COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

CONSIDERATION OF THE NEW FEDERAL STANDARDS OF THE ENERGY INDEPENDENCE AND SECURITY ACT OF 2007	)))	CASE NO. 2008-00408

<u>COMMISSION STAFF'S NOTICE OF INFORMAL CONFERENCE</u>

Commission Staff hereby gives notice that an informal conference has been scheduled for October 21, 2009 at 9:30 a.m., Eastern Daylight Time, in Hearing Room 1 of the Commission's offices at 211 Sower Boulevard, Frankfort, Kentucky, for the purpose of discussing issues related to the Public Utility Regulatory Policies Act of 1978's new standard regarding the consideration of Smart Grid Investments. The standard requires an electric utility to demonstrate that it has considered investing in a qualified smart grid system before investing in nonadvanced grid technologies.

In its final Order in Administrative Case No. 2006-00045,[1] the Commission elected not to adopt the two federal Smart Metering standards of Subtitle E, Section 1252, of the Energy Policy Act of 2005 ("EPAct 2005"). The standards, if adopted, would require each jurisdictional electric utility ("utility") to offer each customer class, and

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[1] Case No. 2006-00045, Consideration of the Requirements of the Federal Energy Policy Act of 2005 Regarding Time-Based Metering, Demand Response, and Interconnection Service (Ky. PSC Dec. 21, 2006).

provide upon request, a time-based rate schedule where the rate charged varies during different time periods and reflects the variance in the utility's cost of service. In addition, the standards would require each utility to provide each customer requesting a time-based rate with a meter capable of enabling the utility to offer and the customer to accept and receive such a rate.

According to the EPAct 2005, a time-based rate schedule will allow a customer to manage energy use and cost through advanced metering and communications technology. The types of time-based rate schedules that may be offered and thus considered include:

- Time-of-use pricing: Prices are pre-established for a specific time period on an advanced or forward basis based on the utility's cost of service. This allows consumers to vary demand and usage in response to these prices to manage their energy cost by shifting usage to a lower cost period or reducing overall consumption.

- Critical peak pricing: Time-of-use prices are in effect except for certain peak days when prices may reflect costs at a higher cost of service. Consumers may receive additional discounts for reducing peak-period energy consumption.

- Real-time pricing: Prices are set for a specific time period on an advanced or forward basis reflecting the utility's cost of service. Real-time prices may change hourly.

- Credits for consumers with large loads that enter into pre-established peak-load reduction agreements that reduce a utility's planned load-capacity obligations.

While the Commission did not adopt the Smart Meter standards, we found that "...demand response programs and time-based pricing are not only practical but economically feasible at this time and should be further explored."[2]

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[2] Id. at 10.

At the time the Commission issued its final Order in Case No. 2006-00045, there were no broadly implemented Smart Metering programs in the United States and few Smart Metering pilots. Since that time, several states have enacted legislation directing their regulatory commissions to investigate and consider Smart Meter programs and others have required the implementation of Smart Meter programs. As a result, the implementation of Smart Meter programs on either a pilot or permanent basis has expanded across the country.

With that in mind, the Commission has determined that a dialogue should be initiated regarding Smart Grid and Smart Meter technology[3] issues to further determine the status of Smart Meter deployment in Kentucky, the interest in establishing pilot or permanent Smart Meter programs in the near-term (within two to five years), and what actions the Commission should take in order to provide for implementation of Smart Meter programs if there is any interest among stakeholders.

An Agenda for the Informal conference is attached as Appendix A. The Parties to the case should be prepared to discuss each item. In order to facilitate the

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[3] For the purposes of this discussion, the Commission will initially rely on the following definition: Smart Meter technology is defined as including metering technology capable of bidirectional communication that records electricity usage on at least an hourly basis, including related electric distribution system upgrades to enable the technology. Smart Meter technology must provide customers with direct access to and use of price and consumption information, to include (1) direct information on their hourly consumption; (2) to enable time-of-use rates and real-time price programs; and (3) to effectively support the automatic control of electricity consumption by the customer, the serving utility, or a third-party, at the customer's request.

This definition is roughly the same as that included in Pennsylvania's Act 129 of 2008 set forth in Title 66, Section 2807, of the Pennsylvania Consolidated Statutes (66 Pa.C.S.A. § 2807).

discussion of the current status of Smart Meter deployment, a summary of the Smart Grid information provided by the utilities in their testimony and responses to data requests has been prepared by the Staff and attached as Appendix B.

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Public Service Commission
P. O. Box 615
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DATED SEP 11 2009

cc: All Parties

APPENDIX A

APPENDIX TO THE STAFF NOTICE OF AN INFORMAL CONFERENCE IN CASE NO. 2008-00408 DATED

Consideration of the New Federal Standards
of the Energy Independence and Security Act of 2007

Informal Conference, Wednesday, October 21, 2009

Agenda

1. Opening remarks and background discussion – Commission Staff

2. Comments of participants

   a. Utilities
   b. Intervenors

3. Brief discussion of the status of Smart Meter technology deployment if status is different from that previously reported – Utilities

4. Identification of conditions necessary for Smart Meter technology deployment

   a. Equipment standards
   b. Software standards
   c. Financial issues
      1. Potential costs
      2. Cost recovery
      3. Rate design
      4. Tariff issues

   d. Security - cyber security issues

5. Closing

   a. General level of utility interest
   b. General level of interest of Intervenors
   c. Next step

APPENDIX B

APPENDIX TO THE STAFF NOTICE OF AN INFORMAL CONFERENCE IN CASE NO. 2008-00408 DATED

Staff Summary of Smart Grid Testimony and Data Responses

Joint Testimony of Big Rivers, Jackson Purchase, Kenergy and Meade

Smart grid is somewhat nebulous and is not defined in EISA 2007. It includes such items as advanced meter infrastructure ("AMI"), transmission and distribution automation equipment and digital communication technology.[4]

Kenergy is midway through a pilot program of an AMI system involving two separate vendors. It involves verifying the success of the technology's use in Kenergy's application. It also has as a focal point the expanded use of metering data and technology to maximize Kenergy's efficiencies throughout the organization. Preliminary results of that program, while not conclusive, have led to further investigation into ways to leverage the data from system planning, reliability studies and reporting and measurement of the effects of major appliance control.[5]

It has been the practice of Big Rivers and its three distribution cooperative members to use equipment that should function well in a smart grid arrangement whenever economically feasible.[6]

Big Rivers and Kenergy have a "real-time" pricing pilot program through which qualifying retail customers who chose to participate could receive time-based retail pricing. Big Rivers provides its members, and they in turn provide their retail customers with usage information in their electric bills. The members have made their customers aware of the program under which retail customers can purchase the power from the renewable energy resource.[7]

DR Responses of Big Rivers, Jackson Purchase, Kenergy and Meade

Response to Staff's First DR, Item No. 15

The cost effective benefit of AMI technology will be found in operating efficiencies, when the retrieving of actual real-time metering data avoids on site verification and the expense of a trip made for any one of several reasons. The AMI system has the capability of demand response control and can provide real-time energy usage information to the consumer.

