South Kentucky RECC
A Touchstone Energy Cooperative
Allen Anderson, President & CEO

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December 7, 2009

RECEIVED
DEC 10 2009
PUBLIC SERVICE
COMMISSION

Mr. Jeff Derouen
Executive Director
Kentucky Public Service Commission
211 Sowder Blvd.
P.O. Box 615
Frankfort, KY 40602-0615

CASE NO: 2009-00489

Dear Mr. Derouen:

Enclosed is an original and ten (10) copies of South Kentucky Rural Electric Cooperative's Application for a Certificate of Convenience and Necessity to install an Advanced Metering Infrastructure System (AMI).

South Kentucky has been awarded a $9.5 million matching grant to install an AMI system from the Department of Energy as a result of the American Reinvestment and Recovery Act.

Before South Kentucky can proceed with final negotiations with DOE we need approval from the Commission to move the project forward. As suggested by the Commission during the Informal Conference we are requesting this application be expedited so that we can secure the funding and equipment to complete the project within the time frame of the grant.

Should you require further information, please let me know.

Sincerely,

Stephen Johnson
Vice President of Finance
South KY RECC

jb Enclosures

RECEIVED

DEC 10 2009

PUBLIC SERVICE
COMMISSION

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

IN THE MATER OF:

APPLICATION OF SOUTH KENTUCKY	)	
RURAL ELECTRIC COOPERATIVE	)	
CORPORATION FOR A CERTIFICATE	)	
OF CONVENIENCE AND NECESSITY TO	)	CASE NO. 2009-00489
INSTALL AN ADVANCED METERING	)	
INFRASTRUCTURE SYSTEM (AMI).	)	

SOUTH KENTUCKY RURAL ELECTRIC COOPERATIVE CORPORATION

SOMERSET, KENTUCKY

I

South Kentucky Rural Electric Cooperative Corporation with a post office address of P.O. Box 910, Somerset, Kentucky 42502 designated as Kentucky 54 - Wayne states that it is a corporation with all rights, characteristics, powers, privileges and duties shown by the records now on file in the office of the Public Service Commission of Kentucky, and that it is engaged in the rural electrification business in the counties of Pulaski, Wayne, McCreary, Cumberland, Lincoln, Rockcastle, Casey, Russell, Laurel, Clinton and Adair, all in Kentucky and Pickett and Scott Counties in the State of Tennessee, by and under the Rural Electrification Act and under authority contained in Kentucky Revised Statutes, Chapter 279. South Kentucky is preparing to deploy a Automated Metering Infrastructure (AMI) System as a component of Smart Grid technology. South Kentucky has been granted a $9.5 million matching grant from the U.S. Department of Energy to automate its electric metering system.

II

South Kentucky Rural Electric Cooperative Corporation's Articles of Incorporation, with amendments, have previously been filed with the Commission in Case No. 96-109.

III

South Kentucky Rural Electric Cooperative Corporation attaches to this application, and fully incorporates by reference, a description of the AMI Project Exhibit A. The facts relied upon showing that the proposed AMI Project is required by a public convenience of necessity are set out in the attached Smart Grid Investment Grant Program Exhibit A. This Program provides the necessary support as to be need for the AMI Program. Three (3) maps showing the location of the proposed AMI Project; are included as Exhibit B.

Exhibit C are excerpts from the U.S. Department of Energy Smart Grid Investment Grant (SGIG) Kickoff Meeting for recipients showing the number of applications along with the number of grants selected for grant funding along with a state map indicating selected projects areas.

Exhibit D is a letter from the selected vendor as to the availability of equipment and lead time.

Exhibit E are letters of support from our Congressmen from the Smart Grid Investment Grant along with a letter from Governor Beshear promoting energy efficiency.

Exhibit F contains a notification letter from the Department of Energy for Grant Funding.

IV

There are no franchises required or in existence. Any permits that may be required in the future, from governmental agencies will be timely obtained as the Project progresses and same will be promptly filed with the Public Service Commission if required.

V

South Kentucky Rural Electric Cooperative Corporation will construct the proposed AMI Project from general funds and matching grant until such time as new loan funds are needed. At that time, loan applications will be filed with the Rural Utilities Service. These loan proceeds will be used to reimburse general funds as expended and to provide money to complete the proposed AMI Project.

VI

There is attached as Exhibit G and fully incorporated by reference, a schedule showing the estimated cost of operation after the proposed AMI Project is completed.

WHEREFORE, South Kentucky Rural Electric Cooperative Corporation of Somerset, Pulaski County, Kentucky, designated as Kentucky 54 - Wayne, pursuant to KRS 278.020, respectfully petitions this Commission as follows:

A. To grant it a Certificate of Convenience and Necessity to install an AMI System.

B. For all proper orders and relief.

____
Darrell L. Saunders
Attorney for Petitioner
700 Master Street
Post Office Box 1324
Corbin, Kentucky 40702
Telephone No. (606) 523-1370

____
Stephen Johnson
Vice President of Finance
South Kentucky Rural Electric
Cooperative Corporation
Somerset, KY 42501

STATE OF KENTUCKY
SCT)
COUNTY OF PULASKI

Subscribed and sworn to before me by Stephen Johnson, Vice President of Finance of South Kentucky Rural Electric Cooperative Corporation, at Somerset, Kentucky this ___________ day of ________________ 2010.

____
NOTARY PUBLIC
State of Kentucky at Large

My Commission Expires______________

Smart Grid Investment Grant Program
DE-FOA-0000058

South Kentucky RECC
A Touchstone Energy® Cooperative

Submitted by:

South Kentucky Rural Electric Cooperative Corporation
925-929 N. Main St.
P.O. Box 910
Somerset, KY 42501-0910
606-678-4121
www.skrecc.com

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South Kentucky RECC AMI Deployment

1. Project Abstract

The South Kentucky Rural Electric Cooperative Corporation (SKRECC) seeks Smart Grid Investment Grant funding to automate its electric metering system to an Automated Metering Infrastructure (AMI) for its 66,249 endpoints in Kentucky counties of Pulaski, Russell, Wayne, Clinton, McCreary, Casey, Lincoln, Adair, Rockcastle, Cumberland and Laurel and the Tennessee counties of Pickett and Scott.

This AMI system is part of the Smart Grid technology, and supports the following SKRECC goals:

- Increased use of digital information and control technologies
- Dynamic optimization of grid operations and resources with full cyber security
- Integration of distributed resources including renewable
- Incorporation of demand response, demand-side resources, and energy efficiency
- Deployment of real-time, automated, interactive technologies for metering, communications and distribution automation
- Integration of smart appliances and consumer devices
- Integration of electricity storage and peak shaving technologies including plug-in electric vehicles and thermal storage air conditioning
- Provision of timely information and control options for consumers
- Development of standards for interoperability
- Lowering of unnecessary barriers to Smart Grid technologies, practices and services
- Educate students of the benefits of Smart Grid technologies through the use of in-school monitoring of usage.
- Increase rate options to members to better match rates with costs to promote efficiency.

The deployment of an AMI system will benefit SKRECC and its consumers by enabling them to make energy efficient choices and shift usage from on-peak to off-peak periods with access to real-time information on usage from their location. Consumers will be able to reduce energy usage in response to pricing or voluntary load reduction events. SKRECC will have the ability to remotely read meter data in intervals so consumers can be billed on time of use so demand can be shifted from on-peak to off-peak periods. This new system will enable SKRECC to be more environmentally friendly, reducing their carbon footprint by shifting time of use of their electricity.

2. Project Tasks and Schedule

SKRECC Project Schedule

	Q1 2010	Q2 2010	Q3 2010	Q4 2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011	Q1 2012	Q2 2012	Q3 2012	Q4 2012
Procurement of software	X											
Interface Software with SEDC & others	X	X										
Procurement of hardware	X	X	X	X	X	X	X	X	X	X	X	
Hire Project Coordinator	X											
Employee Training	X	X	X									
Coordinator Training		X	X									
Communications Backbone Installation	X	X	X	X	X	X	X	X	X	X	X	
Substation Equipment Installation	X	X	X	X	X	X	X	X	X	X	X	
Membership Marketing and Education	X	X	X	X	X	X	X	X	X	X	X	X
Submit quarterly project reports	X	X	X	X	X	X	X	X	X	X	X	
Meter install		X	X	X	X	X	X	X	X	X	X	X
Remote Connect/Disconnect Install *		X	X	X	X	X	X	X	X	X	X	X
File with PSC for new T-O-U Tariff											X	
Receive Approval PSC for T-O-U Tariff												X
Market and Install Load Control *				X	X	X	X	X	X	X	X	X
Install Software for Web Viewing of Usage *			X									
Market and Install in-home Usage Monitors *				X	X	X	X	X	X	X	X	X
Complete and submit final project reports												X

*- remote disconnect, load control switches, and in home usage monitors available in areas where AMI meters have been installed.

3. Management Plan

Project Relevance

SKRECC plans to develop and deploy Advanced Metering Infrastructure capable of supporting automatic meter reading, remote connect/disconnect, in-home usage monitoring, web accessed usage monitoring, load control and time differentiated rate structures.

SKRECC intends to continue to move ahead with detailed planning and development of an AMI system on a timeline that will allow meter installation to begin by early 2010, if funding is approved. Detailed planning will be ongoing during the application review process to meet the stated goal of installation startup by early 2010.

AMI goes beyond just remote meter reading, it captures real-time electric consumption, demand, voltage, current and other information. The data collected can provide more accurate billing and reduced consumer billing questions. Data can be provided at the consumer level and for other enterprise level systems on either a schedule or on demand. AMI implementation is a fundamental component of Smart Grid technology.

SKRECC does not currently offer time-of-use rates but will be developing these in coordination with this "smart grid initiative." SKRECC's use of AMI for time-of-use-pricing will allow consumers to adjust their consumption of electricity based on the day-to-day and hour-to-hour price of electricity and the on-peak price impact on their bills. This will lead to SKRECC establishing critical peak pricing, as well as offering consumers the ability to view their real-time usage on the Web.

The SKRECC AMI system will be tied into its outage management system to better manage outages and verify restoration quickly and accurately.

SKRECC is a distribution cooperative our power is purchased from East Kentucky Power Cooperative (our Generation and Transmission provider). SKRECC is located in South Central Kentucky has 162 employees and serves 66,249 consumers in all or parts of thirteen counties including Pulaski, Russell, Wayne, Clinton, McCreary, Casey, Lincoln, Adair, Rockcastle, Cumberland, and Laurel counties in Kentucky, and Pickett and Scott counties in Tennessee. SKRECC maintains 6,685 miles of distribution line and 49,178 transformers supported by 143,706 poles. Residential consumers represent the majority of our accounts with over 93% of the active accounts being residential. The consumer density is relatively low with only 9.91 consumers per mile of distribution line. This adds to the time required to read, maintain, and service the existing meters and accounts.

The SKRECC service area, located in western Appalachia, has been economically and developmentally depressed for many years – the Appalachian Regional Commission lists seven of the thirteen counties as ARC-designated distressed counties in FY 2009. This fact is evidenced by both the consistently high unemployment rate and the low personal per capita income of the region. The terrain is mountainous.

The June, 2009 unemployment rate in 9 of the 11 counties in the SKRECC service area exceeded the Kentucky unemployment rate of 11.1% for that period. The June 2009 unemployment rates by county, in descending order, were as follows: McCreary 14.5%, Wayne 14%, Rockcastle 13.9%, Cumberland 13.5%, Lincoln 13.3%, Russell 12.2%, Casey 11.4%, Adair 11.3%, Pulaski 10.8%, Laurel 10.7%, and Clinton 9.7%. The two Tennessee counties had the state's highest and 6th highest unemployment rates out of 95 total counties in that state (Pickett County 14.7% and Scott County 19.4%). This was compared to a

Tennessee unemployment rate of 10.8% for the reporting period. The national unemployment rate for June 2009 was 9.5%.

