cannon has provided the list of deliverables to implement the Cannon AMI System.

11.1 Components Provided by Cooper/Cannon



Shelby Energy Cooperative
Shelbyville, KY

Quoted by: Mark Davis, Steve Anderson, Dave Snyder, Jim Roche

Two-way Power Line Carrier AMI and Intelligent Distribution Management System
Proposal Summary Full System Quotation

Prepared: January 16, 2009

ITEM	DESCRIPTION	QTY	UNIT PRICE	Notes
1	MASTER STATION COMPUTERS AND SOFTWARE			
	CANNON TECHNOLOGIES YUKON MASTER STATION with AMI/AMR Software Suite	1	██████████	Includes browser-based AMI Suite and Account Dashboard
	TOWER YUKON APPLICATION SERVER pre-configured for above - REF Computer Spec page for detail	1	██████████	
	RACKMOUNT YUKON APPLICATION SERVER pre-configured for above - REF Computer Spec page for detail	0	██████████	
	TOWER DATABASE SERVER pre-configured for above - REF Computer Spec page for detail	1	██████████	
	RACKMOUNT DATABASE SERVER pre-configured for above - REF Computer Spec page for detail	0	██████████	
	Microsoft SQL Server 2005 Standard Edition - 10 user license (includes installation)	1	██████████	
	Installation of database or master station software on customer provided servers (per server)	0	██████████	
	Computer hardware and software are detailed on the Bill of Material			
	Consumer Web Access Software Module	0	██████████	
	Load Management / Demand Response Software Module	0	██████████	
	Feeder Capacitor Control Software Module (100 feeders or less in database)	0	██████████	
	Esubstation browser-based Rural SCADA substation monitoring & alarming	0	██████████	Calculated based on substation count
	Cannon Standard REAL TIME DATA EXCHANGE (VIA TCP/IP) WITH SCADA, using Cannon RDEX	0	██████████	
	Non-standard Real Time SCADA DATA EXCHANGE	0	██████████	
	Additional Administrative Licenses (does not include browser-based clients which are unlimited)	0	██████████	
2	SUBSTATION INJECTORS AND EQUIPMENT			
	CARRIER CONTROL UNIT WITH ALL INJECTION HARDWARE - for single bus < 25 KV	9	██████████	Based on 10 subs at 9 locations
	ADDITIONAL INJECTION ASSEMBLY - for additional bus in a substation < 25 KV	1	██████████	Based on 10 subs at 9 locations
	CARRIER CONTROL UNIT WITH ALL INJECTION HARDWARE - for single bus > 25 KV	0	██████████	
	ADDITIONAL INJECTION ASSEMBLY - for additional bus in a substation > 25 KV	0	██████████	
	REPEATER ASSEMBLY WITH ALL HARDWARE FOR SUBSTATION INJECTION	0	██████████	
	CCU SelectComm Ethernet Module for CCU 711	0	██████████	Used for IP communications
	Programming Cable for CCU SelectComm Ethernet Module for CCU 711	0	██████████	
	DIGI 4 PORT SERVER ASSEMBLY (Server, PS and Cable)	0	██████████	
	1 LOT OF COAXIAL CABLE FOR CCUs and RPTs (Quantity in Feet calculated from # of CCUs and Rptrs)	6500	██████████	
3	DOWNLINE INFRASTRUCTURE			
	30 AMP CAPACITOR BLOCKING UNITS FOR BANKS UP TO 600 KVAC @ 12.5 KV	0	██████████	Need count of downline cap banks
	60 AMP CAPACITOR BLOCKING UNITS FOR BANKS UP TO 1200 KVAC @ 12.5 KV	0	██████████	
	RPT-902 REPEATER ASSEMBLY FOR SINGLE PHASE COUPLING AT 7.2/7.62 KV GRD WYE	9	██████████	
	RPT-902 REPEATER ASSEMBLY FOR SINGLE PHASE COUPLING FROM 14.4 KV GRD WYE	0	██████████	
	RPT-902 REPEATER ASSEMBLY FOR THREE PHASE COUPLING UP TO 15 KV L to N GRD WYE	12	██████████	
	RPT-902 REPEATER ASSEMBLY FOR THREE PHASE COUPLING FROM 15 KV L to N GRD WYE (over 4000 ft)	0	██████████	
	PASSIVE HOP ASSEMBLY FOR COUPLING ACROSS A NORMAL OPEN	0	██████████	
	ACTIVE HOP ASSEMBLY FOR COUPLING ACROSS A NORMAL OPEN (INCLUDES RPT 902)	0	██████████	
	RPT-801 REPEATER ASSEMBLY FOR SINGLE PHASE COUPLING AT 7.2/7.62 KV GRD WYE	8	██████████	
	RPT-801 REPEATER ASSEMBLY FOR SINGLE PHASE COUPLING AT 14.4 KV GRD WYE	0	██████████	
	RPT-801 REPEATER	0	██████████	

4 RESIDENTIAL AMI METERS AND ACCESSORIES

MCT-410iL Intell. Elctrcn SGL PHASE METER Frm 2S Class 200 w/ TWO-WAY PLC, LP & TOU Sensus iCon	0	
MCT-410iL Intell. Elctrcn SGL PHASE METER Frm 2S Class 320 w/ TWO-WAY PLC, LP & TOU Sensus iCon	0	
MCT-410iL Intell. Elctrcn SGL PHASE METER Frm 3S Class 20 w/ TWO-WAY PLC, LP & TOU Sensus iCon	0	
MCT-410iL Intell. Elctrcn SGL PHASE METER Frm 4S Class 20 w/ TWO-WAY PLC, LP & TOU Sensus iCon	0	
MCT-410iL Intell. Elctrcn SGL PHASE METER Frm 12S Class 200 w/ TWO-WAY PLC, LP & TOU Sensus iCon	0	
MCT-410cL Intell. Elctrcn SGL PHASE METER Frm 1S Class 200 w/ TWO-WAY PLC, LP & TOU Itron CENTRON	0	
MCT-410cL Intell. Elctrcn SGL PHASE METER Frm 2S Class 200 w/ TWO-WAY PLC, LP & TOU Itron CENTRON	14500	
MCT-410cL Intell. Elctrcn SGL PHASE METER Frm 2S Class 320 w/ TWO-WAY PLC, LP & TOU Itron CENTRON	0	
MCT-410cL Intell. Elctrcn SGL PHASE METER Frm 3S/4S Class 20 w/ TWO-WAY PLC, LP & TOU Itron CENTRON	100	
MCT-410cL Intell. Elctrcn SGL PHASE METER Frm 12S Class 200 w/ TWO-WAY PLC, LP & TOU Itron CENTRON	0	
Cannon PLC Retrofit Module Kit for CENTRON (C1S) meters (without installation or testing)	0	
Cannon PLC Retrofit Module Kit for CENTRON (C1S) meters (with installation and testing)	0	
MCT-410fL Intell. Elctrcn SGL PHASE METER Frm 1S Class 200 w/ TWO-WAY PLC, LP & TOU Landis+Gyr FOCUS	0	
MCT-410fL Intell. Elctrcn SGL PHASE METER Frm 2S Class 200 w/ TWO-WAY PLC, LP & TOU Landis+Gyr FOCUS	0	
MCT-410fL Intell. Elctrcn SGL PHASE METER Frm 2S Class 320 w/ TWO-WAY PLC, LP & TOU Landis+Gyr FOCUS	0	
MCT-410fL Intell. Elctrcn SGL PHASE METER Frm 2K Class 480 w/ TWO-WAY PLC, LP & TOU Landis+Gyr FOCUS	0	
MCT-410fL Intell. Elctrcn SGL PHASE METER Frm 3S Class 20 w/ TWO-WAY PLC, LP & TOU Landis+Gyr FOCUS	0	
MCT-410fL Intell. Elctrcn SGL PHASE METER Frm 4S Class 20 w/ TWO-WAY PLC, LP & TOU Landis+Gyr FOCUS	0	
MCT-410fL Intell. Elctrcn SGL PHASE METER Frm 12S Class 200 w/ TWO-WAY PLC, LP & TOU Landis+Gyr FOCUS	0	
Cannon PLC Retrofit Module Kit for FOCUS meters (without installation or testing)	0	
Cannon PLC Retrofit Module Kit for FOCUS meters (with installation and testing)	0	
MCT-410D 200 AMP REMOTE SERVICE DISCONNECT (for 2S Class 200) (does not include meter)	0	

5 LARGE POWER METERING AND DISTRIBUTION AUTOMATION

MCT-430A Elster AlphaPlus meters w/ TWO-WAY PLC, LP & TOU (includes meter) 120-480V	0	
MCT-430A Elster AlphaPlus meters w/ TWO-WAY PLC, LP, TOU & REACTIVE (includes meter) 120-480V	0	
MCT-430A3 Elster A3 Alpha meters w/ TWO-WAY PLC, LP & TOU (includes meter) 120-480V	0	
MCT-430A3 Elster A3 Alpha meters w/ TWO-WAY PLC, LP, TOU & REACTIVE (includes meter) 120-480V	0	
MCT-430A Module KIT for existing Elster AlphaPlus and A3 meters 120-480V (without installation or testing)	0	
MCT-430A Module KIT for existing Elster AlphaPlus and A3 meters 120-480V (with installation and testing)	0	
MCT-430S4 Landis + Gyr S4e meters w/ TWO-WAY PLC, LP & TOU (includes meter) 120-480V	350	Mix of Form 15S/16S, 24S, 5S, 8S/9S
MCT-430S4 Landis + Gyr S4e meters w/ TWO-WAY PLC, LP, TOU & REACTIVE (includes meter) 120-480V	0	
MCT-430S4 Module KIT for existing Landis + Gyr S4e meters 120-480V (without installation or testing)	0	
MCT-430S4 Module KIT for existing Landis + Gyr S4e meters 120-480V (with installation and testing)	0	
MCT-430SL Itron SENTINEL meters w/ TWO-WAY PLC, LP & TOU (includes meter) 120-277V	0	
MCT-430SL Itron SENTINEL meters w/ TWO-WAY PLC, LP, TOU & REACTIVE (includes meter) 120-277V	0	
MCT-430SL Module KIT for existing Itron SENTINEL meters 120-277V (without installation or testing)	0	
MCT-430SL Module KIT for existing Itron SENTINEL meters 120-277V (with installation and testing)	0	
MCT-470 Universal External Polyphase meter & DA (DNP) interface - specify meter/protocol for config	0	

6 POWER LINE CARRIER LOAD CONTROL RECEIVERS			
LCR-3100: 240 VOLT DUAL RELAY, ONE 5 AMP & ONE 30 AMP FOR AC AND WH CONTROL	0		
LCR-3100: 240 VOLT SINGLE RELAY, ONE 5 AMP RELAY FOR AC CONTROL	0		
LCR-3100: 240 VOLT, TRIPLE RELAY, ONE 30 AMP and TWO FIVE AMP	0		
LCR-3100: 240 VOLT SINGLE RELAY, ONE 30 AMP RELAY FOR WH CONTROL	0		
LCR-3100: 480 VOLT SINGLE RELAY - for irrigation control at 480 Volts	0		
7 SPARE PARTS			
SET SPARE PRINTED CIRCUIT BOARDS FOR THE CCU-711	1		Required for all systems
SCU-810 SOLID STATE ARRESTORS	1		Required for all systems
SCU-830 H-FIELD COUPLER TO ENHANCE RECEPTION FOR 2-WAY	1		Required for all systems
SPARE RPT-902 REPEATER	1		
8 TEST EQUIPMENT AND TOOLS			
DB VOLT METER FOR MEASUREMENT OF PLC SIGNAL	1		
COAX CABLE CRIMP TOOL FOR CCU/RPT TO SCU CONNECTIONS	1		
PCT-751 PORTABLE CARRIER TESTER WITH ACEECA RUGGEDIZED HANDHELD AND METER MINDER SOFTWARE	1		
DBV Accessory Kit (12 Volt car adapter for Portable H-Field)	1		
HANDHELD OSCILLOSCOPE, 10 MHz FOR SIGNAL ANALYSIS	1		
PORTABLE SYSTEM TESTER SOFTWARE and CABLE (no laptop computer included)	0		
9 TRAINING, DOCUMENTATION & PROJECT MANAGEMENT			
PROJECT MANAGEMENT, SYSTEM ENGINEERING AND TRAINING			Typically provided over first 24 months
SETS DOCUMENTATION FOR ADMINISTRATION, OPERATION AND MAINTENANCE	1		
SOFTWARE MAINTENANCE AND UPDATE SERVICE	1		
TOTAL			

The attached Cooper standard terms and conditions apply, with the additional condition that freight will be prepaid and added to invoices at a standard rate of 2% for shipment in the contiguous 48 states and at appropriate quoted rates elsewhere. Alternative freight carrier arrangements can be made at purchaser request. Installation Costs, Travel and Living Charges, and Applicable Taxes are not included and will be invoiced separately.

All quoted meter, module and integration prices quoted are based upon a direct sale from Cooper Power Systems to the utility at stated quantities, any deviations from this may result in adjusted meter, module and integration pricing.

This quotation and all the information contained in it are considered to be the confidential information of Cooper Power Systems and shall not be disclosed to any third party without the express written consent of Cooper Power Systems, which consent shall be within the sole discretion of Cooper Power Systems. Quotation is valid for 120 days.

11.2 Components Provided by Shelby Energy

The following items are to be supplied by Shelby Energy:

- Fused cut-outs for substation Primary Coupling Assemblies (PCA) and 3-phase Repeaters
- Fuses: 15A for PCA and 3-phase repeaters
- #6 AWG Solid Conductor (approximately 15 ft per installation)
- 120VAC service to power 120VAC substation equipment
- Miscellaneous mounting brackets and fasteners

12. Terms & Conditions of Sale

Cooper/Cannon has provided the Cooper standard terms of sale.

NOTE: The attached Cooper standard terms and conditions apply with the additional condition that freight will be prepaid and added to invoices at a standard rate of 2% for shipment in the contiguous 48 states and at appropriate quoted rates elsewhere. Alternative freight carrier arrangements can be made at purchaser request.

COOPER POWER SYSTEMS, INC. STANDARD TERMS AND CONDITIONS OF SALE

General: These Terms and Conditions ("T&Cs") of Sale will apply to all sales of goods and services by Cooper Power Systems, Inc., a Delaware corporation ("Seller"), to the purchaser of the goods or services ("Buyer"). **ALL QUOTATIONS, ACKNOWLEDGMENTS AND/OR INVOICES FOR GOODS AND SERVICES ARE SUBJECT TO THESE EXACT T&CS APPEARING ON THE FACE OR REVERSE SIDE HEREOF AND THE TERMS AND CONDITIONS THAT APPEAR IN SELLER'S CURRENT CATALOG THAT RELATE TO SUCH GOODS AND SERVICES.**

Offer and Acceptance: Seller's quotation or acknowledgment constitutes Seller's offer to sell solely in accordance with these T&Cs, and supersedes all previous written and oral quotations, representations and/or agreements. Acceptance can be made by any commercially reasonable means, including Buyer's issuance of an order, acceptance of goods sold or services provided hereunder, acknowledgment or return of Seller's acknowledgment form, or by electronic transmission. Acceptance by Buyer is expressly limited to these T&Cs. If Buyer uses its own purchase order or other form to order, such form will be used for convenience only, and will be subject to these T&Cs. Any inconsistent or additional terms or conditions contained therein are null and void. Quotations must be accepted within thirty (30) days from date of quotation. Prices quoted may be withdrawn or changed by Seller at any time prior to receipt of acceptance by Seller.

Modifications: No salesman or other person is authorized to bind Seller by any agreement, warranty, statement, promise, or understanding not contained herein, and no modifications of these T&Cs will be binding on Seller unless approved in writing by an Executive Officer, Marketing Director, or Service Manager of Seller.

Discrepancies in Specifications: Seller's quotation may be based on Seller's interpretation of plans and specifications submitted to Seller by Buyer. In such situations, Buyer will review Seller's quotation both as to quantities and specifications of the material. Buyer will immediately call to Seller's attention any discrepancies between Buyer's specification and Seller's interpretation, so any necessary change can be made. Seller will not be liable to Buyer for any damage resulting from any discrepancies that Buyer fails to call to Seller's attention.

Changes in Specifications: If Buyer desires changes in specifications upon which Seller's quotation is based, such changes will be paid for by Buyer at Seller's applicable rates, and the time for Seller's performance will be extended to cover time lost and/or additional work involved.

Inspection: Any inspection requested by Buyer must be made at Seller's factory prior to shipment. If Buyer discovers any loss or damage to the goods upon delivery, Buyer will immediately demand an inspection report from the carrier that made delivery, regardless of Buyer's opinion as to cause. Buyer will promptly file any loss or damage claim against the carrier.

Risk of Loss: Buyer will assume all risk of loss and damage in transit and will be liable for costs.

Delivery: Unless otherwise agreed by Seller in writing, or specified in Seller's quotation or the catalog section(s) pertaining to the goods, the following delivery terms will apply. Delivery will be made FOB Seller's factory, with transportation arranged by Seller on behalf of Buyer to a designated location in the 48 contiguous states. Such

costs will be prepaid by Seller and included in the price of the goods. If Buyer requests transportation in a manner different from that arranged by Seller, Seller will invoice Buyer for such costs. Buyer may request shipment freight collect, except that UPS and parcel post shipments cannot be made freight collect. If Buyer requests UPS or parcel post air, Seller will prepay the freight charges, and invoice Buyer for such costs. Each shipment will constitute a separate sale, and Buyer's failure to take one or more deliveries will not constitute cause for cancellation by Buyer. Unless otherwise agreed by Seller in writing, delivery of shipments destined for Alaska or Hawaii will be made FOB Seller's factory, with transportation arranged by Seller on behalf of Buyer to a designated West Coast port when such costs are prepaid by Seller and included in the price of the goods. Transportation from the West Coast port to the final destination will be the responsibility of Buyer. Any and all destination demurrage, detention and/or unloading charges are Buyer's responsibility.