[4] Spainhoward, 14.
[5] Spainhoward, 15.
[6] Spainhoward, 15.
[7] Spainhoward, 17.

Response to Staff's First DR, Item No. 16

Kenergy has identified one potential participant for the real-time pricing pilot program. That potential customer is an industrial customer with a 100 MW load in Hancock Co.

Response to Staff's First DR, Item No. 17

Big Rivers has electronic meters, which measure the total station power consumption, installed at all rural and industrial point substations of its Members or their customers.

Jackson Purchase plans to implement a full system deployment of Cannon AMI meters over a period of 24 months beginning in 2009.

Kenergy has deployed 2 small pilots that utilize power line carrier as a means to provide 2-way communications to meters. An additional objective is to evaluate metering data for the purpose of future rate designs, system automation, reliability improvement and more precise engineering analysis.

Meade has deployed the Landis + Gyr (formerly Hunt Technologies) AMI Infrastructure.

Response to Staff's First DR, Item No. 18

Big Rivers has not deployed any transmission automation equipment other than the remote control capability of substation equipment via its Substation Control and Data Acquisition ("SCADA")/ Energy Management System ("EMS") and remote control capability of certain line equipment via its radio control switching system. These are operator interface systems, not automated systems.

Jackson Purchase has 4 types of distribution automation equipment. The first type is a SCADA system. The second type uses automatic overhead switches that provide service to the Kentucky Oaks shopping mall in Paducah. The last type utilizes two overhead switches that communicate with each other to isolate faults and provide service to critical commercial load near the mall.

All of Kenergy's substations are equipped with 2-way communications for circuit switches and voltage control. A SCADA system constantly monitors status and value for each device. Preset commands control these devices when distribution system conditions indicate a need for response. Every change of state is reported via SCADA to the Operations Center.

Meade currently has four substations outfitted with recloser and regulator controls which have the ability to be remotely controlled by its SCADA system by Power Measurement.

Response to Staff's First DR, Item No. 19

Big Rivers has a digital microwave communication system, which is used in the operation of its transmission system (i.e. SCADA/EMS, two-way radio, radio-controlled switching, etc.) and through which it provides communication connectivity to its three distribution cooperative members and has connectivity to some of its interconnected neighboring utility systems.

Jackson Purchase is installing an AMI system that will be fully integrated with its Outage Management System ("OMS").

Kenergy has not deployed any other digital communication equipment other than that described in the response to Item 17.

Meade currently has digital communication to all substations and its two offices.

Response to Staff's First DR, Item No. 20

Big Rivers has no plans to install additional smart grid technology or components at this time.

Jackson Purchase launched a full scale task force investigating AMR in late 2000 and determined that AMR at that time was not cost effective nor was the technology nature enough to support deployment of an AMR system. Jackson Purchase continued to monitor advancements in AMR technology and in December 2006 launched a 1,000 meter, sub-station wide deployment of the Cannon AMR system.

Kenergy has no budgets or timelines established for full implementation of logic – based devices into a smart application. Kenergy anticipates that the AMI Pilot results will include data that can help define a viable smart grid plan.

As new substations are constructed, Meade installs equipment controls and measurement devices that allow easy interface with SCADA and other similar types for smart grid systems; however, Meade has no immediate plans to install any additional smart grid technology.

Response to Staff's First DR, Item No. 120

The opinion of Big Rivers and its Members on smart grid investments has not changed notwithstanding the smart grid technology incentives provided under the American Recovery and Reinvestment Act of 2009. They will continue to review the measures in the Stimulus Bill to determine if smart grid investments are beneficial.

Response to Staff's Second DR, Item No. 14

It is Kenergy's belief, that full implementation of an AMI system will be cost-effective.

Response to Staff's Second DR, Item No. 15

All new industrial customers with a load of 5 MW or greater are eligible to participate in the real-time pricing pilot program, and all existing Kenergy industrial customers expanding their load by 5 MW or greater are eligible to participate.

Response to Staff's Second DR, Item No. 16

The Jackson Purchase Cannon system is upgradeable. The information available from the Cannon modules allows Jackson Purchase to provide better information to its members concerning billing questions, blinking light/outage calls, voltage inquiries, voltage profiles, etc.

The AMI system was originally included in the 2006/2007 Construction Work Plan but was carried over to the Construction Work Plan for 2009/2010.

Response to Staff's Second DR, Item No. 40

Big Rivers and its member cooperatives have not developed specific smart grid plans. The members are in the process of evaluating or deploying AMI for the purpose of meter reading and are evaluating other potential benefits of AMI, such as demand response and energy efficiency measurement and verification.

Jackson Purchase has been installing an improved communications system to its substations. Jackson Purchase is essentially establishing a network connection at each of its substation sites with this system.

Response to Staff's Second DR, Item No. 41

Additional communication infrastructure to enhance the use of distributed resources has not been evaluated at this time.

Response to Staff's Second DR, Item No. 42

Big Rivers, Kenergy and Meade are not currently exploring communication partnerships with broadband or mobile wireless providers for networking options for smart grid.

Jackson Purchase has partnered with Iris Networks to build a fiber optic communications system through portions of the Jackson Purchase service territory.

Duke Energy Kentucky

SmartGrid is the new name for Duke Energy's Utility of the Future Project to transform the company's gas and electric distribution systems into an integrated, digital network – much like a computer network – to produce operating efficiencies, enhanced customer and utility information and communications, innovative services, and improved reliability among other benefits. One fundamental component of the SmartGrid project is AMI. AMI is a metering and communication system that records customer usage data over frequent intervals, and transmits the data over an advanced communication network to a centralized data management system. SmartGrid projects use the communication network to carry data from AMI and other intelligent devices on the distribution grid, creating a networked system and utilizing the AMI to its greatest extent.[8]

Duke Kentucky supports the EISA 2007 standards related to SmartGrid, but does not believe the standards need to be formally adopted by the Commission.[9]

Duke Kentucky began investigating the development of a data management system in 2004. Initially, the purpose was to gather and correlate data on generation characteristics, outages, transmission loading, distribution system constraints and meters, and then use that data to better optimize Duke Energy's system and employee work loads. Near that same time, Duke Kentucky was also considering the possibility of an AMR project using a power line system in its Midwest region.

