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

January 28, 2013

Re: CONSIDERATION OF THE IMPLEMENTATION OF SMART GRID AND SMART METER TECHNOLOGIES
Case No. 2012-00428

Dear Mr. DeRouen:

Enclosed please find and accept for filing the original and ten copies of Louisville Gas and Electric Company and Kentucky Utilities Company Testimony of Lonnie E. Bellar, David E. Huff, Edwin R. Staton, and David S. Sinclair, in the above-referenced proceeding.

Should you have any questions please contact me at your convenience.

Sincerely,

Rick E. Lovekamp

Rick E. Lovekamp

c: Parties of Record

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

CONSIDERATION OF THE IMPLEMENTATION OF SMART GRID AND SMART METER TECHNOLOGIES	**)))**	**CASE NO. 2012-00428**

TESTIMONY OF
LONNIE E. BELLAR
VICE PRESIDENT, STATE REGULATION AND RATES
KENTUCKY UTILITIES COMPANY AND
LOUISVILLE GAS AND ELECTRIC COMPANY

Filed: January 28, 2013

Q. Please state your name and business address.

A. My name is Lonnie E. Bellar. I am the Vice President of State Regulation and Rates for Kentucky Utilities Company ("KU") and Louisville Gas and Electric Company ("LG&E") (collectively, the "Companies") and an employee of LG&E and KU Services Company, which provides services to KU and LG&E. My business address is 220 West Main Street, Louisville, Kentucky. A complete statement of my education and work experience is attached to this testimony as Appendix A.

Q. Have you previously testified before this Commission?

A. Yes. I have testified in numerous proceedings before the Commission. Most recently, I testified in the Companies' 2012 base rate cases and LG&E's application to amend its Certificate of Public Convenience and Necessity concerning flue-gas desulfurization for Mill Creek Unit 3.[1]

Q. What is the purpose of your testimony in these proceedings?

A. The purpose of my testimony is to address the regulatory items the Commission's Order directed the Companies to address in this proceeding, including the Companies' views on certain Energy Independence and Security Act of 2007 ("EISA 2007") standards, and to provide the Companies' overall recommendation for how the Commission should proceed concerning smart meters and smart-grid technology.

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[1] *In the Matter of: Application of Kentucky Utilities Company for an Adjustment of Its Electric Base Rates*, Case No. 2012-00221; *In the Matter of: Application of Louisville Gas and Electric Company for an Adjustment of Its Electric and Gas Base Rates, a Certificate of Public Convenience and Necessity, Approval of Ownership of Gas Lines and Risers, and a Gas Line Surcharge*, Case No. 2012-00222; *In the Matter of: Application of Louisville Gas and Electric Company to Modify Its Certificate of Public Convenience and Necessity as to the Mill Creek Unit 3 Flue-Gas Desulfurization Unit*, Case No. 2012-00469.

The Companies are also providing the testimony of the following witnesses in this proceeding:

- David Huff addresses the Companies' experiences with smart technologies;
- Edwin R. "Ed" Staton addresses smart technology in the Companies' existing transmission system and the Companies' current plans to deploy additional economical smart elements; and
- David S. Sinclair addresses dynamic pricing and questions and concerns the Commission and any utility would have to address in considering whether to implement such rates.

Q. What is your recommendation to the Commission?

A. The Companies recommend that the Commission refrain from creating mandatory standards or requirements concerning smart metering and smart grid elements at this time. Technologies in these areas are continuing to develop and clear industry standards have not yet emerged; thus, issuing mandatory regulatory standards or requirements now could potentially be counterproductive by cutting off possible benefits from other technologies or industry standards that could emerge. The risks of technological obsolesce and incompatibility continue to be impediments to any significant implementation of this technology under current conditions. Also, the Companies' pilot programs in these areas and the experience of other utilities around the nation have shown that different customer bases and different service territories likely will require unique solutions. Therefore, the Companies recommend that Kentucky's utilities continue to investigate smart technologies and economical means to deploy them.

The Companies further recommend that the Commission make clear in this proceeding that utilities may recover smart-technology investments through tracker mechanisms, including, but not limited to, Demand-Side Management and Energy Efficiency mechanisms. This would help give utilities more clarity on options available for cost recovery when evaluating smart-technology investments.

EISA 2007 Smart Grid Information Standard

Q. What would the EISA 2007 Smart Grid Information Standard require the Companies to do?

A. The standard would require Companies to provide customers direct access to data as follows:

- Prices: Purchasers and other interested persons shall be provided with information on time-based electricity prices in the wholesale electricity market, and time-based electricity retail prices or rates that are available to the consumers.
- Usage: Purchasers shall be provided with the number of electricity units, expressed in kWh, purchased by them.
- Intervals and Projections: Updates of information on prices and usage shall be offered on a daily basis, shall include hourly price and use information, where available, and shall include a day-ahead projection of such price information to the extent available.
- Sources: Purchasers and other interested persons shall be provided annually with written information on the sources of the power provided by the utility, to the extent that it can be determined, by type of generation, including greenhouse gas emissions associated with each type of generation, for intervals during which such information is available on a cost-effective basis.
- Customer data: Customers shall be able to access their own information at any time through the internet and by other means of communication elected by the electric utility for smart grid applications. Other interested persons shall be able to access information not specific to any customer

> through the Internet. Customer-specific information shall be provided solely to that customer.

Q. What is the Companies' position on the EISA 2007 Smart Grid Information Standard?

A. In considering this or any other proposed smart-technology standard, it is important to keep in mind what the status quo is and what the costs and benefits would be to change it. Concerning the EISA 2007 Smart Grid Information Standard, the Companies already provide customers much of the information at issue:

- Prices: Customers currently know their price of electricity around the clock through the Companies' tariffs and customers' bills.
- Usage: Customers have meters on their homes and businesses that allow them to monitor their usage as often as they like, and the Companies send bills to customers every month that inform them of their usage with a comparison of their usage for the same period in the previous year.
- Sources: The Companies inform customers every month about their carbon footprint from electricity.
- Customer data: Customers can access their own historical data online around the clock.

In other words, the Companies' customers already have a wealth of data about pricing, usage, and the carbon-impact of their usage, and they can check their own account information whenever they like. Also, it is not clear that making digitally available the information that is currently in an analog form would produce net benefits, at least in the absence of a dynamic-pricing rate structure. (And as Mr. Sinclair discusses in his testimony, It is not clear that implementing a dynamic rate structure and the investing in the technology required to communicate such pricing to customers—especially hourly pricing on a day-ahead basis—will provide a net benefit.)

Finally, as Mr. Huff discusses in his testimony, the Companies' experience and the experience of other utilities is that customers tend not to respond to time-of-use pricing changes to a great extent. And even though time-of-use or dynamic pricing can cause customers to time-shift some of their energy usage, their overall energy usage tends to go up as customers take advantage of lower-priced time periods, which is counterproductive from an energy-efficiency perspective. Therefore, there appears to be no reason at this time for the Commission to adopt the EISA 2007 Smart Grid Information Standard rather, the Companies recommend that the Commission continue to monitor the development of smart technologies and standards as they continue to develop and evolve. As the current situation demonstrates, as information becomes available the Companies will continue to invest in technology to provide additional information to customers where there is demonstrated value.

<u>EISA 2007 Smart Grid Investment Standard</u>

Q. What is the EISA 2007 Smart Grid Investment Standard?

A. If implemented in Kentucky, the standard would require that, prior to undertaking investments in non-advanced grid technologies, an electric utility demonstrate that it considered an investment in a qualified Smart Grid system based on appropriate factors, including total costs, cost-effectiveness, improved reliability, security, system performance, and societal benefit.

Q. What is the Companies' position on the EISA 2007 Smart Grid Investment Standard?

A. The Companies' position has not changed from its previous statements concerning the standard. In particular, the Companies continue to believe that terms such as "smart grid," "non-advanced grid technologies," and "societal benefit" are poorly defined. Also, as the Companies stated in their joint brief with the Utility Group in Administrative Case 2008-00408:

> As a practical matter, the standard does not facially restrict itself only to the kinds of investments that would require Commission approval, i.e., the kinds of investments that would require obtaining a CPCN; thus, it is not clear whether the standard is creating a dramatically increased regulatory compliance burden or is a minor adjustment to existing regulatory requirements. Jurisdictionally, the standard appears to bring "societal benefit" into the matters the Commission may review concerning utility decision-making, which conflicts with the statutory restriction of the Commission's jurisdiction to the rates and service of public utilities, as well as the Commission's own past orders rejecting invitations to expand its jurisdiction into other matters. These practical and jurisdictional issues should be resolved before the Commission puts into effect any Smart Grid Investment Standard.
>
> These concerns and issues militate against issuing a generally applicable standard at this time, particularly because the Commission may already consider all of the criteria contained in the proposed Smart Grid Investment Standard except "societal benefit" when examining Smart Grid proposals under existing statutes or regulations.[2]

The Companies continue to believe that the best approach concerning smart-grid investments is for the Commission to consider any proposed utility investment, including grid-related investments, using the same basic test the Commission always uses; namely, will the benefits of the proposed investment exceed the costs while ensuring safe and reliable utility service? For that reason, the Companies recommend that the Commission refrain from adopting the EISA 2007 Smart Grid Investment Standard or any other similar standard at this time.

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[2] *Consideration of the New Federal Standards of the Energy Independence and Security Act of 2007*, Administrative Case No. 2008-00408, Joint Brief of Atmos Energy Corp. et al. at 11 (Jan. 13, 2012).

Q. If the Commission decided to implement a Smart Grid Investment Standard of some kind, what would the Companies recommend including or excluding from the standard?

A. If the Commission decides to implement such a standard, the Companies support including some or all of the criteria listed in the EISA 2007 Smart Grid Investment Standard except societal benefits. Social issues should be addressed in legislation by the General Assembly. As I discussed above, the Commission may, and already does, take into account total costs, cost-effectiveness, improved reliability, security, and system performance when evaluating utility proposals. Therefore, the Companies do not object in principle to incorporating such criteria into a new standard to evaluate smart-technology proposals, though the Companies do not believe a new standard is necessary. But any new standard, absent express direction by the General Assembly in the form of legislation, should exclude societal benefits for the reasons I discussed above.

<u>Joint Parties' March 25, 2011 Report</u>

Q. What is the Joint Parties' March 25, 2011 Report?

A. In response to the Commission Staff's February 19, 2012 Guidance Document in Administrative Case 2008-00408, the Companies and other jurisdictional utilities filed with the Commission on March 25, 2011 a report entitled, "Consideration of the New Federal Standards of the Energy Independence and Security Act." The report analyzed and provided recommendations on a wide range of matters related to the smart grid. The report contained four main recommendations:

> 1. The parties of record recommend that the Commission should not adopt any of the EISA 2007 standards, or any variation thereof.

> 2. Pilots and trials built to understand customer behavior (i.e., acceptance, use, sustainability of savings, etc.) and investigate emerging technology integration into existing infrastructure should be continued.
>
> 3. Customer education about the benefits of energy efficiency and specifically smart technology is critical to gaining consumer acceptance and employment of this technology. Consequently, continued and new efforts focused on customer education should be embraced by the Commission.
>
> 4. Resist the urge to implement prescriptive requirements for smart technology deployment.[3]

Q. What is the Companies' position on the Joint Parties' March 25, 2011 Report?

A. Generally, the Companies continue to support all of the recommendations of the report. But as LG&E stated in its December 21, 2012 report to the Commission in Case No. 2011-00440, the Companies plan to engage a third party to assess the maturity and value of the smart technologies for the Companies' customers.[4] The third-party study will provide the Companies and the Commission additional insight into the possible value of full-scale deployment, pilot programs, targeted deployments, and other possible strategic directions for investments in smart technologies.