Another indicator of the region suffering from an under achieving economy is that of per capita income. All 13 of the counties have per capita personal incomes considerably below the averages for their respective states. The U.S. Department of Commerce, Bureau of Economic Analysis, shows the 2004 per capita personal income by Kentucky counties as follows: McCreary $16,381, Cumberland $18,035, Rockcastle $18,057, Casey $18,262, Lincoln $18,405, Wayne $19,768, Adair $19,768, Russell $19,778, Laurel $20,956, Clinton $21,222, Pulaski $23,790. The Tennessee counties were Scott at $18,735 and Pickett at $18,790. The Kentucky and Tennessee statewide per capita personal incomes for the same period were $27,265 and $29,844 respectively.

SKRECC serves terrain that includes hills, mountains, forests, valleys and rivers and parts of the territory are somewhat isolated and scarcely populated with low meter density across large portions of our territory. Power Line Carrier Technology will be utilized due to the proven track record in similar terrain.

The lack of information and communication has been a factor in preventing SKRECC from utilizing our consumers desire to reduce their electric usage and corresponding system electrical demand. In addition to consumer benefits there are societal and environmental benefits from an AMI system through the reduced CO2 emissions from power plants through electric usage reduction and also through reduced vehicle emissions from manually reading meters and manually connecting and disconnecting accounts. There is also an added benefit of moderated demand growth for both the distribution cooperative and the generation and transmission cooperative.

SKRECC proposes the following system configuration:

- Advanced solid state meters and modules that provide the ability to record interval usage and demand data, support on-demand reads, allow remote programming, and provide outage and tamper detection.
- A two way power line carrier communications network that supports the meters and AMI applications with real time communications capability.
- A meter data management system, that will collect organize and manage the data captured using AMI, and make this information available to our consumers through the World Wide Web.
- Automated connect/disconnect collars which allow SKRECC to turn on and turn off high turnover rental accounts and isolated homes and cabins.
- In home real time electric usage monitoring through the use of installed monitors for accounts which do not have Internet access and/or want to access their information directly without "going online."
- Pre-paid metering that will allow consumers to avoid deposits and benefit low income consumers and also allow members that work seasonally to pre-pay for their electric service.
- Load control of water heaters, air conditioners, and swimming pool pumps through the installation of load control monitors to help reduce peak demand.

Benefits of the system will include, but not be limited to:

- Better service due to the elimination of routine estimated meter reads.
- Elimination of billing errors due through better monitoring and greater detail of electric usage.
- The ability for customer service representatives to call up the member's recent detailed consumption history.
- The elimination of physical visits to the premises to read the meter also removes vehicles from the road and reducing CO2 emissions.

- Improved outage response time through continuous monitoring of electric accounts.
- The ability to verify restoration status and better locate the source of each outage.
- New demand-side management options, including load management, load aggregation, and rate options.
- Consumer access to their own usage data through the Internet.
- The elimination of physical visits for connecting and disconnecting electric accounts.
- Reduced potential for equipment damage due to low and/or high voltage conditions as these will be alarmed and investigated.
- Consumers can avoid deposits with the use of pre-paid options and consumers that work seasonally can pre-pay for their electric service.
- Increased revenue through the reduction of line loss due to better collection and utilization of load data.
- Delayed upgrades to electric facilities due to a greater knowledge of line and transformer loading.
- Reduction of energy theft through the use of tamper detection and better monitoring of consumer usage.

All SKRECC consumers will be able to utilize the system infrastructure in a non-discriminatory basis, regardless of their financial means. Data will be available to consumers by either web based applications or through the use of in-home usage monitors for those without Internet access.

A detailed communications plan will be developed to ensure that consumers are aware of the infrastructure changes and the progress of the project this will include regular updates through our monthly Kentucky Living Magazine and bill stuffers with ongoing progress reports.

The AMI system will be interfaced with other software applications throughout the organization.

Cost Savings

- The most obvious benefit of implementing AMI is the elimination of manual meter reading expenses. An additional benefit of eliminating manual meter reading is a reduction in the number of vehicles and the corresponding reduction in $CO2$ emissions.
- The implementation of AMI will allow for remote connect and disconnect of electric service. This will allow SKRECC to execute these requests much quicker and reduce field visits and highway miles on vehicles.
- AMI will eliminate the need for calculation of estimated bills caused by misread or unread meters. This results in better customer service through more accurate billing and less need for consumers to contact SKRECC to resolve billing concerns.
- AMI can help improve outage response time by helping locate the cause of an outage. Outage alarms can help our Dispatchers pinpoint the specific oil circuit recloser or fused cutout that is out of service. It can also verify all the consumers on a line were returned to service thus avoiding inadvertently leaving consumers out of service who may not be at home to notify SKRECC of the outage. Outage identification will also allow us to identify and concentrate restoration efforts on critical facilities necessary for first responders and homeland security.
- AMI will identify malfunctioning meters and higher than expected usage which will reduce the number of billing adjustments and in turn will improve consumer satisfaction.
- New electronic meters will retain their accuracy over time much better than electromechanical meters. This better registration of energy use will lead to a reduction in line loss and a corresponding benefit to all consumers by assuring accurate billing of all accounts.

- Electricity theft is a problem that creates consumer inequity and leads to higher electric bills for responsible consumers. The AMI system will include the capability of tamper detection with will alert SKRECC of potential irregularities and theft of service situations. The ability to identify and address potential theft of service will also decrease line loss and help reduce costs to all consumers.
- The new AMI system will allow for the development of Time-of-Use Tariff's which will allow members to move their electric usage to "off peak" hours. This will in turn reduce the need for Generation, Transmission, and Distribution capacity.
- Load Control will be implemented with the installation of devices on water heaters, air conditioners and swimming pool pumps. This as well reduces the need for Generation, Transmission and Distribution capacity.
- In home and web based monitoring will allow greater detail to the consumer which will increase their awareness of energy usage and demand and also reduce the need for Generation, Transmission and Distribution capacity.
- AMI will help reduce the potential for electric and electronic equipment damage through better detection of over or under voltages.

Perhaps the greatest long term benefit of AMI may prove to be the environmental benefits associated with the ability to shape and control electric load. This more efficient usage of energy will defer new generation requirements and improve system load factor.

The AMI system will have no ecological or environmental impact and will actually lead to a significant reduction in emissions from both power plants and vehicles. The alternative is increased construction of generation facilities and a corresponding increase in emissions including CO2. To achieve the benefits of demand response SKRECC must be able to implement new programs to encourage load shifting and curtailment whose effectiveness must be verified through AMI.

Deployment

Deployment of the system will require the employment of a project director and field crew for installation. The V.P of Engineering and Operations will oversee the overall project which will include the project director and field installation crews which can consist of multiple installers.

<u>Environmental Impact</u>

The AMI system SKRECC has selected minimizes environmental impacts by utilizing SKRECC's existing power line infrastructure and does not require repeaters, line conditioning devices or other equipment to transmit data. The endpoints are mounted within the electric meter, which means a smaller equipment footprint as the customer location. Also, the substation equipment is put within the substation behind the fence, utilizing existing space. The Environmental NEPA review indicates that this project has a categorical exclusion.

Project Team

SKRECC has a dedicated team of industry experts committed to a successful AMI deployment. The team includes:

Allen Anderson	President/CEO
Dennis Holt	V.P., Engineering & Operations
Stephen Johnson	V.P., Financial Services
Ruby Patterson	V.P., Member Services & Public Relations
Kevin Newton	Engineering Team Leader P.E.
Dallas Hopkins	Dispatch/Technical Services Team Leader
Tony Tupman	Meter Technician Team Leader
Jeff Greer	Regulatory Service Controller
Joe Langdon	I.T. Team Leader

Below is the vendor that will be utilized in providing equipment and support services for SKRECC's AMI deployment project.

Vendor	Address	Contact	Description
HD Supply Utilities	3100 Cumberland Blvd Suite 1700 Atlanta, GA 30339 877-HDS-4407	Bill Lawyer Regional VP - Sales	Supplier of Smart Grid hardware – meters, modules, transformers, CRUs. Supplier and installer of AMI software.

Management Plan

As Executive Project Team Leader, Mr. Holt will be the main point of contact for the Department of Energy and will be responsible for ensuring the SKRECC team implements the AMI deployment project tasks on schedule, within budget and will be providing the DOE will all project status reports. Mr. Holt will be managing the contract negotiations with vendors, implementing the project plan provided above and providing Mr. Anderson with progress reports on the AMI deployment.

Mr. Newton, Mr. Hopkins and Mr. Tupman will support Mr. Holt and will oversee the day-to-day installation of the AMI system. They will also be responsible for communications to field personnel and vendors.

Mr. Greer will be taking the lead on developing new pricing options for SKRECC's consumers – based on the data gathered from the new AMI system – and provide insight on any regulatory issues.

Mr. Anderson will receive monthly project updates and take a leadership position in communicating the AMI project to SKRECC'S Board of Directors, consumers and community leaders in the SKRECC service area.

Mr. Johnson will be responsible for all of the financial reporting technical and project support for the project.

Ms. Patterson will be responsible for educating SKRECC consumers on the benefits of the AMI system.

4. Technical Approach to Enabling Smart Grid Functions

I. Installation specs for the AMI project and how it connects to existing infrastructure

TWACS Technology
SKRECC has chosen to install the Aclara Two-Way Automatic Communications System (TWACS®) Technology. TWACS is a proven, fixed network solution that uses patented technology to transmit data over power lines. Aclara TWACS Technology offers two-way communication to electric meters and provides for timely billing, load control, demand response, and outage detection and assessment. With the system, SKRECC can effectively manage customer data and reduce costs while enabling innovation and providing superior customer service. In a consistently changing utility environment, the TWACS system provides a solid foundation on which to build the metering solutions of today and tomorrow.

The perceived niche of the TWACS technology is one of a lower density population solution. While the majority of TWACS customers do have a rural component to their territory, the TWACS system is capable of addressing high data volumes and high population density. Many other AMR/AMI providers experience problems in rural areas and others are not cost effective in low population densities; the TWACS system remains consistent in cost and functionality with no need for repeaters or collectors to ensure data is transmitted to the head-end.

TWACS' proven ability to perform well in rural areas is because its technology was designed to leverage existing infrastructure, enhance data output, and provide secure communications between the meters and the master station. Using the concept of a smart module, the TWACS system has been able to work with both basic function and smart meters to provide utilities of all sizes with reliable metering data.

Functionality
The TWACS solution offers cost-effective coverage over all of the SKRECC service territory by utilizing the existing power delivery infrastructure, which offers cost, reliability and reduced complexity advantages over other public and private communication infrastructure approaches. No network communications components are required outside of the utility's distribution substation. There are no additional system-wide dedicated endpoint communication systems to engineer, install and maintain; and no concerns of technology, or business risks, associated with the use of third party communications systems. Furthermore, as new consumers are added to SKRECC system, no additional TWACS-specific infrastructure is required since the signals continue to follow the power lines. Only when new substations, busses or feeders are added to the distribution system is additional infrastructure required to maintain full communication coverage.

The safe, efficient and reliable delivery of electricity to its consumer base is a core competency of any electric utility. The TWACS solution will permit SKRECC to install, operate and control a powerful, bi-directional communication network within the course of normal business processes, leveraging the existing skill sets of the utility workforce. The TWACS substation equipment utilizes familiar components, such as distribution transformers, substation communications equipment and current transformers, and can be deployed safely, quickly and efficiently using the utility's existing internal, or contract, workforce.

TWACS 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
- Tamper data
- Power Quality data
- Down loadable firmware

SKRECC does not anticipate any technology obsolescence in using a TWACS system. TWACS maker Aclara is constantly reviewing its product offerings to provide customers like SKRECC with the latest and most current capabilities. When developing new products, Aclara 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.