Once Duke Energy determined the actual technologies needed to bring its vision for the future (as set forth in its "use cases"), vendors of metering, behind-the-meter and communication products were surveyed to assess their product offerings and to compare to Duke Energy's functional requirements. At this point, Duke Energy has developed an architecture that allows it to minimize the proprietary communications networks and increase the long-term flexibility of the "smart grid." The process of developing technology and vendors will be an ongoing process.

Duke Kentucky has developed a prototype of its SmartGrid vision, which it calls the Envision Center. Located in Erlanger Kentucky, the Envision Center represents what Duke Kentucky foresees as the culmination of SmartGrid technology design and implementation for the future of energy delivery.[10]

The focus of the Gridwise Architectural Council ("Gridwise"), with whom Duke Kentucky is working, is on standards, i.e., how communications systems work together and the benefits of meters using the same "language."[11]

Duke Kentucky has introduced various components of SmartGrid technologies that include installation of electric and gas smart meters and the associated AMI infrastructure, distribution communications equipment and software, substation automation and line sensor equipment. In 2008, it completed the majority of an initial deployment of AMI in Kentucky.[12]

Pursuant to the Commission's Order in Duke Kentucky's last electric rate case, Duke Kentucky started deploying an AMI solution based on Power Line Communications ("PLC") technology.

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[8] Arnold, 3.
[9] Arnold, 4.
[10] Arnold, 5-6.
[11] Arnold, 7.
[12] Arnold, 8.

Duke Kentucky has deployed approximately 25,800 gas AMI modules and approximately 37,300 electric AMI meters in Northern Kentucky since 2007. In addition, approximately 1,200 single phase commercial electric meters, 300 extended range (320 amp) residential electric meters and 50 Transformer Type commercial electric meters have not been deployed. As of December 1, 2008, Duke Kentucky obtained 98.5% of the AMI Electric readings on the first reading attempt and 95.6% of the Gas readings on the first reading attempt.[13]

Many of the SmartGrid benefits are not capable of measurement. If an outage occurs on a residential circuit, Duke Kentucky may know of it even before the customer is aware of the outage. It may be repaired even while a customer is away from the home.[14]

Benefits of SmartGrid considered by Duke Kentucky include operational benefits, quantifiable customer / societal benefits, and qualitative customer / societal benefits:[15]

<u>Operational benefits</u>

- Metering Benefits
- Outage Benefits
- Distribution Benefits
- Other Operational Benefits

<u>Quantifiable customer / societal benefits</u>

- Reduction in the number of customer outages
- Reduction in usage
- Avoided costs associated with plug-in hybrid electric vehicles

<u>Qualitative customer / societal benefits</u>

- Increased customer satisfaction related to more accurate billing
- Increased customer satisfaction related to additional choices
- Increased road safety due to decreases in the number of vehicles on the road
- Increased perceived safety as a result of elimination of the requirement for a meter reader to physically be on a customer's property or within a customer's residence
- Increased health of the environment due to reduced demand and managed demand

In addition to deploying smart meters and supporting AMI infrastructure, Duke Kentucky's vision includes:[16]

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[13] Arnold, 8-9.
[14] Arnold, 10.
[15] Arnold, 10-14.
[16] Arnold, 14-15.

1. Establishing communication links to all substations;
2. Replacing any distribution feeder circuit protective devices that are not conducive to automation with new circuit breakers that are conducive to automation;
3. Upgrading old electromechanical relays with state of the art microprocessor controlled relays, and establishing remote control capability of all electric distribution circuit breakers greater that 4kv;
4. Automating switched bank capacitors and voltage regulators to enable integrated volt / var optimization and implement a voltage reduction strategy;
5. Establish communication links and enable remote control capability of electronic reclosers; and
6. Enhanced sectionalization and deployment of self healing technology.

The SmartGrid can enable Duke Kentucky to assess load profile data for a home on an hourly basis for several days for trouble-shooting purposes. Information from the "end points" of the system will also be combined with data from other distribution assets to better plan for growth, asset management, restoration services, etc. Distribution system, energy efficiency and demand-response planning will also be enhanced by gathering more granular consumption data over weeks and months.

The entire SmartGrid system working together will provide Duke Kentucky with the ability to provide new service options for its customers.

The intelligent meters and related SmartGrid equipment would also enable Duke Kentucky to limit its amount of load in an emergency. It will enable Duke Kentucky to increase its energy efficiency offerings, provide for larger-scale distributed generation and maximize load control potential.[17]

The Commission has authority to consider residential SmartGrid deployment as an element of demand side management (DSM) plans. The DSM statute gives the Commission authority to review utility sponsored DSM and energy conservation plans and approve such plans for recovery via a discrete rider adjustment.[18]

Duke Kentucky's AMI Initiative provides one solution of the possible components which build a Smart Grid and is providing benefits today to our Kentucky customers. The solution has the capability to confirm power-restoration events, contributing to improved reliability. The Kentucky AMI Initiative also supports security best practices including firewalls, intrusion detection, isolated network segments and user access controls. The network is not accessible to the public internet. Duke Kentucky's AMI Initiative supports interval data collection from electric meters and daily data collection from gas meters.[19]

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[17] Arnold, 16.
[18] Arnold, 17-18.
[19] Arnold, 18-19.

DR Responses of Duke Kentucky

Response to Staff's First DR, Item No. 30

AMR systems deployed at Duke Energy, such as the ITRON drive by system in the Carolinas, relies on one way radio transmissions from the meter to radio receivers within trucks dispatched to collect monthly meter reads.

Response to Staff's First DR, Item No. 31

Duke Kentucky does not believe that there is potential to increase participation in these four rates (Rate DS, Rate DP, Rate DT, and Rate TT) because they apply based on customers' peak demand and service voltage.

Response to Staff's First DR, Item No. 33

Duke Kentucky only completed the first phase of TWACS and BADGER technologies deployment as part of the Proof of Concept. As a result, this total deployment cost was approximately $11 million of the projected $24 million in capital expenditures.

Response to Staff's First DR, Item No. 34

There currently is no installed distribution automation in the Duke Kentucky electric system in Northern Kentucky. Though Duke Kentucky has SCADA control of substation breakers, there are no self-healing concepts installed on the distribution lines. The 69kV transmission system does not currently have any automation installed to sectionalize a line to keep a substation in service for failures on only one source to a substation. Duke Ohio installed transmission sectionalizing equipment at the new Dayton substation to allow the faulted section of 138kV line to be isolated so the Dayton substation can be re-energized with an outage of only a few seconds.