The Companies will also continue to participate in groups to help develop industry standards for smart technologies and to stay abreast of other utilities' experiences with smart-technology deployments. For example, the Companies are participants in the Smart Grid Interoperability Panel ("SGIP"), a public-

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[3] *In the Matter of: Consideration of the New Federal Standards of the Energy Independence and Security Act of 2007*, Admin. Case No. 2008-00408, Consideration of the New Federal Standards of the Energy Independence and Security Act at 50 (Mar. 25, 2011).

[4] *In the Matter of: Request of Louisville Gas and Electric Company to Withdraw the Tariffs for its Responsive Pricing and Smart Metering Pilot Program*, Case No. 2011-00440, Smart Meter Update Report at 2-3 (Dec. 21, 2012).

private partnership that defines requirements for essential communication protocols and other common specifications and coordinates development of these standards by collaborating organizations. In addition, the Companies have an elected representative on the Smart Grid Implementation Methods Committee ("SGIMC") of SGIP, a working group whose mission is to identify, develop, and support mechanisms and tools for objective standards impact assessment, transition management, and technology transfer to assist in deployment of standards-based smart grid devices, systems, and infrastructure. The Companies' involvement in organizations like SGIP and the SGIMC will allow the Companies to be engaged in the standards process, and will afford the opportunity to learn from best practices of other utilities, which the Companies can share with the Commission and other Kentucky utilities.

March 25, 2011 Comments of the Attorney General and the Community Action Council

Q. What are the March 25, 2011 Comments of the Attorney General and the Community Action Council?

A. The Attorney General ("AG") and the Community Action Council for Lexington-Fayette, Bourbon, Harrison, and Nicholas Counties, Inc. ("CAC") filed comments on March 25, 2011, in Administrative Case No. 2008-00408, which the Commission incorporated into the record of this proceeding. The AG-CAC comments raise a number of issues the Companies would like to address.

Q. The AG and CAC state that smart grid deployments carry a real risk of incurring costs without equal or greater benefits to customers, so any smart grid deployments should be gradual and thoroughly analyzed to ensure net

benefits.[5] What is the Companies' view on this issue?

A. The Companies believe that smart-technology investments are not fundamentally different than any other kind of utility investment. Therefore, absent a policy decision by the General Assembly to promote this particular type of investment over other possible investments, the level of cost-benefit analysis appropriate for a proposed smart-technology investment will depend on the nature and size of the proposed investment. This is the same philosophy the Companies use when considering any investment.

Q. The AG and CAC state that smart grid deployments cannot be one-size-fits-all, and that what works in one service territory may not work in another.[6] What is the Companies' view on this issue?

A. The Companies agree with the CAC and AG. Customers, existing systems, and relevant features of service territories, including topography and customer density, vary significantly from utility to utility, and often within the service territory of a single utility. For that reason, there is no single smart-grid technology or deployment strategy that will fit every utility in Kentucky. That is one of the reasons why imposing mandatory standards or rules related to smart technologies for utilities is inadvisable, at least at this time.

Q. The AG and CAC state, "[U]tilities installing smart meters should be required to credit the estimated operational benefits against costs passed on

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[5] *In the Matter of: Consideration of the New Federal Standards of the Energy Independence and Security Act of 2007*, Admin. Case No. 2008-00408, Joint Comments of Intervenors Community Action Council and Attorney General at 1 (Mar. 25, 2011).
[6] *Id.*

to consumers."[7] The CAC and AG further express a preference for such crediting to be provided to customers in the form of bill credits in certain amounts.[8] What is the Companies' view on this issue?

A. The Companies respectfully disagree with the AG and CAC on this issue. If a rigorous cost-benefit analysis shows net benefits to customers from a particular program or deployment and the Commission approves the program or deployment, nothing further should be required. That is the same standard and approach applied to every other utility infrastructure investment, and there is no reason to change it merely because a proposed investment relates to smart technologies. Presumably, the Commission will not approve a program or deployment it does not believe is reasonably likely to produce net benefits, which is the same protection customers have for all other utility investments.

That notwithstanding, the Companies are not advocating for double-recovery; if a utility were recovering through a tracker mechanism the cost of a smart-technology investment that would result in the elimination or reduction of a clearly identifiable cost that was previously included in base rates, the elimination or reduction should be adjusted accordingly in the tracker mechanism. This approach is consistent with the Companies' long-standing practice and the Commission's equally long-standing policy. But the AG and CAC appear to be taking the position that customers should receive direct bill credits for projected net benefits not necessarily directly linked to eliminating clearly identifiable costs in a mechanism or otherwise; that is what the Companies oppose and is

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[7] *Id.* at 2.
[8] Id. at 2-3.

unprecedented.

Therefore, the Companies oppose any proposal to impose customer credits related to smart-technology programs or deployments. The Companies welcome a thorough, reasonable review for any of their proposals. But there is no reason to alter the long-established review approach for utility investments just because a particular investment relates to smart technologies.

Q. The AG and CAC state, "[T]he Joint Intervenors recommend: (a) Proposed investments in smart metering and SG technologies should be justified by a robust cost-benefit analysis; (b) the implementation of smart metering and SG investments should be accompanied by measurable and enforceable performance metrics; and (c) SM and SG investments must be subject to prudency reviews and audits to determine if the consumer benefits have been delivered as promised."[9] What is the Companies' view on these issues?

A. The Companies agree that investments in smart technologies should be supported by robust cost-benefit analysis and subject to thorough prudence reviews. As I stated above, that approach is consistent with the Commission's reviews of all proposed utility investments, and the Companies welcome it.

Turning to the AG and CAC's next recommendation, the Companies agree in principle that smart technology implementations should have performance metrics to enable the Commission and others to determine if an implementation is performing as expected. But the specific metrics should be determined on a case-by-case basis; as the Companies and other utilities have stated previously, each

[9] *Id.* at 3.

utility is different, and so will be each smart-technology implementation. Therefore, each implementation will likely require its own set of performance metrics.

Finally, the Companies agree with the prudency principle the AG and CAC state in their recommendation that "SM and SG investments must be subject to prudency reviews and audits to determine if the consumer benefits have been delivered as promised." But prudency is a before-the-fact determination, not one made with the light of hindsight. If a utility proposes and Commission approves a smart-technology deployment, and if the utility then performs as proposed concerning implementation and cost, the utility should not be exposed to a disallowance risk or other financial penalty. Again, there is nothing about smart-technology investments that makes them different from any other utility investment, and there is no reason to make them more financially precarious for utilities.

Q. The AG and CAC state that utilities should recover smart-technology investments through base rates, not a tracker, to prevent "full-tilt" investment.[10] What is the Companies' view on this issue?

A. The Companies respectfully disagree with the AG and CAC; the Commission should not restrict smart-technology-investment recovery strictly to base rates. Indeed, such a restriction would act as a disincentive to utilities to invest in smart technologies due to the regulatory lag associated with base-rate cases. It would also remove the statutory incentive structures of KRS 278.285, which specifically

[10] *Id.* at 4.

attach to Demand-Side Management and Energy Efficiency ("DSM-EE") programs and investments, including smart-technology investments. Indeed, clarifying that DSM-EE tracker recovery would be available for prudent smart-technology investments would likely be a strong incentive to utilities to search for such investments.

Q. The AG and CAC state that stranded costs should be avoided in any smart-technology deployment, and that any stranded costs must be exceeded by benefits.[11] What is the Companies' view on this issue?

A. Any smart-technology deployment must allow the deploying utility to recover any remaining capital investment made in the older technologies being replaced. But the cost-benefit analysis of a proposed smart-technology deployment must include the cost to customers of the older technology being replaced.

Q. The AG and CAC state that time-of-use rates should always be optional, never mandatory, at least for any customer where a new meter to replace an existing functional meter would be required.[12] This is CAC-AG's view even though many customers would have to take service under time-of-use rates to maximize savings smart technologies could provide.[13] What is the Companies' view on this issue?

A. No customer should be obligated to be on a dynamic rate, as opposed to a pure time-of-use rate, without the means to know and adjust to the changing rate; however, if a utility provides its customers appropriate metering and other means of adjusting to dynamic prices, the utility should be able to make a dynamic rate

[11] *Id.* at 4.
[12] *Id.* at 5.
[13] *Id.* at 5.

mandatory, though perhaps with exceptions for certain situations, e.g., customers with medical equipment that must operate at all times.

But what kind of meter a particular customer should have is a separate and distinct issue. The Companies believe a customer should receive accurate price signals to the maximum extent justified by average net benefits. That is why, for example, the Companies' Power Service customers have demand meters but Residential Service and General Service customers generally do not. This is the same approach to metering the Companies would use for any large-scale smart-meter deployment.

Q. The AG and CAC state that, in lieu of time-of-use rates, utilities should focus on educating customers about traditional conservation approaches and available Demand-Side Management and Energy Efficiency ("DSM-EE") programs.[14] What is the Companies' view on this issue?

A. The Companies are leaders in DSM-EE and customer education, and will continue to be, as Mr. Huff addresses in greater detail in his testimony. But smart-technology deployments must be judged on their own merits. Indeed, they may provide net benefits beyond those achievable though traditional conservation and other non-smart-technology DSM-EE efforts.

Q. The AG and CAC state that utilities should keep fixed charges low and usage charges relatively higher to encourage conservation.[15] What is the Companies' view on this issue?

A. The Companies respectfully disagree with the AG and CAC on this issue. As a

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[14] *Id.* at 6.
[15] *Id.* at 6.

general rule, utilities should provide customers price signals that accurately reflect the costs customers create. Sound economic principles support this approach. That is also the approach the Companies have taken in their rate cases, which have progressively, albeit gradually, moved toward customer, demand, and energy charges for all rate classes that reflect the classes' costs of service.

Q. The AG and CAC state that utilities should expand time-of-use rate offerings to commercial and industrial customers.[16] What is the Companies' view on this issue?

A. The Companies already have time-of-use rates for commercial and industrial customers. Each utility should implement rates appropriate for their customers.

Q. The AG and CAC state that remote disconnection must not interfere with traditional billing and dispute rights, and that remote disconnection may jeopardize effectiveness of low-income assistance.[17] What is the Companies' view on these issues?

A. The Companies agree that any smart-meter deployment that provides remote disconnection capability must not impair customers' rights, and that utilities should consider possible risks to the effectiveness of low-income assistance in any smart-technology proposal involving remote disconnection.

Q. The AG and CAC state that the privacy of customer data is paramount, so utilities should follow strict cyber-security and privacy protocols.[18] What is the Companies' view on this issue?

A. The Companies agree generally with the AG and CAC, and are participating in

[16] *Id.* at 7.
[17] *Id.* at 7.
[18] *Id.* at 8-11.

efforts to develop such protocols.

On one point, however, the Companies disagree, namely the AG and CAC proposal to require utilities to obtain written permission from a customer before divulging any of the customer's information to a third party.[19] This goes too far; the Companies use third parties to perform a variety of tasks, including service restoration and meter reading. To the extent consistent with applicable privacy laws, utilities must be able to disclose customer data to reputable third parties for limited purposes without prior written consent.[20]

Smart Grid Roadmap

Q. What is the Smart Grid Roadmap?

A. The Smart Grid Roadmap is the final product of the Kentucky Smart Grid Roadmap Initiative ("Roadmap Initiative"). The Roadmap Initiative brought together utilities, academics, regulators, and other stakeholders, including the Companies, to discuss and make recommendations concerning the future of the smart grid in Kentucky, including a broad time-line for smart-grid implementations in the Commonwealth. The Roadmap Initiative produced a final Smart Grid Roadmap on September 18, 2012.

The Companies appreciated being able to participate in the Roadmap Initiative process, and believe the Roadmap provides helpful general information for considering possible future smart grid deployments in Kentucky. But they fundamentally disagree with placing the development and deployment of smart technologies on an essentially arbitrary schedule; rather, utilities should propose,

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[19] *Id.* at 8.