Aclara offers additional products to extend the capabilities of the TWACS system:

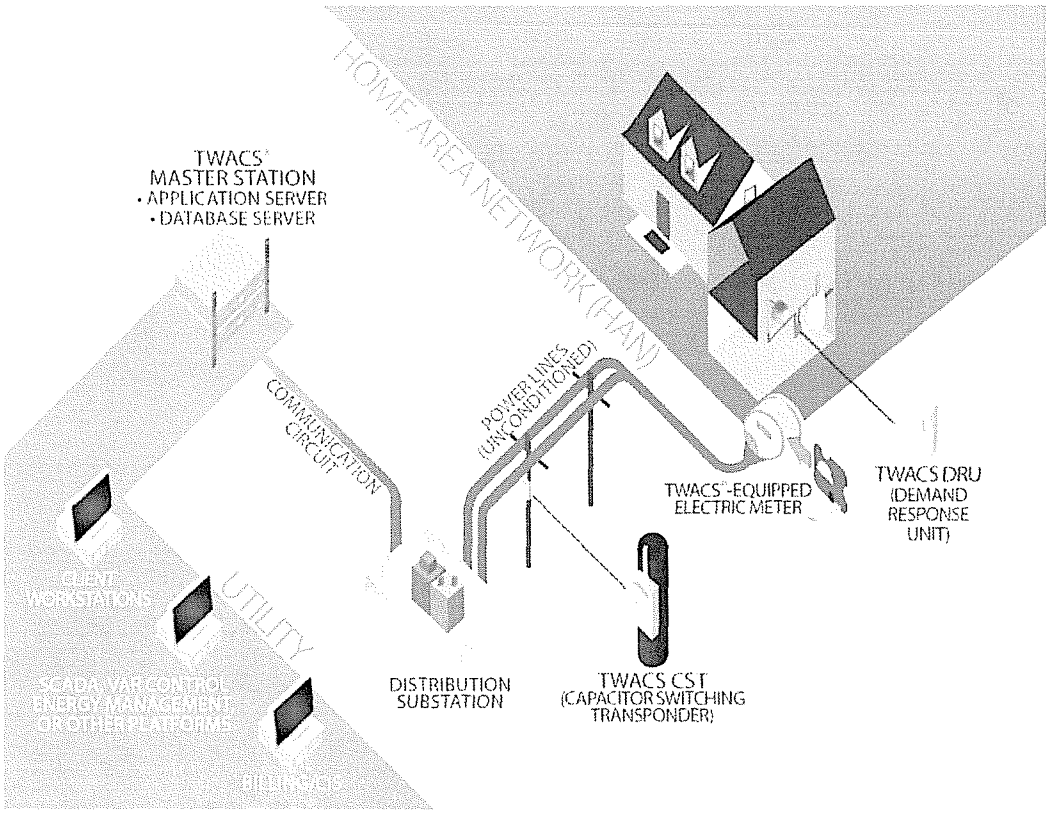
- Disconnect Switch Interbase (DSI) (separate collar remote disconnect/reconnect option)
- In-Home Display for passive demand response
- Prepayment solutions
- Load Control solutions

Some of the products and additional functionality from Aclara scheduled for release in the near future include:

- Distribution Automation
- Two-way Communicating Capacitor Control Switch
- Controllable/Addressable Thermostat
- Enhanced Power Quality Data
- Additional security features

Methodology

The TWACS system consists of three component levels – master station TWACS operation software/TWACS Net server (TNS), substation communications equipment (SCE) and endpoints or modules. The chart below illustrates how these systems work together to achieve the function of a Smart Grid program.



Software
The TNS master station is installed in the data center. The exact hardware and software configuration is flexible, but specific requirements will be defined properly. Generally, the TNS master station consists of a single server, but could be comprised of multiple servers (i.e. application, database and multiple communication servers) depending on system size.

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 are currently being tested by many other applications for certification as an integration API.

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 SKRECC 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 system also provides restoration verification and can assist the utility in reducing unnecessary field visits.

UtiliSales is the software application which manages the prepay billing and IHD notifications for a TWACS prepay program using the IHD. UtiliSales utilizes XML web services implemented through the Microsoft.NET architecture coupled with SQL Server stored procedures and a SQL Server database for scalability, easier product deployment and updates.

Substation Communications Equipment (SCE)
SCE is the communications hub for the TWACS system. Installed at the substation, the SCE provides the communications connections between the TWACS modules and the master station.

The control receiver unit (CRU) 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.

The modulation transformer unit (MTU) 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. The outbound modulation unit (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.

The inbound pickup unit (IPU) 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. When concurrent phase communications are utilized (e.g. overlapping TWACS communication on all three electrical phases), the multiple input receiver assembly (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.

Endpoints
Endpoints collect and transmit data from the meter and provide communications to the customer. The TWACS system requires a meter module.

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 foreword, reverse, net and secure. These include mappable registers and history storage at the module.
- Demand Data including15-minute peak, 30-minute peak, 60-minute peak, fixed block, and rolling block.

- 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
- Electric meters currently supported by the UMT are L+G FOCUS, GE's I-210, Elster A3 Alpha and GE kV2c.

The in-home display is often used with the prepay solution to enable direct communications with a customer about their usage and to send balance information. This unit is easily deployed. Customers need only to plug it into an existing power outlet and the product will receive signals sent to the customer's premise. This product has also been used for direct communications with customers not involved in prepay programs to alert them to peak demand events, usage alerts and other notifications the utility wishes to provide.

The load control transponder (LCT) is a two-way load control device featuring two relays, one 30 amp normally closed relay suitable for controlling water heaters or other heating loads, and one 3 amp 24 volt 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.

The demand response unit (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.

<u>Data Communications</u>

Data Acquisition

The TWACS system is a fixed network, utility communications system. Running at a centralized location, the TWACS operating software communicates with endpoints, such as meters, by way of existing power lines. The system allows full two-way access to and from the customer's meter, providing both communications and control features. The complete communications pathway for a TWACS command can be simplified into a four-step process:

1. A command is initiated from the TWACS 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 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 TWACS system provides the data necessary to manage multi-rate billing structures, consumer usage, load profiling, power quality, tamper notifications, integration with other systems and secure communications and data storage. These functions help optimize the functionality of existing billing, load management, systems planning and power quality through secure delivery of data. This data collection also enhances operational efficiencies by reducing unnecessary field visits, enhances information available to customer service representatives, supports consumer satisfaction and even reduces overhead costs.

Data Storage
The TNS is the heart of the TWACS system. It interfaces the TNS operator and other users to the TWACS system. While configuration options vary depending on the complexity by the number of users and substations configuration involves a server and some form of communications links connecting TNS to the substation.

TNS is often configured with a bank of modems allowing the TNS server to dial out and connect with substations. The basic TNS server configuration involves a Windows 2003 server running three applications – Oracle database server, TNS application server and communication server. The Oracle database server is responsible for managing the meter and meter-related databases. The TNS application server is responsible for running the TNS programs and providing an interface for communications. The communication server is responsible for interacting with communications facilities like dial-ups or dedicated-line facilities to connect to the substation equipment. For a more advanced TNS configuration, the Oracle database server, TNS application server and communication server would be segregated and run on separate processing machines.

The TNS software runs on a PC platform that is dedicated to the operation of a TWACS network. It is comprised of three components – application, database and communications. The TNS application software created by Aclara manages the network and performs load control and AMI functions, as well as other supported services. The database software from Oracle maintains all of the information about the system components, operational information and resultant metering data and other information retrieved from TWACS-enabled endpoints. The communications software handles the communications between the TNS and the substation equipment.

II. How the installation will actually enable Smart Grid functionality

The TWACS system is compatible with Smart Grid programs and applications designed to counteract the weaknesses in the existing power infrastructure, making TWACS a key ingredient in a comprehensive Smart Grid solution. The TWACS system supports Smart Grid through energy efficiency, better power reliability, secure systems, interoperability, distribution automation and increased consumer interaction.

Energy Efficiency: As a subcomponent of energy efficiency, load control offers a means to manage load without adversely impacting consumer convenience. The TWACS load control option provides for proven load shedding strategies that will enable SKRECC to manage demand, prevent excessive consumption and conserve energy. The system also provides significant and valuable data to evaluate load, implement multi-rate pricing structures, inform and educate consumers, and determine strategies for better management of the power system.

Improved Power Reliability: The TWACS solution offers a way to identify, monitor and evaluate power reliability issues that may be occurring within a SKRECC'S power system. It can help SKRECC identify voltage issues, power availability problems, momentary and sustained outage information, peak loads, consumption analysis and other information necessary to maintain the system efficiency and functionality. The TWACS system also offers a solution to curtail potentially damaging situations by offering a load control solution to enable SCRAM load strategies when sudden peaks occur and to autonomously drop load when a voltage or system frequency threshold is reached.

Additionally, the Capacitor Switching Transponder provides an effective way to leverage the TWACS system to actively manage grid reliability and efficiency by controlling circuit voltage and reducing system losses due to VAR flow, enabling more reliability across the system. The TWACS system also offers the ability to collect data required to compute the loading on individual components and conductor sections to determine where to spend maintenance and/or upgrade dollars as well as allowing SKRECC to better site future substations.

Secure Systems: The TWACS solution offers a secure communications path for data to be transmitted. The design of the system focuses on ensuring the data stored in the master station servers is protected by being integrated within the SKRECC secured data center and corporate infrastructure, thereby allowing the greatest flexibility for configuration and maintaining secure data. Access to the system is restricted to a roles and rights schema that enables only the appropriate personnel to access the data on the system. The level of access is also restricted and based on the user's assigned role.

The key TWACS network equipment all reside within the SKRECC substation – a secure environment that itself is critical to system operations. There is no field collector, repeater or conditioning equipment required – eliminating this potential access point to the system that other solutions entail.

Interoperability: The TWACS system offers a modular approach to AMI system design. Implementing a standard TWACS metering solution enables faster addition of other products as the SKRECC AMI solution matures. This "plug 'n' play" focus allows a utility to determine the timeline for implementing new programs such as load control, home area networking, or distribution automation capabilities without having to replace existing hardware to ensure support. But the TWACS system does not stop there. The integration capabilities of the TWACS system software enables utilities to link all the meter and system data collected by TWACS to other systems including SCADA, OMS, billing, MDM and customer presentment.

Distribution Automation: As one of the components of the TWACS system, the Capacitor Switching Transponder (CST) uses the TWACS communications protocols to automate capacitor banks with two-way controls, providing valuable information, savings and control. Capacitor banks can be administered across the SKRECC service area and the CST actively manages grid reliability and efficiency by controlling circuit voltage and reducing system losses due to VAR flow. The CST offers several benefits for system reliability including:

- Automates voltage and VAR management to reduce losses, thereby releasing system capacity
- Optimizes power factor on a system-wide basis and does not require highly technical on-site maintenance adjustments
- Reduces consumer complaints due to low-voltage situations
- Extends capacitor coverage improving voltage profile and reducing losses
- Avoids power factor penalties
- Synchronizes daily and seasonal requirements

SKRECC will consider additional distribution automation solutions as those become available for deployment over the next few years.