Response to Staff's First DR, Item No. 37

KRS 278.285(h) allows the Commission to approve: "Next-generation residential utility meters that can provide residents with amount of current utility usage, its cost, and can be capable of being read by the utility either remotely or from the exterior of the home." Duke Kentucky believes that this authority would include the system infrastructure including communication equipment and information technology necessary to provide the functionality set forth in the statute.

Duke Kentucky believes that the statute limits the recovery via a discrete rider charge to residential customers only.

Response to Staff's First DR, Item No. 38

There are no smart grid investments included in the specific programs proposed under the save-a-watt initiative.

Response to Staff's Second DR, Item No. 40

Duke Kentucky plans to deploy a two way communications network within its distribution grid that will enable SmartGrid functionality and provide the necessary foundation to enable demand response and new energy efficiency programs. Technologies like Home Area Networks (HAN) and other smart devices like programmable communicating thermostats that meet both customer needs and the company's thresholds for cost effective energy efficiency programs will be considered for future offers.

Response to Staff's Second DR, Item No. 41

Duke Kentucky will leverage mobile wireless, power line carrier, fiber optic, Wi-Fi and potentially other communications technologies to establish HANs, Local Area Networks and Wide Area Networks ("WAN") needed to support its SmartGrid deployments in multiple jurisdictions.

Response to Staff's Second DR, Item No. 42

Duke Kentucky has and will continue to develop strategic partnerships with commercial network providers to provide the capability to back haul data required for distribution automation, metering systems and energy efficiency functionality.

Response to Staff's Second DR, Item No. 43

Duke Kentucky has prioritized the SmartGrid elements it plans to pursue in jurisdictions where a comprehensive SmartGrid deployment has been approved such as Ohio. First priority includes the deployment of an extensive communications network designed specifically for its distribution grid. This network will provide the two way communications connectivity to enable AMI, distribution automation, and energy efficiency.

East Kentucky Power Cooperative, Inc. ("EKPC")

The Commission should not adopt a formal smart grid regulatory review standard, as proposed. It should consider establishing a collaborative process with the utilities and other stakeholders to monitor smart grid developments, to identify promising new technologies and concepts, and to potentially engage in pilot programs on a voluntary basis that appear to offer net benefits. Positive net benefits refers to the condition where the prospective cost savings for generation and transmission services are greater than the costs of the technology including implementation, and the costs associated with the risks and uncertainty of future net benefits.

Smart grid technologies and information systems consist of five major categories including Sensing and Measuring, Advanced Control Methods, and Improved Interfaces and Decision Support. Smart grid technologies are complementary to, rather than substitution for, conventional power system equipment and facilities. A formal regulatory review involving technology selection that implies technology substitution possibilities is not necessarily applicable. It is unlikely that many opportunities where smart grid technologies substituted for conventional technologies exist, although a known, working smart grid technology may delay the deployment of a major conventional technology.

Smart grid technologies may potentially offer at some point substantial benefits in the form of lower electric bills and improved reliability for retail customers. EKPC and its members along with customers are putting forth efficient market-based pricing programs that will utilize interval meters. Smart grid technologies geared to reliability and, in particular, real-time operations will increasingly need to operate across electric utility service providers to realize effectiveness. In short, smart grid, to a substantial extent, will be regional in nature. In short, the net benefits to local smart grid investments will likely be manifested outside the host utilities territory. The burden of demonstrating, within formal regulatory processes before the Commission, that occasional small scale investments in smart grid technologies and concepts of one type or another provide net benefits is substantial. High resource costs, substantial siting limitations, and an increasingly larger array of substitute possibilities available to consumers present utilities with strong incentives to minimize total costs. With the incentives that are inherently present within today's energy markets, with rising costs and increasing ranges of potential substitutes, the Commission can be assured that Smart grid technologies which provide positive net benefits will be adopted by service providers where appropriate.[20]

Electricity cannot be readily stored and the pattern of power flows within a transmission network follows physical laws. Accordingly, economic costs and wholesale market prices can be highly differentiated among network locations. This means that substantial cost savings and overall gains in market efficiency can potentially be realized through marginal cost-based pricing programs, including real time pricing and critical peak pricing, where load decreases during high load and high cost periods can obtain major cost savings and mitigate the need for capacity. To this end, EKPC and its member systems are initiating a real time pricing pilot program, and have implemented a Direct Load Control program. These programs provide retail consumers with economic cost information for EKPC. These programs mitigate high costs associated with near-term conditions, and incorporate relevant information regarding economic cost and tight supply-demand balance. The programs obtain market efficiency on the appropriate costs and conditions. Wholesale market prices, to a large extent, are driven by variation in electricity demand of the Eastern markets, and may be much different in level and variation of local economic costs.[21]

Some in the industry think about the smart grid chiefly from the perspective of grid monitoring and management. Others focus on the customer end, sometimes inappropriately equating smart metering with the smart grid. Smart metering is, of course, just one possible component of the smart grid.[22]

The National Energy Technology Laboratory classifies smart grid technologies into five categories. These areas are 1) Integrated Communications, 2) Sensing and

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[20] Camfield, 4-6.
[21] Camfield, 6-7.
[22] Camfield, 8.

Measuring, 3) Advanced Components, 4) Advanced Control Methods, and 5) Improved Interfaces and Decision Support.

Integrated communications connects suppliers and users of electricity in a national and rapid network. No such standards exist for the user side in the areas of automated meter reading or demand response or in distribution automation.

Smart grid Sensing and Measurement technologies record power flows or power information at all stages of the electricity supply process. Such technology includes customer metering, wide-area monitoring systems and dynamic line rating technology for the transmission grid. Also included are advanced protection systems that serve to conduct fault testing, for example. At the customer end, technologies relate to residential customer networks and advanced metering are included.

Advanced Component methods includes fields such as power electronic devices such as static VAR compensators, superconductivity technology, distributed generation, distributed storage devices and complex system such as micro grids.

Advanced Control methods consist of distributed intelligent agents to manage power, analytical tools consisting of computer hardware and software for information processing and operational applications such as outage management.

Improved Interfaces and Decision Support includes technologies that improve grid "visualization" and decision support. These can include software and controls that provide information to decision makers charged with system management. The theme of this technology area appears to be information synthesis.[23]

Investment of latest technology complimenting conventional technology may appear to offer positive net benefits. However, it may also be the case that the technology in question could be superseded by an improved technology in the not too distant future. While the utility must evaluate such issues on a regular basis, it would be difficult to accurately gauge results in a systematic, consistent and timely review by regulators.[24]

DR Responses of EKPC and its 16 Distribution Cooperative Members

Response to Staff's First DR, Item No. 51

EKPC uses MV-90 to read energy usage, demand, and peak data for large industrial customers.