Corrections After Acceptance: After acceptance by Buyer, quotations are subject to change by Seller for correction of clerical errors. Seller will immediately notify Buyer of any such corrections, and Buyer may thereafter revoke acceptance within ten (10) days of receipt of notice of such corrections. Failure of Buyer to revoke its acceptance within such period will constitute acceptance of Seller's changes.

Returns: Material returned for credit or replacement may be accepted by Seller only if a written return authorization and related instructions have previously been obtained by Buyer from Seller's manufacturing location, which may be issued at Seller's sole discretion. Only standard products of current design, regularly carried in Seller's stock, and in saleable condition may be accepted for credit.

Title: Title to and right to possession of (but not risk of loss or damage to) any goods sold hereunder remains with Seller until all payments are made in full by Buyer, and Buyer agrees to do all acts necessary to protect such right and title.

Terms and Payment: Buyer will make payments net thirty (30) days from date of invoice in U.S. Dollars. Any invoices not paid when due will be subject to a late charge at the rate of 1.5% per month or the highest rate allowable by law, if lower. If Seller institutes formal proceedings to collect any past due amounts, Seller may recover all costs associated with the proceedings, including attorney's fees. If shipment is delayed by request of Buyer, and not attributable to Seller or any cause beyond Seller's reasonable control, the goods will be held for Buyer, at Buyer's risk and expense, and Seller will issue an invoice as of the original shipment date. If Buyer is in default for any payments to Seller under any order, Seller may withhold shipment of such order or any other outstanding order. Seller's acceptance of orders and release of shipments will be subject to approval of Seller's Credit Department. If, in the sole judgment of Seller, Buyer's financial condition at any time poses an unacceptable credit risk, Seller may require full or partial payment in advance or cancel any outstanding orders and receive reimbursement for Seller's reasonable cancellation charges. In the event of bankruptcy or insolvency of Buyer, or if any such proceeding is brought by Buyer under any bankruptcy or insolvency laws, Seller may cancel any outstanding orders at any time during the period allowed for filing claims, and Seller will receive reimbursement for its reasonable cancellation charges. The rights of Seller hereunder are cumulative and in addition to all rights available to Seller at law or in equity.

Taxes: Seller's prices do not include sales, use, excise, or other taxes. All such taxes will be paid by Buyer.

Shipment/Force Majeure: Shipment dates are approximate and are computed from the date Seller receives acceptance with complete specifications and/or drawing approvals. Seller will take all reasonable action to maintain the computed shipment dates, but Seller will not be liable for delays in delivery or in performance due to causes beyond Seller's reasonable control, including acts of God, acts of Buyer, or inability to obtain necessary labor, materials, manufacturing facilities, or transportation. In the event of such delay, the date of delivery or of performance will be extended for a period equal to the time lost by reason of the delay. All orders are subject to Government Priorities.

Limited Warranty: Seller warrants to Buyer only, that the goods delivered will be free from defects in material or workmanship when used and installed in accordance with Seller's operating instructions. Seller will, if given prompt notice by Buyer, correct, by repair or replacement at Seller's option, any defect that appears under proper and normal use of the purchased goods within one (1) year after date of shipment or within one (1) year after installation of the goods, but not exceeding eighteen (18) months from date of shipment. The furnishing of warranty repairs or replacement will not extend the original warranty period. Unless otherwise agreed in writing, Seller will not be liable for the following costs relating to the goods to be repaired or replaced: (a) removal; (b) reinstallation; (c) transportation from Buyer's facilities to Seller's facilities; or (d) any other cost incidental to the foregoing. However, Seller will pay for transportation of repaired or replaced goods from Seller's facilities to Buyer's facilities. The liability of Seller under this warranty (except as to title), or for any loss or damage to the goods, whether the claim is based in contract, or at law, or otherwise, will not exceed the cost of correcting defects in the goods as herein provided, and upon the expiration of the warranty period, all of Seller's liability will terminate. This constitutes the exclusive remedy of Buyer and the exclusive liability of Seller. **THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL, EXPRESSED OR IMPLIED, OR STATUTORY (EXCEPT AS TO TITLE). SELLER EXPRESSLY DISCLAIMS AND EXCLUDES ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SELLER DOES NOT WARRANT ANY GOODS MADE BY OTHER MANUFACTURERS.**

Supervision of Installation: Unless otherwise agreed in writing, Seller will have no responsibility for installation of the goods or supervision thereof.

Tests: The conditions of any test of the goods will be agreed in writing, and Seller will be notified of, and may be represented at any such tests.

Protection Against Infringement: In the event any equipment manufactured by Seller is made in accordance with drawings, samples or specifications designated by Buyer, Buyer will defend, indemnify and hold Seller harmless, at its own expense, from any and all damages, costs and expenses (including attorney's fees) relating to any claim that such equipment, or the use thereof, infringes any patents, foreign or domestic. In the event any equipment is designed by Seller, and the equipment has not been modified by Buyer or its customers, Seller agrees to hold Buyer and its customers harmless against any damages awarded by a court of final jurisdiction in any suit for the infringement of any United States patent by reason of the sale or use of such equipment, provided that Seller is notified promptly in writing of any claim or suit and is permitted to assume the full control of the defense against any such claim and Buyer provides assistance (at Seller's expense) for such defense. In case any judgment rendered in such suit becomes final (beyond right of appeal), and where Buyer has complied with the foregoing provisions to Seller's satisfaction, Seller agrees to pay all damages awarded against Buyer. Subject to the above limitations, if Seller agrees to a settlement or is otherwise enjoined from manufacture, use or sale of the equipment (or any part thereof), in a suit in which the equipment is held to infringe (beyond right of appeal), then Seller may, at its own expense, either: (a) procure for Buyer rights to the patent; or (b) modify or replace said equipment with non-infringing equipment accomplishing the same purposes; or (c) withdraw such equipment and refund to Buyer the purchase price thereof. Buyer's remedies for damages resulting from the infringement or claimed infringement of any patent by the equipment are exclusively limited to the provisions of this paragraph.

Exclusivity of Remedy and Limitation of Liability: In the event that Buyer claims that Seller has breached any of its obligations hereunder, Seller may request the return of the goods and tender to Buyer the purchase price paid by Buyer for such goods and in such event, Seller will have no further obligation to Buyer except to refund such purchase price upon redelivery of the goods. If Seller so requests the return of the goods, Buyer will return the goods to Seller in accordance with Seller's instructions at Seller's expense. Seller's liability for any claim of any kind (except Protection Against Infringement), whether the claim is based in contract or at law, will not exceed the purchase price of the goods or services furnished, or the portion thereof which gives rise to the claim. **THE REMEDIES PROVIDED FOR IN THIS SECTION AND THE SECTION ENTITLED "LIMITED WARRANTY" CONSTITUTE THE SOLE RECOURSE OF BUYER AGAINST SELLER FOR BREACH OF ANY OF SELLER'S OBLIGATIONS UNDER THESE T&CS, WHETHER THE CLAIM IS BASED IN CONTRACT OR AT LAW, INCLUDING CLAIMS BASED ON WARRANTY, OR OTHERWISE. THIS CLAUSE WILL SURVIVE FAILURE OF AN EXCLUSIVE REMEDY.**

IN NO EVENT WILL SELLER BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, REGARDLESS OF THE FORM OF ACTION, WHETHER THE CLAIM IS BASED IN CONTRACT OR AT LAW. ANY ACTION AGAINST SELLER UNDER THIS AGREEMENT MUST BE COMMENCED WITHIN ONE (1) YEAR OF ACCRUAL OF THE CAUSE OF ACTION.

Special Containers: In the event Buyer purchases goods requiring containers (such as oil barrels, drums, reels, etc.) or tarpaulins or other special covering, Buyer will be invoiced for such containers or covering; however, if agreed in writing at the time of purchase, Seller will refund such amount if Buyer, at Buyer's expense, returns such containers and/or coverings in good condition, within four (4) months from the original shipment date, to a receiving point designated by Seller, and Buyer promptly forwards an invoice or memorandum and necessary shipping documents to Seller.

Assignment: Buyer will not assign this agreement, or any rights therein, without the written consent of Seller. Any such assignments will be void.

Other Laws: Any provisions required to be included in these T&Cs by any applicable federal, state or local law, rule, or regulation are incorporated herein. Acceptance and execution of orders accepted by reason of any law or administrative regulation having the effect of law, or in order to carry out the intent or purpose of any such law or regulation or to acquiesce in a request by a government agency or official thereof, or contingent upon the continuance in effect of such law, regulation or request, may be canceled by Seller upon the expiration or withdrawal of such law, regulation or request, provided, however that Seller, at its option, may complete such order.

Minimum Charge: The minimum billing charge is \$100. Seller requires a minimum \$50 emergency handling charge for all orders that require shipment the same day or next day. Other emergency handling charges will be billed as incurred by Seller.

Standard Package: If Seller's product is published with a standard package quantity, Buyer must order in standard package multiples, unless quantity pricing is listed for the product in Seller's current, published price list.

Cancellation: Upon Seller's written consent, Buyer may cancel acceptance of Seller's offer, in whole or in part, upon fifteen (15) days written notice. However, Seller will assess a cancellation charge that takes into account Seller's costs for the work already performed, including the value of: (a) all services provided by Seller; (b) use of Seller's facilities; (c) material acquired by Seller; (d) any commitments made by Seller; and (e) Seller's lost profits. In no event will Buyer's liability for canceling a purchase order exceed the dollar amount specified on the order. Seller may cancel any outstanding orders placed by Buyer, if Buyer is in default of or breaches any provision under these T&Cs, or if substantial changes occur in the availability to Seller of raw materials or components.

Waiver: The waiver by Seller of any provision hereof will not constitute: (a) a waiver of any other provision hereof; or (b) a waiver of a subsequent breach of the same provision.

Penalty or Liquidated Damages/Premiums for Early Shipment:

Orders from Buyer that include a penalty or liquidated damage clause will not be honored by Seller, unless Seller has specifically accepted the clause in writing. In appropriate cases, Seller may request from Buyer a price premium for shipments made prior to Buyer's requested shipping date.

Governing Law: All matters relating to the interpretation and effect of these T&Cs will be governed by the laws of the State of Delaware.

Resolution of Disputes: Any claim or dispute arising in connection with this Agreement which is not settled by Seller and Buyer within sixty (60) days after notice is first given by either party to the other will be finally settled by arbitration under the American Arbitration Association Commercial Arbitration Rules, and judgment upon the award rendered by the arbitrator(s) may be entered in any court having jurisdiction over it.

Complete Agreement: The complete agreement between Seller and Buyer is contained herein and in the applicable T&Cs that appear in Seller's current catalog, and no additional or different terms or conditions stated by Buyer will be binding upon Seller unless agreed to in writing. No course of dealing or usage of trade will be relevant to supplement or explain any terms used in this agreement.

Bulletin #03007 Effective 5-1-03

13. Component Availability & Project Schedule

Cooper/Cannon has provided a listing of the delivery timeframes for major components as well as a proposed project schedule.

13.1 Component Availability

Component Availability :: Current Lead Times		
Components	Type	Estimated Delivery Date
Residential Meters/Modules – high volume forms	Meters/Modules	██████████
Residential Meters/Modules – low volume forms	Meters/Modules	██████████
Polyphase Meters/Modules	Meters/Modules	██████████
Remote Disconnects	Disconnects	██████████
Carrier Control Unit (Substation Injector)	Infrastructure	██████████
Primary Coupling Capacitors	Infrastructure	██████████
Signal Coupling Units (SCU 810)	Infrastructure	██████████
PLC Repeater (RPT 902)	Infrastructure	██████████
Capacitor Blocking Units (CBU 610)	Infrastructure	██████████
Capacirformer	Infrastructure	██████████

These lead times current as of 01-15-2009.

13.2 Proposed Project Schedule

Cooper/Cannon has provided a proposed project schedule and upon receipt of order will work with Shelby Energy to develop a mutually-agreeable project schedule.

Proposed Activities :: Estimated Project Schedule		
Milestones/Tasks	Responsibility	Estimated Delivery Date
Agreement Reached, Terms Negotiated, Contract Signed	Shelby Energy Team Cooper/Cannon Team	██████████
Kick-Off Meeting, Current State Assessment, Future State Assessment	Shelby Energy Team Cooper/Cannon Team	██████████
Technology Review, Project Plan—Statement of Work	Shelby Energy Team Cooper/Cannon Team	██████████
System Implementation Planning	Shelby Energy Team Cooper/Cannon Team	██████████
Organizational Readiness & Training Plan	Shelby Energy Team Cooper/Cannon Team	██████████
First Procurement (Server, Equipment for initial Substation, initial AMI Modules)	Shelby Energy Team Cooper/Cannon Team	██████████
Phase I :: Training and Implementation <ul style="list-style-type: none"> ▪ Completion of onsite support and training covering: substation equipment installation, meter/module inspection of work and training installation, support master system training including support on report generation 	Shelby Energy Team Cooper/Cannon Team	██████████
Phase I :: Pilot System Acceptance Test <ul style="list-style-type: none"> ▪ Conduct Pilot System Acceptance Test 	Shelby Energy Team Cooper/Cannon Team	██████████
Phase I :: Pilot System Acceptance Test <ul style="list-style-type: none"> ▪ Completion of Pilot System Acceptance Test 	Shelby Energy Team Cooper/Cannon Team	██████████
Phase II :: Full Deployment <ul style="list-style-type: none"> ▪ Implementation of the next 9 Substations/8 Locations and remaining meters/modules 	Shelby Energy Team Cooper/Cannon Team	██████████
Phase II :: Full Deployment <ul style="list-style-type: none"> ▪ System Rollout Concludes 	Shelby Energy Team Cooper/Cannon Team	██████████

Confidentiality

The material contained in this proposal document represents proprietary, confidential information pertaining to Cooper/Cannon's processes & methods, product line features & functions or future product line features & functions. By accepting this document Shelby Energy Cooperative hereby agrees that the information in this document shall not be disclosed outside of Shelby Energy Cooperative. It will not be duplicated, used, or disclosed by Shelby Energy Cooperative employees for any purpose other than to evaluate Cooper/Cannon fit for a future project.

Disclaimer

This document represents Cooper/Cannon best efforts for a solution based on information provided to date.

CANNON

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www.cooperpowereas.com



October 1, 2008

Shelby Energy Cooperative, Inc.
Attn: David Graham
620 Old Finchville Road
Shelbyville, KY 40065

Dear Mr. Graham:

Landis+Gyr Energy Management Solutions (Landis+Gyr) sincerely appreciates the opportunity to respond to Shelby Energy Cooperative's Request for Proposal for an AMI System.

We look forward to working in partnership with our sister company Landis+Gyr Energy Measurement Products and our business partners on this two-year deployment to build knowledge, provide training, reduce costs and increase efficiencies for Shelby Energy Cooperative. Landis +Gyr provides a strong local infrastructure for sales support and technical support, including Brownstown Supply (agent) and S.C. Irby for Landis+Gyr Energy Measurement Products meter support. We believe our proposal offers the best solution for Shelby Energy Cooperative and will not only meet your expectations, but will exceed them.

Landis+Gyr's TS2 system sets the standard for power line communication as the only system to offer simultaneous connection with every meter and true two-way communication. Our customers also benefit from our growing portfolio of technology choices and the scalability of our systems. Our solutions grow along with your utility size and needs. More importantly, we provide protection from stranded assets by maintaining a migration path for efficient upgrades as new features become available.

The Landis+Gyr TS2 system offers near-term operating efficiencies and a solid pathway into the future. Leveraging the Landis+Gyr Holdings group of companies and best-in-class partnerships, our comprehensive solution provides maximum benefit to your utilities and their customers through enhanced productivity, while allowing improvements to existing transmission, distribution, customer service and data collection objectives.

We have utilized our relationship with the Landis+Gyr Holdings group to present the opportunity for you to partner with Landis+Gyr AMI and metering businesses working seamlessly together. We offer Shelby Energy several metering choices and feel certain you will find a complementary combination of functionality and price within these robust partnerships.

We appreciate the opportunity to do business with Shelby Energy Cooperative. This is an exciting time for both our companies, and we look forward to working with you.

Sincerely,

A handwritten signature in black ink, appearing to read 'Jay D. Evensen', with a horizontal line extending to the right.

