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FPL

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U.S. Department of Energy
Office of Electricity Delivery & Energy Reliability
1000 Independence Ave., S.W.
Room 8H033
Washington, DC 20585

Via E-mail: smartgridpolicy@hq.doe.gov

Re: Smart Grid Request For Information (RFI): Addressing Policy & Logistical Challenges

Florida Power & Light Company ("FPL") appreciates the opportunity to submit the following comments in response to the request by the U.S. Department of Energy ("DOE") for input regarding policy and logistical challenges that confront Smart Grid implementation, as well as recommendations on how to best address them (Federal Register/Vol.75, No.180/Friday, September 17, 2010/Notices).

BACKGROUND

FPL, a wholly-owned subsidiary of NextEra Energy, Inc., is a public utility incorporated in the State of Florida that provides wholesale and retail electric service. It is one of the largest and highest-performing electric utilities in the nation. In 2009, FPL served 4.5 million customer accounts, delivering electricity to more than 8.8 million people. FPL owns and maintains 73,700 miles of transmission and distribution lines in Florida.

FPL has a vested interest in the successful development of Smart Grid. FPL was awarded a $200 million American Recovery and Reinvestment Act (ARRA) Smart Grid Investment Grant from the DOE to help support its “Energy Smart Florida” plan to deploy Smart Grid technologies. As part of this initiative, we are implementing one of the largest cross-cutting Smart Grid deployments in the country incorporating 4.5 million Automated Metered Infrastructure (AMI) smart meters, as well as a number of technologies and grid equipment providing transmission/substation intelligence, distribution automation, in-home displays and gateways, enhanced performance and diagnostic centers, and distributed generation. Moreover, we are engineering Energy Smart Florida to incorporate interoperability and cybersecurity, and will provide significant customer and workforce education. Over the next three years, FPL will continue to install Smart Meters for all of its residential and business customers throughout the state of Florida. FPL customers expect affordable, reliable, clean-energy solutions now and in the future, and FPL is committed to meeting this expectation by investing to make its infrastructure stronger, smarter, cleaner, more efficient and less reliant on any single source of fuel. The utility currently has the lowest residential rates of all 55 utilities in the state of Florida and service reliability significantly better than the national average.

I. SUMMARY

FPL believes the Smart Grid represents an important new technology platform for the electric utility industry and its customers. This platform, as it continues to be developed and deployed, can be an enabler for better and more reliable control of the electric power system, enhanced management and monitoring of the grid, and more information for both the utility and its customers to make better informed decisions over energy supply and usage. The basic technologies to provide these capabilities largely exist today, and have been functionally proven at the device level and at small scale. The challenge of building the Smart Grid will be one of developing the standards for interoperability of these technologies, weaving them together into integrated systems and testing them at large scale, and developing and evolving the applications needed to provide the control, monitoring and management, and energy information capabilities cited above.

There is a lot of hype surrounding Smart Grid that often well exceeds the rather simple view just articulated. Some of its proponents, most notably those in the supplier community, conjure up visions of a "new tomorrow" just around the corner not unlike the way futurists from decades past celebrated the imminent arrival of the picture phone and the flying car. Many of these expectations fall into the areas of customer control over their energy usage and the integration of entirely new energy sources, uses, and controls (distributed generation, energy storage devices, in-home appliance and device sensors and controls, information displays, smart appliances, time-of-use/critical peak pricing rates, variable load controls, electric vehicle charging, vehicle-to-grid power generation, etc.) into the power grid at the customer premise. Some of these expectations – like the eventual development of the picture phone – may eventually be realized, but perhaps in ways their prognosticators did not foresee (e.g., mobile handheld devices, in the case of the picture phone). And others – like the flying car – may go waiting for much longer, if they ever become practical at all. The fact is that all early indications lead industry to believe that the prospects for success of such devices and constructs are long-term;

however, there is much consumer piloting and testing that needs to continuously be done in the early deployments of the Smart Grid.

Of course, much of the hype and attention comes from comparisons of Smart Grid to the Internet, which has seen a similar explosion of innovation, new business models, and levels of consumer engagement. But the Internet comparison is apt in other ways, too. The original design and development of the Internet dates back nearly forty years, and is based on underlying technologies (since updated) that are older still. In fact, it took nearly twenty-five years for consumer-friendly internet applications to appear and for the familiar businesses of Yahoo!, Amazon, and Google to arrive on the scene. During this time, the core infrastructure of the Internet was built out and basic communications and control applications were developed, tested, and tuned for end-user acceptance. The Smart Grid is no different in that it needs time for the basic foundational framework to be established for which innovation and greater consumer adaptability and interplay will result.