There are a few customers that are not on the MV-90 Web system but do have access to their energy consumption data on a near real-time basis. These customers

[23] Camfield 9-10.
[24] Camfield, 11-12.

have installed specialized electronic equipment that interfaces with the metering system, telemeters the data within the plant, and displays the data within their control rooms.

MV-90 is a software package that performs a number of meter reading and bill preparation functions.

EKPC also maintains a number of sophisticated load research meters.

12 of the 16 Member Systems have installed sophisticated automatic metering reading systems. Fleming-Mason Energy,
Inter-County Energy, Shelby Energy, and
South Kentucky have no AMR.

It should be noted that the EKPC Simple Saver DSM program (direct load control) will use the Member Systems' AMR system to communicate to those customers where paging signals are not available.

<u>Response to Staff's First DR, Item No. 52</u>

EKPC and the Member Systems have a limited number of automation equipment components installed on the transmission and distribution systems. Each system is briefly described below:

System Protection.
Data Recorders.
EKPC has installed the Obstacle Collision Avoidance System Motor Operated Switches.
Dynamic Thermal Circuit Ratings.

Blue Grass, Cumberland Valley, Jackson Energy, Nolin, Salt River, Shelby Energy, and South Kentucky have installed SCADA systems.

Owen has a SCADA system installed and operational and is continually investigating expanding its smart grid opportunities.

<u>Response to Staff's First DR, Item No. 53</u>

EKPC has hybrid type of digital communications systems, which combines fiber optics with digital microwave system. This system provides a communication platform on which a large number of voice and data applications depend.

All the member systems are participating in the direct load control program, Simple Saver DSM program. Deployment is on-going.

Blue Grass has deployed digital radios to get an IP network to the substations for connection to the AMR system and SCADA.

Farmers is in the process of installing a new digital radio system.

Owen has deployed digital radios to get an IP network to the substations for connection to the AMR system and SCADA.

Salt River has only deployed SCADA and AMR.

<u>Response to Staff's First DR, Item No. 54</u>

EKPC's plans for installation of smart grid technology include:

Fault Locators
Dynamic Thermal Circuit Ratings
System Protection
Phasor Measurement Units
Digital Communication Link

<u>Response to Staff's First DR, Item No. 55</u>

Potential benefits of smart grid technologies are likely to be inherently regional in nature, particularly where system reliability is concerned. There is precedence that regional benefits, concerns, and issues precipitate collaboration among utilities and stakeholders.

Owen is very willing to collaborate and work with any and all utilities to expand its knowledge of smart grid possibilities.

<u>Response to Staff's First DR, Item No. 120</u>

Stimulus funding opportunities are being sought by EKPC. It is conceivable that EKPC could speed up investments specific to the smart grid, relative to a traditional investment, should stimulus funds be available and affordable.

Advent of stimulus funds may expedite Owen's efforts to install smart grid technology.

<u>Response to Staff's Second DR, Item No. 4</u>

List of EKPC projects that may qualify for Federal stimulus money:

Project	Estimated Cost
Microprocessor Relays	$I.0M
Fault, Disturbance, and IED Monitoring	$0.5M
State Estimation	$0.5M
345 kV Transmission Tie to MIS0	$38.0M
Transformer Monitoring	$1.6M
DTCR	$1.0M
Distribution SCADA	$I0.0M
DSM	$20.1M
Smart Pricing	$1.0M
Smart Distribution Capacitors	$18.2M
Total	$91.9M

Kentucky Power

EISA 2007 Smart Grid Standard:

It is the policy of the United States to support the modernization of the Nation's electricity transmission and distribution system to maintain a reliable and secure electricity infrastructure that can meet future demand growth and to achieve each of the following, which together characterize a Smart Grid:

1. Increased use of digital information and controls technology to improve reliability, security, and efficiency of the electric grid.
2. Dynamic optimization of grid operations and resources, with full cyber-security.
3. Deployment and integration of distributed resources and generation, including renewable resources.
4. Development and incorporation of demand response, demand-side resources, and energy-efficiency resources
5. Deployment of "smart" technologies (real-time, automated, interactive technologies that optimize the physical operation of appliances and consumer devices) for metering, communications concerning grid operations and status, and distribution automation.
6. Integration of "smart" appliances and consumer devices.
7. Deployment and integration of advanced electricity storage and peak-shaving technologies, including plug-in electric and hybrid electric vehicles, and thermal-storage air conditioning.
8. Provision to consumers of timely information and control options.
9. Development of standards for communication and interoperability of appliances and equipment connected to the electric grid, including the infrastructure serving the grid.
10. Identification and lowering of unreasonable or unnecessary barriers to adoption of smart grid technologies, practices, and services.

A smart grid system will assist in converting the current system for generating and delivering electric power from one that is centralized and producer-controlled to "one that is less centralized and more consumer-interactive." Although smart-metering is an important component of a smart grid, the smart grid is not limited to smart-metering.[25]

Kentucky Power supports the adoption of EISA 2007 standards with

- Consideration of Smart Grid Investments (Section 1107(a)(16))
- Smart Grid Information (Section 1307(a)(17))

Adoption of the EISA 2007 standards concerning the remaining topics is unnecessary. Coupled with the Commission's general ratemaking, certificate, and DSM

[25] Wagner, 21-22.

authority, the Commission and electric utilities have more than adequate ability to advance the purposes of federal law.[26]

Kentucky Power, as an operating unit of AEP, has participated in the development of AEP's smart grid initiative. Known as gridSMART, the initiative began in 2007. It includes AMI, distribution grid management, and HAN, along with the information technology systems that support and integrate each.[27]

Three features comprise the AMI system: smart meters, two-way communications networks and the information technology systems to support their interaction. AMI uses internal communications systems to convey real-time energy use and load information to both AEP and to the customer.[28]

AMI provides capability to monitor equipment and can quickly convey information about certain malfunctions and operating conditions. It also facilitates customers' ability to achieve benefits related to certain future customer-owned advanced technologies and appliances.

When paired with tariff options and the HAN, AMI can empower customers to control their energy usage by providing real-time information and usage data, allowing them to better understand their energy consumption and potentially reduce their electricity bill. AMI can help speed service restoration through better information about the facilities involved. Customers also can receive faster response to service requests, including meter reading and service connection, due to remote execution of those activities.