Jay D. Evensen
Vice President, Commercial Operations



Landis+Gyr Energy Management Solutions Response to Shelby Electric Cooperative Request for Proposal for AMI System

1. **Shelby Energy desires an AMI system that utilizes two-way powerline carrier communications to allow remote monitoring and control function to the meter.**

[Redacted]

2. **The AMI system will provide:**

- **Daily usage readings of all meters including date and time stamp of reading**

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

- **Daily demand usage and T-O-U data without the use of a T-O-U capable meter**

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted text block]

[Redacted text block]

[Redacted text block]

- **Hourly data**

[Redacted text block]

- **Support for advanced metering functions such as remote disconnect/reconnect, distribution power quality monitoring, and outage detection**

[Redacted text block]

[Redacted text block]

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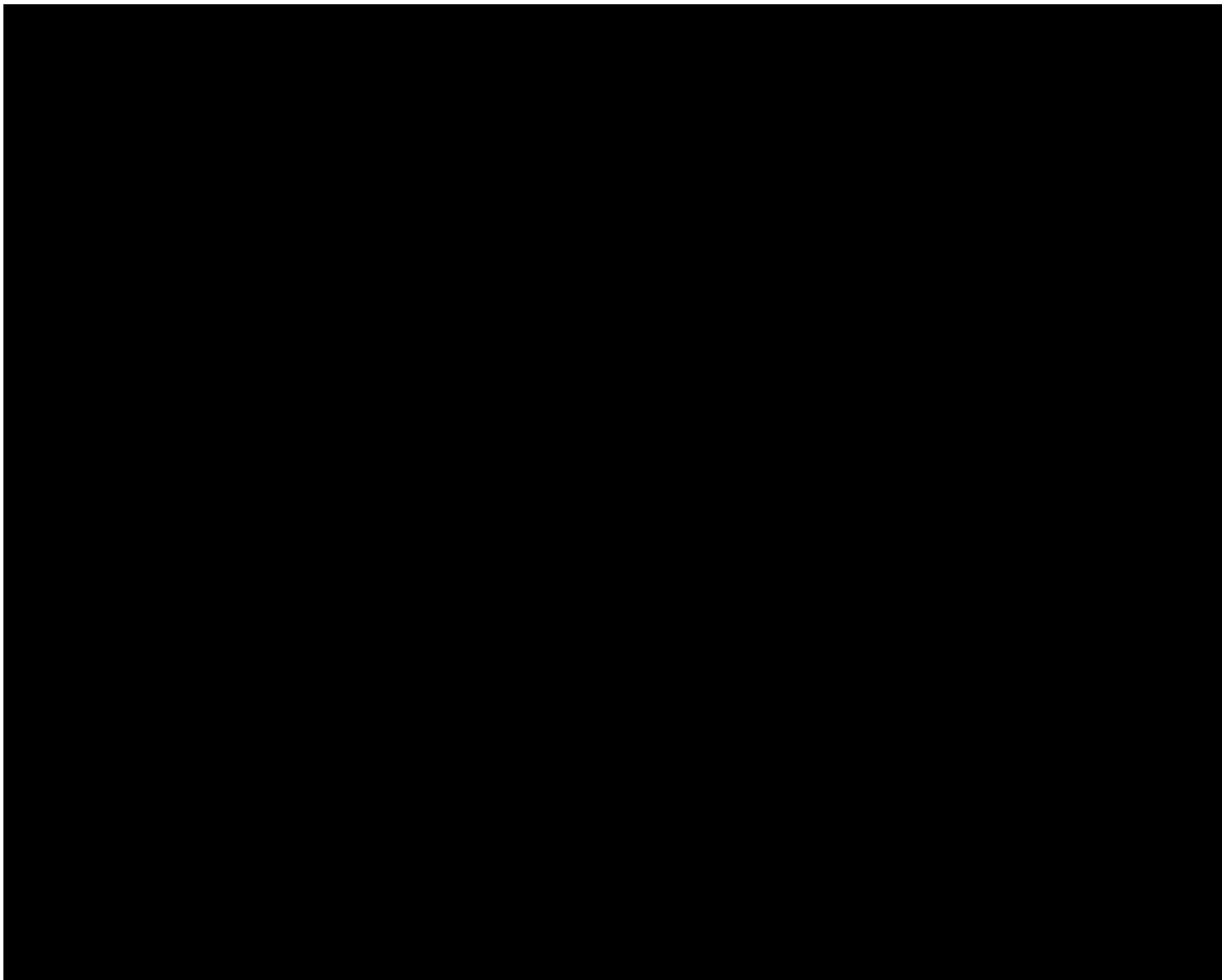
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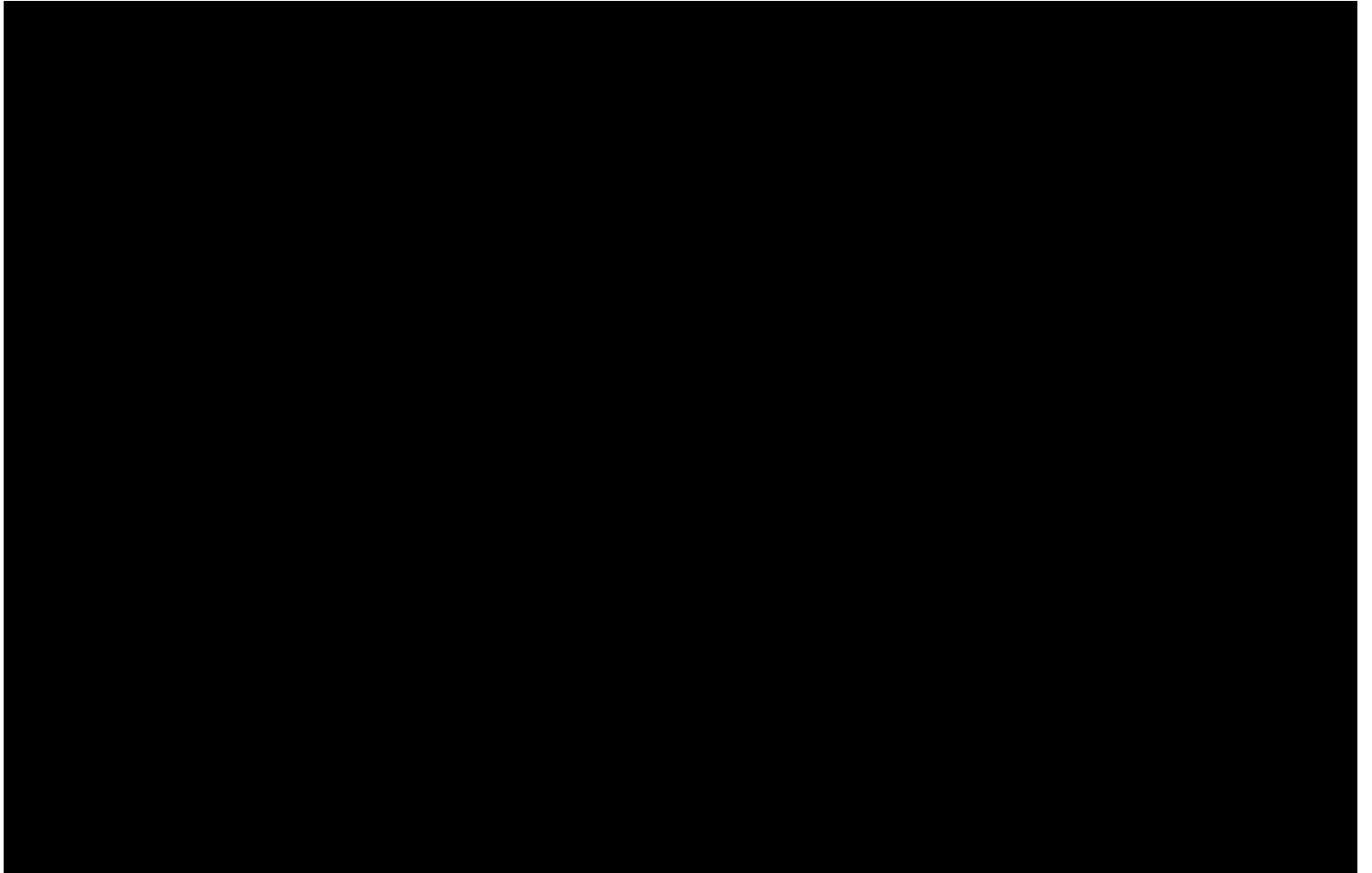
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Power Distribution Reliability Report



Power Distribution Reliability Report Graphs



[Redacted]

Service History with Temperature

[Redacted]

[Redacted]

[Redacted]

[Redacted text block]

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[REDACTED]

[REDACTED]

- [REDACTED]

- [REDACTED]

- [REDACTED]

- [REDACTED]

[REDACTED]

- **The ability to install any meter on any substation without reprogramming**

[REDACTED]

- **Backfeed a circuit without loss of billing data or ability to read meter**

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

- **Data to be displayed on a single-phase meter to match the reading provided by the AMI module**

[REDACTED]

- **Data to be sent to a single-phase meter to be displayed on meter for billing purposes (e.g., demand reading)**

[REDACTED]

- **End-of-line voltage readings**

[REDACTED]

[REDACTED]

[REDACTED]

- **Reliability indices (SAIFI, SAIDI, CAIDI)**

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

3. The AMI system should additionally allow polyphase meters to:

- **Read any register programmed in the meter**

[REDACTED]

- **Access all diagnostic registers including site diagnostics, power quality diagnostics, health diagnostics, etc.**

[Redacted]

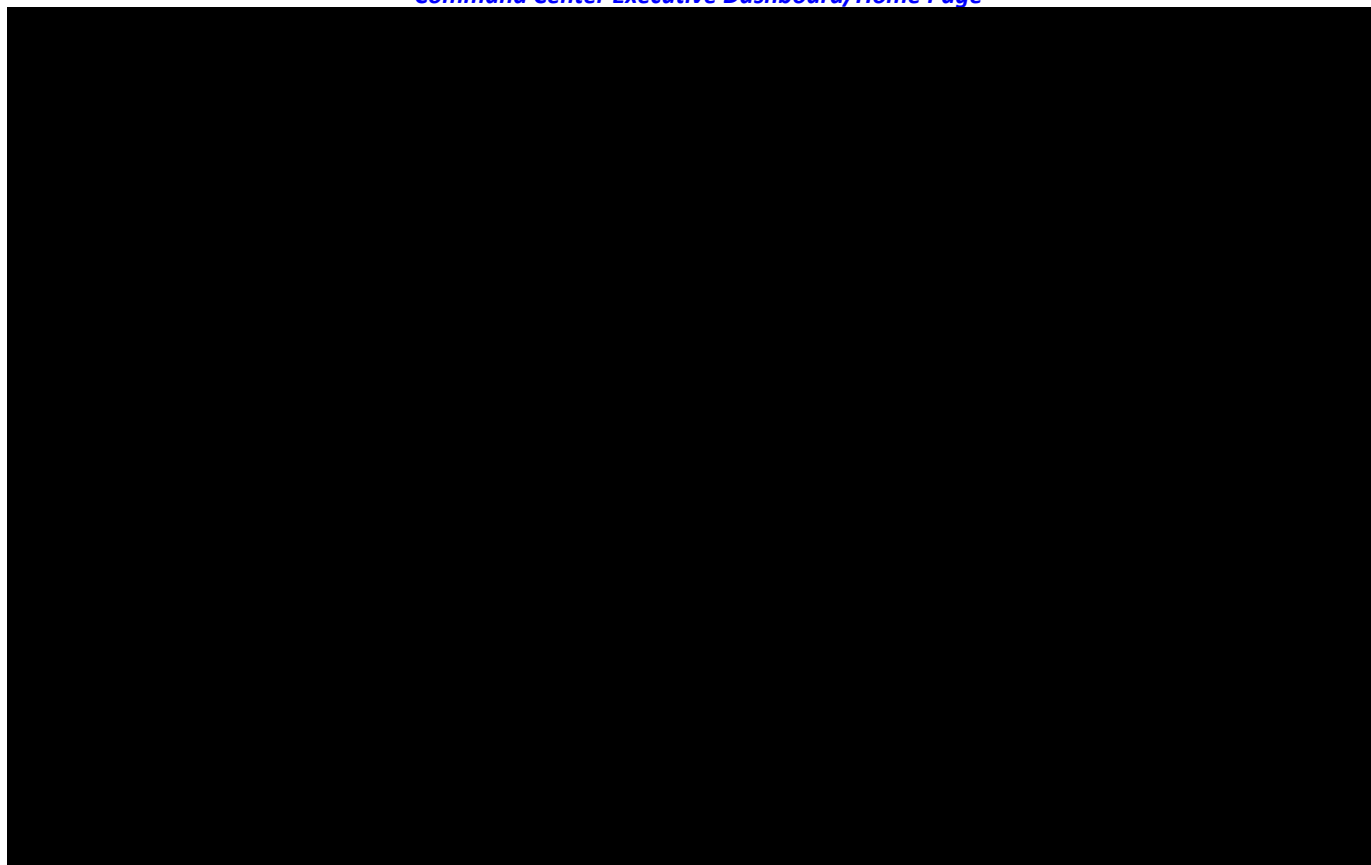
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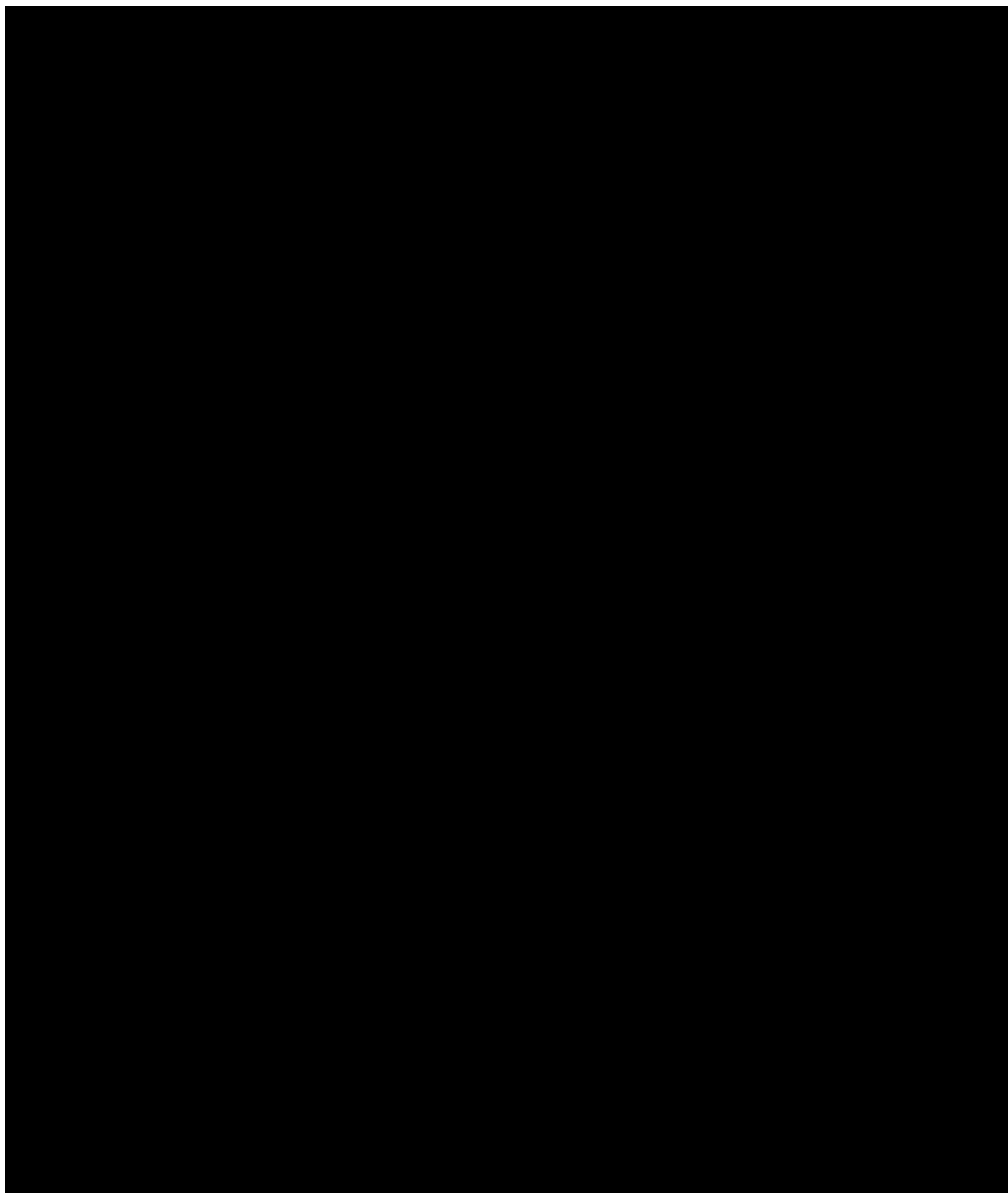
[Redacted]

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Command Center Executive Dashboard/Home Page



Command Center Dashboard



[Redacted]

[Redacted]

[Redacted]

[Redacted]

- **Schedule remote demand resets after reading**

[Redacted]

[Redacted]

4. **The proposed AMI system will increase meter reading performance and accuracy, reduce energy theft, and allow incremental deployment and expansion.**

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

[Redacted]

- 5. Please specify in detail the costs associated with this proposal including, but not limited to, hardware, software, substation equipment, office equipment and training. Also specify what is not included (specify minimum requirements, if any) to complete the AMI project. (This proposal should at least include all additional hardware needed to complete the initial deployment of the AMI system.)

[Redacted]

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6. Specify in detail the training needed for successful operation and deployment of the AMI system.

[Redacted]

[Redacted]

7. Provide detailed warranty information on all hardware, software, etc. A complete description of all warranty coverage shall be included in the proposal.

[REDACTED]

[REDACTED]

8. Provide information on availability and delivery schedule issues that may arise during scheduled deployment.

[REDACTED]

[REDACTED]

[REDACTED]



TS2 System Overview

Landis+Gyr Energy Management Solutions' (Landis+Gyr) TS2 Advanced Metering Infrastructure (AMI) system provides a flexible, scalable and modular solution that utilizes innovative ultra-narrow-bandwidth (UNB) technology to deliver data using the existing power line infrastructure. UNB technology takes advantage of a little-used segment of the very-low-frequency spectrum band to transfer data from distant electric, water and gas meters to utility offices.

Landis+Gyr's endpoint, installed in each meter, transmits data continuously to a substation processing unit (SPU), placed at the substation. The SPU relays the data to a SQL Server database at the utility office, where the data is managed using web-based software called Command Center™.

The TS2 system provides bidirectional communication. With TS2, commands to get on-demand readings, change time-of-use schedules, activate load control or disconnect/connect electric service can be sent over the power line, eliminating costly trips into the field.

The endpoint's two-wire connection to line voltage provides both power and a communication path. This enables the endpoint to be packaged for installation inside both electromechanical and solid-state meters, single phase and polyphase, as well as in Landis+Gyr's Load Control Switch and Remote Service Switch. Our endpoints work with more meters than any other power line carrier AMI solution.

In addition to supporting demand and time-of-use rate structures, TS2 endpoints provide momentary and sustained outage information. System performance characteristics and outage notification and restoration functionality are also provided. The endpoint's non-volatile EEPROM memory ensures that data is never lost.