[20] Also, a written-consent requirement that required an actual paper signature would unnecessarily increase costs. Any consent requirement should permit electronic consents, as well.

and the Commission should consider, smart-technology investments as they become prudent on a utility-by-utility basis.

Q. What are the Companies' views on the Roadmap's six high-level "Key Recommendations"?[21]

A. The Roadmap's six high-level "Key Recommendations" are below, each followed by the Companies' view.

1. "Encourage investments focused on future-proof data network architecture, preferably one that is Internet Protocol based."

The Companies believe any communications network a utility deploys should be as "future-proof" as possible. But it is inadvisable to require, or even prefer, a particular communication protocol. Internet Protocol has some advantages, including its relative ubiquity. But it also has disadvantages, including potential security vulnerabilities.

2. "Creation of an official Kentucky Smart Grid Council composed of academic, industrial, governmental, and stakeholder members."

Without more specifics than the Roadmap provides, the Companies cannot take a position on the advisability of creating such a council. The Companies would likely support such a group if its purpose were to research and identify possible opportunities for economical smart-technology investments for utilities to consider, but not if the group's purpose were to create or propose mandatory standards that might inhibit rather than support innovation.

3. "Funding of energy/technology policy and technology development

[21] Roadmap at 7.

research within the state university system."

Without more specifics than the Roadmap provides, the Companies cannot take a position on the advisability of such funding. In particular, the sources and purposes of the funding and research would have to be better defined before the Companies could take a position on such a proposal.

4. "Creation of regulatory mechanisms to foster increased investments in both cost-effective demand response programs and energy efficiency technologies such as Volt/VAR."

The Companies believe that KRS 278.285, as interpreted and implemented by the Commission, provides adequate incentives for utilities to deploy cost-effective DSM-EE programs. The Companies have a robust portfolio of DSM-EE programs and are regularly looking for new ways to improve and expand their cost-effective DSM-EE offerings. That notwithstanding, as I stated earlier in my testimony, the Companies recommend that the Commission make clear in this proceeding that smart-technology investments may be recovered through utilities' DSM-EE cost-recovery mechanisms.

5. "Allow for real-time and multi-tariff pricing."

The Companies believe this ability already exists. Utilities may propose, and the Commission may approve, any rate structure appropriate for a rate class. To the extent new investments would be necessary to support a new rate structure, as they would be for dynamic pricing, the Commission would perform a prudence review of the investment. The Companies believe this process is adequate and does not require change.

6. "Establishment of clear metrics to establish priorities and goals for Smart Grid deployments in KY."

Each utility's smart-technology deployments, if any, should be value-driven, not responsive to an arbitrary timetable or metrics detached from the net benefits or yet to be confirmed industry-standards, if any, such deployments might provide.

Q. The Roadmap makes certain Key Recommendations concerning Advanced Metering Infrastructure ("AMI"), which relate primarily to implementing dynamic pricing and enabling automated responses to such pricing.[22] What are the Companies' views on these recommendations?

A. As Mr. Sinclair discusses in his testimony, it is not clear there are any net benefits to be gained from dynamic pricing for retail customers, particularly hourly pricing forecasted on a day-ahead basis, which the EISA 2007 Smart Grid Information Standard would require. Therefore, the Companies do not support any recommendation that would result in a requirement for AMI to support dynamic pricing.

Q. Concerning Advanced Distribution Operations ("ADO"), the Roadmap states, "Kentucky regulations should therefore ensure that saving energy on the 'customer side' of the meter through conservation programs such as CVR Volt/VAR does not reduce utility revenue. Additionally, advanced distribution system modeling and analysis is not being utilized in Kentucky. It is the recommendation of the KSGRI that such tools be utilized in all

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[22] *Id.* at 23-24.

future resource planning in the state, particularly to evaluate the benefits of energy efficiency and renewable energy technologies against the addition of generation capacity from fuel-based sources."[23] What are the Companies' views on these recommendations?

A. The Companies agree with the recommendation concerning conservation programs' possible adverse effects on utility revenue. One way to prevent such adverse effects is to use existing DSM-EE recovery mechanisms for such conservation programs, ensuring recovery of lost revenues.

With respect to the recommendation concerning additional analysis for energy efficiency and renewable-energy technologies, the Companies have commissioned a thorough DSM-EE potential study in their footprint, and have consistently reviewed renewable proposals provided in response to the Companies' generation RFPs. The Companies do not believe additional requirements regarding such analyses are necessary.

Q. With respect to Advanced Transmission Operations ("ATO"), the Roadmap makes the following recommendations: "The dynamic thermal rating application may be utilized by transmission operators in Kentucky to increase the utilization of existing transmission assets without significant investment to build additional lines. More advanced fault location and restoration systems can be employed to protect the system from disturbances, and reduce outage time. Synchrophasor technology using PMUs may be deployed to provide transmission operators with improved

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[23] *Id.* at 28.

wide area grid monitoring and awareness, and may help prevent large-scale blackouts along with the SCADA system."[24] What are the Companies' views concerning these recommendations?

A. As Mr. Staton discusses, the Companies' transmission grid is already relatively "smart" and is getting smarter. For example, the Companies use thermal ratings and are replacing existing relays with Schweitzer relays.

Q. The Roadmap makes the following recommendations concerning Advanced Asset Management ("AAM"): "To enable AAM, the KSGRI recommends increased deployment of sensors that provide the operational and health status of all important assets, and the installation of analytical tools and capabilities to better optimize system and human assets. It is the opinion of the KSGRI that the wide area communication infrastructure necessary to enable ubiquitous AAM throughout Kentucky should be considered in any business and/or rate case related to any or all of the following: AMI, ADO, and ATO."[25] What are the Companies' views on these recommendations?

A. As Mr. Staton discusses in his testimony, the Companies deploy SCADA and other smart components that contribute to AAM.

Q. Concerning Distributed Energy Resources ("DERs"), the Roadmap recommends: (1) DERs be considered in all generating capacity increase cases; (2) state should encourage utilities and customers to deploy DERs, and should consider a customer incentive programs for DERs; (3) supporting DER integration should be considered in any smart-grid case before the

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[24] *Id.* at 31.
[25] *Id.* at 33.

Commission; and (4) state should clarify regulatory status of DERs, and should consider implementing a tax credit for DER deployment.[26] **What are the Companies' views on these recommendations?**

A. With respect to the first recommendation, the Companies already consider small generating units and power-purchase agreements when studying possible capacity additions. The Companies seek proposals from a wide variety of potential sources, including renewable sources, to ensure their customers receive the best value to meet their energy needs.

Concerning the Roadmap's other DER-related recommendations, the Companies do not object to customer-owned DERs; indeed, the Companies have tariff provisions to address them, e.g., the Companies' net-metering tariff provisions. But providing tax or other incentives to customers to install DERs does not appear to have a root in net benefits, but rather an arbitrary preference for customer-owned DERs, which is not economically optimal.

Finally, customers who own DERs must pay the full costs of any supplemental or back-up service they require from utilities. That is not currently true of some net metering customers due to the statutory restrictions of KRS 278.466. Though the Companies do not oppose customer-owned DERs, such customers should pay for the benefits they receive from the utility's system; otherwise, the utility's other customers would effectively subsidize DER-owning customers.

Q. Finally, with respect to Customer Education ("CE") the Roadmap

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[26] *Id.* at 36.

recommends that utilities work to design and deliver CE programs to ensure customers can make the most of smart infrastructure.[27] **What is the Companies' position concerning this issue?**

A. The Companies agree with the Roadmap's recommendation. The Companies have demonstrated their commitment to CE through their DSM-EE programs, material available on the web, bill inserts, advertising, and other means. The Companies would use CE to ensure that any customer-facing smart-technology deployments created maximal net benefits.

Dynamic Pricing

Q. The Commission's DATE Order in this proceeding directs utilities to provide testimony on dynamic pricing. What is the Companies view on dynamic pricing?

A. The Companies have some experience offering dynamic pricing rate structures. As Mr. Huff's testimony discusses, LG&E's Residential Responsive Pricing ("RRP") and General Responsive Pricing ("GRP") pilot programs, which used time-of-use rates with a dynamic component, did not produce an average net decrease in energy consumption, but rather an increase. Some time-shifting of demand occurred, and customers reported generally feeling more empowered to make decisions about energy consumption.

The Companies did offer a truly dynamic, real-time-pricing rate to large commercial and industrial customers for two years, from December 1, 2008, through November 30, 2010 (the rates stayed in the Companies' tariffs longer

[27] *Id.* at 37-38.

than that, but no new customers were permitted to join after November 30, 2010). During the entire two-year offering, no customers chose to take service under the rate. There could be many reasons why customers chose not to participate in the Companies' truly dynamic rate offerings, but one may be what Mr. Sinclair discusses in his testimony, namely that it is not obvious that dynamic pricing is perceived by customers to offer them an economic advantage as compared to more traditional rate designs.

As Mr. Sinclair further discusses, there are many unanswered questions about dynamic pricing that any utility would need to answer before proposing such a program.

Because there are so many variables involved in creating a dynamic pricing program, the Companies do not recommend issuing a standard or rule regarding dynamic pricing at this time; rather, utilities desiring to implement such programs should bring them to the Commission for consideration on a case-by-case basis.

<u>Recommendation and Conclusion</u>

Q. What are the Companies' recommendations to the Commission in this proceeding?

A. The Companies recommend that the Commission refrain from putting in place any mandatory requirements concerning smart technologies or any of the other topics at issue in this proceeding. The technology and industry standards in this area are still very much in flux, though they are maturing and may coalesce in the near- to medium-term. For now, the Companies recommend that the Commission and all the participants in this proceeding use this opportunity to share views and gather information from each other while LG&E and KU continue to investigate smart technologies and economic means to deploy them for our customers.

The Companies further recommend that the Commission make clear in its final order in this proceeding that utilities may recover smart-technology investments through tracker mechanisms, including, but not limited to, Demand-Side Management and Energy Efficiency mechanisms. This would help give utilities more clarity on cost recovery options when evaluating smart-technology investments.

Q. Does this conclude your testimony?

A. Yes.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **Lonnie E. Bellar**, being duly sworn, deposes and says that he is Vice President, State Regulation and Rates for Louisville Gas and Electric Company and Kentucky Utilities Company and an employee of LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

Lonnie E. Bellar
Lonnie E. Bellar

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 24TH day of January 2013.