Increased Consumer Interaction: There are a number of ways utilities increase interaction with consumers including demand response programs, consumer education and multi-rate pricing structures. The TWACS solution supports programs like these through the extendibility of the system and the options available. The following list identifies the ways in which the TWACS solution supports increased consumer interaction:

- Demand Response—SKRECCC plans to shave our peak demand and hopes to achieve results on a per consumer basis that is similar to Florida Power and Light (FPL). FPL has one of the largest demand response programs in the world through their deployment of the TWACS load control solution. FPL has deployed over 800,000 LCT units. FPL has experienced an overall load reduction per system-wide event of approximately 1000 MW when using a cycling strategy. FPL has achieved a typical demand reduction of 1.44kW per consumer for an individual consumer participating in the program using a cycling strategy.
- Consumer Education – The data collected by the TWACS solution provides SKRECC with the information necessary to educate its consumers on their personal energy usage habits and ways to conserve energy. This information can be tailored to show times of the day when a specific consumer is using the most energy and provide ways to become more energy efficient. This information can be provided to the consumer via in-home display devices, mailers or an on-line and interactive consumer presentment tool. The TWACS software under consideration offers a customer presentment solution which provides members with their actual energy usage – including daily consumption, demand readings and actual interval data. The tool includes reports, warnings, notifications, billing costs and other information online. It also has analytical tools which are designed to assist the consumer in identifying energy saving actions. In addition, SKRECC plans on utilizing the installed AMI system for education within each school served by South Kentucky, through the utilization of Internet monitoring of the schools use by the students.
- Multi-rate pricing structures—The TWACS solution currently supports TOU, CPP and other rate structures through the use of interval data. When integrated with an MDM or other application to apply the rate calculations.

III. Ability to extend the installed AMI technology to a broader set of locations or applications – once the installation is complete.

The TWACS solution offers the added benefit of helping SKRECC as it grows. 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 a newly constructed home or business, as long as no new substations or feeders are included in the construction. A utility would only need to add components, beyond the meter module, when a substation or feeder is added to the power infrastructure.

The TWACS architecture is inherently scalable. 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 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. The TWACS transponders provide unlimited endpoint scalability.

TWACS offers flexible design to enable additional functionality, equipment and system functions to the system without degradation of the communications bandwidth. There is ability to expand the system to include: demand response capabilities such as load control; home area networking; distribution automation; new functionality through firmware downloads; and multiple input receiver assembly.

IV. Metrics and Other Assessments of Operational Performance

Data to be collected includes KWH usage and demand data on an interval basis in addition to voltage monitoring. This data can then be utilized for many different cost savings purposes. It will provide an accurate system usage model to be used in planning including identifying necessary upgrades, potential voltage problems and deferring the need for new line upgrades and substations. The data can also be used by the consumers through in-home viewing to better manage and control their electric usage and associated costs.

5. Technical Approach to Interoperability and Cyber Security

Interoperability
SKRECC has chosen an Aclara AMI system because this company fully supports the effort to evolve systems in the Smart Grid to be interoperable. Aclara has been heavily involved in the Standards Development Organizations for many years as well as the more recent effort by NIST and EPRI to develop the Smart Grid Interoperability Standards Roadmap (herein referred to as the NIST Roadmap).

A sample of the SDOs that Aclara is involved in is:

- IEC-61968 and other IEC standards
- IEEE P2030, 802.15, 802.11 and other IEEE standards
- ANSI C12.1, C12.18, C12.19, C12.22 and other ANSI standards
- Zigbee

The TWACS system SKRECC has selected offers integration into back-office applications, data sharing, flexible backhaul solutions and adherence to ANSI, IEEE, MultiSpeak and other standards.

I. Summary of information exchange interfaces for communicating automation devices and systems

The integration of systems is one of the most important aspects of the National Institute of Standards and Technology (NIST) Roadmap. The Smart Grid will be a system-of-systems. As such, using open standards at the integration points is critical. This will allow systems to interoperate, and limit the stranding of legacy assets already deployed in the field.

The TWACS system currently supports such open standards at the integration points. The system is a hierarchical system with three tiers – the master station software, the substation communication equipment and the transponder end points that are integrated into meters. The integration points are at the master station and at the end points.

On the master station side, integration with upstream systems is achieved with IEC-61968 and Multispeak interfaces. At the network layer, upstream applications can communicate with the master station using Internet Protocols.

On the end point side, data can be sent and received to and from the meter using ANSI C12.18 and C12.19. In order to integrate with Home Area Networks (HAN), the end-points use Zigbee and the Smart Energy Profile.

II. Summary of how the project will provide open available and proprietary aspects of the interface specifications and how existing communications devices or systems will be integrated into the project

The Aclara AMI system will interface with our SEDC billing system using an interface that was developed by SEDC and Aclara. This interface is used at other utilities and has been found to be a reliable interface. The Aclara AMI system will also interface with our Outage Management and Mapping systems which are provided by Tremble/UAI. These interfaces were developed by Aclara and Tremble/UAI and have also been found to be reliable at other utilities.

The integration points with the TWACS system are based on standard interfaces. Integration with other systems can be achieved through these standard interfaces.

The standard interfaces abstract equipment within the TWACS system that operate with legacy proprietary protocols. This allows legacy devices to be integrated in with the Smart Grid project. It also ensures that assets are not stranded as the Smart Grid evolves. Additionally, Aclara, the maker of the TWACS system, has spent many years integrating its system in with over 25 other legacy systems.

III. Summary of how the project will address response to failure and device upgrade scenarios, so overall system impact is mitigated

SKRECC will do an initial verification of the functionality of the smart meter at the time of the installation. We feel this extra effort is worthwhile initially, and will prevent extra visits by field personnel to our endpoints.

The TWACS system has robust mechanisms that allow the system to identify potential issues in the field. These mechanisms exist at the master station level, at the substation communication equipment level, and the end-points.

At the master station level, the software allows the system operator (or other systems) to monitor the health of the system. Diagnostics, tamper alarms, and notifications are used to inform the system operators or other systems of potential issues in the field. The system also allows for automation of the recovery of data when issues occur that are not permanent. For example, if a WAN link goes down for a period of time between the master station and the substation, the system will automatically recover when the link is available again. Once the link is recovered, the system will request or resend data to the end-points without user intervention. The system also has a robust retry algorithm that accounts for reliability issues on difficult communication paths. All communication systems must have such an algorithm to ensure the highest level of reliability.

At the substation communication equipment, notifications are the primary method to communicate field failures. A sample what the equipment can monitor and notify is listed below:

- Notifications that the equipment is out of service.
- Notifications that there is a potential equipment problem. This does not necessarily mean that the equipment is not operable, just that it should be investigated.
- Notifications of exceeding limits of voltage or temperature.
- Equipment interaction error
- Unroutable response
- Inbound acquisition error
- System call error
- Processing exception
- Response not received by process
- Unexpected response
- Error in internal SCE response

The end-points support robust alarm, diagnostics, tamper, and outage and power quality indicators. A sample of those is listed below:

Alarm Indicators	**Diagnostic Indicators**
• Discontinuous date	• NV memory R/W error
• Discontinuous time	• Outbound detector error
• Invalid date	• Inbound SCR error
• Invalid time	• NV memory checksum error
	• EMTR communications error
Tamper Indicators	• Program memory error
• 24-hour no-consumption	• EMTR diagnostic error
• Reverse consumption	• Meter comm. Error
	• RTC failed
Outage/Power Quality Indicators	• Meter status (indicates problems w/ host meter)
• Power down count increased	• Loopback test failed
	• NV memory error

The end-points also copy information from the meter status tables (ANSI C12.19 - Manufacturer Table 03) to indicate meter problems and alarms.

TWACS supports firmware upgrade of all devices in the field including the substation communication equipment and the end devices. The application to perform the upgrade provides the flexibility to the user to assign a priority to the upgrade versus other work that is being performed in the system. Typically, operators of the system will set up the firmware upgrade jobs such that they are performed in the background without impact to other jobs running in the system. These capabilities allow the TWACS system to be a highly reliable, highly available system for the Smart Grid now and for the future.

IV. Summary of how the project will support compatibility with NIST's emerging smart grid framework and standards

Because Aclara supports Smart Grid evolution, it has been heavily involved in the Standards Development Organizations for many years. As well, Aclara has been involved in the more recent effort by NIST and EPRI to develop the Smart Grid Interoperability Standards Roadmap.

Aclara supports the stated benefits of the framework for the Smart Grid:

- Power reliability and power quality benefits
- Safety and cyber security benefits
- Energy efficiency benefits
- Environmental and conservation benefits
- Direct financial benefits

For many years, Aclara has encouraged interoperability while allowing the flexibility needed to attain the above benefits, which coincide with the conceptual model developed by NIST. This model is used throughout the roadmap to help define a path toward interoperability and to realize the benefits listed above. Aclara supports the notion that the path toward interoperability will be an evolution. The guiding principles as stated in the document are that the approach toward interoperability should allow loose coupling of systems, layered systems, and shallow integration of systems.

The roadmap also discusses cyber security as a key issue in the Smart Grid. Aclara maintains a robust security life cycle where the system is audited to find issues. A plan is put in place to fix the issues, fixes are developed and deployed, and the cycle repeats with an audit. Issues may not only be technological in nature, but could be process or procedure issues. Aclara works with utilities such as SKRECC to identify and maintain a secure deployment for the system. Further discussion of this follows in the cyber security section of this document.

One of the main goals of the NIST Roadmap is to define the standards that should be followed in each domain where Smart Grid products operate (operations, markets, service provider, bulk generation, distribution, transmission, and customer). The TWACS system already supports many of the standards in question. TWACS maker Aclara has been involved in the development of these standards. The standards are mapped to the GWAC stack which is the defined layering model for the Smart Grid. A sample of the key standards that apply to the domain areas are:

- NERC reliability
- IEC 61968-9
- IEC 61970
- Multispeak
- SNMP
- WC3 XML, XSD, SOAP, EXI, WSDL
- IEEE 802.15
- IP, SSL, TLS
- AMI-SEC
- ANSI C12.18, C12.19, C12.1, C12.xx
- Zigbee/Smart Energy Profile

This is not an all-inclusive list. The NIST Roadmap includes hundreds of standards that apply to many different domains of the Smart Grid. Aclara systems like TWACS continue to evolve as the Smart Grid evolves. Any updates to existing standards as needed will meet the NIST framework and roadmap.

Cyber Security

I. Summary of cyber security risks and how they will be mitigated at each stage of the lifestyle

SKRECC has a privacy committee that reviews potential risks related to data privacy and cyber security on an ongoing basis. SKRECC is proactive in reviewing trends related to new developing threats to security and privacy and take measures to mitigate these threats. SKRECC plans to do a fresh review at each step of the implementation process of this project to determine what the potential threats of implementing the next step of the project will be and implement measures that will mitigate those risks.
SKRECC advocates and supports an information security approach that leverages industry standard tools and best practices throughout the product lifecycle. SKRECC has implemented those systems and practices necessary to protect the confidentiality, integrity, and availability of all the data that is generated as part of our electric services.

e information security risks associated with the deployment of smart grid technologies stem from the possibility of any of a number of threats being realized. These threats can be summarized in two broad categories: environmental and human. Environmental threats include everything from acts of nature, such as wind, fire, and flood, to poor air quality or electrical anomalies due to solar events. Risks founded in human threats stem from more conventional information security concerns such as malware, hacking, social engineering, and human error, to name a few.

Security needs vary by location and installation. Consequently, the information security strategy employed at each location must be customized to address the environmental, risk, and threat factors that are unique to that location.

Aclara will also provide specific security configuration and process advice to cover a variety of subjects including, but not limited to:

- Server Hardening
- Database Hardening
- Network and Communications Security
- Vulnerability Management
- Intrusion Detection and Analysis
- Disaster Recovery
- Penetration Testing
- Physical Security

SKRECC'S view of the information security lifecycle is that it begins when the project is conceived, and it continues for the duration of every installation.

II. Summary of cyber security criteria used for vendor and device selection

Smart Grid technologies are, by their very nature, connected. Consequently, these technologies are subject to the same information security vulnerabilities as have troubled systems since the dawn of the World Wide Web. What's more, the legacy systems and processes common in the utility industry introduce yet another layer of vulnerability that is unique to the industry. Therefore, it is essential for any entity seeking to deploy Smart Grid technologies to first gain a thorough understanding of the cyber security implications of their deployment.