TS2 System Components

Endpoint

The endpoint is the AMI device installed in each meter. Each TS2 endpoint comes pre-programmed with default settings to achieve plug and play installation. The endpoint's two-wire connection to line voltage provides both power and a communication path. This enables the endpoints to be packaged for installation inside both electromechanical and solid-state meters. The TS2 system also provides support for devices outside the meter, including Landis+Gyr's Load Control Switch and Remote Service Switch, allowing the utility to control load and service disconnects from the utility office. Other applications that will be available in the near future include pre-pay meters and in-home displays.

Endpoint Operation: Each endpoint uses a unique frequency assigned by its respective substation controller to continuously transmit data. Each endpoint can be remotely configured over the power line to eliminate trips into the field when rate schedules change. The endpoints contain a flashable microprocessor that accommodates firmware upgrades, ensuring that new features can be added without requiring the utility to install new endpoints. Each endpoint supports both demand and time-of-use rate structures and provides momentary and sustained outage information. In addition, each endpoint works with Landis+Gyr's back office software to self-monitor and provide information about tampering. This feature offers revenue protection to the utility.

The Landis+Gyr system uses true two-way communication. Commands – such as load control, remote disconnect or changes in billing packets – can be sent in near real time to the endpoints at the same time data is being transmitted from the endpoint – without corrupting the current data packet. The utility can change time-of-use periods and manage critical peak pricing from the utility office.

In 2007, Landis+Gyr introduced a new enhancement called streaming data. A data element from a meter such as kWh, or voltage if the meter supports this, is continually streamed to a newly designed substation processing unit and to Command Center. Each hour's data is received at the utility with a one- to two-hour latency. This means that if a customer is on the phone, their consumption of one to two hours previous may be viewed. This data may be used for load profiling information for cost of service studies or exported to a portal to be viewed by the customer in late 2008.

Because all endpoints can receive commands simultaneously, Landis+Gyr offers the ability to request coincident demand data for a group of meters, by substation, or for the entire distribution system. These requests may be sent immediately or scheduled to reoccur at a specified frequency. This feature is also useful for remote demand reset and collection of final readings for account transfers. In meters that support voltage reporting, such as in the Landis+Gyr FOCUS, valuable voltage data can be retrieved to assist with distribution engineering and operations.





The endpoint has been architected with the future in mind. The user is provided with a means of configuring each endpoint to transmit the data necessary to support the rate structures for each customer class. Different data may be transmitted each day of the week to accommodate collection of data which may be required less frequently, such as gas and water usage and power outage statistics.

Meters Supported: Solid state meters supported for residential applications include the Landis+Gyr Energy Measurement Products FOCUS, Itron CENTRON and Sensus iCon. These solutions incorporate the full functionality of the TS2 endpoint inside the meter. This includes TOU and maximum demand functionality.

An endpoint is also available for GE kV2c, Landis+Gyr Energy Measurement Products S4/S4e and Itron Sentinel meters.

In this application the meter performs the metrology calculations. The endpoint reads the resulting parameters from the internal meter register and transmits the requested values to the utility office. The endpoints allow the utility to access over 200 data values, including basic billing data, voltages and currents, reactive power, time of use (TOU), and a variety of power quality values. The utility can define a standard daily packet or a unique packet for each day of the week. Special packets may be requested at any time.

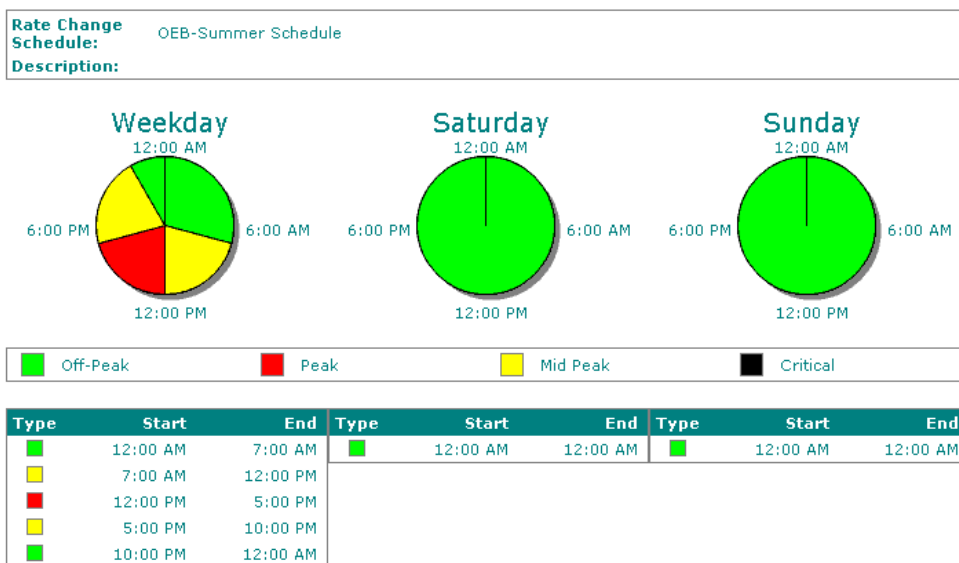




Endpoint Configuration: Single-phase endpoints are factory preprogrammed with Kh, kWh and dial-digit values. Factory default values are Kh = 7.2, kWh = 0, and dial digits = 5. Factory default settings may be changed using the handheld programmer or remotely from the utility office.

Endpoints are configurable to ensure that existing and future electric rate structures are supported.

- kWh Usage:** After configuring the endpoint with the initial kWh reading on the meter register, the endpoint's internal kWh register matches the meter's register. A snapshot of this internal kWh register is transmitted daily over the distribution system. The endpoint performs a direct register read of kWh values on solid-state meters.
- Time-of-Use:** The endpoint supports time-of-use (TOU) rate structures with up to four daily rate periods. The usage during each 15-minute interval in a day is allocated to one of the four rate periods, as specified by the user. The rate periods can be customized for weekdays, Saturdays and Sundays, with exclusions for holidays. Thus, a high-demand rate period can be applied to different time periods on a weekday than it is on a Saturday or Sunday. This enables more effectively matching higher billing rates with higher demand/consumption periods that vary on different days of the week. The system also enables creating a seasonal schedule accommodating up to eight changes in the TOU rates structure throughout the year as load profiles change with the seasons.
- Maximum Demand:** The endpoint supports 15-, 30- and 60-minute maximum demand intervals. Both block and rolling calculations are supported. The user may configure the endpoint to transmit the daily maximum demand or choose to reset the demand registers remotely. Remote demand reset may be scheduled to reoccur at the end of each billing period. For time-of-use rate structures, the maximum demand for each rate period is measured.





Outage Detection: In addition to providing electric consumption metering capability, the endpoints track each occurrence of an interruption in voltage and present this information to Landis+Gyr's Command Center and the utility's outage management system automatically. This means that the utility does not have to wait for a customer to report an outage. Whether one customer or many thousands of customers are without power, the utility knows about it in minutes. In remote areas or in storm situations, this automatic system-wide outage reporting is invaluable.

Outage Tracker



Collector	Currently Power Failed	Power Restored
Houston / HOUSTONBUSS1	12	72
Eupora / EUPORA	0	5
Houston / HOUSTONBUSS2	3	85
Grand Total	15	162

Endpoint Actions

Add to status group Auto-Find Enabled

HOUSTONBUSS1

Meter #	Type	Map Loc	Phase	Power Failed Detection Time	Power Restoration Detection Time	Approximate Duration	Status Groups
<input type="checkbox"/> 14366	TS2	HW-8-02-D-003	A	1/24/2007 11:54 PM	1/25/2007 4:48 AM	5 hours	
<input type="checkbox"/> 14908	TS2	MT-2-35-B-504	C	1/25/2007 6:45 AM	1/25/2007 7:36 AM	45 min	
<input type="checkbox"/> 15097	TS2	MT-1-01-A-007	A	1/25/2007 6:42 AM	1/25/2007 9:57 AM	3 hours	
<input type="checkbox"/> 15166	TS2	HE-7-09-C-002	C	1/25/2007 6:42 AM	1/25/2007 8:03 AM	75 min	
<input type="checkbox"/> 15248	TS2	MT-2-36-B-010	C	1/25/2007 7:00 AM	1/25/2007 9:48 AM	3 hours	
<input type="checkbox"/> 15472	TS2	VA-5-26-D-001	A	1/24/2007 11:30 PM	1/25/2007 4:48 AM	5 hours	
<input type="checkbox"/> 15552	TS2	SP-2-23-D-001	B	1/25/2007 7:36 AM	1/25/2007 7:51 AM	30 minutes	
<input type="checkbox"/> 15601	TS2	HW-9-05-B-315	B	1/25/2007 7:00 AM	1/25/2007 12:36 PM	6 hours	
<input type="checkbox"/> 15866	TS2	HW-8-04-D-001	A	1/24/2007 11:30 PM	1/25/2007 4:54 AM	5 hours	
<input type="checkbox"/> 15888	TS2	HW-8-02-C-008	A	1/24/2007 11:45 PM	1/25/2007 5:06 AM	5 hours	

EUPORA

Meter #	Type	Map Loc	Phase	Power Failed Detection Time	Power Restoration Detection Time	Approximate Duration	Status Groups
<input type="checkbox"/> 21816	TS2		C	1/25/2007 7:09 AM	1/25/2007 9:00 AM	2 hours	
<input type="checkbox"/> 21870	TS2		B	1/25/2007 12:09 AM	1/25/2007 7:30 AM	7 hours	
<input type="checkbox"/> 22724	TS2		A	1/25/2007 12:06 AM	1/25/2007 7:30 AM	7 hours	
<input type="checkbox"/> 24712	TS2		C	1/25/2007 8:27 AM	1/25/2007 9:30 AM	60 min	
<input type="checkbox"/> 24723	TS2		A	1/25/2007 8:12 AM	1/25/2007 10:18 AM	2 hours	

HOUSTONBUSS2

Meter #	Type	Map Loc	Phase	Power Failed Detection Time	Power Restoration Detection Time	Approximate Duration	Status Groups
<input type="checkbox"/> 14591	TS2	HK-9-18-D-586	A	1/25/2007 3:24 AM	1/25/2007 12:54 PM	10 hours	
<input type="checkbox"/> 15334	TS2	HK-9-18-C-763	A	1/25/2007 2:57 AM	1/25/2007 8:00 AM	5 hours	
<input type="checkbox"/> 15405	TS2	HK-9-18-C-767	A	1/24/2007 3:03 PM	1/24/2007 7:03 PM	4 hours	
<input type="checkbox"/> 15405	TS2	HK-9-18-C-767	A	1/25/2007 2:54 AM	1/25/2007 8:00 AM	5 hours	



Power Quality Monitoring: The accumulation of this data arms the utility's customer service, operations and distribution planning departments with valuable outage statistics. This data may be used to calculate power reliability indices for reporting to the utility's public service commission. The statistics calculated include:

- **Momentary Interruptions:** A count of voltage interruptions lasting anywhere from three cycles to 30 seconds in duration.
- **Momentary Event Interruptions:** A momentary event interruption is defined as one or more momentary interruptions occurring within a five minute time period. This counter enables multiple recloser operations resulting from a single fault to be classified as a single event.
- **Sustained Interruptions:** A count of voltage interruptions with duration greater than 30 seconds.
- **Sustained Interruption Duration:** A cumulative duration of sustained interruptions in minutes.

Power Distribution Reliability Report

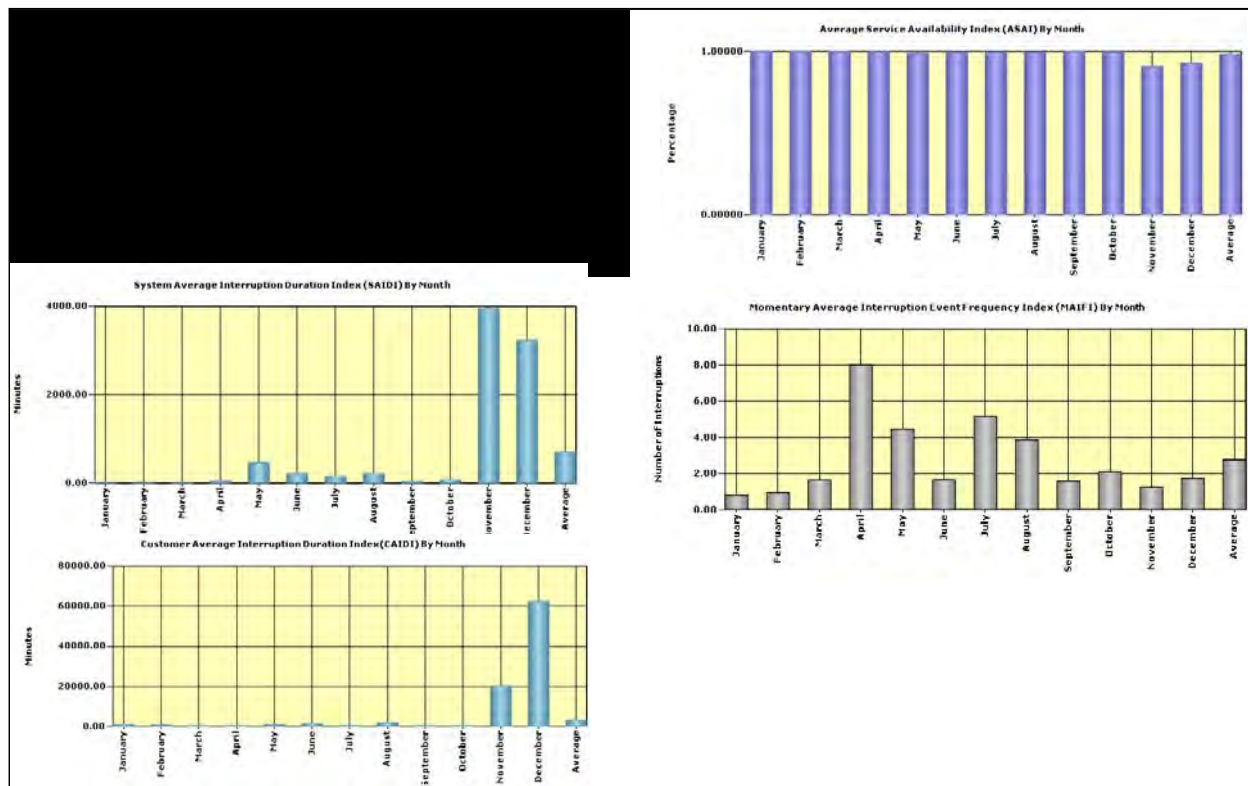
Power Distribution Reliability Report for 2007

Criteria : All

Month	Total Meters	SAIFI	SAIDI	CAIDI	ASAI	MAIFI
January	8447	0.03	91.52	3031.80	0.99795	0.76
February	7910	1.19	533.62	447.27	0.98677	3.98
March	9423	0.18	149.00	837.14	0.99666	0.98
April	8917	1.02	771.45	759.61	0.98214	4.99
May	9201	0.12	67.01	565.52	0.99850	1.86
June	9435	1.47	334.15	226.96	0.99227	6.94
July	9060	0.56	204.02	362.33	0.99543	3.11
August	8687	0.37	153.83	416.85	0.99655	4.67
September	9359	0.78	204.43	260.53	0.99527	1.91
October	8468	0.09	219.62	2359.81	0.99508	1.09
November	6760	0.12	184.99	1601.19	0.99572	1.54
December	9489	0.40	112.05	278.73	0.99749	3.25
Average	8763	0.53	252.14	477.62	0.99415	2.92



Power Distribution Reliability Report Graphs



Substation Processing Unit

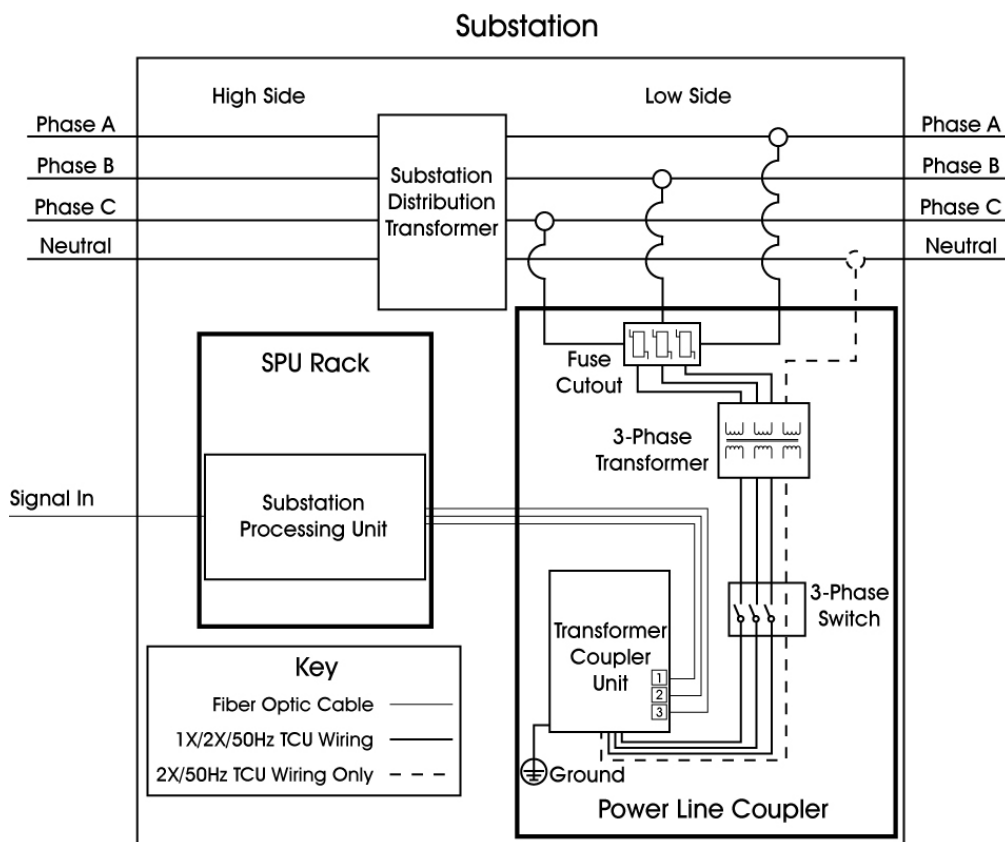
The substation processing unit (SPU) is a device installed in a substation that controls bidirectional communication with both the Command Center software in the utility office and endpoints installed at metering locations. The SPU is built around an industrial-grade computer designed to withstand the harsh environment of a substation. The SPU uses Landis+Gyr’s proven ultra-narrow-bandwidth (UNB) power line carrier technology to continuously receive data from each endpoint on the substation. The SPU also facilitates sending messages to each endpoint from the substation. This messaging can be broadcast simultaneously to an individual endpoint, group of endpoints or all endpoints.