(SEAL)
Notary Public

My Commission Expires:

7/21/2015

APPENDIX A

Lonnie E. Bellar
LG&E and KU Services Company
220 West Main Street
Louisville, Kentucky 40202

Education

Bachelors in Electrical Engineering;
University of Kentucky, May 1987
Bachelors in Engineering Arts;
Georgetown College, May 1987
E.ON Academy, Intercultural Effectiveness Program: 2002-2003
E.ON Finance, Harvard Business School: 2003
E.ON Executive Pool: 2003-2007
E.ON Executive Program, Harvard Business School: 2006
E.ON Academy, Personal Awareness and Impact: 2006

Professional Experience

LG&E and KU Energy LLC

Vice President, State Regulation and Rates	Nov. 2010 – Present

E.ON U.S. LLC

Vice President, State Regulation and Rates	Aug. 2007 – Nov. 2010
Director, Transmission	Sept. 2006 – Aug. 2007
Director, Financial Planning and Controlling	April 2005 – Sept. 2006
General Manager, Cane Run, Ohio Falls and Combustion Turbines	Feb. 2003 – April 2005
Director, Generation Services	Feb. 2000 – Feb. 2003
Manager, Generation Systems Planning	Sept. 1998 – Feb. 2000
Group Leader, Generation Planning and Sales Support	May 1998 – Sept. 1998

Kentucky Utilities Company

Manager, Generation Planning	Sept. 1995 – May 1998
Supervisor, Generation Planning	Jan. 1993 – Sept. 1995
Technical Engineer I, II and Senior, Generation System Planning	May 1987 – Jan. 1993

Professional Memberships

IEEE

Civic Activities

E.ON U.S. Power of One Co-Chair – 2007
Louisville Science Center – Board of Directors – 2008
Metro United Way Campaign – 2008
UK College of Engineering Advisory Board – 2009

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

CONSIDERATION OF THE IMPLEMENTATION OF SMART GRID AND SMART METER TECHNOLOGIES	)))	CASE NO. 2012-00428

TESTIMONY OF
DAVID E. HUFF
DIRECTOR OF CUSTOMER ENERGY EFFICIENCY AND SMART GRID STRATEGY
KENTUCKY UTILITIES COMPANY AND
LOUISVILLE GAS AND ELECTRIC COMPANY

Filed: January 28, 2013

Q. Please state your name, position, and business address.

A. My name is David E. Huff. I am the Director of Customer Energy Efficiency and Smart Grid Strategy for Louisville Gas and Electric Company ("LG&E") and Kentucky Utilities Company ("KU") (collectively, "Companies") and an employee of LG&E and KU Services Company, which provides services to the Companies. My business address is 220 West Main Street, Louisville, Kentucky.

Q. Have you previously testified before this Commission?

A. Yes, I have testified in proceedings before the Commission. Most recently, I testified in the Companies' 2011 DSM Case.[1]

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to address the results of the Companies' previous Smart Meter Pilot, review the maturation process of Smart Grid and Smart Meter technology, address the Companies' ongoing study of this subject, and the role of customer education.

2007 – 2011 Smart Meter Pilot Program

Q. Please describe the Smart Meter Pilot Program and associated results.[2]

A. The Smart Meter Pilot incorporated a price-responsive rate structure with time-of-use and real-time (critical peak pricing) components. The time-of-use component provided known rates for known periods that applied about 99 percent of the time. The weekday and weekend hours were divided into three time-of-use periods, each with different rates ranging from low to medium to high. The real-time component had a published rate that was approximately five times higher than the

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1 See PSC Case No. 2011-00134

2 March 22, 2012 Commission Order Case 2011-00440.

standard residential tariff rate during hours of critical peak period generation. LG&E limited the critical peak pricing period to no more than 80 hours per year (approximately one percent of the time) and participants received notice at least one-half hour before critical peak pricing began in order to shift usage.

LG&E installed smart meters equipped with electronic cards that provided two-way communication. The smart meters allowed LG&E to record and transmit a customer's usage during different pricing periods. LG&E also installed energy-use display equipment (in-home monitors) to allow participants to receive the pricing signal from LG&E indicating the rate that was currently applicable. These in-home monitors also provided the half-hour notice of the critical peak pricing period. Finally, LG&E equipped some participants with programmable thermostats to enable them to maximize energy savings and allow their ability to shift any non-critical load to non-critical time periods.

LG&E drew its participants and a control group on a voluntary basis from six metering routes (about 2,000 customers). LG&E's plan was to draw up to 150 Smart Meter Pilot participants from these six meter reading routes. The remainder of the customers was considered as a control group that received various levels of equipment but were not direct participants in the pilot. Members of the control group were not on the pilot program tariffs.

LG&E found that participants in the Smart Meter Pilot consistently shifted load from higher-priced weekday hours to lower-priced off-peak and weekend time periods; the participants overall used more energy than non-participants. In addition, LG&E noticed there was a "bounce back" effect following critical peak pricing events where participants began overriding thermostat settings or using their major appliances sooner than expected. As a result, there was a savings of up to 1 kW per participant, but the bounce back effect resulted in a peak that was up to 0.8 kW higher than the pre-event peak.

The Companies' experience in the pilot program was consistent with the experience of other utilities, namely that customers tend not to respond to time-of-use pricing changes to a great extent and their overall energy usage tends to go up as customers take advantage of lower-priced time periods, which is counterproductive from an energy-efficiency perspective.

LG&E could not fully test and evaluate two-way communications because fully embedded systems were not readily available or economically feasible during the Smart Meter Pilot period. LG&E stated that the hardware and software employed had become outdated and limited in performance compared to more recently available technology. In addition, the third-party vendor responsible for meter data management services determined that it would no longer support the meter data platform.

The Smart Meter Pilot was designed to provide residential and commercial customers a variable rate schedule for their energy usage and to determine whether customers would change their electric usage behavior if they were provided either economic incentives or additional information related to their energy cost. LG&E reported that the results indicated there were load reductions, shifts in peak usage to off-peak periods, but that customers receiving critical peak pricing signals created higher peaks and consumed more energy.

In its Final Report, LG&E stated that it believes that pilots and trials designed to understand customer behavior (i.e., acceptance, use, sustainability of savings, etc.) and investigate emerging technology integration into existing system infrastructure should be continued. LG&E stated that it planned to continue its dynamic pricing and smart metering efforts while developing and refining a number of issues and plans to ensure that deployment does not outpace technology.

The Smart Meter Pilot Program confirms the need to carefully consider and develop the criteria for the new technology and its application to customer behavior. The risks of obsolesce in and incompatibility of technology are significant barriers to any full scale implementation of smart grid investments at this time.

<u>Smart Meter Review Strategy</u>

Q. How would the Companies characterize the maturation process of Smart Grid and Smart Meter technology?

A. Federal stimulus funding created a number of projects, which are creating the maturation of Smart Meter technology, increasing production of Smart Meters and Smart Grid Components to meet the needs of utility projects, and driving the potential for the marginal costs of these technologies to decline.[3]

Given the general trend of declining Smart Grid Component costs, as the

[3] Electric Power Research Institute Report, "Estimating the Costs and Benefits of the Smart Grid", March 29, 2011, http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000000001022519 page 3-5.

market matures, it is important to periodically perform a comprehensive review of Smart Metering and dynamic pricing project economics to evaluate changes, the relation of costs to benefits, and guide utility decisions.

Q. Are the Companies reviewing Smart Meter and dynamic pricing offerings?

A. Yes. To develop a practical business case to determine whether another pilot program should be undertaken and if so, the scope, scale and focus, a comprehensive approach to deal with the variables of customer acceptance, customer education, financial, technology, and rate structure, is essential. Customers are one of the central focal points of Smart Meter or dynamic pricing investments. As the market matures, technology converges on a set of standards, production increases to meet demand, and competition among suppliers should decrease the costs. With time, this may result in the customer and utility benefits justifying the investment. However, under present circumstances, the identification of market maturity, economic evaluation, and customer acceptance can be a difficult task.

Q. What is the status of reviewing and refining the Companies' Smart Grid strategy?

A. The Companies believe that continuing research and refining of smart grid strategy is needed prior to significant deployments. To assist the Companies with additional information, we plan to engage a third party to assess the maturity and value of the technology specifically for the Companies' customers. Specifically the study would seek to:

1) Determine customer value and overall impact on energy efficiency through understanding customer perspectives and acceptance of advanced meter technology and dynamic pricing offers.
2) Develop an assessment of cost and capabilities associated with investing in new technologies on a full-scale, through pilot or targeted deployments, or other strategic direction.
3) Assess the cost and benefits of integrating new technology with existing systems and the Companies' current IT infrastructure.
4) Quantify the risk associated with investing while technology continues to emerge in metering, communications, electric distribution, and data management systems.

It is anticipated that this assessment will be completed by year end. However, the comprehensive assessment can provide both the Companies and the Commission additional insight into the value of full-scale deployment, smaller scale pilots, targeted deployments, or other strategic direction.

Customer Education

Q. What is the importance of customer education with regard to Smart Meter?

A. Customer education about the benefits of energy efficiency and specifically smart technology is critical to gaining consumer acceptance and employment of technology.

Should any decisions be made to deploy smart technology requiring customer engagement, the Companies would use a similar approach to the educational process utilized for Customer Energy Efficiency. All of the customer education efforts provided through the Customer Energy Efficiency Department are used to enhance customer awareness of energy efficiency, improve customer understanding of program benefits, encourage wise energy use and compel customers to participate in Demand Side Management/Energy Efficiency programs. Customer education allows the Companies to inform consumers that energy efficiency initiatives can help support customers to make sound energy-use decisions, increase control over energy bills and empower them to actively manage their energy usage.

As a result of customer education efforts, customer engagement in energy efficiency programming provides a reduction in energy consumption, allowing all customers to benefit from the delayed need for the construction of additional generation assets.

Q. Does this conclude your testimony?

A. Yes.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **David E. Huff**, being duly sworn, deposes and says that he is Director of Customer Energy Efficiency & Smart Grid Strategy for Louisville Gas and Electric Company and Kentucky Utilities Company and an employee of LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

David E. Huff

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 24TH day of January 2013.

(SEAL)
Notary Public

My Commission Expires:

7/21/2015

APPENDIX A

David E. Huff
LG&E and KU Energy LLC
220 West Main Street
Louisville, Kentucky 40202

Education

MBA, Indiana University
BSME, Rose-Hulman Institute of Technology

Professional Experience

Louisville Gas and Electric and Kentucky Utilities	
Director, Customer Energy Efficiency and Smart Grid Strategy	March 2010 - Present
Director, Distribution Operations	March 2003 – March 2010
LG&E Energy	
Director, Revenue Collection Process	January 2000 – March 2003
Louisville Gas and Electric	
Director, Gas Operations Support &Interim Mktg Director	June 1997 – January 2000
Wholesale Excellence Team Leader	November 1995 – June 1997
Division Manager – Trimble County Station	July 1994 – November 1995
Operations Manager – Mill Creek Station	January 1992 – July 1994
Mechanical Engineer	1983 - 1992

Professional Memberships

Registered Professional Engineer – Kentucky
Kentucky Clean Fuels Coalition – Board Member
University of Louisville Conn Center for Renewable Energy Research -- Technical Advisory Board Member
University of Louisville Speed School of Engineering – Advisory Board Member of Electric & Computer Engineering Department
E-Source DSM Executive Council Member

Civic Activities

Boy Scouts of America Executive Committee Member and Volunteer – Lincoln Heritage Council
Past Project WARM Board Member
Committee Member of Boy Scout Troop 15
Eagle Scout

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

CONSIDERATION OF THE IMPLEMENTATION OF SMART GRID AND SMART METER TECHNOLOGIES	)))	CASE NO. 2012-00428

TESTIMONY OF
EDWIN R. "ED" STATON
VICE PRESIDENT, TRANSMISSION
KENTUCKY UTILITIES COMPANY AND
LOUISVILLE GAS AND ELECTRIC COMPANY

Filed: January 28, 2013

Q. Please state your name and business address.

A. My name is Edwin R. "Ed" Staton. I am the Vice President of Transmission for Kentucky Utilities Company ("KU") and Louisville Gas and Electric Company ("LG&E"), and I am an employee of LG&E and KU Services Company, which provides services to LG&E and KU (collectively "the Companies"). My business address is 220 West Main Street, Louisville, Kentucky 40202. A complete statement of my education and work experience is attached to this testimony as Appendix A.

Q. Have you previously testified before this Commission?

A. Yes. I testified most recently before the Commission in the proceeding concerning East Kentucky Power Cooperative, Inc.'s application to join the PJM Interconnection, LLC as a full member.[1]

Q. What is the purpose of your testimony in these proceedings?

A. The purpose of my testimony is to address smart technology in the Companies' existing transmission system and the Companies' current plans to deploy additional economical smart elements.

Q. How are smart-technology deployments in transmission systems different than other kinds of smart-technology deployments?