The following is a list of cyber security criteria that SKRECC has evaluated as part of its smart grid project:

1. Vendors and associated partners should show a commitment to emerging industry standards for information security through participation in, and endorsement of, standardization efforts.
2. The vendor should display a level of internal information security expertise and commitment indicative of a security conscience organization. Examples may include, but are not limited to: established regular information security training for employees, written information security standards for development and manufacturing, and established procedures for information security testing and validation.
3. The vendor's products should be implemented in a manner that integrates with SKRECC existing information security infrastructure. Otherwise, the vendor's products should incorporate a separate information security component. Such components should be administered and maintained in a manner that accounts for emerging threats.
4. The products being evaluated should be extensible in such a way as to allow their internal programming to be updated to account for future threats and vulnerabilities.

5. The vendor should provide detailed instructions or advice on how to deploy and maintain their products in a secure fashion.
6. The products should include features and/or design elements intended to protect said products from physical security threats and/or detect when physical security has been compromised.
7. Introduction of the vendor's products into SKRECC current environment should not introduce additional vulnerabilities to, or reduce existing protections for, SKRECC's legacy systems.

III. Summary of relevant cyber security standards and/or best practices that will be followed

SKRECC is in the process of implementing the Fair and Accurate Credit Transaction Act (Red Flag) rules and the recommended Best Practices of vendors of hardware and software in order to maintain reliability and security of hardware, software, the network, and data within our organization. We also comply with best practices related to the management of firewalls, intrusion prevention, antivirus software, installation of patches, and business continuity.

While this work is still evolving, Aclara is dedicated to development of the framework that has been started in the NIST Roadmap. Several significant steps have been taken toward identifying what it will take to secure the Smart Grid. Aclara systems meet many of the standards as defined today and will continue to grow toward full support that is solidified by NIST. Aclara believes in living a security life cycle built on a continuous process of auditing and improvement. To this end, both internal and external audits have been held to identify weaknesses followed by solution development and implementation to fix the problems.

As outlined in the NIST Roadmap, the architecturally significant use cases for security come from the following:

- Intelligrid Use Cases
- AMI Business Functions (AMI-SEC)
- Benefits and Challenges of Distribution Automation (T&D DEWG)
- EPRI Use Case Repository
- SCE Use Cases

The full list of relevant use cases can be found in Appendix D of the NIST Smart Grid Interoperability Roadmap. A sample of those germane to the Aclara systems is:

- Meter Reading Services
- Pre-Paid Metering
- Revenue Protection
- Remote Connect/Disconnect of Meter
- Outage Detection and Restoration
- Meter Maintenance
- Real Time Pricing for Customer Load
- Time of Use Pricing
- Critical Peak Pricing

The Cyber Security Coordination Task Group led by NIST recently published a list of Smart Grid Cyber Security Requirements. This will undoubtedly become the governing document to define security requirements for the Smart Grid.

There are dozens of standards identified for scrutiny for the Smart Grid that will assist in assuring security for these use cases. A sample of the most significant standards to which TWACS works toward compliance includes:

- Federal Information processing Standard (FIPS) 200, Minimum Security Requirements for Federal Information and Information Systems.
- FIPS 199, Standards for Security Categorization of Federal Information and Information Systems
- NERC, Security Guidelines for the Electricity Sector: Vulnerability and Risk Assessment
- National Infrastructure Protection Plan
- NERC/CIP 002, 003-009
- AMI-SEC System Security Requirements
- Open HAN SRS
- NIST Special Publications 800-53, 800-82, 800-39

Along with the standards listed, some best practices apply specifically at the master station software level. The system employs the following approaches to address authentication, authorization, and non-repudiation.

The master station software installation establishes an initial credential with an administrative role. This credential is given to an administrator who can subsequently manage other users and their roles. The administrator may define any roles he desires, typically being operator, administrator, and customer service representative. Every resource leverages this role-based authorization mechanism for access privileges.

Authentication is required to start the application. Usernames and passwords are encrypted and stored using LDAP. Application screens and the components therein, can only be accessed if the user has the appropriate role. All screens use SSL (which also uses RSA public key encryption) to secure the HTTP connection. The software stores the user's credentials in the session, never "trusting" that the request accurately identifies the user. The same mechanisms used for screen authentication and authorization are used for web services.

Beyond the master station software, SKRECC can employ authentication and encryption on the communication link to the substation. SKRECC endorses using information security best practices to secure this link.

IV. Summary of how project supports emerging smart grid cyber security standards

The TWACS system supports firmware upgrade of all devices in the field including the substation communication equipment as well as the end devices. The application to perform the upgrade provides the flexibility to the user to assign a priority to the upgrade versus other work that is being performed in the system. Operators of the system can set up the firmware upgrade jobs such that they are performed in the background without impact to other jobs running in the system.

Aclara systems like TWACS do not allow broad based systemic failures in the grid in the event of a cyber security breach.

The TWACS system communicates over the power lines between the distribution substation and the endpoint. The physical nature of the power line itself and the power required to signal TWACS outbound implies a physical security to the communication network as encouraged in NERC CIP-005.

The various AMI functions of the system are discussed:

Meter Reading

If the security breach is such that false data is substituted as coming from the Aclara AMI system and fed into a data consumer, this is beyond the boundary of the AMI system so the responsibility of upstream systems. The data consumer should perform validation on the data and discard it rather than pass it along to other systems. Most utilities have Meter Data Management systems in place and these systems perform Validation Editing and Estimating (VEE).

If the security breach were such that meters could be read in unlimited fashion, then no harm would be done to the network. Although TWACS communicates over the power lines, no amount of communication will interfere with the security of the grid.

Remote Connect / Disconnect

Many smart meters have an integral whole house disconnect. TWACS supports communication with these devices, but for those designs that support group addressing, the group sizes are limited to be hundreds of homes. The amount of load affect is insignificant compared to the level identified by NERC CIP-002-1.

Load Control / Demand Response

NERC CIP-002-1 provides information to quantify the amount of load shed that must occur in order to qualify as a critical cyber threat:
R1.2.5. Systems and facilities critical to automatic load shedding under a common control system capable of shedding 300 MW or more.

Analysis of this requirement shows that it implies controlling the load to 100,000 homes. The largest known substation in the US has less than 50,000-metered endpoints.

If a single distribution substation were penetrated and suffered a cyber security failure, and a command was broadcast to all devices within all homes fed by the substation, the levels of power that would be affected would in no way reach the levels cited by NERC CIP-002-1.

If a cyber breach occurred in the back office, and all substations were asked to forward a SCRAM command to all devices in the service territory, all devices would react immediately. This only becomes a concern in areas where the service territories were quite large, and the installation base had a significant percentage of the load under control. The timing of the SCRAM command would also have to be such that a significant number of end-devices were actively consuming load at the time the command is received.

If a service territory had several hundred thousand loads under control, totaling more than 300MW of power, it could become an issue. Aclara's firsthand experience comes from Florida Power and Light which is operating an Aclara load control system of this magnitude. Their 800,000 load control devices control as much as 1200MW of power. They have never reported a security breach. Other utilities with much smaller installations and would not qualify as a CIP-

002-1 threat even if security were breached.

Capacitor Switching

Capacitors are used along feeders for volt/var control. When remote switching of these capacitors is supported via TWACS, only one switch can be addressed at a time. When a switch is thrown, it only affects a percentage of the power flowing down a given feeder. This was described above to be only a tiny fraction of the levels considered significant. (The power affected is approximately kW not MW.)

6. Project Costs Savings

Data to be collected includes KWH usage and demand data on an interval basis in addition to voltage monitoring. This data can then be utilized for many different cost savings purposes. It will provide an accurate system usage model to be used in planning including identifying necessary upgrades, potential voltage problems and deferring the need for new line upgrades and substations. The data can also be used by the consumers through in-home viewing to better manage and control their electric usage and associated costs.

The below estimated savings will help keep energy cost low, lower peak demand, lower losses, lower O & M costs, reduce cost of power interruptions, and lower emissions of greenhouse gases. The cost/benefit of the installation of the system will include the following:

- Meter reading cost savings – SKRECC currently pays $0.67 per meter to read 67,000 meters per month. The potential savings is $540,000 per year.
- Reduction of field visits by SKRECC personnel – In 2008 SKRECC performed 19,927 connects and disconnects of accounts at an average cost of $20 per visit the savings with approximately 90% of these being performed remotely. This would save approximately $359,000 per year.
- Improve transformer loading – We estimate we could avoid overloading three transformers per month at an average cost of installation of $1,333 each or $48,000 per year.
- Improve outage restoration by verifying restoration of service after a line is restored – The estimated reduction in overtime hours by field personnel could approach $60,000 per year.
- Reduce theft of electric service through tamper detection – Based on experience we estimate 0.3% of total KWH of 1.3 billion at a rate of $0.8836 per KWH or approximately $345,000 per year.
- Reduction of loss of energy sales through detection of stopped meters – estimated to also be 0.35% of total KWH of 1.3 billion at a rate of $0.8836 per KWH or approximately $402,000 per year.
- Improve line losses through better line balancing – estimated to also be 0.3% of total KWH of1.3 billion or approximately $249,000 per year.
- Reduce system peak demand through a demand response program – Based on Florida Power & Light's estimated savings per member of 1.44 KW and 5,000 members utilizing load control for 6 months each year we estimate the savings to be approximately $43,000 per month or $260,000 per year.
- Reduced overtime charges for reconnecting delinquent accounts after hours by approximately $40,000.
- Reduction in bad debt write-off's of approximately 10% or $70,000 per year.

In addition other benefits which are currently unquantifiable include.

- Better service due to the eliminated estimated meter reads
- Reduction in insurance claims filed due to identifying and repairing electrical outages when the consumer is not home
- Through the installation of this system we will have the ability to monitor and respond to critical facilities utilized in securing the safety and welfare of our citizens. i.e. communication facilities, hospitals, police stations, fire departments, military suppliers, prisons, water plants, etc.
- Improve customer service through better information for high bill complaints which will reduce the number of field visits as more questions can be answered from the office
- Reduce the number of field visits for false outages reported by the customer
- Reduce system peak demand by utilizing time-of-use rates
- Better identification of over or under voltage situations which will reduce equipment damage

- Avoided deposits by the member through the use of pre-paid metering
- Reduced CO2 emissions through the reduction of coal consumption for electricity production and also fewer road miles through the elimination of field meter reads and reduction of truck rolls for connects and disconnects of electric service.
- Reduced capital outlay for new power plants and the associated savings in interest costs and operation and maintenance costs.