The components can be installed in a standard 19-inch rack inside a control house. In the event that a control house is not available, the substation processing unit can be installed in a NEMA 3R enclosure at a location that is within 150 feet of the substation metering wires.

The following photo shows a SPU 3000 substation processing unit.



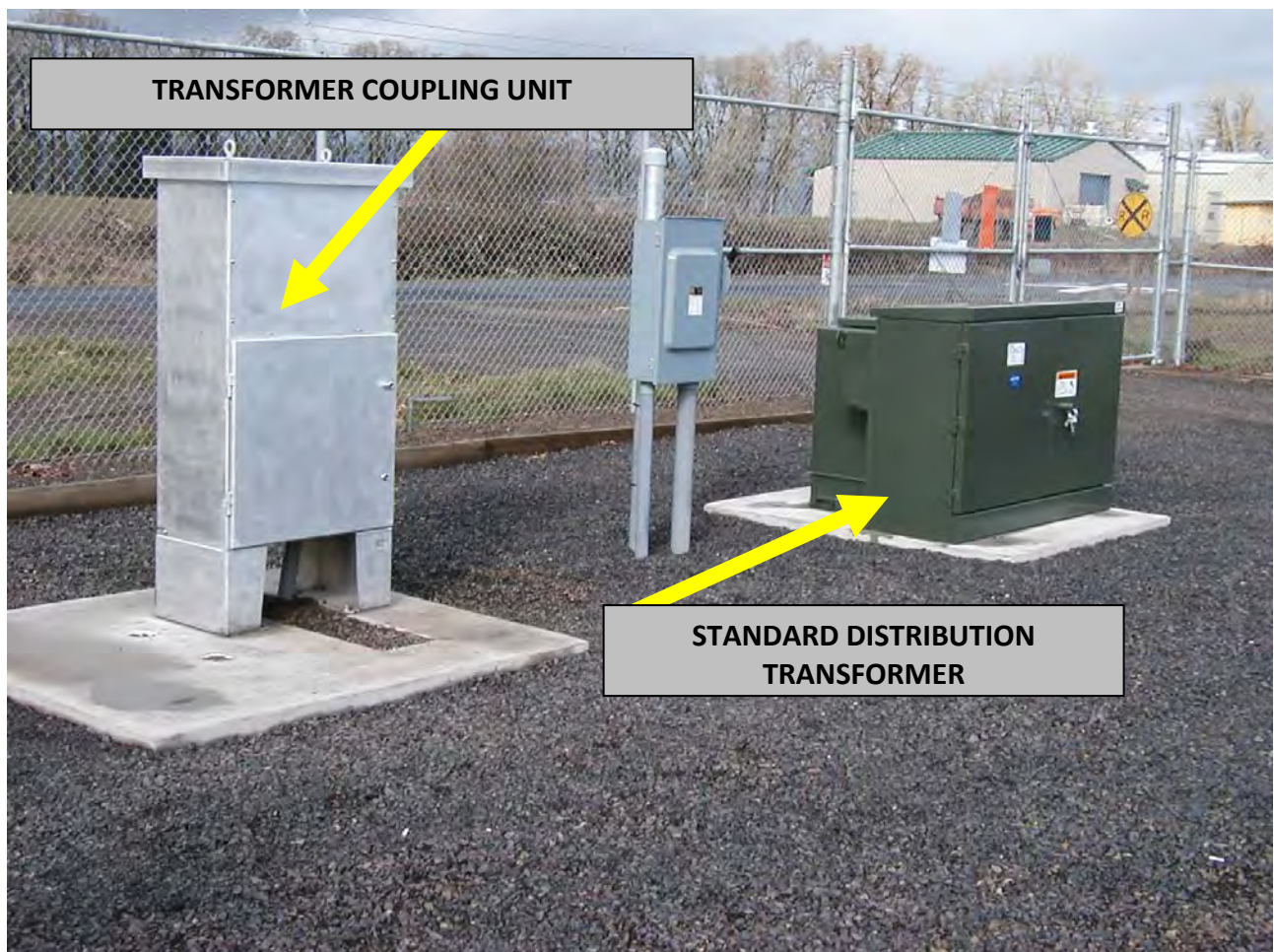
The following diagram illustrates a typical single-bus, single-TCU power line coupler installation.



Power Line Coupler

The power line coupler is a device installed at each distribution substation which couples a low-voltage signal onto the power line for communication with endpoints. The device also provides isolation between the substation processing unit and the electrical distribution system via fiber optic connection.

The Transformer Coupling System consists of the Transformer Coupling Unit (TCU) and a 75 kVa three-phase pad-mount transformer or three-phase pole mount transformer bank consisting of three 25kVa transformers. The TCU can accommodate all distribution voltages and may be installed on either a grounded wye or delta distribution bus.





Command Center™ Software

Landis+Gyr's Command Center software is the heart of your AMI system and the key to managing your operations efficiently. By integrating AMI data with your customer information system, outage management system and engineering analysis application, Landis+Gyr's Command Center lets you increase operational efficiencies and improve customer service.

Developed in an open architecture that will integrate seamlessly with current software applications, Landis+Gyr's Command Center software contains reports that are tailored for use by billing, finance, customer service, operations, distribution planning and engineering departments. Landis+Gyr's software solution brings benefits to your entire business.

Command Center MDM: For additional meter data management, Landis+Gyr offers the advanced features of Command Center MDM, which provides a software integration toolkit with built-in support for many popular utility applications. MDM supports multiple systems processing data from multiple AMI/AMR systems and networks, including power line carrier (TS1 and TS2), short-hop RF, RF Mesh and GPRS. It offers a live repository for AMI data for 5+ years and over 70 reports. These include:

- Service history reports with temperature and interval data;
- Validation groups threshold with reporting;
- Interruption validation;
- High usage/demand reporting;
- Usage by substation;
- Voltage reporting;
- Tamper detection analysis reporting; and
- System maps based on GPS coordinates.





Command Center MSP: In addition, Landis+Gyr also offers the Command Center Managed Services Package (MSP), which provides a simple way to implement and operate your AMI system. These services give you complete control of your AMI system by providing access to your data through a secure, browser-based protocol, while Landis+Gyr provides the IT expertise, server management and disaster recovery protection for your data. Landis+Gyr's MSP eliminates the need to purchase computer hardware, software licensing or to hire the technical support necessary to administer the AMI Central Server. In addition, MSP customers receive the benefits of Landis+Gyr's support agreement including access to world-class technical support.

Mobile Administration Software

The Mobile Administration Software (MAS) was developed for the Windows Mobile operating system and makes quick work of endpoint installations. The Mobile Administration Software works with Symbol and Dolphin handheld computers and provides the capability to communicate with the endpoint through the meter glass without de-energizing the meter. The MAS is capable of changing the meter constants, initial kWh reading, and data transmission configuration of the endpoint. The MAS also augments the meter change-out process by providing the capability to collect installed and removed meter data for download to the host computer. Bar code scanning is also supported to aid in collection of the meter numbers. Data captured using the MAS can be downloaded each day to the host computer via wireless, serial, or modem communication. The Windows Mobile operating system offers additional features providing better extensibility for future projects.



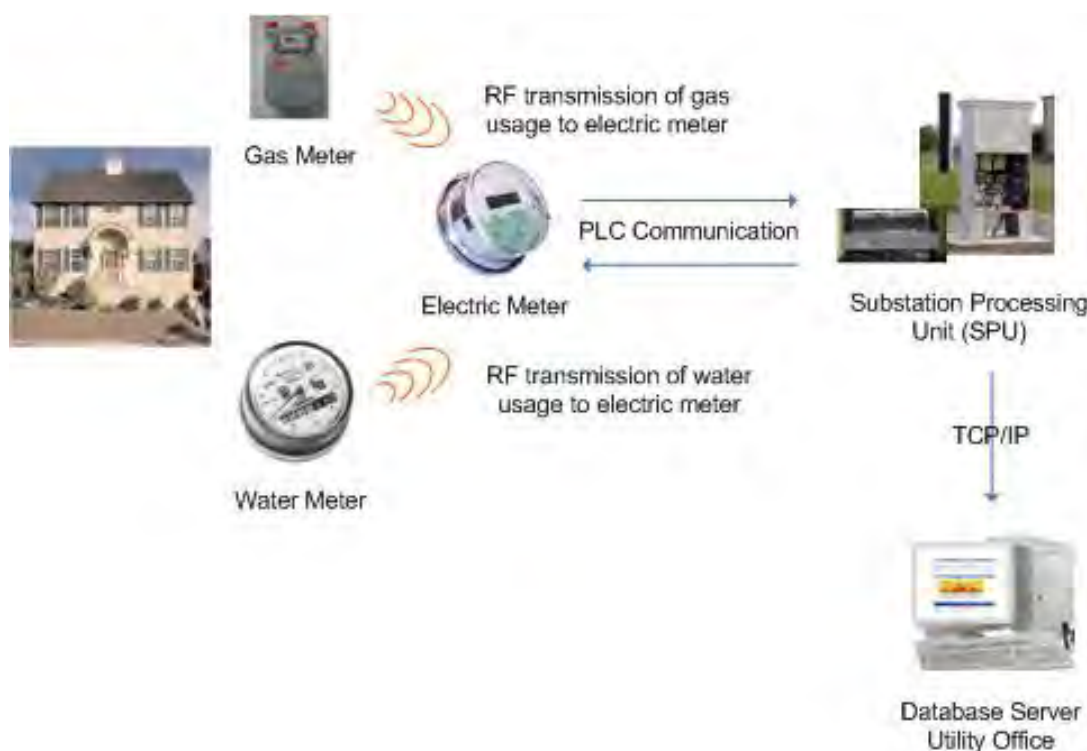
Multi-Utility Solution for Electric, Water and Gas

Landis+Gyr delivers an innovative power line carrier (PLC) solution for electric, water and gas meters. Using the utility's existing power line infrastructure, Landis+Gyr's multi-utility endpoint, partnered with Badger Meter's ORION® transmitter, provides daily usage, tamper detection and water leak detection notification without requiring the utility to send a radio receiver-equipped van, build radio towers or incur additional infrastructure expense.

The daily water and gas data, transmitted across the power lines with the electric data, gives the utility the opportunity to improve cash flow by shortening the time between reading and receipt of payment, improve customer service by allowing consumers to pick the billing date that meets their needs, and promote operational efficiencies with more detailed theft and tamper information.

Key Features:

- Wireless radio link to gas and water meters means no external interfaces, cables, antennas or sensors.
- Endpoints may be programmed remotely from utility office
- Endpoints provide tamper and water leak detection notification
- Shared infrastructure means faster return on investment for AMI
- Electric utilities can offer meter reading services to water and gas service providers
- PLC communication path is as reliable as the power network
- Daily reads translates to improved cash flow with more billing options



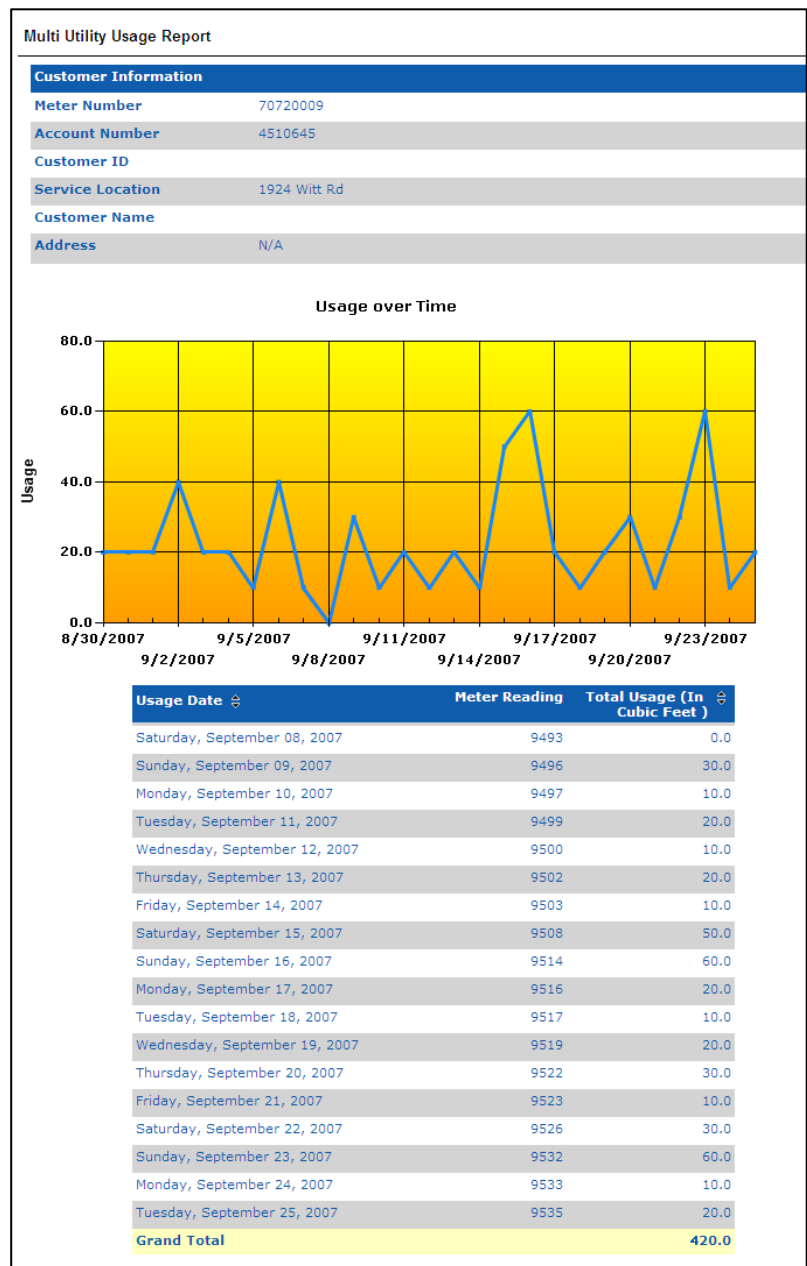
How It Works: A Badger ORION RF transmitter is connected to the water meter or gas meter encoder. A Landis+Gyr TS2 endpoint is installed in the electric meter where it is used to collect daily electric meter readings. Attached to this endpoint is an RF receiver and antenna, which “listen” to the transmissions from the ORION transmitter. Every 20 minutes, the receiver activates itself and records the meter reading, plus the flags indicating water leak and/or tamper detection. On a daily basis, at midnight, the latest readings are combined and transmitted via power line carrier to the substation processing unit located at the electric substation. The SPU decodes and stores the readings for transmission to the utility office.

The RF receiver in the multi-utility endpoint also monitors the RF signal transmitted from the ORION transmitter. If there is a 24-hour period when no signal has been received, the endpoint sends back a Stale RF indication in the next night’s data packet.



Each of these three conditions, tamper detect, water leak detect, and stale RF, are included on the dashboard in the Command Center software. The dashboard summarizes the overall operating condition of the AMI system. By clicking on the alert on the dashboard, the utility operator is linked to the Suspect Meters Report. Using this report the operator can immediately determine which meter is sending the suspect reading, and can note how long the condition has existed. This information is also included in the billing extract to the customer information system or billing system, for access by customer service personnel.

Water Meters: A Badger ORION RF transmitter is connected to the water meter encoder. There are three types of ORION transmitters available, depending on the application. The ORION pit transmitter is fully encapsulated in a tube-shaped package that mounts through a hole in the pit lid. This transmitter is most common in southern climates, and in some commercial buildings. The pit package is designed to survive extended periods underwater without damage. For meters located indoors, there are two alternatives. The integral-mount ORION is one piece with the meter register. This provides the ultimate in ease of installation and protection against tampering. The remote-mount ORION can be positioned up to 75 feet from the water meter to allow for best RF signal propagation to the electric meter in difficult environments. The ORION transmitter is compatible with all Badger Meter registers and with the encoding heads of other major manufacturers.





Tamper detection is monitored at the ORION transmitter on pit transmitters and remote transmitters where there is a cable between the register and the transmitter. Traditionally, this has caused problems for utilities when the cable is short-circuited or disconnected. This can occur accidentally by the homeowner damaging the wire or through intentional tampering to prevent older-style pulse counters from registering usage. This can go undetected for long periods of time before being discovered. Badger Meter has solved this problem. If the transmitter cable is opened or shorted, even momentarily, a latching flag is set in the transmitter and sent to the receiver in the multi-utility endpoint for inclusion in that night's data packet. It can only be reset when a technician visits the site to correct the tamper condition and reset the flag.

Badger Meter has provided a sophisticated water leak detection circuit in the ORION transmitter. The ORION transmitter monitors water flow each hour. If there is a period of 24 consecutive hours with at least one gallon of flow each hour, then the leak detect bit is set and transmitted to the TS2 endpoint in the electric meter. If there is a one-hour period where no flow is registered, then the flag is automatically reset and the 24-hour counter starts over again.