A. Smart-technology deployments in a transmission system typically have fundamentally different purposes than those implemented in distribution systems or at the customer level. The primary goals of transmission-system deployments are maintaining or improving system efficiency, reliability, or security. Although

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[1] *In the Matter of: Application of East Kentucky Power Cooperative, Inc. to Transfer Functional Control of Transmission Certain Facilities to PJM Interconnection, LLC*, Case No. 2012-00169, Testimony of Edwin R. "Ed" Staton (Oct. 1, 2012).

these aims are not necessarily absent from distribution or customer-level deployments, the aims of such deployments typically are to provide customers additional data to make more informed consumption decisions (including dynamic pricing), to enable microgrids or distributed generation, to increase the efficiency of utility billing or service operations, or to improve distribution operations, such as voltage maintenance. Because of these fundamentally different goals, the technologies and criteria for evaluating the technologies differ. For example, as I explain further below, transmission deployments must account for security concerns that distribution and customer-level deployments do not, such as cyber-attacks and Critical Infrastructure Protection ("CIP") issues.

Q. How have the Companies deployed smart technologies in their transmission system?

A. The Companies have already deployed smart technologies in a number of ways in their transmission system. In that sense, the Companies' grid is already relatively "smart."

First, the Companies have deployed Supervisory Control and Data Acquisition ("SCADA") elements throughout their distribution and transmission networks for a number of years. These systems give the Companies visibility throughout their transmission system to monitor element performance and contingency conditions.

Second, the Companies are deploying digital relays throughout their transmission system for new projects, replacement of existing control house facilities, and as existing relays fail. Use of these microprocessor-based relays provides numerous benefits over the traditional electromechanical relays, including capture of event data which aids in the root cause analysis, and identification of possible hidden or contributing causes. These relays also provide numerous functions within a single box, replacing up to nine discrete devices with a single relay.

Third, the Companies use local substation networks. If interconnected in the future, these networks can provide automation and efficiency gains through remote access that can allow for gathering detailed event data remotely, querying and updating relay settings remotely, monitoring the status of the system and equipment in greater detail, and gathering and distributing Synchrophasor data. (The Companies have not yet interconnected these networks due to cyber-security concerns. The Companies are evaluating processes and technology available to ensure that Bulk Electric System ("BES") cyber assets remain protected from cyber-security exposure and while regulations around Critical Infrastructure Protection continue to evolve.)

Fourth, the Companies have also deployed communications processors throughout their transmission system.

For new projects and existing control house upgrades, the Companies are implementing these new technologies through the use of drop-in control houses that are built off-site with the new technologies pre-installed and wired, which enables the Companies to install, test, and commission new equipment in a relatively short time frame, reducing system impacts.

Q. What are the Companies' plans for deploying additional smart elements in their transmission system?

A. The Companies will continue to deploy smart technologies in their transmission grid in the manner and for the reasons I described above.

Q. Are there costs that can be easy to overlook when considering investments in smart technology?

A. Yes, there are additional potential costs concerning possible smart-technology deployments that are easy to overlook but must be taken into account, particularly in transmission-related deployments. First, because of smart elements' reliance on expanding fiber and communications infrastructure and technical complexity, restoration of service following storms or other failures is not limited only to the traditional transmission assets and can add time for service restoration, which is a real cost, as well as the often-higher-cost labor required to replace such technology that may also be damaged. Second, as digital technologies are further deployed, the resulting expanded reliance on smart technologies can exacerbate problems when communications or other systems fail. Third, the required communication between these components inherently adds an additional cyber security risk that must be adequately mitigated and constantly maintained before interconnection is implemented.

Q. Does this conclude your testimony?

A. Yes.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) **SS:**
COUNTY OF JEFFERSON)

The undersigned, **Edwin R. Staton**, being duly sworn, deposes and says that he is Vice President, Transmission for Louisville Gas and Electric Company and Kentucky Utilities Company and an employee of LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

Edwin R. Staton

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 22ND day of January 2013.

(SEAL)
Notary Public

My Commission Expires:

7/21/2015

APPENDIX A

Edwin R. "Ed" Staton
Vice President, Transmission
LG&E and KU Energy LLC
220 West Main Street
Louisville, Kentucky40202

Work History

Vice President, Transmission –Kentucky Utilities Company and Louisville Gas and Electric Company, Louisville, Ky

Director Transmission –LG&E and KU Services Company, Louisville, Ky

Director of Distribution Operations – Kentucky Utilities Company, Lexington, Ky.

Manager of Distribution Operations – Auburndale Operations Center, Louisville Gas & Electric Company

District Manager – Kentucky Utilities Co. - Elizabethtown, Ky.

Local Service Manager – Kentucky Utilities Co. – Eddyville, Ky.

Line Technician/Service Technician – Kentucky Utilities Co. – Morganfield, Ky.

Education

Diploma – Tates Creek High School, Lexington, Ky.

Associate Degree – Business Management, University of Kentucky – Henderson Community College, Henderson, Ky.

Bachelor of Science Degree – Business Administration (minor in Accounting), - University of Southern Indiana, Evansville, Indiana

Master of Business Administration – Western Kentucky University, Bowling Green, Ky.

Vocational Training

Kentucky Institute for Economic Development

Public Utilities Regulations Guide

Gas Distribution Operations – Institute of Gas Technology, Des Plains, Ill.

STATON APPENDIX A CONTINUED

E.ON Academy - International Management Program – IMD (International Institute for Management Development), Lausanne, Switzerland

M.I.T. Sloan School of Management, Executive Program in Corporate Strategy, Boston, Mass.

Community Service

• President – Lyon Co. Chamber of Commerce	1996-1997
• Co-Chairman – Eddyville Industrial Foundation	1997-1998
• Board member – Elizabethtown Chamber of Commerce	2000
• Member – Larue Co. Industrial Foundation	1999-2003
• Member – Elizabethtown luncheon Rotary Club	1999-2000
• Member – Kentucky Industrial Development Council	1996-present
• Junior Achievement:	
Classroom instructor	
Coral Ridge Elementary School, Louisville, Ky.	2001-2002
• Board member – Junior Achievement of the Bluegrass	2007-present
• Junior Achievement:	
Classroom instructor	
Tates Creek Middle School, Lexington, Ky.	2008-present

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

CONSIDERATION OF THE IMPLEMENTATION OF SMART GRID AND SMART METER TECHNOLOGIES	)))	**CASE NO. 2012-00428**

TESTIMONY OF
DAVID S. SINCLAIR
VICE PRESIDENT, ENERGY SUPPLY AND ANALYSIS
KENTUCKY UTILITIES COMPANY AND
LOUISVILLE GAS AND ELECTRIC COMPANY

Filed: January 28, 2013

Q. Please state your name, position, and business address.

A. My name is David S. Sinclair. I am Vice President, Energy Supply and Analysis for Louisville Gas and Electric Company ("LG&E") and Kentucky Utilities Company ("KU") (collectively, "Companies") and an employee of LG&E and KU Services Company, which provides services to LG&E and KU. My business address is 220 West Main Street, Louisville, Kentucky 40202. A complete statement of my education and work experience is attached to this testimony as Appendix A.

Q. Please describe your job responsibilities as it relates to this case and any previous testimony you have given before the Commission.

A. I am the officer that has responsibility for sales analysis and forecasting, generation planning, and generation dispatch so I am keenly interested in issues that will impact how much electricity our customers will want and when they will want it. In this particular case, there is a question as to how the development of a smart meter program and an associated dynamic pricing scheme would impact our customers' demand for electricity.

I have previously provided testimony before this Commission on several occasions, most recently in Case No. 2011-00375, the CPCN case for Cane Run Unit 7.

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring the following exhibits:

Exhibit DSS-1 –2010 U.S. Residential Electricity Consumption by End-Use

Exhibit DSS-2 – Fuel Cost Supply Curve, July 2011

Exhibit DSS-3 – 2011 System Lambda

Q. What is the purpose of your testimony?

A. One of the purported benefits of installing a smart meter system is the ability to send consumers "dynamic" price signals so that they can make more informed decisions regarding the consumption of electricity, thus resulting in a better allocation of resources in the economy.[1] The purpose of my testimony is to: i) provide an overview of the role price plays in the consumption of electricity, ii) define alternative approaches to creating dynamic pricing schemes, and iii) discuss possible consumer and regulatory issues associated with alternative dynamic pricing schemes.

<u>Section 1 – Electricity Consumption and the Impact of Price</u>

Q. Please describe how the Companies' customers use electricity.

A. It is important to note that the demand for electricity is a "derived demand," meaning that consumers' demand for it is based on their consumption of something else. When consumers use electricity, what they are really consuming are such things as lighting, environmental control (heating and cooling), refrigeration, computing, cooking, cleaning, entertainment, and machine operations. The derivative nature of the demand for electricity means it will vary fairly predictably based on the time of day (lighting and certain machine operations) and the time of year (heating and cooling) because consumers' desire for the goods made possible by electricity vary hourly and seasonally. Therefore, to understand the demand for electricity and how it might potentially respond to different price signals, it is important to understand the types of customers in our service area and how they use electricity.

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[1] "Kentucky's Smart Grid Roadmap," Kentucky Smart Grid Roadmap Initiative, 2012, p. 24. *See* http://energy.ky.gov/generation/Documents/KYSGRM_Final.pdf.

Table 1 shows the breakout of the Companies' 2011 actual retail sales by customer class. Approximately 35 percent is residential, 26 percent is commercial, and 30 percent is industrial. Each of these classes uses electricity for different purposes and will respond differently to such things as price changes, the availability of new technologies, and weather. Even within these customer classes there is a wide range of factors that will influence the quantity and timing of electricity usage, including business types, lifestyles, building structures, business activities, and wealth levels.

Table 1. Combined Company Actual Sales by Revenue Class, 2011

Revenue Class	Electricity Sales (GWh)	Percentage
Residential	10,810	35%
Commercial	8,015	26%
Industrial	9,128	30%
Other[2]	2,944	9%
Total	30,897	100%

To better understand consumer demand, it is important to look into further detail of how each of these groups is using electricity. Exhibit DSS-1 shows U.S. residential electricity consumption by end-use in 2010.[3] I would expect the Company's residential customers to have a similar end-use profile. An examination of the data indicates that much of this load is not likely to be very time sensitive. For example, some of the larger end-uses are space cooling (22%), space heating (6.0%), and lighting (14%) where the demand for these end-uses is largely driven by time of

[2] Includes Public Authority, Public Street and Highway Lighting, and Municipal Pumping sales.
[3] U.S. Energy Information Administration, http://www.eia.gov/tools/faqs/faq.cfm?id=96&t=3

day (in addition to being seasonal). Similarly, color TV usage (7.0%) is unlikely to be subject to much time shifting (although it could be subject to conservation by turning it off). Other, mainly smaller end-uses, such as clothes washing (1.0%) and drying (4.0%) and dishwashing (2.0%), have greater ability to be shifted in time during the course of a day and between days. Finally, I would note that the "Other" category (19%) consists of many small appliances, some whose usage might be capable of being time shifted such as a vacuum cleaner and others, like a clock or toaster, whose usage is not likely to be capable of significant time shifting.

For commercial customers, electricity end-use varies by type of building but overall, electricity is primarily used for lighting and cooling loads. Industrial end-uses vary greatly as some industries are more electricity intensive than others. However, motor system usage accounts for approximately 60% to 70% of the total electricity used in an industrial facility.[4]

Finally, because the demand for electricity is derived from consumers' demand for other things, the quantity of electricity consumed over time has been strongly influenced by, and will continue to be influenced by, their demand for the service provided by new end-use technologies and changes in the energy efficiency of new equipment that is used to replace existing equipment.

Q. Since the demand for electricity is "derived" from the demand for other things, what role does the price of electricity play in determining the quantity of electricity demanded by consumers?