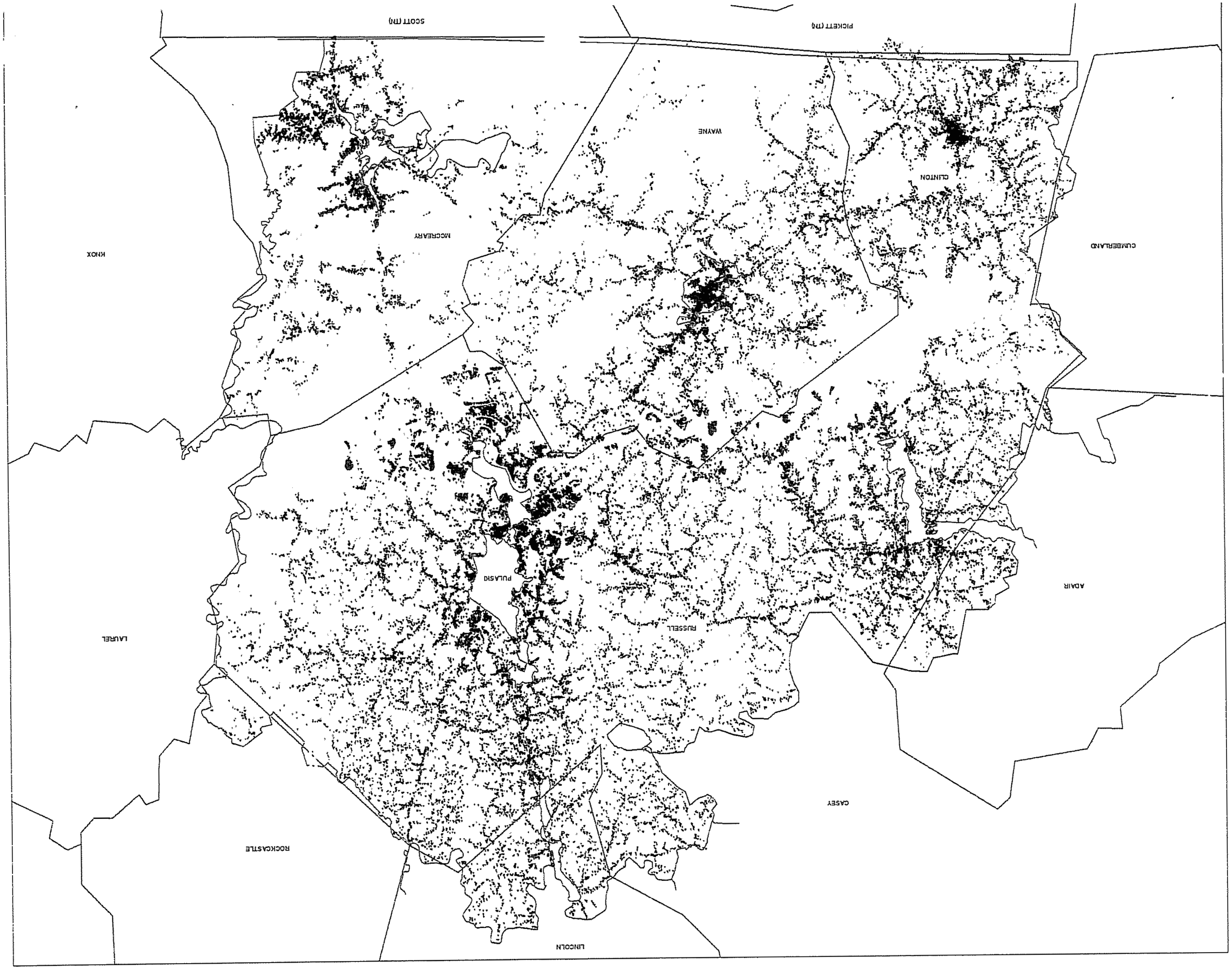


EXHIBIT B
PAGE 1 OF 3

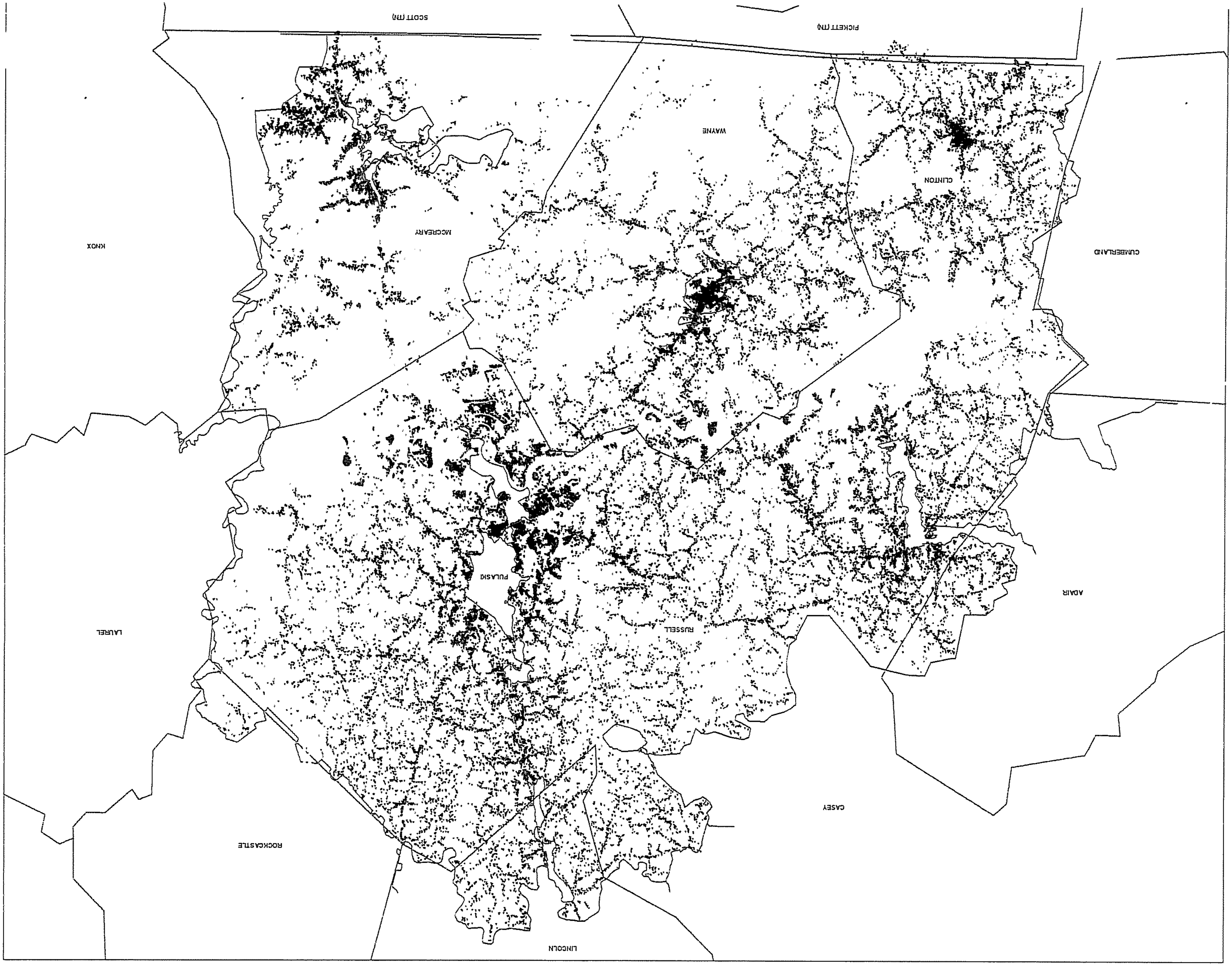


EXHIBIT B
PAGE 2 OF 3

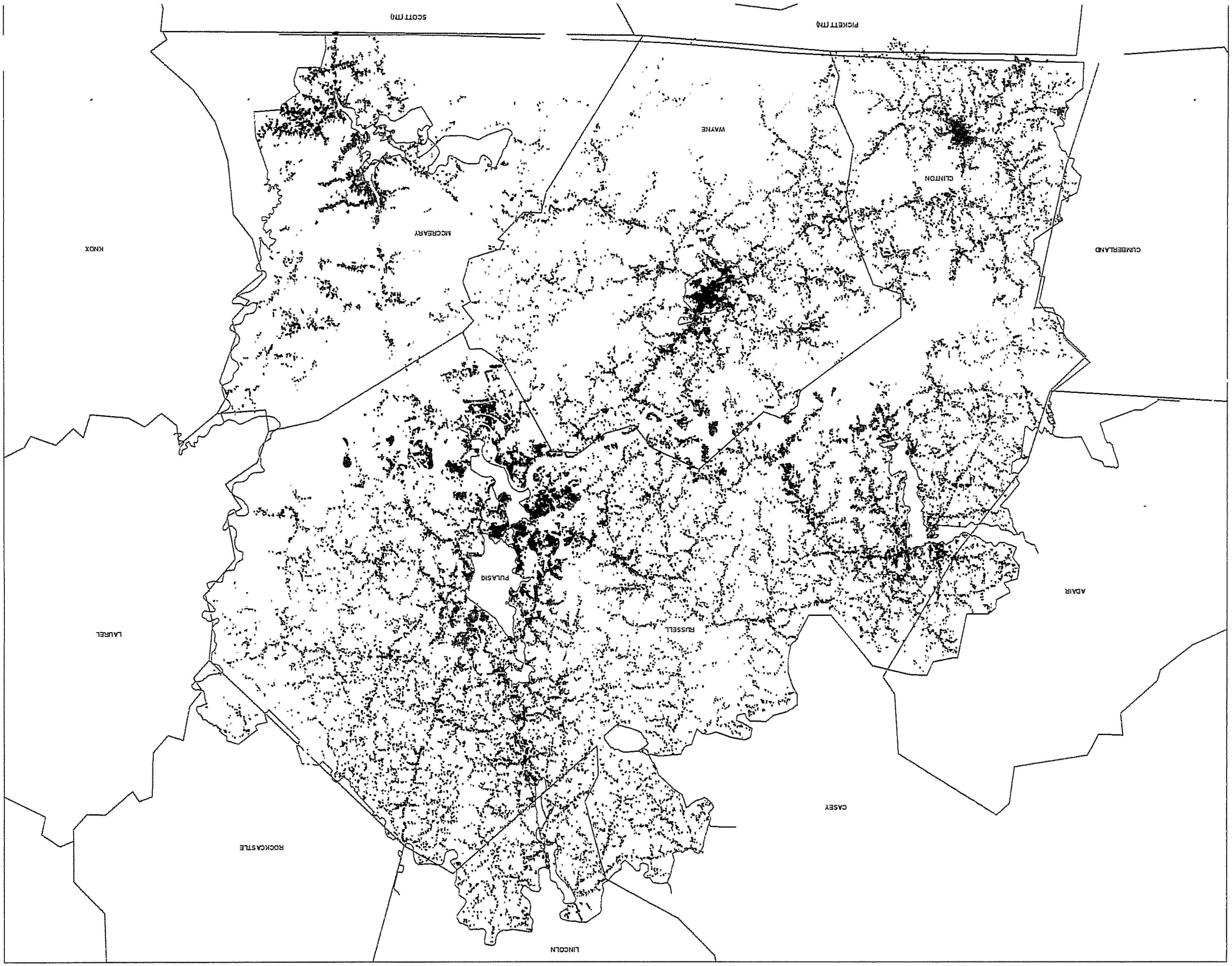
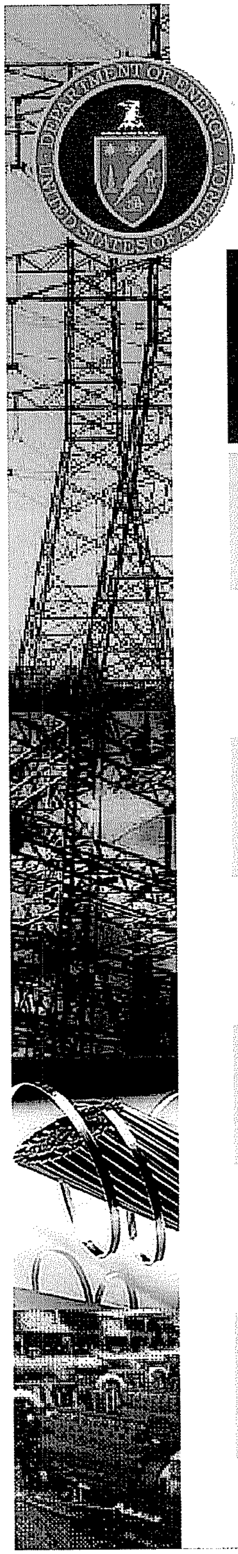