Gas Meters: A Badger ORION RF transmitter is connected to the gas meter encoder. The transmitter utilizes the meter drive to measure gas consumption. The ORION transmitters are compatible with the majority of utility gas meter models and makes currently in operation in the U.S. The transmitters have a magnetic tamper function in addition to using a seal wire. If tamper is detected, a latching flag is set in the transmitter and sent to the receiver in the multi-utility endpoint for inclusion in that night's data packet. It can only be reset when a technician visits the site to correct the tamper condition and reset the flag.

Integrating Endpoint Information with Utility Applications

The value of Landis+Gyr's TS2 system is greatly enhanced by the ability of utilities to use Landis+Gyr-generated data seamlessly with other vital utility applications. Integration of AMI data with customer information systems, outage management systems and GIS can increase overall efficiency, potentially generate additional revenue and improve customer service. The Command Center software package is built on an open architecture using technologies that allow tight integration with the utility's other software applications.

Landis+Gyr, has been very active in the development of the MultiSpeak[®] standards, and provides more MultiSpeak 3-compliant interfaces than any other vendor. The goal of this initiative is to define a common data exchange between vendor applications or utility customer-built software systems.

Following are some of the interfaces provided:

- CIS/billing interfaces: provides sharing of data between CIS/billing systems and the Command Center, including customer data, readings data and meter data.



- Outage management system interfaces: the Command Center can automatically notify outage management systems when a power outage or restoration occurs.
- GIS and engineering analysis application interfaces: phase data can be provided from the Command Center for use by GIS and EA applications. Coincident demand and maximum demand data provided to engineering analysis applications can help with load balancing and transformer sizing.
- Service connect/disconnect: an interface exists that allows another utility application to use the Command Center software to disconnect or connect meters from the utility office.





Executive Summary

A trusted name for more than 100 years, Landis+Gyr Holdings creates advanced metering solutions for utilities around the world that enable them to grow and prosper in an ever-changing market. Through a wide array of solutions, Landis+Gyr Holdings helps end users improve their energy efficiency, to reduce their energy costs, thereby contributing to a sustainable use of resources.

The Landis+Gyr Energy Management Solutions division (referred to within as Landis+Gyr) is a technologically advanced, customer satisfaction-driven developer and supplier of advanced metering infrastructure (AMI) systems and automated energy monitoring and control solutions. Landis+Gyr's AMI solutions provide utilities worldwide with a continually growing array of field-proven products and services to cost-effectively manage human resources and fixed assets, allowing utilities to simultaneously deliver enhanced customer service functionality across all customer classes.

Landis+Gyr offers customers a complete range of AMI solutions, including one-way and two-way PLC technologies as well as one-way and two-way RF technologies. The suite of companies represented by Landis+Gyr Holdings only enhances our solutions offering and further improves our capability to take on significant growth in the AMI and smart metering sectors of the utility industry. Landis+Gyr offers the following key features that no other AMI provider can provide:

- AMI solutions to address your system needs, providing 100 percent functionality with 100 percent coverage.
- Enhancements to our two-way solutions to leverage our best-in-class offerings.
- A single source for a wide range of ancillary AMI products, including metering, load control, disconnect capability, in-home displays and a prepaid metering solution.
- A history of strategic relationships with other companies, offering customers a total solution.
- Unparalleled service and support, ensuring successful implementation and operation.
- The investment capital backing needed to address your AMI needs.

In an effort to define a solution for Shelby Energy Cooperative that both maximizes functionality and minimizes costs, Landis+Gyr recommends its TS2 power line carrier technology for Shelby Energy Cooperative's electric meter population.

Landis+Gyr's power line carrier systems use ultra-narrow-bandwidth (UNB) technology to deliver data across long distances using the existing power line infrastructure, without the expense of repeaters or line conditioning equipment. UNB technology takes advantage of a little-used segment of the very-low-frequency spectrum band to transfer data from distant electric, water and gas meters to utility offices.

Our TS2 endpoints transmit data from electric meters continuously to the substation processing unit, placed at your substation. The substation processing unit relays the data to a SQL Server database at the utility office, where the data is managed using Web-based software called Command Center™.

The transmission of daily billing determinant data is very reliable; in fact you can expect 99.6 percent readings availability within a three-day billing window. Redundant data storage – in the endpoint, in the substation processing unit and in our data warehouse – guarantees billing determinant data won't be lost due to a power or communication failure.

Features you can expect from our TS2 system not available with our competitors' offerings include:

- ***“Always On” Connectivity Model:*** Our system continuously monitors every endpoint in the system for outage and restoration detection. It doesn't matter if 50 meters are out of power or 50,000 – you'll know every location without power in a matter of minutes. And it doesn't require time-consuming polling or risking asset destruction from overheating caused by frequent polling from other vendors or the need for a dedicated “system administrator.” Engineering, Operations and duty supervisors can focus on outage restoration instead of outage analysis, allowing service to be restored more quickly. And when service is restored, our system will automatically tell you if power has been restored to every home before your crew leaves the area.
- ***Billing Determinants Stored and Displayed at the Meter:*** Our TS2 solution is the only PLC solution that stores time-of-use data in the endpoint, providing actual usage data for billing. Other systems need to “ping” to retrieve data, and unless every “ping” is 100 percent successful, these systems will miss data. Since estimated data can't be used for time-of-use billing, systems that “ping” for data are ineffective.
- ***Battery-Free Time of Use (TOU):*** With the Landis+Gyr TS2 solution, the traditional need for a battery in a TOU meter is eliminated. Battery-free TOU is provided in many supported meters, eliminating lost billing data due to interrupted polling. There is no need to use TOU-specific meters, greatly reducing the cost of TOU implementation to the utility.
- ***Meter Platform Independence:*** Our system is compatible with more meters than any other AMI vendor. We provide under-glass, user-configurable endpoints for single-phase and polyphase use in both electromechanical and solid-state meters. We also have both electromechanical and solid-state compatibility for multi-utility endpoints, allowing utilities to select the meter technology that meets their requirements. Electric meters and Landis+Gyr AMI solutions are not required to be pre-configured at the factory prior to shipment, which eliminates extended deliveries.
- ***Plug-and-Play Installation:*** Each TS2 endpoint is pre-programmed with default settings to achieve plug-and-play installation. The TS2 system automatically finds each deployed endpoint, without requiring user intervention.
- ***Smart Endpoints:*** With flexible programming options, each endpoint – single-phase or polyphase – can be programmed to return a unique packet of data. All endpoints do not have to be programmed the same, and can be remotely configured using our Web-based software, Command Center.

- **True Two-Way Communication:** Our system uses “true two-way” communication. Commands can be sent to the endpoints at the same time data is being transmitted from the endpoint – without corrupting the current data packet. You can change time-of-use periods and manage critical peak pricing from the utility office. True two-way capability enables a coincident system read that other technologies can’t provide, allowing you to compare system consumption to system energy purchases.

Innovative Software Integration Options

It’s a challenge to keep up in this age of rapidly changing technology. At Landis+Gyr, we realize we need to stay in step with the latest technologies to give our customers the tools they need. That’s why we were the first to use the Microsoft.Net framework to develop software for the AMI industry. Our Command Center software takes advantage of .Net’s open architecture and flexible Web service integration options to help utility employees do their jobs better and faster.

Command Center is the most user-friendly platform on the market today, providing powerful integration features for sharing data with other utility applications, like CIS applications, outage management systems, mapping software and engineering analysis applications. Plus, Command Center allows viewing of system health data and alerts in one place, on the Command Center dashboard. And our participation in MultiSpeak® means we’ll continue offering interoperable software compatibility, allowing utilities to get full value from metering data.

Support

Our innovations go beyond the actual AMI technologies – extending well into support options. Landis+Gyr provides seven unique levels of support, including field engineering services, project management, system engineering, installation services, call center support, product specialists and unique training opportunities.

Alliances and Partnerships

Landis+Gyr has relationships with wireless utility partners comprising approximately 14 million installed endpoints, 18 million under contract. In addition, we have over 450 power line carrier customers with over 5 million installed endpoints and over 150 distribution and automation customers with over 200,000 installed radios.

Our company also has several alliances which complement our AMI systems offerings and will be of benefit. We have relationships with every major meter manufacturer and offer the most compatible meter module line in the world. We foster strategic partnerships with Landis+Gyr Energy Measurement Products, Itron, GE, Elster, Sensus, Badger and others. In addition, we work with software vendors to provide integration with the broadest range of utility applications in the industry.

We have also worked in alliance with system integrators; CIS, OMS, WOMS and communication providers; and HAN automation providers. Landis+Gyr is also a member in good standing with several utility organizations with varying degrees of participation and representation.

Commitment

Landis+Gyr will continue to invest in breakthrough AMI technologies and is committed to evolving our systems offerings, technologies and tools to serve the AMI market. With consistent growth and strong financial performance, the Landis+Gyr Holdings family of companies will be there for you, meeting and exceeding your AMI needs today and tomorrow.



CONFIDENTIAL

Date: September 29, 2008
 Quote Number: 002627-20080929

Company Name	Shelby Energy Co-op
Contact	David Graham
Address	620 Old Finchville Road
City, State, Zip	Shelbyville, KY 40065
Phone Number	502-633-4420
Email	davidg@shelbyenergy.com

**Pricing Quotation
 Commissioning Certification Program**

Description	Part Number	Unit Price	Qty	Ext. Price
Commissioning Training				
Certification Training (Per Person Cost)	TRAIN-00041		1	
Orientation and Commissioning with FSR (First Sub)	SERV-00034		1	
Substation Commissioning for Hands On and Certification (Second Sub) (Per Person Cost)	SERV-00025		1	
Feeder Study Kit	FASY-0628-0002		1	
Cable Assembly, Lemo to Din Rail Adapter Cable for Feeder Study Kit	CABL-00253		5	
Total				

Notes: Travel Cost is paid by customer, Hunt is not responsible for any travel cost associated with Training.
 Employee trained must observe one substation commissioning by a Hunt FSR prior to attending class.

If Customer chooses to have Hunt commission its substations, the cost for the first substation commissioning is \$XXXXX and \$XXXXX for each additional substation if commissioned in the same week.

Hunt can commit to commissioning up to 3 substations in the same week with advance notice so travel arrangements can be made.

Account Executive: Joe Thomas at 218-562-3841
Sales Coordinator: Kim Pohl at 800-926-6254
Quote Coordinator: Lisa Hanson at 218-562-5175
Rep Firm: Brownstown Electric Supply, Mark Monroe at 800-742-8492

See Next Tab for Commissioning Tool list for Training



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Quote Number: 002627-20080929

Company Name	Shelby Energy Co-op
Contact	David Graham
Address	620 Old Finchville Road
City, State, Zip	Shelbyville, KY 40065
Phone Number	502-633-4420
Email	davidg@shelbyenergy.com

Pricing Quotation - Summary
TS2 FDC at 10 Substations - 2 Year Deployment

Description	Unit Price	Qty	Ext. Price
Software			
Command Center Software	No Charge with CCMSP	1	
RSS Functionality	No Charge with CCMSP	1	
Command Center MDM Add-On		1	
Subtotal			
Substation Hardware			
All Substation Equipment-(10) (Pricing includes all TCUs, SPUs and Blades)		10	
Subtotal			
Meter Modules - Residential			
Residential Solid State Meter + Integrated AMI, Type AL Meter		14,500	
Residential Solid State Meter + AMI, FM 3-S, 4S (120 or 240v) CL-20		100	
Subtotal			
Meter Modules - Commercial			
Solid State Polyphase L+G Type S4 Meter + AMI		350	
Subtotal			
Other			
L+G FOCUS Type AX-SD-2S Service Disconnect Meter + AMI			
Remote Service Switch			
Load Control Switch			
Subtotal			
Additional Equipment For Programming			
Opto Wand & Holder, Program Station, Manuals		1 each	
Subtotal			
Training and Implementation Services			
Project Management & Training		1	
Subtotal			
2009 Annual Support & Software Agreement Package			
Required Second Year of Deployment Phase			
Subtotal			
Hunt Total Extended Price			
Hunt System Cost Per Endpoint			14,950

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Pricing Quotation

Command Center MSP with MDM Option Based on 14,950 Total Deployed Endpoints

Description	Part Number	Unit Price	Qty	Extended Price
Up to 12,500 deployed endpoints				Mthly Fee
Command Center Managed Services Package (MSP)	SERV-00019		1	
CC MSP- MDM Add-ON OPTIONAL			12500	
Total Monthly Fee				
Total Annual Fee				
Pricing structure below will be applied once 12,501 to 30,000 endpoints are deployed.				Mthly Fee
Command Center Managed Services Package (MSP)	SERV-00020		14950	
CC MSP- MDM Add-ON OPTIONAL			14950	
Total Monthly Fee				
Total Annual Fee				

Command Center MSP Notes:

A minimum of a one year contract is required, with a maximum period of two years. Pricing is valid through entire contract period.
 Command Center MSP and MDM will be invoiced monthly.
 Communication charges will be invoiced monthly via separate invoice.

Training is required prior to implementation of Command Center MSP.

Command Center MSP Benefits:

Database Administration and Communication Monitoring
 Guaranteed Up-Time
 Data readily available via access to Internet Browser
 Minimized start-up costs associated with running the system
 Reduces IT and operational costs
 Experienced staff with comprehensive knowledge administering the system
 No Need to purchase and maintain:
 - Software and server licenses
 - Software upgrades
 - Server hardware
 Hunt Technologies' Annual Support and Software Agreements

Annual Savings:

Annual Support and Software Agreements
 System Management Support Annually
 IT Disaster Recovery Support Annually

Total Estimated Annual Savings

One-Time Cost Avoidance

Server Software and Hardware
 Microsoft® Windows and SQL Licenses
 Communication Hardware at Central Server location (modems, routers, etc.)
 TS2 Command Center Software with RSS Functionality

Total Estimated Cost Avoidance

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Rep Firm: Brownstown Electric Supply, Mark Monroe at 800-742-8492

Quotation Summary

[REDACTED]

[REDACTED]

Confidentially: Information provided on Budgetary Quotations is confidential. Customer shall take all reasonable precautions to prevent such information from being divulged to third persons, including officers and employees not having legitimate need for the information.

Aclara TWACS Technology Advantages

Works On Existing Data Transmission Infrastructure

Owning the Aclara TWACS Technology power line communication network provides multiple competitive advantages. The system allows you to manage your data-collection process and control critical interval data. You can reduce risk by not depending on a third party's proprietary system to carry the data or provide it when you need it.

Provides 100% Service Territory Coverage

Aclara TWACS Technology achieves the highest coverage in the industry, particularly for geographically diverse utilities. Since the utility's existing power lines are used "as is," coverage exists, for the most part, everywhere the power flows. All the rich features of Aclara TWACS Technology are available in urban, suburban, and rural areas including immediate on-request reads, daily or hourly interval data, load control, or connect/disconnect service.

Supports Demand Response, Utility Requirements, And Customer Expectations

Aclara TWACS Technology is a scalable system that provides the data needed by utilities to meet technical and customer-service expectations. The system provides:

- ✓ Support for demand response including critical peak pricing and time-of-use
- ✓ Data collection at 15-minute intervals
- ✓ Load control data for load forecasting and pricing
- ✓ Load profiling to allow retrievable billing
- ✓ Two-way data transfer for recording peak demand and remote reset
- ✓ Immediate integration of consumption data into your billing system.

Offers System Management Through Line Monitoring

Aclara TWACS Technology monitors outages and significantly decreases restoration time by verifying where and when power is restored. Its ability to monitor instantaneous line voltage not only helps to determine the need for capacitor switching and/or voltage regulation, but provides targeted phase and feeder identification for restoring power. Utilities can utilize Aclara TWACS Technology to turn potential penalties into improved earnings by establishing a metrics-based service quality improvement program.

Tracks Energy Diversion

With Aclara TWACS Technology, utilities have a unique means for tracking energy diversion and correcting theft, which cost utilities up to \$10 billion a year and reduce profits up to 30% *. The system's tamper detection feature quickly identifies customers whose energy usage has significantly changed or whose meter is in a reverse rotation mode.

* *Energy Service Fraud "A Guide to Utility Automation—AMR, SCADA & IT," Michael Wiebe, Pennwell Publishing*

Reduces Service Calls

Aclara TWACS Technology can reduce the costs of service calls, which can add up once hourly labor minimums, overhead, vehicle, and benefit costs are calculated. Use Aclara TWACS Technology to remotely perform:

- ✓ Meter re-reads, verifications, and justifications
- ✓ On-request reads (deliverable within 20 seconds of request)
- ✓ Service connects and disconnects
- ✓ Tamper and/or theft of service checks
- ✓ Weather-related calls
- ✓ Determination of scope and probable cause of outages
- ✓ Service restoration monitoring
- ✓ Equipment maintenance responses

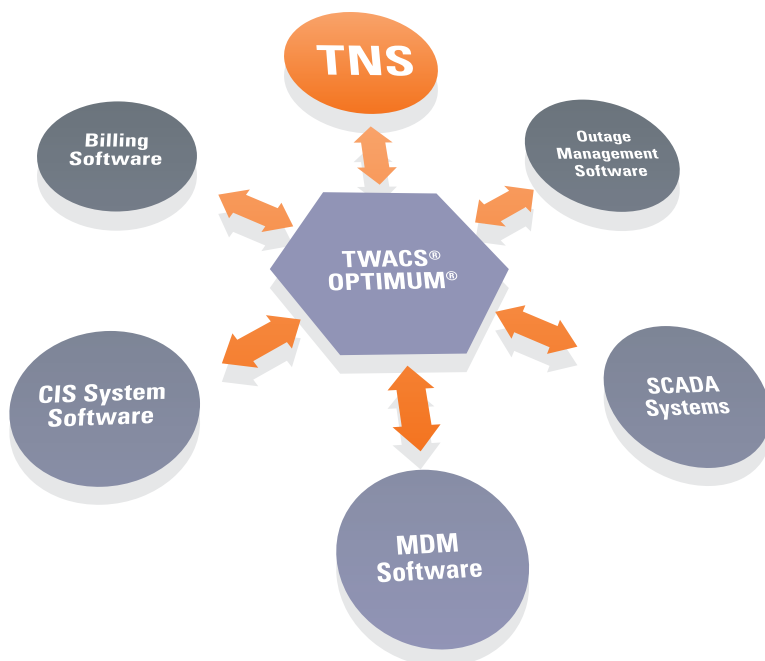


TWACS[®] OPTIMUM[®]

MULTISPEAK[®] COMPLIANT INTEGRATION SOFTWARE

Integrate utility applications to the TWACS AMI system and get timely access to the data needed to effectively manage power outages, perform restorations, improve customer service, and more.