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[4] U.S. Department of Energy: Industrial Technologies Program. Improving Motor and Drive System Performance. Washington, DC: Office of Energy Efficiency and Renewable Energy, 2008. [p. 3, 45, 46]; http://www.motorsmatter.org/resources/gen_quickfacts.html.

A. Over the years, numerous studies have looked at the impact of price on the quantity of electricity consumers' demand.[5] In general, these studies have shown that price is not a primary driver for electricity consumption, both in the short- and long-run. In economic terms, the quantity of electricity demanded is viewed as being "inelastic" with respect to price, meaning that for a 1 percent change in price, the quantity of electricity demanded will change (in the opposite direction of the price change) by less than 1 percent. This doesn't mean that the price of electricity does not impact the quantity demanded. Rather, it means that it will take rather large changes in the price of electricity to impact the quantity demanded by a little bit.

Q. From an economic theory perspective, why would the quantity of electricity demanded be inelastic with respect to price?

A. Goods or services are generally price inelastic if they are necessities, have few or no close substitutes, or their cost is a small percent of a consumers overall income. Clearly in today's modern world electricity has these attributes, particularly in the short-term. One only has to observe customers' frustrations during an extended storm outage to realize that they view electricity as a necessity.

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[5] "Regional Differences in the Price-Elasticity of Demand for Energy" by M.A. Bernstein and J. Griffin, RAND Corporation for NREL (2006); "Price Responsiveness in the AEO2003 NEMS Residential and Commercial Buildings Sector Models" by S. Wade, Energy Information Administration (2005); "Price Elasticity of Demand for Electricity: A Primer and Synthesis" by B. Neenan, EPRI (2007); "A Global Survey of Electricity Demand Elasticities" by C. Dahl was presented at the 34th IAEE International Conference: Institutions, Efficiency, and Evolving Energy Technologies in June 2011 at the Stockholm School of Economics in Sweden. *See*: http://www.hhs.se/IAEE-2011/Program/ConcurrentSessions/Documents/1%20online%20procedings/2154147%20Dahl2154147.pdf

Q. How would the inelasticity of demand for electricity impact the development of a pricing scheme that might be part of a smart meter system?

A. One of the benefits touted by some associated with the installation of a smart meter system is the ability to send consumers "dynamic" price signals.[6] Because the demand for electricity is inelastic and it is derived from the demand for other goods and services whose demand is driven by the time of the day and outside air temperature, a dynamic pricing scheme would need to have large price variations throughout the day, between days (e.g., weekday and weekend), and possibly even seasonally to have a material impact on the demand for electricity (particularly in the short-run).

Section 2 – Alternative Approaches to Dynamic Pricing Schemes

Q. You have used the term "dynamic pricing." What do you mean by that?

A. While I am not aware of any official definition in the industry, the term "dynamic pricing" seems to be associated with a tariff structure that allows for some degree of change in a consumer's energy price during the course of a day. To me, a key question that needs to be addressed in the context of a smart meter system is the degree of dynamism associated with a dynamic pricing scheme.

Q. What do you mean by "degree of dynamism"?

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[6] Kentucky's Smart Grid Roadmap, p. 42; "Can a Smart Grid Turn us on to Energy Efficiency?" March 2009, CNN.com. *See* http://articles.cnn.com/2009-03-01/tech/eco.smartgrid_1_smart-grid-energy-efficiency-national-electricity-grid?_s=PM:TECH; "The U.S. Smart Grid Revolution," KEMA, December 2008. *See* http://www.smartgridnews.com/artman/uploads/1/KEMA_s_Perspectives_for_Job_Creation.pdf; "It's a Smart World," The Economist, November 6, 2010.

A. I use the phrase "degree of dynamism" to describe how frequently a dynamic price changes and the variability/uncertainty of the drivers that cause the price change. For example, a tariff that merely specified fixed prices that changed twice a day (e.g., on-peak and off-peak) over the course of a year would have a relatively low degree of dynamism because prices change infrequently and are stable over time. On the other hand, a tariff that allowed for prices to change every 5 minutes based on the variable cost of supplying energy would have a high degree of dynamism because prices are constantly changing and the drivers of price have the potential to be volatile, thus causing large price changes from one point in time to the next.

Q. What are some possible dynamic pricing schemes that the Companies could develop in the context of a smart meter program?

A. I think the design of any dynamic pricing tariff should be informed by the objectives that it is seeking to accomplish. For example, if an objective is more efficient dispatch of the Companies' generating assets, then the design should include frequently changing prices (at least hourly) that are linked to the Companies' cost of supplying energy. This type of scheme would be similar to that utilized in organized wholesale energy markets such as MISO and PJM.[7] Another possible objective might be to defer the need for future capacity or encourage energy efficiency investments by consumers so the dynamic pricing scheme would need to include information

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[7] Testimony by MISO in the Companies' Case No. 2003-00266 regarding exit from MISO (*See* http://psc.ky.gov/pscscf/2003%20cases/2003-00266/miso_testimonyronaldrmcnamara_092904.pdf) and testimony from EKPC regarding their proposed transfer of transmission control to PJM in Case No. 2012-00319 (*See:* http://psc.ky.gov/pscscf/2012%20cases/2012-00169/20120503_ekpc_application_volume%201.pdf) discuss MISO and PJM's pricing methods.

regarding possible future capacity and energy costs (in order to create large differences between time periods) and could change with less frequency during the course of the day. I suggest that there is almost an infinite array of possible dynamic pricing schemes, particularly when one is willing to move away from a traditional cost-of-service approach to tariff design. As I said before, there needs to be some considerable thought given to the objectives that the dynamic pricing scheme would be trying to achieve.

Section 3 – Consumer and Regulatory Issues Associated with Dynamic Pricing Schemes

Q. What are some considerations that should inform the design of a dynamic pricing scheme?

A. To me, one of the fundamental issues that should be addressed up-front relates to whether the dynamic pricing scheme is focused on recovering actual costs or is driven by such issues as avoided costs or societal costs. If the scheme departs from actual costs, then there must be regulatory mechanisms that reconcile the Companies actual cost of providing service with the likely over collection of costs associated with an avoided or societal cost scheme. The impact of these reconciling mechanisms on consumer behavior would also need to be factored into understanding how effectively the dynamic pricing scheme would be at achieving its objectives.

The other fundamental issue that I see relates to consumer acceptance of a dynamic pricing scheme. It would be quite easy to develop a dynamic pricing scheme that, while theoretically sound, would be overly complex for customers to understand and for the Companies to administer, create unacceptable volatility in bills, and force customers to make changes in their end-use behaviors that they find disruptive and undesirable. In my opinion, a high degree of customer acceptance and satisfaction is critical to the success of any dynamic pricing scheme associated with a smart meter program.

Q. What would a dynamic pricing scheme look like that is based on the Companies' actual cost of service?

A. A dynamic pricing scheme that is actual cost-of-service oriented would likely be one where the price of energy would change hourly and be based on the Companies' marginal cost of providing energy. This would be very similar to the way in which prices are determined in an organized wholesale market such as MISO and PJM.

Q. What are some possible issues associated with such a scheme?

A. There are several. First, our actual marginal cost of generation in an hour would not be known until after the fact (just as actual hourly prices are not known with precision in PJM and MISO until well after the fact) so the dynamic price would have to be based on an estimate. Second, by charging the estimated marginal cost of energy, the Companies would, at a minimum, over collect fuel costs because marginal fuel cost is almost always greater than average fuel cost (which is what existing rate mechanisms are based on). This over collection of fuel costs would necessitate constant monthly refunding to consumers, most likely in the form of a lump-sum credit so as not to distort the hourly dynamic price. Third, there would need to be a radical change in rate design for certain customers, particularly residential. A dynamic pricing scheme based on the marginal cost of energy would almost always result in a significantly lower energy rate and require a much greater monthly customer charge as compared to today's rate design.

Q. Why would the marginal energy cost-based dynamic pricing scheme result in lower energy prices and a higher monthly customer charge for residential consumers?

A. It is my understanding that today's residential tariff recovers a considerable amount of fixed costs in the energy charge. Moving to a marginal energy cost-based dynamic pricing scheme, though more correct from an economic theory perspective, would remove all of these fixed costs from the energy charge. As can be seen in Exhibit DSS-2, the Companies' marginal energy cost throughout much of the year would be driven by the cost of its coal-fired generation units. These costs range from 2.1 cents/kWh to 3.7 cents/kWh and are well below the current residential base energy charge of approximately 7.4 cents/kWh for LG&E and 7.2 cents/kWh for KU.[8] I would also note that in 2011, in only approximately 1,768 hours were combustion turbines used to serve the Company's native load meaning that the rest of the year the marginal cost of energy would have been based on the relatively stable cost of coal-fired generation. In the future, there will be more hours where gas could be on the margin with the upcoming retirement of six coal units and the construction of Cane Run Unit 7.

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[8] Louisville Gas & Electric Company Rates, Terms and Conditions for Furnishing Electric Service P.S.C. Electric No. 9; Kentucky Utilities Company Rates, Terms and Conditions for Furnishing Electric Service P.S.C. No. 16; Energy charge excludes adjustments for Demand-Side Management Cost Recovery Mechanism, Fuel Adjustment Clause, Environmental Cost Recovery Surcharge, Franchise Fee Rider, School Tax, and Home Energy Assistance Program.

Q. Would there be any side effects of such a large reduction in the residential energy charge?

A. There are two effects that come to mind immediately. First, one of the purported benefits associated with a dynamic pricing scheme in a smart meter program is that it would send better price signals to consumers to encourage energy efficiency. However, in a marginal energy cost-based dynamic pricing scheme, a residential consumer would generally see a large reduction in energy price compared to existing rates. Adopting such a dynamic pricing scheme would likely increase energy consumption and reduce the value of energy efficiency investments as compared to today's residential energy charge.

The second impact would be to reduce the value of customer installed generation and net-metered generation such as solar, therefore, reducing the amount of such generation that would otherwise be installed. This reduction would occur for the same reason that I just cited for reducing the investment in energy efficiency. The economics to customers for installing generation such as solar is highly dependent on the value of the energy that is no longer purchased from the Companies. Lowering the energy price portion of the tariff, while perhaps better reflecting the true economic value of such generation, would significantly reduce the value of energy savings to a customer who installed solar generation.

Q. Do you believe that the degree of volatility in the Companies' marginal energy cost shown in Exhibit DSS-2 would have a material impact on energy consumption under a marginal cost-based dynamic pricing scheme?

A. As I previously stated, the demand for electricity is inelastic with respect to price, particularly in the short-term, meaning that large changes in price are needed to produce even a small change in quantity demanded. Based on the Companies' generation fleet, an hourly, marginal cost-based dynamic pricing scheme would result in rather small hourly price changes on most days, often measured in a few tenths of a cent per kWh. Therefore, I would not expect such a dynamic pricing scheme to materially alter electricity demand from hour to hour on most days. Of course, on a high load day with very high natural gas prices, customers could see hours where prices change considerably as load transitions from being served by coal units to simple cycle combustion turbines, particularly our very high cost secondary combustion turbines. The four charts shown in Exhibit DSS-3 illustrate this point. These charts show the Companies' system lambda for various weekdays in 2011. (System lambda is the incremental cost of the next kWh of generation that would be produced to serve incremental load.[9]) Chart 3-1 shows that the system lambda stays relatively flat at approximately 2.6 cents/kWh over the hours of a low load day in October. On days with higher load, the system lambda increases to almost 6 cents/kWh at its highest and can see significant volatility as shown in Chart 3-2. Chart 3-3 shows the variation in system lambda on the Companies' 2011 peak day. Chart 3-4 shows the day with the largest one-day range (lowest hour to highest hour) in system lambda - 3.2 cents/kWh. This last type of day, with a large range of prices,

[9] This cost includes fuel and adders for variable operating costs of environmental controls and for emissions allowances. Note that this value does not necessarily reflect the cost of the highest cost unit that is on-line because that unit may be already fully loaded because of the operating capability of the unit. Therefore, the next increment of generation would come off of a lower cost unit.

raises another issue from a customer acceptance perspective. Prices have the ability to alter consumers' behavior because they transmit information. When making a purchase decision, consumers evaluate not only the current price of a product, but also consider what they think the price will be in the future. On the day shown in Exhibit DSS-3, Chart 3-2, many consumers are unlikely to be able to forecast the large increases in prices that occur in Hours-Ending 15 and 23 and the corresponding decrease that occurs in Hour-Ending 24. This inability to forecast future prices will impact the effectiveness and customer satisfaction with this type of dynamic pricing scheme.