AMI allows for remote connect or disconnect. Power quality monitoring can improve customer satisfaction while tamper detection capability deters energy theft. Less personal interaction with energized equipment also improves employee and public safety.[29]

Distribution grid management provides real-time control and monitoring of selected electrical components within the distribution system. These electrical components will be connected via a two-way wireless communication system to AEP's dispatch operations center. The capacitor banks, voltage regulators, and reclosers will be equipped with sensors, which provide information on operational status and analog data such as voltage or current. When a fault occurs, automated switches isolate a circuit by automatically opening (de-energizing) or closing (re-energizing), depending on its location. Only the customers in the section of line where the fault occurs experience a sustained outage. Customers in the other line sections are immediately transferred to another source thus limiting their outage to only a momentary interruption. The time

[26] Wagner, 3.
[27] Wagner, 23.
[28] Wagner, 24.
[29] Wagner, 24.

required to identify the fault location and the facility damages can be reduced as crews responding will have a smaller area to patrol and possibly some additional information on the nature of the fault. Sensors and intelligent controllers can monitor load flow characteristics and direct controls on capacitor and voltage regulating equipment to optimize power factor (VAR flow) and voltage levels. Power factor optimization improves energy efficiency by reducing losses on the system. Voltage Optimization can allow a reduction of system voltage that still maintains minimum levels needed by customers but will cause a corresponding reduction in energy consumption.[30]

Distribution grid management is an integral part of the gridSMART initiative due to the reliability and energy efficiency benefits it can provide. The reliability benefits are mostly societal with some cost savings as system repair needs can be identified and completed more quickly. The energy efficiency benefits can help lower both the amount and cost of energy by reducing losses, energy usage, and peak demand requirements. While the reliability benefits are realized mostly by the customers in areas where grid management is applied the energy efficiency benefits are realized by all consumers.[31]

AEP's final component of the gridSmart initiative is located within customers' homes and allows customers to conserve energy and save money through increased information and control of their electric usage.[32]

As part of the HAN, customers will receive a programmable communicating thermostat (PCT) in their homes or businesses. PCTs will have the ability to receive electrical energy consumption data from the meter, store the data, and provide the customer with real-time and historical energy usage. The PCT can receive price signals from electric meters and be programmed to regulate temperature accordingly, allowing the customer to regulate their indoor temperature in response to daily or seasonal electric price fluctuations while maintaining an acceptable level of comfort. The capability to cycle air conditioning on and off upon receiving a critical peak signal from the electric meter.[33]

Load Control Switch (LCS) is another HAN component. An LCS is a device installed ahead of a major electrical appliance that can either turn the appliance on or off or cycle the appliance on and off as in the case of an air conditioning unit.[34]

The HAN can provide real-time and historical electrical usage, providing the customer with the knowledge and opportunity to control usage, conserve energy and save money. HAN will enable AEP to provide the customer pricing options including time-differentiated rates. Data collected by the HAN can help AEP shape future pricing programs to suit customers' needs. In addition, as customers save money by shifting

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[30] Wagner, 25-26.
[31] Wagner, 26.
[32] Wagner, 26.
[33] Wagner, 26-27.
[34] Wagner, 27.

load to off-peak hours, it will help AEP reduce demand and potentially defer the need for new generation.[35]

Other information technology systems included in AEP'S gridSMART initiative are: meter data management, OMS and geographical information system. These systems allow for data to be obtained, stored, shared and analyzed across business applications within AEP.[36]

The AMI and HAN portions of gridSMART are closely linked and can use a common communication system. HAN communications also can be established by other means, i.e., paging, broadband and cellular networks. The considerations to be reviewed are the timing of the investments planned and the technology deployed. Distribution grid management can be undertaken on a stand alone basis. The key is to build the communications network to maximize initial benefits, while planning for future gridSMART deployments.[37]

There has only been a limited deployment in Kentucky in the pilot phase.[38]

Kentucky Power converted all residential meters to AMR technology in 2006...is not currently proposing to convert to AMI technology until 2012 or later.[39]

Kentucky Power currently believes the more prudent course would be to implement home area network technologies in conjunction with its AMI roll out. Kentucky Power is investigating in-home display technologies that work with the current AMR system and provide customers information on their electrical usage.[40]

Kentucky Power has undertaken three distribution automation projects demonstrating Distribution Grid Management concepts. Kentucky Power is planning for the implementation of SCADA at all of its substations. Also is planning to automate portions of its distribution grid.[41]

These demonstration projects are the: Cannonsburg area in the Ashland District, the Buckhorn area in the Hazard District, and the Inez area in the Pikeville District.[42]

Cannonsburg:

The project is underway involving portions of three circuits from two substations. Using the project to perform load transfers during outages. This area served by the

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[35] Wagner, 27.
[36] Wagner, 28.
[37] Wagner, 27-28.
[38] Wagner, 28.
[39] Wagner, 29.
[40] Wagner, 29.
[41] Wagner, 28-30.
[42] Wagner, 30.

circuits and substations consists of a mix of residential and commercial load, including schools, fire departments, retail stores, water, and sewer facilities.

- The Cannonsburg Station's Cannonsburg 34 kV Circuit, with about 1,400 Customers
- The Cannonsburg Station's Route 3 34 kV Circuit (2.200 customers), can be transferred anytime
- The Princess Station's Meade 34 kV Circuit, (1,600 customers) can be transferred about 90% of the year (except during winter peak), limiting the effects of a circuit outage.[43]

Buckhorn:

These two Buckhorn circuits, Chavies 12 kV (serves 728 customers) and Canoe 34 kV (serves 1,236 customers) can be tied together at their extremities via stepdown transformers on the end of the Canoe circuit and customers from both circuits can be transferred to the other in outage recovery situations from either circuit. Kentucky Power is installing automatic switches and other devices to enable the automatic transfer of 351 customers and the town of Buckhorn from the Canoe circuit and 237 customers and the Buckhorn State Park and Lodge from the Chavies circuit in outage recovery situations of either circuit. This procedure will reduce outage time and customer minutes of interruption thus improving customer relations in the Buckhorn area.[44]

Inez:

Under light load conditions, the Lovely 34 kV circuit has the capability to serve all 2,053 customers served by the Inez 34 kV circuit.

Kentucky Power installed switching devices that automatically transfer the town of Inez to the Lovely 34 kV circuit upon an outage at Dewey Station or the Inez 34 kV circuit, even during peak load periods, which will reduce Customer Minutes Interrupted and promote better community relations by providing shorter outage durations for the town of Inez during contingency situations. This arrangement will also reduce Customer Minutes Interrupted for 452 customers during peak load conditions and 1,363 customers during light load conditions normally served by the Lovely 34 kV circuit, upon an outage of the Lovely Station or the Lovely 34 kV circuit by automatically transferring these customers to the Dewey Station, Inez 34 kV circuit. This project is in service.[45]

AEP has successfully installed sodium sulfide (NaS) batteries on the distribution grid to help with system reliability and defer capacity additions. The estimated cost of a battery installation is $5 million per MW.[46]

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[43] Wagner, 30.
[44] Wagner, 31.
[45] Wagner, 32.
[46] Wagner, 32.