TWACS OPTIMUM enables utilities to use the industry-accepted software standard MultiSpeak to facilitate interoperability of third-party business and automation applications. OPTIMUM provides web-service integration, allowing multiple departments within a utility to connect to the TWACS AMI system, and empowering them to deliver an improved level of service.



TWACS OPTIMUM delivers:

Improved customer support

Allow in-house CIS to verify power at locations, disconnect and reconnect remotely, read meters on-demand, and view stored usage data

Automated meter installation and replacement

Update meters in the TWACS system using the standard service order process of the in-house CIS system

Outage verification

Integrate outage management systems with TWACS technology, determine extent of outages, and verify restoration

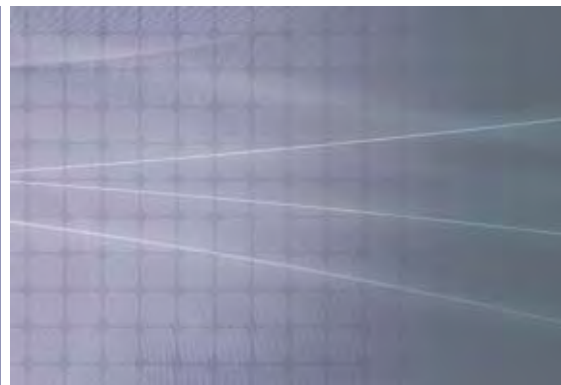
Demand response equipment operations

Link demand-response applications for integrated control over critical power or price periods



TWACS[®] PROAsys[™]

POWER RELIABILITY OUTAGE ASSESSMENT SYSTEM



Positive outage notification and restoration confirmation saves time and money and improves customer satisfaction.

TWACS PROAsys helps utilities make use of the data they collect from AMI to quickly assess system status and identify outages. The application reports voltage at the meter, monitors power reliability, and verifies customer-reported outages. PROAsys differentiates between momentary and sustained outages, allowing utilities to quickly determine where to send repair crews, and reducing the time it takes to complete restoration of service.



Each TWACS PROAsys delivers:

Outage detection

Reduces restoration time by recognizing nested outages

Event notification

Reports outages by e-mail or page

Mapping functionality

Displays network status on third-party geospatial maps

Event analysis

Prevents future distribution irregularities

Restoration detection

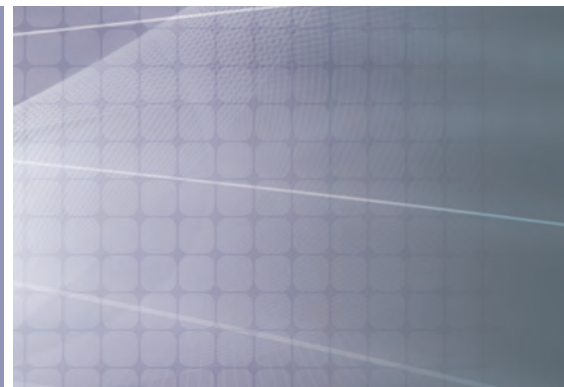
Offers spot verification of outage restoration

Third-party integration

Works with web-based, third-party software solutions and supports integrations with SCADA, IVR, GIS, CIS, and OMS systems



TWACS[®] Net Server with TWACS OC Software



The heart of the TWACS system, with its easy-to-use graphical interface, provides fast access to AMI data, allowing utilities to promptly answer customer inquiries.

The **TWACS Net Server (TNS) with TWACS OC (Operations Center)** software manages the TWACS communications network and controls advanced metering data for utilities. The software employs a relational database and a Windows-based interface to manage the data generated by a utility's metering operations.



TNS with TWACS OC delivers

Server/client control

- Firewall compatible
- Flexible system accessibility
- Permissions-based data access
- Enhanced upgradeability

Network management

- Intuitive setup and configuration
- Simple updates and modifications
- Two-way addressing for communication
- Minimal substation maintenance

Automatic meter reading

- Commercial metering with demand reset
- On-request meter reads
- Tamper detection and diagnostics
- Billing file creation and integration

Third-party interfaces

- Customer information systems
- Billing programs
- Meter data management systems
- Load research software
- Outage management solutions

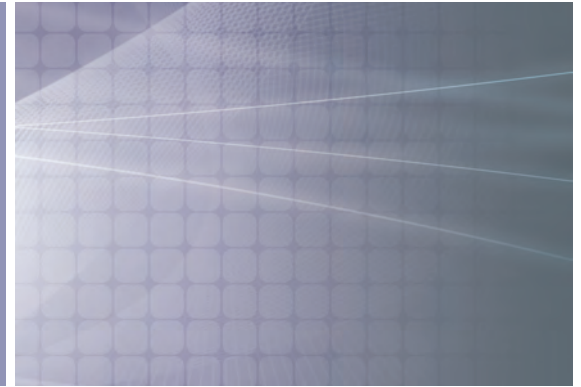
Optional TNS applications

- Power Reliability Outage Assessment System (PROASYS™)
- Prepaid UtiliSales™
- Demand response system
- Distribution automation solution



TWACS[®] NG

NETWORK GATEWAY



The highly customizable TWACS NG software allows utilities to monitor, collect, communicate, and correlate usage data more effectively, for better outage, energy, and resource management.

The scalable system can process large volumes of data retrieved at frequent intervals from millions of meters. Access to this interval data enhances control over distribution planning and operations, ensures success of demand response and time-based pricing programs, and improves customer service.



TWACS NG delivers

Web user interface design

Reduces deployment costs, overhead, and maintenance

Scalable and efficient operation

Handles millions of endpoints without affecting network performance

Open architecture

Interfaces with other utility software applications and works with emerging data exchange standards

Role-based security

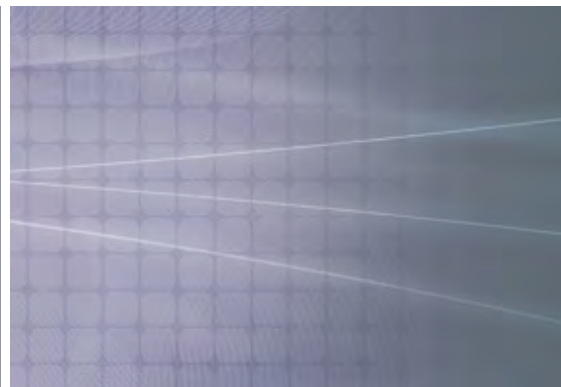
Allows utility customers to assign access to system functions based on job title

User configurable priorities with flexible scheduling

Provides the data you want, when you need it



TWACS[®] DSI



The Aclara TWACS DSI provides a simple way to connect and reconnect power customers. The switch manages power delivery to seasonal and rental properties, locations where utility-worker safety is a concern, and homes or businesses previously disconnected for nonpayment. The DSI eliminates service calls to turn power on and off — saving the utility time and money.

The DSI utilizes a 200-amp latched relay that works in conjunction with the Aclara TWACS technology's two-way power-line communications system. Aclara's TWACS technology maintains the link between the utility control center and the individually addressed meter site, allowing for almost instantaneous processing of connect signals. Meters remain powered when service is not connected for monitoring and communication purposes.



Each TWACS DSI delivers

Remote service operation

Permits a customer service representative to connect and reconnect meters from the utility office

Universal design

Works with common S-Base residential and commercial meters

Unique identification

Ensures security and integrity with an addressable, factory-assigned identity

Revenue collection

Paves the way for future pre-pay metering implementations

Tamper detection

Verifies proper operation and indicates bypass conditions



TWACS[®] Prepayment Solution

The TWACS Prepayment Solution delivers a cost-effective and flexible way to collect payment in advance of customer usage. Recover debt, eliminate meter reading and billing, and better serve customers while protecting – and even increasing – revenue.

Prepayment technology provides meter control through a TWACS DSI (disconnect switch interbase) device or a board integrated into the meter. An in-home display updates consumers as to usage and account balances, and transactions and updates are managed by Aclara's UtiliSales software, a customer-information system, or other third-party application. Utilities accept payments over any network connection or by telephone – special kiosks are not required.



The TWACS Prepayment Solution delivers:

Customer choice

Provides an option for renters, college students, and other frequent movers

Convenience

Simplifies connection and disconnection of service; eliminates credit checks

Consumer control

Makes budgeting easier and encourages customers to manage power usage

Network communications

Updates account details through an in-home display

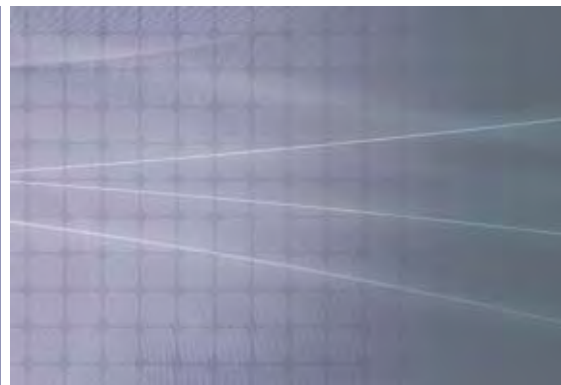
Vending options

Collects payments via automated telephone service, websites, or cash registers



TWACS[®] UMT-C

UNIVERSAL METERING TRANSPONDER-COMMERCIAL



The TWACS UMT-C for commercial and industrial customers provides the utility with remote, two-way access to usage and voltage data.

The UMT-C takes a daily and on-billing cycle snapshot using ANSI C12.19 open protocol to gather meter data. The transponder captures data from up to 32 utility-selected meter registers and can deliver consumption, demand, time-of-use, reactive energy, power factor, Q-hour, apparent power, and voltage readings – typically within 20 seconds of a request.

The UMT-C supports collecting four channels of interval data in 15-, 30- and 60-minute lengths. The unit's expanded memory maintains a minimum of 35 days of interval data, depending on the configuration. For example, a two-channel configuration of 60-minute interval data provides over 160 days of history.

The UMT-C is available for the GE kV2c and Elster A3 Alpha[®] meters and is also compatible with KYZ outputs and inputs as provided by the meters.



Each TWACS UMT-C delivers:

Outage assessment and restoration

Works with TWACS PROASYS[™] to provide timely dispatch of crews and real-time monitoring of service restoration

Voltage monitoring

Retrieves phase-voltage measurements from the meter for automatic monitoring that allows troubleshooting from the office

Diagnostics and alarms

Checks the meter's diagnostic registers each hour, indicating an alarm on its next response

Upgradeability

Supports remote upgrades of transponder firmware

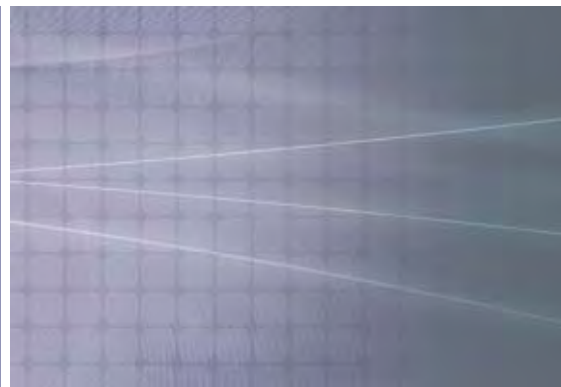
Remote reset commands

Schedules remote demand resets to occur on or off the billing cycle date



TWACS[®] CMT

COMMERCIAL METERING TRANSPONDER



The TWACS CMT remotely captures and transmits electric-usage billing and interval data in real time to meet the load-profiling requirements of direct-access commercial accounts.

The CMT can be scheduled to collect meter and billing data in 15-, 30-, and 60-minute intervals, eliminating the costs associated with separate recording instruments. The transponder collects interval billing data to support peak demand, combined billing, and other utility requirements along with non-billing information such as outage indices, phase voltages, currents, and power factor in real time.

The CMT module is available for the Landis+Gyr S4E and Itron SENTINEL[®] single- and poly-phase commercial meters and is also compatible with KYZ outputs and inputs as provided by the meters.



Each TWACS CMT delivers:

Outage assessment and restoration

Works with TWACS PROASYS[™] to provide timely dispatch of crews and real-time monitoring of service restoration.

Installation options

Mounts in the factory or installs as a retrofit kit

Voltage monitoring

Retrieves phase-voltage measurements from the meter, enabling automatic monitoring and field-diagnostics capabilities from the office

Time-of-use billing

Accumulates up to five TOU tiers and allows adjustments to the TOU schedule.

Tamper detection

Includes multi-level password security and remote monitoring of reverse power flow, flags interruptions in daily consumption, and offers self-diagnostics



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TWACS[®] UMT-R

UNIVERSAL METERING TRANSPONDER—RESIDENTIAL

The TWACS UMT-R for solid state, residential meters provides remote, two-way access to usage and voltage data and ensures recent meter data is available to the utility.

The UMT-R performs scheduled and on-request reads, with data directly from ANSI C12.19 tables, and allows the utility to remotely reset the peak demand on individual meters or meter groups.

The UMT-R transmits fixed- and rolling-block demand as well as forward, reverse, net, and secure consumption data. It supports collecting two independent channels of interval data in 15-, 30- and 60-minute lengths. These features enable real-time pricing and direct-access settlement, as well as peak-demand and aggregated billing.

The UMT-R is available for the Landis+Gyr FOCUS[™] AL, FOCUS AX, and the GE I-210+[™] direct-sampling, solid-state meters.



Each TWACS UMT-R delivers:

Outage assessment and restoration

Works with TWACS PROASYS[™] to provide timely dispatch of crews and real-time monitoring of service restoration

Meter data history

Stores daily reads for seven days and interval data for a minimum of 35 days

Upgradeable firmware

Reduces costs and simplifies upgrades to future product enhancements

Faster customer response

Allows customer service representatives to access meter data in less than 20 seconds

Ease of installation

Installs within the meter and accesses data directly from ANSI C12.19 tables

Remote service switch operation

Supports integrated disconnect functionality when purchased as a meter option



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TWACS[®] XM

EXPANDED MEMORY TRANSPONDER

The TWACS XM transponder for residential meters captures complete and accurate billing data with scheduled and on-request remote reads from individual or groups of meters.

The transponder installs inside the residential meter and provides usage data in 60-minute intervals, as well as peak demand down to 15-minute intervals.

The TWACS XM transponder models integrate with electromechanical, General Electric I-210, Landis+Gyr Focus[®], and Itron's CENTRON[®] meters.



Each TWACS XM delivers:

Installation flexibility

Retrofits into existing meters

Faster customer response

Allows customer service representatives to access meter data in less than 20 seconds

System intelligence

Retrieves data after communication interruptions

Remote demand reset

Reads data and resets demand remotely

Meter data history

Stores daily reads and interval data for seven days

Outage management assessment

Works with the Aclara PROASYS[™] software to quickly conduct feeder checks during outages and verify meters are restored before dispatching repair crews

TWACS XM Transponder Features

Consumption	Daily consumption snapshot	7 days
	Reverse consumption snapshot	7 days
Demand	Interval	15- and 30- minute*
	Method	Fixed block
	Automatic demand retrieval and reset	Billing-cycle date
<i>*Only 15-minute interval data when used with Itron's CENTRON[®] meter</i>		
Interval data	Interval	60 minutes
	Interval type	Net
	Channels of data	1
	Interval capacity	7 days
<i>Note: Ideal for time-of-use billing when combined with Aclara MDM software solutions.</i>		
TWACS technology communication	Fast outage ping	Yes


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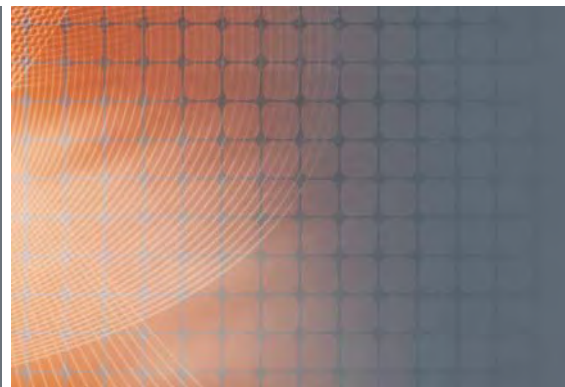
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Aclara™ DRU

DEMAND RESPONSE UNIT



When energy demand is high, the Aclara DRU reduces peak-power costs without impacting customer service.

The Aclara Demand Response Unit (DRU) is a one- or two-way device that curbs demand and safeguards against under-voltage or under-frequency conditions. At the heart of the DRU is the unique Intelligent Comfort™ system, which employs a patent-pending, adaptive load-control algorithm and a unique, 24-hour energy-use appliance profile to provide adaptive control while eliminating the need for complex system modeling.



The Aclara DRU delivers

Distributed load shedding

Cycles appliances on and off intelligently to maintain acceptable customer satisfaction

Power-interrupt protection

Maintains load-control strategies during momentary outages

Direct and autonomous load control

Ensures fair distribution of loads across network

Flexible load management

Adjusts for time and season

Tamper detection

Indicates potential bypass of the control relay

Two-way communications

Aids in troubleshooting

Adaptable design

Handles up to two residential appliances or commercial systems



TWACS[®] CST

CAPACITOR CONTROL SOLUTION

Central administration of capacitor banks helps dispatchers make better distribution decisions and reduces costly on-site maintenance.