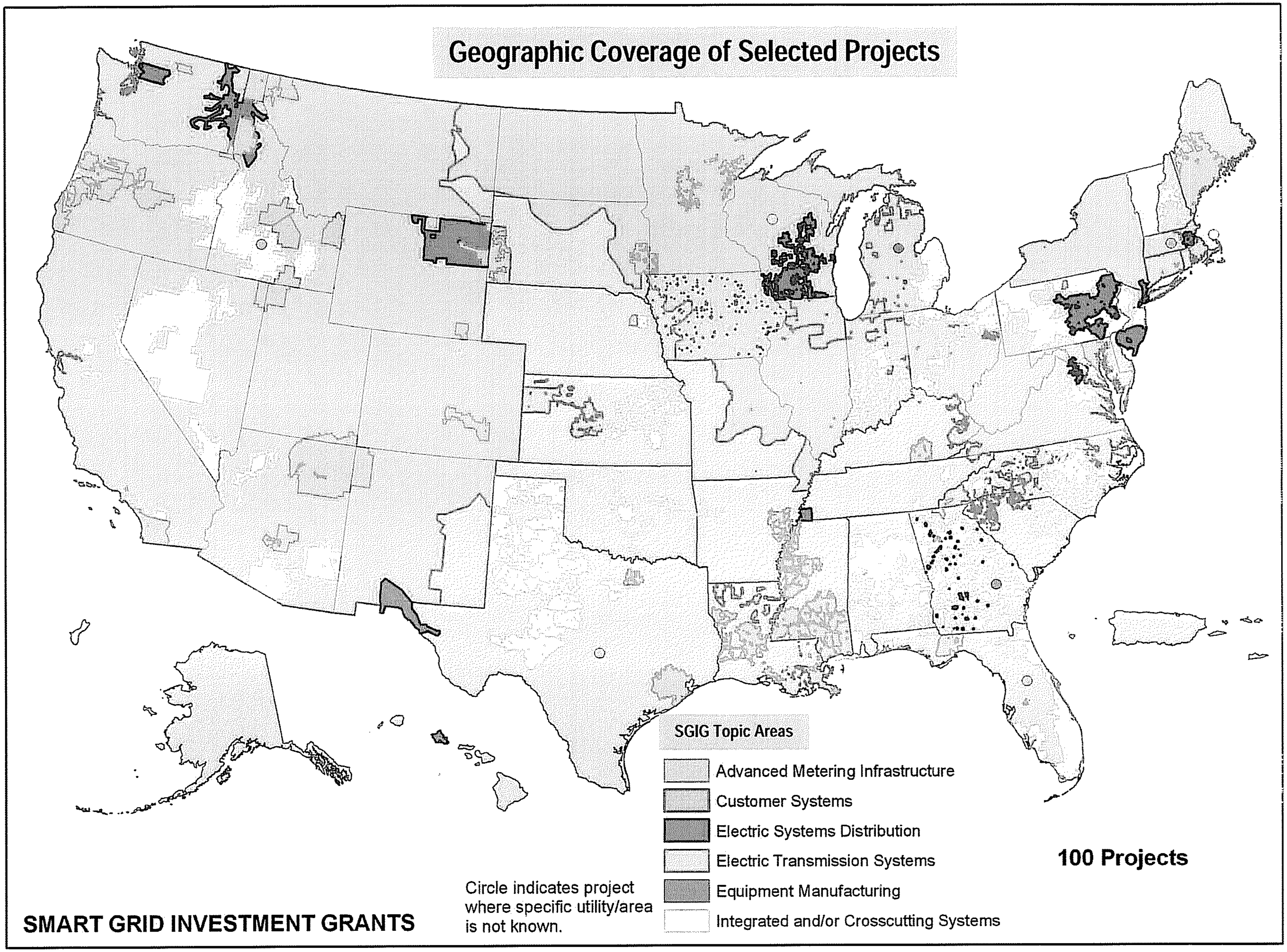
EXHIBIT B
PAGE 3 OF 3



Summary of SGIG Selections

Topic Area	Number of Applications Selected/ Conforming	Federal Funding ($)	Applicant Funding ($)	Applicant Cost Share (%)
Equipment Manufacturing	**2**/14	25,786,501	25,807,502	50.02
Customer Systems	**5**/27	32,402,210	34,933,413	51.88
Advanced Metering Infrastructure	**31**/138	818,245,749	1,194,272,137	59.34
Electric Distribution	**13**/39	254,260,753	254,738,977	50.05
Electric Transmission	**10**/28	147,990,985	150,454,793	50.41
Integrated and Crosscutting	**39**/143	2,150,505,323	3,082,366,420	59.09
Total	**100**/389	**3,429,191,521**	**4,742,573,246**	**58.04**

EXHIBIT C
PAGE 1 OF 2



Oct 21, 2009

EXHIBIT C
PAGE 2 OF 2

HD SUPPLY UTILITIES
6020 Industrial Heights Drive
Knoxville, TN 37909
Phone: 1-800-332-9149
Fax: 865-588-8885

November 6, 2009

South Kentucky RECC
925-929 North Main Street
Somerset, KY 42501

Attn: Kevin Newton

Ref: TWACS

After looking at inventory and the start up of AMI through the Stimulus funding any orders entered after December 31st 2009 will be looking at lead-times up to 18-20 weeks. Thus if at all possible we need to get South Ky's order entered into the system as soon as possible. Our system works on a first in, first out basis. If we can get your order entered this year we can plan for the lead-times and cover them with yearly projections to Aclara. Currently we have 27.500 single phase modules in stock that can go toward your order and give us enough time to cover the lead-times. As mentioned above they are on a first entered order.

If you have any questions, please contact myself or Lisa Lane.

Sincerely,

Marty Lawson
Outside Sales Representative

HAROLD ROGERS

Congress of the United States
House of Representatives
Washington, DC 20515-1705

August 13, 2009

The Honorable Steven Chu
Secretary
U.S. Department of Energy
1000 Independence Avenue SW
Washington, DC 40585

Dear Secretary Chu:

It has been brought to my attention that the South Kentucky Rural Electric Cooperative (SKRECC) has submitted an application for a grant through the Department of Energy's Smart Grid Investment program (DE-FOA-0000058) to automate its electric metering system for over 66,000 customers in a 13-county region of Southern Kentucky and Northern Tennessee. I am writing to offer my strong support for SKRECC's application to implement an Automated Metering Infrastructure (AMI) which promotes energy efficiency, cost savings and environmental stewardship.

SKRECC, headquartered in Central Kentucky, is a distribution cooperative employing 162, serving some 66,250 customers and maintaining over 6,600 miles of distribution line and nearly 50,000 transformers. SKRECC's service area has traditionally been economically and developmentally depressed – in fact, seven of the thirteen counties served by SKRECC are classified as distressed by the Appalachian Regional Commission, and the unemployment rate in the region exceeds both the Kentucky and national averages. Therefore, the importance of keeping electric rates as low as possible for these consumers cannot be understated. Upgrading the electric metering system to AMI will enable SKRECC and its consumers to make more energy efficient choices and reduce costs by eliminating the need for manual meter reading expenses (estimated at $912,000 annually). Concurrently, this will allow SKRECC to more easily shift usage from on-peak to off-peak periods.

In addition to the lower electrical usage and electricity bills that will benefit consumers, an effective AMI system has added societal and environmental benefits through the reduction of carbon dioxide emissions. Although SKRECC's primary power generator, East Kentucky Power Cooperative, has taken impressive strides in recent years to reduce carbon emissions and utilize renewable feedstocks, the reduction of emissions through the power grid is of particular import in the Commonwealth of Kentucky, where 93% of electricity is produced from coal. When compared with the alternative construction of additional generation facilities and a corresponding compared with the alternative construction of additional generation facilities and a corresponding increase in emissions, Smart Grid technology, such as AMI, has an unprecedented potential to shape and control the electrical load – and by extension emissions resulting from coal-based generation. Therefore, SKRECC's desire to upgrade its electric system aligns closely with the environmental goals set forth in the Smart Grid Investment Grant Program.

I urge your full consideration of SKRECC's request, as it comes with my fullest confidence and endorsement. Please do not hesitate to contact me or my Legislative Assistant, Megan O'Donnell, at (202) 225-4601, should you have questions.

Sincerely,

HAROLD ROGERS
Member of Congress

August 12, 2009

The Honorable Steven Chu
Secretary of Energy
United States Department of Energy
1000 Independence Avenue, Southwest
Washington, D.C. 20585

Re: South Kentucky RECC – Smart Grid Application

Dear Secretary Chu:

I am writing in support of a Department of Energy Application submitted on behalf of South Kentucky Rural Electric Cooperative (SKRECC) for $9,538,233 with a South Kentucky RECC match of $9,538,234 for a total project of $19,076,467. The purpose of this project will be to integrate a smart grid system within the South Kentucky RECC service area consisting of 11 counties within South Central Kentucky and two counties in Northern Tennessee. With this deployment to approximately 67,000 consumers, South Kentucky RECC will be able to better manage load demand of power supply and provide real time energy usage data to customers.

This system will, in addition, enable customers to see the true effect of energy usage at real time rates and how it affects their family budgets, which in turn will lead them to better understand how to reduce their home energy consumption.

I support this application and appreciate your prompt attention and support as well.

Sincerely,

Ed Whitfield
Member of Congress

JIM BUNNING
KENTUCKY

United States Senate

WASHINGTON, DC 20510

August 26, 2009

The Honorable Stephen Chu
Secretary of Energy
Department Of Energy
1000 Independence Avenue, SW
Washington, D.C. 20585

Dear Secretary Chu:

I am writing to express support for the South Kentucky Rural Electric Cooperative (SKRECC) and their proposal for funding under Department of Energy's Smart Grid Investment Program (DE-FOA-0000058).

The purpose of this project is to integrate a smart grid system within the South Kentucky RECC service area that encompasses 11 counties in South Central Kentucky and two counties in northern Tennessee. Servicing approximately 67,000 consumers in this area, South Kentucky RECC will be able to better manage load demand of power supply and to provide real time energy data to their consumers.

I ask that you give South Kentucky RECC's proposal full and fair consideration, and forward me a copy of any correspondence that you send them.

Thank you for your time and consideration of this matter. I look forward to hearing from you.

Best personal regards,

JIM BUNNING
United States Senator

JB:cw

COMMONWEALTH OF KENTUCKY
OFFICE OF THE GOVERNOR

STEVEN L. BESHEAR
GOVERNOR

700 CAPITOL AVENUE
SUITE 100
FRANKFORT, KY 40601
(502) 564-2611
FAX: (502) 564-2517

March 20, 2009

The Honorable Steven Chu
Secretary
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Re: State Energy Program Assurances

Dear Secretary Chu:

As a condition of receiving Kentucky's share of the $3.1 billion funding for the State Energy Program (SEP) under the American Recovery and Reinvestment Act of 2009(H.R. 1)(ARRA), I am providing the following assurances.

I have written to the Kentucky Public Service Commission and requested that they consider actions to promote energy efficiency, consistent with the Federal statutory language contained in H.R. 1 and their obligations to maintain fair, just and reasonable rates.

I have received assurance from the Secretary of the Kentucky Public Protection Cabinet, which is authorized to adopt building codes for the Commonwealth, that it will initiate actions to improve building energy codes consistent with Kentucky law, Kentucky Constitutional requirements and the statutory language contained in ARRA.

Kentucky will, to the extent practicable, prioritize its energy investments to take advantage of existing programs and to expand programs. As is set forth in our recently released *Intelligent Energy Choices for Kentucky's Future*, Kentucky is committed to a balanced energy policy and a robust improvement in energy efficiency and renewable energy.

I want to assure you that, within the limits of my authority as Governor, I will provide the leadership that moves Kentucky forward in these critical areas. We look forward to immediate distribution of the Federal SEP funds to permit Kentucky to make progress in energy efficiency and renewable energy.