In addition to the charts in Exhibit DSS-3 which show individual days, Table 3-1 shows the monthly variation in system lambda. This table demonstrates that while the monthly mean, median, and minimum system lambda is generally consistent over the months, there is more variability in the monthly maximum system lambda, with the highest values occurring in the summer months.

Q. What issues would need to be addressed in an avoided cost or societal cost based dynamic pricing scheme?

A. I see two categories of issues: determining the appropriate value for the avoided or societal cost and the refunding of the inevitable over collection (as compared to actual costs) that would occur. With respect to determining avoided or societal costs, I see the former as easier than the latter. The Companies already make regulatory filings that are based on estimated avoided costs (e.g., DSM programs and QF tariffs); utilities could use a similar approach for a dynamic pricing scheme. But there can be much disagreement among parties as to the nature, timing, and amount of societal costs because of the subjective nature of what constitutes a societal cost. Furthermore, one can argue that the costs that society are willing to pay are captured through the political, regulatory, and legal review processes, therefore the Companies' actual costs already reflect societal costs. Given the vagaries associated with the concept of societal costs, I can see where trying to develop a dynamic pricing scheme based on them would be quite problematic and contentious.

The issues associated with the refund mechanisms are similar to what I previously discussed related to marginal energy cost pricing and the over-collection of actual fuel costs, except that with avoided or societal costs, we would also be dealing with capital costs. For example, if we assume that the Companies expect to need new capacity in three years then we could design a dynamic pricing scheme that charges customers a higher price today in order to encourage them to reduce their demand (either through behavioral changes or energy efficiency investments) so that the need for new capacity is deferred. If customers actually reduce their demand, then the Companies will not incur the cost for new capacity and thus will have over-collected the actual cost of providing service. Note that while some customers reduced their demand when faced with higher prices (so no revenue was collected), it is highly unlikely that total system demand is zero for that time period. Thus, some customers will pay. Any refunds of such over-collections would have to be done in such a manner as to not undo or destroy the demand reduction due to the higher price, otherwise the Companies will become short of capacity and the reliability of the system will be jeopardized.

Q. You previously mentioned that consideration needed to be given to consumer acceptance of a dynamic pricing scheme. What did you mean by that?

A. As with any business, the Companies are mindful of how their actions impact customers. One of the most important impacts that any business can have on customers is its pricing. Therefore, changes to pricing should not be taken lightly. At this point in time, there is not much information in the electric utility industry regarding the degree of dynamism that is acceptable or preferable by customers. Even outside the electric utility industry, it is hard to find examples of retail consumers preferring price uncertainty and volatility to stable, predictable prices. However, it is not hard to envision that many customers would be opposed to having their price of electricity change every hour (that would mean 744 unique prices for a typical month) or unexpectedly change dramatically from one hour to the next. Based on the experiences of the Companies and utilities in other states, there is little evidence suggesting utility customers are eager to enroll in dynamic pricing programs.[10] For example:

- On June 30, 2011, the Companies reported to the Commission (Case No. 2007-00161) that the Real-Time Pricing ("RTP") pilot program had garnered no participants, despite initial interest from several customers. After reevaluation,

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[10] On March 22, 2012, the Commission issued an Order in Case No. 2011-00440 approving discontinuance of LG&E's Smart Meter Pilot and the cancellation and withdrawal of the Responsive Pricing Service tariff and the General Responsive Pricing Service tariff. *See*: http://psc.ky.gov/PSCSCF/2011%20cases/2011-00440/20120322_PSC_ORDER.pdf.
On June 22, 2012, LG&E submitted a report describing its efforts to develop a new dynamic pricing program or smart meter application. This report described the challenges of implementing such programs at Duke Energy Ohio, Baltimore Gas and Electric, and PPL Corporation. *See*: http://psc.ky.gov/PSCSCF/Post%20Case%20Referenced%20Correspondence/2011%20cases/2011-00440/20120622_LGE%20Response%20to%2003212%20Order.pdf.

the RTP tariffs were withdrawn with the Companies' base rate case effective January 1, 2013 (Case Nos. 2012-00221for KU and 2012-00222 for LG&E).[11]

- The California Division of Ratepayer Advocates ("DRA") believes that the current emphasis on defaulting smaller customers to dynamic pricing programs, such as critical peak pricing and real-time pricing, is inadvisable, and that dynamic pricing should be offered to smaller customers only on a voluntary "opt-in" basis, as a supplement to time-of-use ("TOU") rates.[12,13] DRA recommends that most residential and small business customers transition, over time, to stable, predictable rates that vary by season and time of day.
- In 2009, Connecticut Light & Power conducted an AMI metering study ("Plan-it Wise Energy Program") with 3,000 customers. The goal was to examine customer interest in, and response to, three peak time "dynamic pricing" rates. For every 100. residential customers solicited through direct mail, only 3.1% enrolled in the pilot. Commercial and industrial customers were solicited by

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[11] *See:* http://psc.ky.gov/PSCSCF/Post%20Case%20Referenced%20Correspondence/2007%20cases/2007-00161/20110630_LGE%20and%20KUs%20Report%20on%20RTP%20Program.pdf.

[12] DRA is an independent consumer advocacy division within the California Public Utilities Commission that represents the customers of California's investor-owned utilities. DRA's statutory mission is to obtain the lowest possible rates for utility service consistent with safe and reliable service levels. Source: Time-Variant Pricing for California's Small Electric Consumers, May 2011, Robert Levin, Ph.D. *See*: http://www.dra.ca.gov/general.aspx?id=239.

[13] In contrast to real-time pricing and critical peak pricing, TOU rates are generally not regarded as "dynamic" because neither the timing nor the rates themselves are left unspecified; therefore TOU rates cannot adjust "on the fly" to reflect actual system conditions.

direct mail plus outbound calling and enrolled at a higher rate than residential customers, but only at 4.5%.[14]

Finally, because the demand for electricity is derived from a customer's demand for something else, a customer may make the economic decision to forgo that "something else" because of the price of electricity, but they still may not be happy about it. For example, to reduce the need for future generating capacity, a dynamic pricing scheme could price summer peak energy to such a level that some consumers (particularly low-income) can no longer afford cooling. While the larger objective of reducing the need for future capacity may have been achieved, some consumers perhaps would have preferred to be more comfortable if they could have afforded it under a more traditional rate design.

<u>Section 4 – Conclusion</u>

Q. Your testimony has covered a number of topics; please summarize your key points.

A. My testimony highlights some of the issues associated with developing a dynamic pricing scheme as part of a smart meter program:

i) the demand for electricity is derived from the demand for other goods and services and is generally regarded as price inelastic in both the short- and long-term,

ii) while the concept of "dynamic price" is much talked about, there is little understanding or appreciation of what I call the "degree of dynamism" that consumers are seeking or would tolerate,

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[14] Connecticut Public Utilities Regulatory Authority, Docket No. 05-10-03RE01. *See*: http://www.cl-p.com/Home/SaveEnergy/GoingGreen/Plan-it_Wise_Energy_Program/ for a summary of the program and detailed reports.

iii) there is probably an infinite array of dynamic pricing schemes that could be created so it is critical that the objectives for the scheme be well articulated and understood, and

iv) the pricing of a product or service is a critical business function and can impact customer satisfaction.

In sum, "dynamic pricing" is not a simple, ready-to-implement concept; rather, there are numerous regulatory and consumer implications of any dynamic pricing scheme that need to be well thought through and understood.

Q. Does this conclude your testimony?

A. Yes it does.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **David S. Sinclair**, being duly sworn, deposes and says that he is Vice President, Energy Supply and Analysis for Kentucky Utilities Company and Louisville Gas and Electric Company and an employee of LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

David S. Sinclair

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 23RD day of January 2013.

(SEAL)
Notary Public

My Commission Expires:

7/21/2015

APPENDIX A

David S. Sinclair

Vice President, Energy Supply and Analysis
LG&E and KU Energy, LLC
220 West Main Street
Louisville, Kentucky 40202
(502) 627-4653

Education

Arizona State University, M.B.A. -1991
Arizona State University, M.S. in Economics – 1984
University of Missouri, Kansas City, B.A. in Economics - 1982

Professional Experience

LG&E and KU Energy, LLC
2008-present – Vice President, Energy Supply and Analysis
2000-2008 – Director, Energy Planning, Analysis and Forecasting

LG&E Energy Marketing, Louisville, Kentucky
1997-1999 – Director, Product Management
1997-1997 (4^{th} Quarter) – Product Development Manager
1996-1996 – Risk Manager

LG&E Power Development, Fairfax Virginia
1994-1995 – Business Developer

Salt River Project, Tempe, Arizona
1992-1994 – Analyst, Corporate Planning Department

Arizona Public Service, Phoenix, Arizona
1989-1992 – Analyst, Financial Planning Department
1986-1989 – Analyst, Forecasts Department

State of Arizona, Phoenix, Arizona
1983-1986 – Economist, Arizona Department of Economic Security

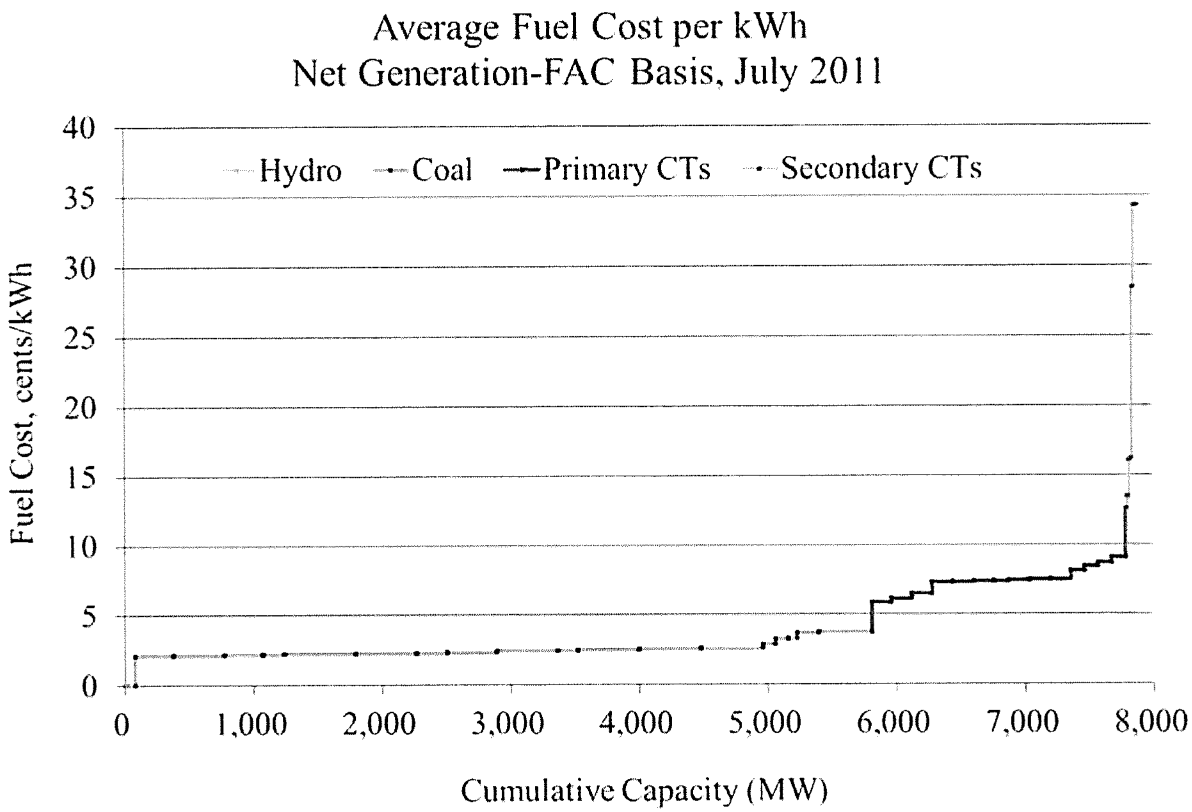
Exhibit DSS-1 – 2010 U.S. Residential Electricity Consumption by End-Use