The **TWACS CST (capacitor switching transponder)**, operating with TWACS Master Station software, allows utilities to actively manage grid reliability and efficiency. The two-way solution can monitor circuit voltage, neutral current, and contact closure of the capacitor bank, thereby allowing remote management of capacitance in the distribution network. Remote management helps utilities reduce losses due to reactive power flow and avoid power-purchase penalties.



Each TWACS CST delivers

On-demand status information

Provides troubleshooting, alarms, voltage profiles, and bank status

Cost efficiencies

Reduces overhead related to capacitor bank patrols and line loss

System intelligence

Provides real-time voltage, status, and error reports, and synchronizes daily and seasonal requirements

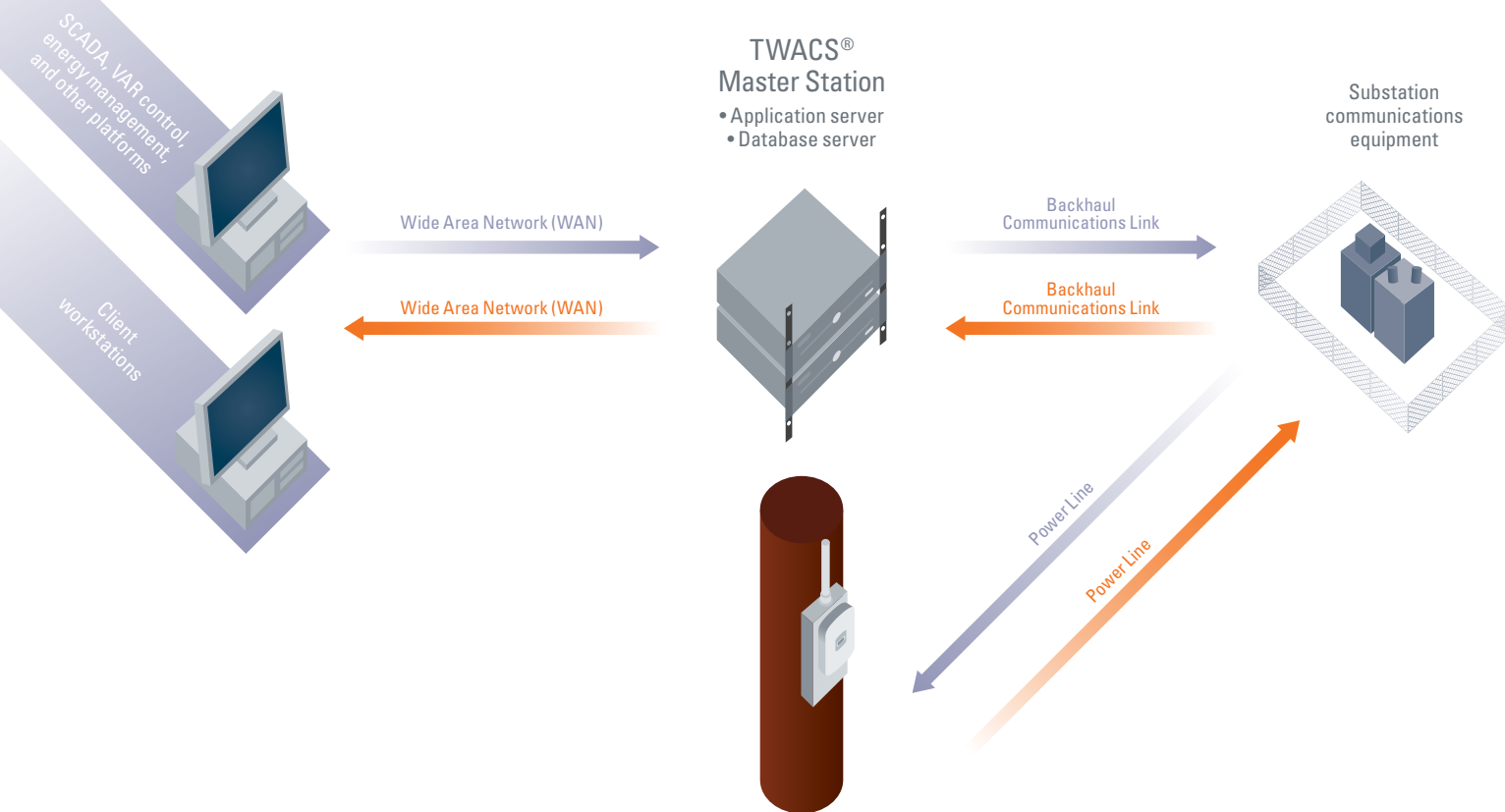
Safety improvements

Eliminates manual switching

Problem notification

Monitors neutral currents to pinpoint partial bank failures and blown fuses

TWACS CST System Diagram



TWACS CST mounted on a distribution pole

Operated from a single phase distribution transformer at 120 Vac, the TWACS CST can report voltage at 15-minute intervals and works on any Delta or Wye distribution network.

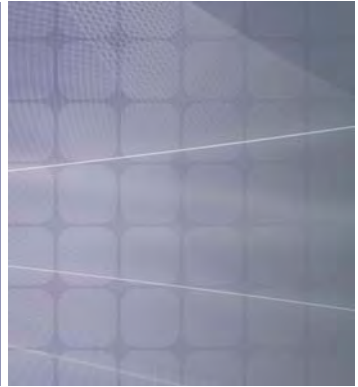
Technical Benefits

- Offers an “anti-pump” feature that eliminates simultaneous operations
- Ensures local control with remote-door interlocking, configurable open/close timers, and enable/disable and trip/close functions
- Contains two 30-amp SPDT (single pole double throw) contactors as control switches
- Employs both a digital and an analog input for feedback monitoring
- Connects to a ringed four- or six-jaw meter socket



TWACS[®] HANfx[™]

HOME AREA NETWORKING



Empowering customers to make intelligent choices on how they use energy.

The **Aclara HANfx** solution reduces peak-demand energy costs by encouraging customers to proactively cut power usage. The HANfx system is an expandable home area network that employs a variety of intelligent devices such as programmable thermostats and simple in-home displays. It helps customers stay informed about peak pricing, current demand, and their own power usage, allowing them to make smart decisions and empowering them to conserve energy.

HANfx delivers

Scalable architecture

One-way in-home displays migrate to two-way demand-response devices

Flexible technology

Supports standards-based technologies including ZigBee[®] and Z-Wave[®]

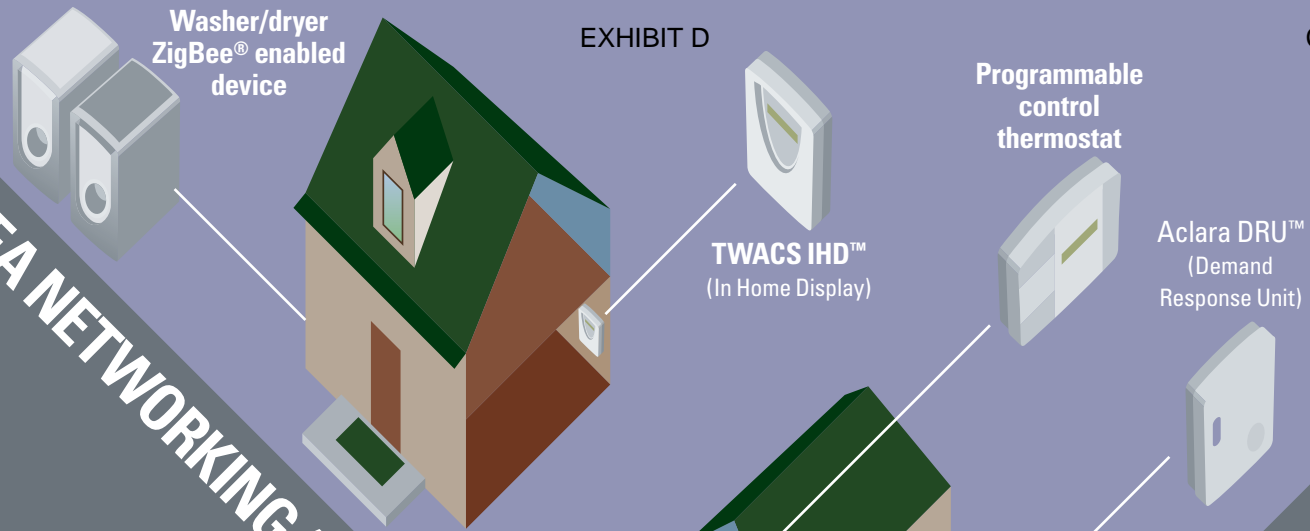
Migration path

Create comprehensive energy-conservation strategies with HANfx

Customer benefits

- Transparent demand response
- Improved interaction with utility
- Awareness of energy pricing
- Increased conservation

HOME AREA NETWORKING (HAN)



Power-lines (Unconditioned)



Utility benefits

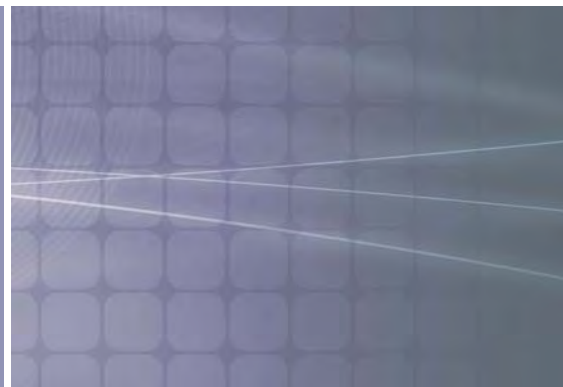
- Comprehensive demand response
- Critical peak-pricing notification
- Demand and usage feedback
- Prepay information





TWACS[®] IHD

IN-HOME DISPLAY



Improve customer service by communicating directly with your customers.

The TWACS IHD (In-Home Display) receives messages, alerts, billing, and account-status information directly to customers. When combined with the UtiliSales[™] master system software, this simple plug-in demand response component keeps customers informed so they can make money- and energy-saving decisions.



The TWACS IHD delivers

Demand response notification

Provides time-of-use and critical peak pricing data, which allow customers to make informed usage decisions

Prepayment support

Offers a simple and straightforward means to keep prepayment customers aware of their balance and warn them before their power is interrupted

Standard billing

Informs customers of their bill balance and usage

Alert and notification services

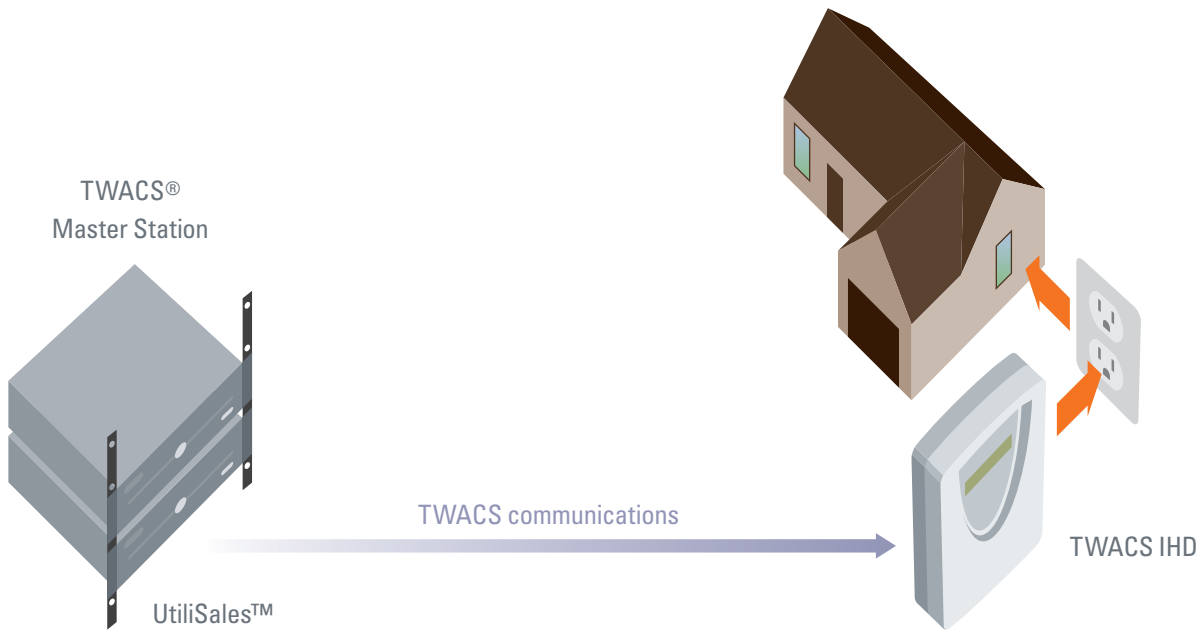
Improves communications by providing custom messages that can assist in customer service or notification of pending service work

Multiple language support

Supports English, Spanish, and French, with both visual and audible alerts

Easy deployment

Plugs into standard electrical outlets



- Standard TWACS IHD displays**
- Account balance
 - Average daily use
 - Daily or monthly cumulative usage
 - Pending peak
 - Active peak

02-21-06 2:55AM
Bal: \$81.92

Active Peak:
\$0.37692/kWh



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Substation Communications Equipment (SCE)



The Substation Communications Equipment (SCE) is the intelligent interface between the Central TWACS® Net Server (TNS) master station software and remote transponders in DCSI's TWACS® (Two-Way Automatic Communication System) power line network.

The SCE is comprised of communications and power equipment located within a utility distribution substation. It receives commands from the TNS, translates the commands to TWACS format, and couples them to the utility power network for transmission to the remote transponders. The SCE then decodes transponder response messages for transmission back to the TNS. The SCE autonomously performs TWACS network management functions, such as determining electrical path data for each transponder and synchronizing the date/time for all transponders.

Each SCE is a stand-alone communications hub,

capable of independently and simultaneously executing commands, receiving data, and transmitting results back to the TNS. There are no limitations on the number of remote transponders that may be accessed from a single SCE. One SCE may interface with up to 12 substation busses, with up to 128 individual inputs, and may simultaneously receive and decode up to six channels of inbound information from remote transponders. Throughput can be increased by installing additional receivers to permit each substation bus to operate independently. Further throughput increases result from the ability of the SCE to buffer and store up to 25 TNS commands and the resultant data. The SCE uses CRC error detection and Hamming error correction algorithms to ensure data integrity.

SCE to TNS communications are through a standard voice-grade communications link, carried on a variety of physical media (dedicated

telephone, dial-up telephone, microwave, hybrid fiber/coax, radio, etc.). Both public and private networks have been used — the choices are based on the utility's existing wide-area communications assets and other factors within their territories. An asynchronous, UCA*-compliant protocol is used to maximize flexibility and to ensure that the system remains open and interoperable.

The SCE's major components are the Outbound Modulation Unit (OMU) and the Control and Receiving Unit (CRU). The OMU produces the TWACS outbound message (i.e., from substation to remote transponder) which commands a transponder to respond with remotely acquired data, take a control action, or download an internal parameter. The outbound signal is coupled to the substation bus through a distribution transformer, referred to as a Modulation Transformer Unit. The CRU component receives the inbound data from one or

more remote transponders, verifies the integrity of the data, performs any necessary communication retries and returns the data to the TNS. The inbound signal is coupled to the CRU through an Inbound Pickup Unit (IPU) inserted in the existing metering or protection CT circuit. The CRU is responsible for all communication between the substation and the TNS. Each substation requires one CRU and as many OMUs as there are independent busses. SCE components may be used indoors or outdoors. Enclosures are highly resistant to the effects of precipitation, high humidity, solar load/UV and a corrosive (salt) atmosphere. They can withstand ground potential rises and switching transients. The components contain surge protection to ensure equipment reliability and are interconnected using fiber optic cables for reliability in the utility substation environment, as verified by over 15 years of operational experience.

* Utility Communication Architecture

Substation Communications Equipment

Outbound Modulation Unit (OMU)



Control and Receiving Unit (CRU)



Functional Specifications	Value or Range
Line Voltage	120 VAC @ 50/60 Hz (small cabinet) 125VDC or 120VAC @ 50/60 Hz (large cabinet)
Operating Temperature	Indoor CRU: 0°C to +60°C * option available for -40°C (small cabinet only) Outdoor CRU: -40°C to +55°C OMU: -40°C to +60°C * option available for -50°C
Storage Temperature	-40°C to +85°C
Humidity	Indoor CRU: 0 - 95% non-condensing Outdoor CRU: 0 - 100%, condensing OMU: 0 - 100%, condensing
Dimensions	Indoor small cabinet CRU: 33"H X 24"W X 21"D Indoor large cabinet CRU: 72"H X 24"W X 18"D Outdoor CRU: 33"H X 33"W X 21"D OMU: 25"H X 30"W X 12"D
EMI/RFI Susceptibility	MIL-STD-461/462 @10 V/m
AC Surge/Transient	ANSI/IEEE C62.41-1991 Cat. B ANSI/IEEE C37.90.1-1989
EMI/RFI Emission	FCC Part 15 Subpart J, Class A
External Interfaces	
Outbound Coupling MTU	Bus voltages up to 46kV Capacity up to 160 MVA/bus MTU Secondary: 277/480 VAC ±20%
Inbound Coupling	Inbound Pickup Unit (IPU) in 5 Amp (typ) CT loop, either bus or feeder level; mounted either external or internal to CRU
TNS to SCE Link	RS-232, 1200-9600 bps, direct, modem, 2W/4W leased or dialup Others: radio, microwave, fiber, cellular, satellite, IP-addressable
TNS to SCE Protocol	Asynchronous ADLC (a UCA-compliant open protocol) SCE firmware downloadable from TNS