The final two provisions of the EISA 2007 smart grid standards would permit utilities to recover the costs of their investments in smart grids, as well as the recovery of the remaining book-value costs of any equipment rendered obsolete by the deployment of the "qualified smart grid system."[47]

Kentucky Power believes that the large investments required for ratepayers to reap the benefits of a smart grid system will not be made unless utilities are assured of their ability to earn a return on and to recover their investments, including any remaining investment in facilities rendered obsolete as a result of the company's smart grid investments. Kentucky Power supports the adoption of the standards by the Commission. Kentucky Power also supports the Commission's explicit recognition of the need to foster smart grid investments through the adoption of the first part of the federal smart grid standards.[48]

The economic life of many smart grid investments will be much shorter than the equipment it is replacing or supplementing This, of course, will mean higher depreciation rates. Second, with respect to each smart grid investment, the utility should be permitted to recover its costs, including operating costs and return on and of capital investments, net of benefits.[49]

DR Responses of Kentucky Power

Response to Staff's First DR, Item No. 75

None of the AMR hardware installed in 2006 would be utilized when Kentucky Power deploys AMI.

An AMR - AMI comparison is not a true comparison because of the functional differences in the AMI system. There are additional features on AMI meters that provide added capabilities, such as an internal connect/disconnect switch or radio home area network (HAN) chip to communicate to 'in home' devices.

Response to Staff's First DR, Item No. 78

The following types of distribution automation schemes are being considered:

Distributed Intelligence schemes utilizing peer to peer communication.

Substation Controller Based Intelligence schemes utilizing a substation controller that monitors the status and loading of ail devices and controls reclosers and witches to reconfigure the system to restore customers in unfaulted zones using capacity from adjacent circuits.

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[47] Wagner, 33.
[48] Wagner, 33.
[49] Wagner, 33.

Centralized Intelligence Schemes utilizing the SCADA system to monitor the status and loading of all devices and to control reclosers and switches to reconfigure the system to restore customers in unfaulted zones using capacity from adjacent circuits.

AEP Transmission is currently evaluating three projects within the Kentucky Power service territory that would increase the level of automation to improve energy efficiency and system performance. These projects include:

Adding circuit breakers to the shunt reactors at the Baker 765 kV Station.
Modifying the Static Var System at the Beaver Creek Station.
Modifying the Unified Power Flow Controller at the Inez Station.

The communications technology presently being utilized in Kentucky Power for gridSMART deployments is 900 MHZ spread spectrum mesh technology.

The original implementation schedule for Kentucky Power's gridSMART plan covered years 2008 to 2017. The goals include 3 MW of NaS battery installations, 12 MW of demand reduction through demand side management, energy efficiency, and demand response programs, installation of 185,000 smart meters, and progress with distribution automation installation where applicable.

<u>Response to Staff's First DR, Item No. 80</u>

All single-phase, class 200A and class meters 320A (mostly residential) were converted to radio frequency (RF) meters or PLC meters. Approximately 160,000 meters were converted. Approximately 144,000 were RF meters and approximately 16,000 were PLC. Electro-mechanical meters that were removed and the obsolete ones were retired.

Kentucky Power purchased mobile collectors to collect the readings for the RF meters.

Kentucky Power had 26 full-time and 14 temporary meter reading positions. The conversion reduced these positions by 10 full-time and 14 temporary meter reading positions.

<u>Response to Staff's First DR, Item No. 81</u>

All three distribution automation demonstration projects involve the use of S&C Electric Company's "IntelliTEAM II Automatic Restoration System".

The Inez Area DA project was in-service by the end of 2008.

The Cannonsburg Area DA project is projected to be in-service by June 2009.

The Buckhorn Area DA project is projected to be in-service by December 2009.

<u>Response to Staff's First DR, Item No. 82</u>

Kentucky Power submits that it would be appropriate for the Commission to generally recognize customer and societal benefits that are produced through the deployment and implementation of smart grid investments, without the need for each electric utility to demonstrate the existence or quantification of such benefits without requiring the precise quantification of such benefits. Electric utilities deploy and implement smart grid technology, it is appropriate to allow recovery of prudently-incurred costs that are not otherwise offset by operational cost savings. Kentucky Power also submits that timely cost recovery is critical to enable utilities to deploy and implement smart grid technology.

Response to Staff's Second DR, Item No. 31

AEP's Indiana Michigan Power subsidiary recently deployed a 10,000 meter gridSMART pilot in South Bend, Indiana. Using RF meshing technologies and smart meters that can communicate with in-home devices, Indiana Michigan Power intends to deploy demand response through programmable communicating thermostats in June 2009. This is the first deployment of smart meters within AEP.

Response to Staff's Second DR, Item No. 32

To the extent the EISA 2007 smart grid standards and the associated smart grid investments seek to modify or influence customers' consumption patterns, Kentucky Power believes the associated costs of these smart grid programs would flow through the DSM surcharge. To the extent any costs associated with smart grid investment are not designed to modify or influence customer's consumption patterns, those costs would follow the normal course of business and be recovered through Kentucky Power's base rate cases.

Response to Staff's Second DR, Item No. 42

The cost to use commercial broadband or mobile wireless networks has not compared favorably to the cost of utility-owned communications networks for AMI/smart meter systems. AEP has leveraged both wired broadband and mobile wireless services for specific communications requirements where these options have been determined to be a more cost effective option. Two such examples are AEP's use of cellular networks as a back haul option for AMI data collectors and the use of leased frame relay circuits for SCADA links to substations.

Response to Staff's Second DR, Item No. 43

Since Kentucky Power has fully deployed an AMR system, it does not plan to deploy AMI/smart meter systems until 2012 or later.

Priority has been placed on the initial deployments of distribution grid management options.

The execution pace of Kentucky Power's gridSMART deployment plan will be directly linked to available capital and its ability to recover the cost, net of operational benefits, from these proposed investments.