Sincerely,

Steven L. Beshear

cc: Gil Sperling
Director, Office of Weatherization and Intergovernmental Programs
U.S. Department of Energy

Department of Energy
Washington, DC 20585

October 27, 2009

Allen Anderson
South Kentucky Rural Electric Cooperative Corporation
925-929 N. Main Street
PO Box 910
Somerset, KY 42501-0910
Via Electronic Mail: aanderson@skrecc.com

Subject: Notification of Selection for Smart Grid Investment Grant - Funding Opportunity Announcement (FOA) DE-FOA-0000058, Control #: 09-0468, Project Title: South Kentucky Rural Electric Cooperative Corporation AMI Deployment, Topic Area: Advanced Metering Infrastructure

Dear Allen Anderson,

I am pleased to inform you that your application in response to the Smart Grid Investment Grant FOA has been selected for award negotiations.

Our collaborative goal now is to expeditiously negotiate grants in order to begin implementation of the selected projects. In the near future, we will be providing you with questions and comments on your application. These will define areas that will require discussion and clarification with you so that an award can be completed. In addition, the Office of Electricity Delivery and Energy Reliability plans to conduct a briefing for all selectees, tentatively scheduled for the week of November 16, 2009. Information on the briefing will be e-mailed to you shortly.

Thank you for the time and effort in making your submission. We look forward to negotiating an award and allowing your project to begin quickly and efficiently to the benefit of our Nation. If you have any questions concerning your selection, please contact the Contracting Officer, Donna.Williams@hq.doe.gov.

Again, congratulations. I and my entire team look forward to working with you.

Sincerely,

Patricia A. Hoffman

Patricia A. Hoffman
Acting Assistant Secretary
Office of Electricity Delivery and Energy Reliability

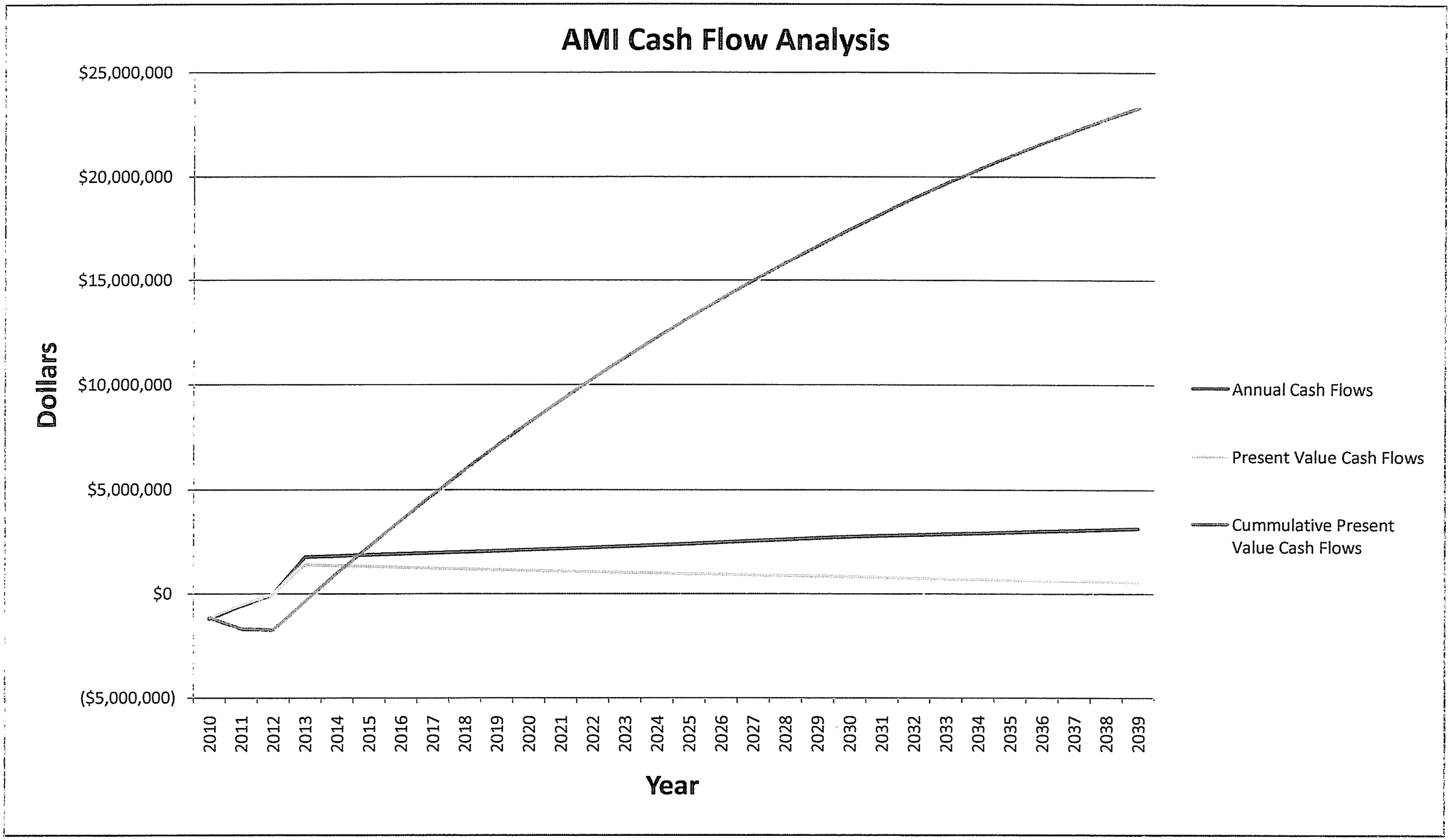


EXHIBIT G
PAGE 1 OF 2

South Kentucky RECC
AMI Cash Flow A[illegible]is

Year	PV Factor	Total Project Cost	In-House Labor & Overhead (3)	DOE Reimbursement	A Net Borrowings	B Savings (2)	C Payments: Interest	Payments: Principal	Estimate Future Annual Operating Costs: Meter Reading	Meter Replacement	AMI Tech.	DSL	Software & Hardware	D Total Operating Costs	(A+B+C+D) Annual Cash Flows	Present Value Cash Flows	Cummulative Present Value Cash Flows
2010	0.943396	(6,333,333)	1,500,000	3,166,667	(1,666,666)	1,131,040	(297,759)	(2,868,907) #	(360,000)	0		(4,000)	(40,000)	(404,000)	(1,237,385)	(1,167,344)	(1,167,344)
2011	0.889996	(6,333,333)	1,500,000	3,166,667	(1,666,666)	1,696,560	(419,121)	(2,747,545)	(180,000)	0	0	(12,000)	(40,000)	(232,000)	(621,227)	(552,890)	(1,720,234)
2012	0.839619	(6,333,333)	1,500,000	3,166,667	(1,666,666)	2,262,080	(547,981)	(2,618,684)	(45,000)	0	0	(20,000)	(40,000)	(105,000)	(57,567)	(48,334)	(1,768,568)
2013	0.792094					2,296,011	(369,940)	(218,781)	(25,000)	(30,000)	(64,000)	(24,000)	(40,000)	(183,000)	1,743,071	1,380,675	(387,893)
2014	0.747258					2,330,451	(356,446)	(232,275)	(25,000)	(30,000)	(64,000)	(24,000)	(40,000)	(183,000)	1,791,005	1,338,343	950,450
2015	0.704961					2,365,408	(342,119)	(246,602)	(25,000)	(30,000)	(64,000)	(24,000)	(40,000)	(183,000)	1,840,289	1,297,331	2,247,781
2016	0.665057					2,400,889	(326,910)	(261,812)	(25,000)	(30,000)	(64,000)	(24,000)	(40,000)	(183,000)	1,890,979	1,257,609	3,505,390
2017	0.627412					2,436,902	(310,762)	(277,960)	(25,000)	(33,750)	(64,000)	(24,000)	(40,000)	(186,750)	1,939,390	1,216,797	4,722,187
2018	0.591898					2,473,456	(293,618)	(295,104)	(25,000)	(37,500)	(64,000)	(24,000)	(40,000)	(190,500)	1,989,338	1,177,486	5,899,673
2019	0.558395					2,510,558	(275,416)	(313,305)	(25,000)	(41,250)	(64,000)	(24,000)	(40,000)	(194,250)	2,040,892	1,139,623	7,039,296
2020	0.526788					2,548,216	(256,092)	(332,629)	(25,000)	(45,000)	(64,000)	(24,000)	(40,000)	(198,000)	2,094,124	1,103,158	8,142,454
2021	0.496969					2,586,439	(235,576)	(353,145)	(25,000)	(48,750)	(64,000)	(24,000)	(40,000)	(201,750)	2,149,113	1,068,043	9,210,497
2022	0.468839					2,625,236	(213,795)	(374,926)	(25,000)	(52,500)	(64,000)	(24,000)	(40,000)	(205,500)	2,205,941	1,034,231	10,244,728
2023	0.442301					2,664,615	(190,671)	(398,051)	(25,000)	(56,250)	(64,000)	(24,000)	(40,000)	(209,250)	2,264,694	1,001,676	11,246,404
2024	0.417265					2,704,584	(166,120)	(422,602)	(25,000)	(60,000)	(64,000)	(24,000)	(40,000)	(213,000)	2,325,464	970,335	12,216,739
2025	0.393646					2,745,153	(140,054)	(448,667)	(25,000)	(63,750)	(64,000)	(24,000)	(40,000)	(216,750)	2,388,349	940,165	13,156,904
2026	0.371364					2,786,330	(112,382)	(476,340)	(25,000)	(67,500)	(64,000)	(24,000)	(40,000)	(220,500)	2,453,448	911,123	14,068,027
2027	0.350344					2,828,125	(83,002)	(505,719)	(25,000)	(71,250)	(64,000)	(24,000)	(40,000)	(224,250)	2,520,873	883,172	14,951,199
2028	0.330513					2,870,547	(51,810)	(536,911)	(25,000)	(75,000)	(64,000)	(24,000)	(40,000)	(228,000)	2,590,737	856,272	15,807,471
2029	0.311805					2,913,605	(18,693)	(570,028)	(25,000)	(78,750)	(64,000)	(24,000)	(40,000)	(231,750)	2,663,162	830,387	16,637,858
2030	0.294155					2,957,309			(25,000)	(82,500)	(64,000)	(24,000)	(40,000)	(235,500)	2,721,809	800,635	17,438,493
2031	0.277505					3,001,669			(25,000)	(86,250)	(64,000)	(24,000)	(40,000)	(239,250)	2,762,419	766,585	18,205,078
2032	0.261797					3,046,694			(25,000)	(90,000)	(64,000)	(24,000)	(40,000)	(243,000)	2,803,694	733,999	18,939,077
2033	0.246979					3,092,394			(25,000)	(93,750)	(64,000)	(24,000)	(40,000)	(246,750)	2,845,644	702,813	19,641,890
2034	0.232999					3,138,780			(25,000)	(97,500)	(64,000)	(24,000)	(40,000)	(250,500)	2,888,280	672,965	20,314,855
2035	0.219810					3,185,862			(25,000)	(101,250)	(64,000)	(24,000)	(40,000)	(254,250)	2,931,612	644,398	20,959,253
2036	0.207368					3,233,650			(25,000)	(105,000)	(64,000)	(24,000)	(40,000)	(258,000)	2,975,650	617,054	21,576,307
2037	0.195630					3,282,155			(25,000)	(108,750)	(64,000)	(24,000)	(40,000)	(261,750)	3,020,405	590,882	22,167,189
2038	0.184557					3,331,387			(25,000)	(112,500)	(64,000)	(24,000)	(40,000)	(265,500)	3,065,887	565,830	22,733,019
2039	0.174110					3,381,358			(25,000)	(116,250)	(64,000)	(24,000)	(40,000)	(269,250)	3,112,108	541,850	23,274,869

Footnotes:
(1) Average Rate of Return 6.00%
(2) Exhibit A page 29 of 30.
(3) Utilization of Coop Labor, Overhead & Other Expense Items