End-Use	Billion Kilowatthours	Share of Total (%)
Space Cooling	316	20.0
Lighting	202	14.0
Water Heating	131	9.0
Refrigeration	109	8.0
Color TV and Set-Top Boxes	96	7.0
Space Heating	87	6.0
Clothes Dryers	57	4.0
Personal Computers & Related Equipment	50	3.0
Furnace Fans & Boiler Pump Circulation	40	3.0
Cooking	31	2.0
Dishwashers (1)	29	2.0
Freezers	24	2.0
Clothes Washers(1)	10	1.0
Other Uses(2)	270	19.0
Total Consumption	**1,451**	

(1) Does not include water heating.
(2) Includes small electric devices, heating elements, and motors not listed above.

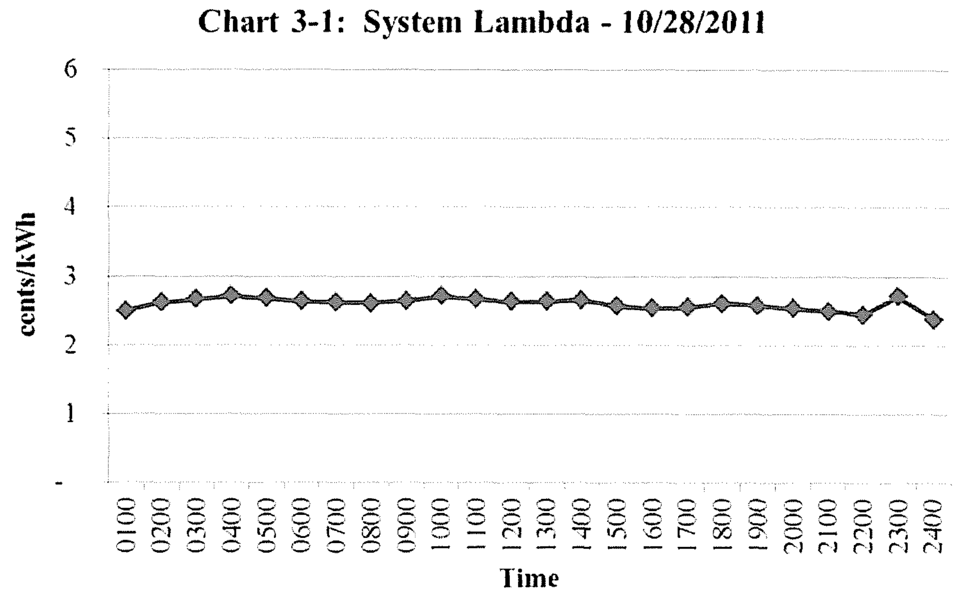
Source: U.S. Energy Information Administration
http://www.eia.gov/tools/faqs/faq.cfm?id=96&t=3

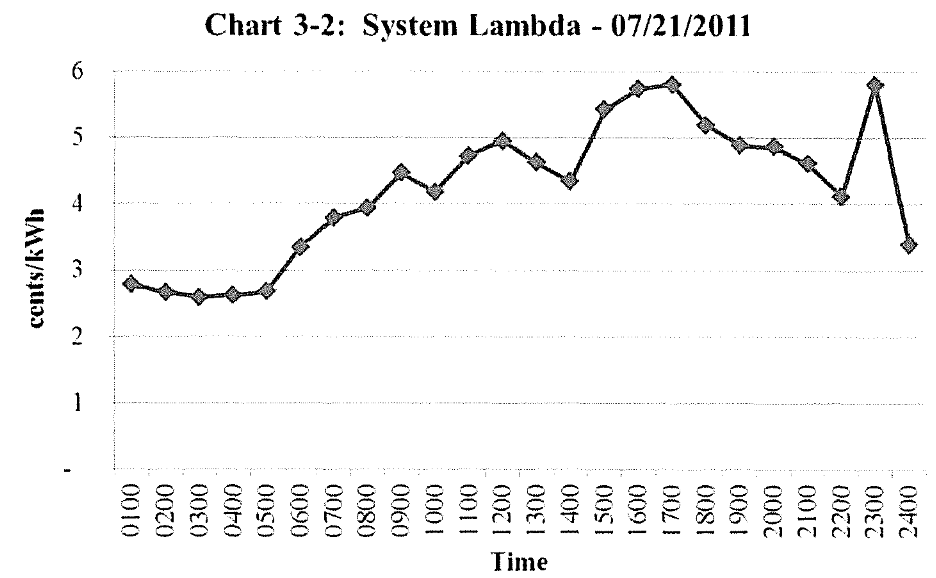
Exhibit DSS-2 – Fuel Cost Supply Curve, July 2011[15]



[15] These fuel costs were reported in the Companies' FAC filings for July 2011, shown on Form B – Page 5, Line 4.b, "Cost per kWh: Net Generation – FAC Basis (cents/kWh)." The unit capacities were reported at Line 1.c, "Net Demonstrated Capability (MW)." Primary combustion turbines ("CTs") comprise E.W. Brown Units 5-11, Trimble County Units 5-10, and Paddy's Run Unit 13. Secondary CTs comprise Cane Run Unit 11, Paddy's Run Units 12 and 13, Zorn, and Haefling Units 1-3. Because Paddy's Run Unit 12 did not run in this month, its fuel cost is shown as the same as Paddy's Run Unit 11's fuel cost. Tyrone Unit 3 is not included because it was on inactive reserve.

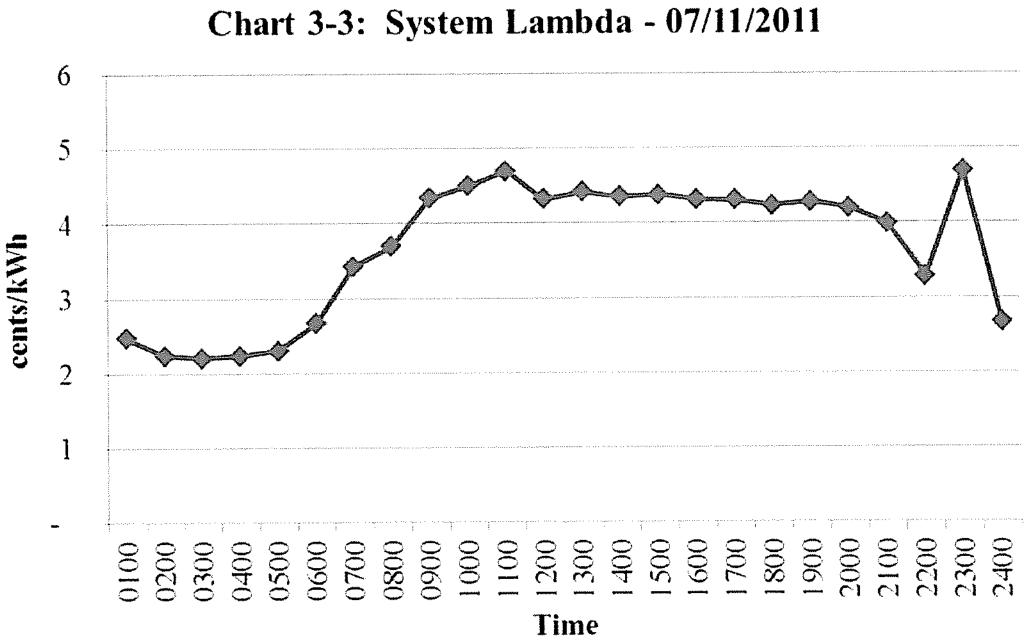
Exhibit DSS-3 – 2011 System Lambda[16]





[16] The Companies' hourly system lambda is reported annually on FERC Form No. 714, Annual Electric Balancing Authority Area and Planning Area Report, Part II, Schedule 6. *See*: http://elibrary.ferc.gov/idmws/common/opennat.asp?fileID=12979162.

Exhibit DSS-3 – 2011 System Lambda, *Continued*



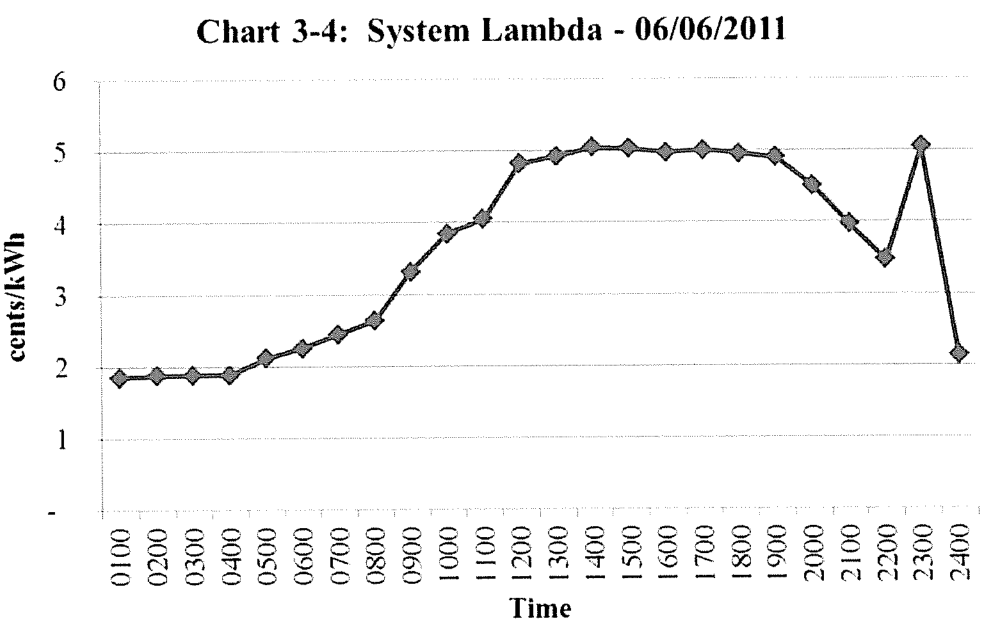


Exhibit DSS-3 – 2011 System Lambda, *Continued*

Table 3-1: 2011 Hourly System Lambda, Monthly Summary Statistics

Cents/kWh	**Mean**	**Median**	**Maximum**	**Minimum**
January	3.0	2.9	4.9	2.0
February	2.9	2.8	5.0	2.0
March	2.9	2.8	4.6	2.2
April	2.9	2.8	4.4	2.2
May	3.0	2.9	4.9	1.9
June	3.0	2.7	5.5	1.9
July	3.3	3.1	5.8	1.8
August	3.2	3.0	5.0	1.9
September	2.6	2.5	4.6	1.8
October	2.6	2.6	3.7	1.7
November	2.7	2.7	3.8	2.0
December	2.5	2.4	3.6	2.0