Louisville Gas and Electric Company / Kentucky Utilities Company ("LG&E/KU")

The industry has yet to reach a consensus on a common definition or description of a "smart grid." By choosing one definition now, the Commission could effectively limit the scope and consideration of future smart grid technologies and investment in the state of Kentucky.[50]

The National Institute of Standards and Technology has primary responsibility for coordinating the development of a framework that includes protocols and model standards for information management in order to achieve interoperability of smart grid devices and systems. Without the consensus standards recommended by this group, it is unlikely that the various Smart Grid devices and systems deployed throughout North America will interoperate.[51]

LG&E/KU have launched a Responsive Pricing and Smart Metering Pilot program consisting of 100 customers for rate RS aid 50 customers eligible for rate *GS* in a given year. The rate structure of the program utilizes time of use ("TOU") and real time, critical peak pricing components. Customers in the Responsive Pricing and Smart Metering Pilot program receive smart thermostats, energy use display devices and water heater/pool pump controllers to automate energy use based on the price of electricity[52].

DR Responses of LG&E/KU

Response to Staff's First DR, Item No. 92

The only AMI deployed is the "smart" equipment associated with LG&E's Responsive Pricing and Smart Metering Pilot, which the Commission approved in its July 12,2007 Order in Case No. 2007-001 17.

Response to Staff's Second DR, Item No. 93

Distribution automation equipment deployed by LG&E/KU includes:

Both LG&E and KU employ automated load transferring capabilities in select distribution substation and circuit applications. These applications fall into one of three general categories:

1. Automatic substation bus transfer schemes in large, critical substations with multiple buses and transformers
2. Automated distribution circuit load transfer switchgear in the core downtown Lexington area

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[50] Bellar, 8.

[51] Bellar, 8.

[52] Bellar, 8-9.

3. Customer-specific automated second source transfer solutions, including automated bus transfer schemes in substations for very large Customers and second feed, distribution circuit source transfer schemes for critical customers such as hospitals, data centers and other critical services.

Transmission automation equipment deployed by LG&E/KU includes:

LG&E/KU own and operate a traditional Transmission System with a classic protection philosophy. The Transmission protection system is designed to protect the system against fault conditions and operational issues with minimal impacts to the availability of the system. This design maximizes availability while ensuring reliability.

The KU and LG&E transmission system is both monitored and controlled using the SCADA functions of the EMS. This system communicates with Remote Terminal Units located in substations to help the transmission system operator monitor the reliability of the transmission network and control remote devices when necessary.

The traditional protection system automatically trips and recloses per the LG&E/KU engineering standards. This level of automated protection meets the North American Electric Reliability Council Mandatory Reliability Standards and the LG&E/KU engineering standards. The equipment involved in this level of protection includes protective relays, breakers, motor operated switches, and miscellaneous other equipment.

The LG&E/KU transmission protection standards call for all new protection systems to be installed using microprocessor relays and other high speed devices. It is also the LG&E/KU practice to install optical ground-wire fiber optic cable (static wire) on all new transmission lines to facilitate high speed communications.

Response to Staff's Second DR, Item No. 94

Distribution digital communication equipment deployed by LG&E/KU includes:

Virtually all routine communications (for voice, data, video and system control functions) at both LG&E and KU are digital. There is only limited digital communication capability in place for the purpose of automation or smart grid initiatives outside of traditional SCADA which is in place in a portion of LG&E and KU substations.

Response to Staff's Second DR, Item No. 95

LG&E has recently completed the first year of a three-year Responsive Pricing and Smart Meter pilot. Data from this pilot will continue to provide the necessary operational and technical experience to develop a long-range smart grid strategy.

Response to Staff's Second DR, Item No. 120

Smart grid strategies are long-range investments that will fundamentally change the utility industry. Therefore the value proposition and long-range financial implications to our customers are of paramount concern consistent with our prudency obligations under our current regulatory framework. In this regard, short term funding opportunities, e.g. "Stimulus funding" would not alter the long term investment strategy.

The time frame identified for stimulus funding to assist in recovering the nation's sagging economy may not be sufficient.

Response to Staff's Second DR, Item No. 33

LG&E/KU use single-phase electro-mechanical meters for nearly all residential and small non-residential customers. Record only consumption information; for non-residential customers, such meters also record peak demand.

For larger commercial and industrial customers, LG&E/KU use solid state three-phase meters. These meters can also record demand every fifteen minutes, provide power factor information, and do load profiles.

LG&E/KU made a strategic decision to adopt a Smart Metering Platform by switching from electromechanical meters to solid state meters. These Smart Meters will allow both utilities the ability to establish various energy rate offerings, such as time of use rates.

The Responsive Pricing and Smart Metering Pilot Program ("Pilot")...is aimed at evaluating the impact of various drivers on electric consumption / consumer behavior. These drivers include pricing (via time-of-use rates with critical peak pricing component), automation (via smart thermostats), and information (via in-home energy usage displays).

Both utilities are offering their large industrial and commercial customers the opportunity to participate in a three-year Real Time Pricing program. Customers energy pricing are based upon ail hourly rate structure where the hourly rates are provided to the customers on the prior day. This advanced notice is provided to allow customers time to adjust their energy consumption.

Response to Staff's Second DR, Item No. 40

LG&E/KU are currently evaluating options for Smart Grid deployment. The plan will include the infrastructure and technology that is scalable and provides "plug-in" capability with foreseeable applications (such as robust home-area-network and distribution-automation) that enable the enhancement of demand response and energy efficiency. At the meter means accommodating time of use rates as well as a wide range of communications protocols for demand-response and energy-management devices. From the meter to the utility offices, the focus is upon data security/integrity and scalability of bandwidth to accommodate increasing volumes of data, particularly from the use of distribution monitoring and automation.

Response to Staff's Second DR, Item No. 41

LG&E/KU are currently evaluating several design possibilities (i.e., combinations of getting data to collectors, and to "backbone" fiber network, and/or directly to their offices). Their emphasis is currently on identifying and quantifying the costs and benefits of these options as well as monitoring the pending security and data-integrity issues.

Response to Staff's Second DR, Item No. 42

LG&E/KU are calculating costs and benefits with both public and private solutions for WAN communications as part of their Smart Grid analysis.

Response to Staff's Second DR, Item No. 43

LG&E/KU are in the process of determining which smart grid technologies and field components to pursue and implement for the long-term. Priorities:

1. Customer load and use management (which will include installing smart meters, "behind the meter" technology such as smart thermostats, and technology to maximize the benefit of distributed generation and plug-in-hybrid electric vehicles).
2. Distribution monitoring and control (e.g., SCADA, automation of the distribution network, and system hardening)
3. Transmission monitoring and control (e.g., SCADA, automation of the transmission network, and system hardening)

LG&E/KU will deploy a redundant fiber-optic network and associated information technology simultaneously with the roll-out of "smart" field hardware across all three of the functional areas discussed above.

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