The Smart Grid is based on internet technologies, and there is every reason to believe that innovation will develop more quickly within the confines of already-proven communications standards and protocols. But nevertheless, the initial phases of Smart Grid deployment, like those of the Internet, will be focused on constructing, testing, and tuning the infrastructure "plumbing" of the new intelligent digital grid, while the end-user applications are developed, piloted, and evolved based on consumer acceptance. Enhancements to the grid infrastructure alone should provide the ability to deliver more reliable, lower cost, and better service to customers. We believe that Smart Grid technologies will enable FPL's customers to better manage their energy bills and continue to rely on high service reliability and quality in the long term. In addition, we think Smart Grid technologies will help FPL achieve greater energy efficiency and integrate cleaner, alternative energy sources – such as wind and solar – while enabling innovation and helping to reduce Florida's emissions and carbon footprint. But our perspective is that at its current nascent level of maturity, the realized benefits are at the electrical grid level due to the correlation to the increased reliability and quality of service our electric consumers enjoy; moreover, there is more than enough support for the continued development and build-out of the Smart Grid infrastructure that is truly interrelated and interoperable. It is speculative at best to promise much more than that because part of the speculation revolves around whether customers embrace more control over their energy usage, how they will respond to different pricing signals, and what technologies they will embrace.

II. DETAILED RESPONSE

With the foregoing in mind, it is difficult at this time to answer many of the detailed questions posed in the RFI. Therefore, rather than respond to each individual question, we have organized our comments below by the major sections of the request. FPL is a member company of the Electric Edison Institute (EEI), which is submitting its own response to the RFI on behalf of its members. As such, our response is intended to supplement those areas of EEI's comments (sections A-D of the RFI) where FPL has specific views it desires to highlight. For sections E-H of the RFI, FPL's perspective is well-represented by EEI's response and we defer to those comments.

A. Definition and Scope

We believe that defining Smart Grid in as concise and straightforward a manner as possible, along with setting reasonable and achievable expectations for its deployment, is critical to stakeholder understanding and acceptance. This is especially true for customers, policymakers, and regulators. Each of these constituents must make decisions regarding the cost and perceived value of Smart Grid, and these can only be made in the context of understandable functions, realizable business cases, and achievable expectations. Simply put, Smart Grid is the digitalization of the electric power grid. More precisely, it is the application of digital technologies to power system control, grid monitoring and management, and energy usage measurement. These capabilities, performed via digital technologies perfected in the computer and network communications sphere, can enable new applications and improved control for the utility and the customer based on richer and more granular data available to both.

In fact, the phrase "Smart Grid" by itself can probably be understood at least on a basic intuitive level by consumers steeped in the age of the Internet and smart phones. Applying more ambitious definitions of Smart Grid, such as that offered in Title XIII of the Energy Independence and Security Act of 2007, can be confusing and misleading, both for consumers and policymakers. While the intent may have been not to inadvertently prohibit the advancements and deployment of new technologies and capabilities by listing as many as one could conceive, the reality is that the ten points in Title XIII that "…together define a Smart Grid" do little if anything to illuminate the meaning of Smart Grid for consumers, and several of the points (for example, the deployment and integration of distributed resources and generation and the deployment of advanced energy storage) do not necessarily require a Smart Grid at all.

B. Interactions with and Implications for Consumers

1. Transparent and Active Aspects of Smart Grid

It is important to understand that with the Smart Grid defined as above, large parts of the Smart Grid will result in no change in the basic interactions between end-use consumers and the grid. For instance, the integration of monitoring and control technologies upstream of the meter promise to improve the performance and efficiency of the grid in a variety of ways yet will result in essentially no change in the nature of consumer interactions. We will refer to these as the "transparent" aspects of Smart Grid.

Consumers will still benefit significantly from the transparent aspects of Smart Grid, without having to alter their behavior at all. Reliability, cost, and customer service are all likely to be enhanced and total system performance improved, but consumers' basic interactions with their electric service – namely, passive receipt of energy, a periodic billing cycle, and occasional interaction with a customer service function – will remain as they are today.

While it is impossible to know for sure, it is quite possible that in the long run these may be the most important benefits of Smart Grid. We simply do not have enough knowledge today to be sure where the greatest benefits may be derived.

Nevertheless, most attention is focused on aspects of Smart Grid that may significantly alter the nature of consumers' interactions, as referenced in the RFI: "… many Smart Grid technologies aim to narrow the typical consumers' knowledge gap by empowering consumers with greater knowledge of and ability to control their consumption and expenditures. This vision transforms many consumers' relationship with the grid . . ." We will refer to these aspects of Smart Grid as "active," indicating that they will generally imply changes in consumer behavior and a shift from a largely passive role to one involving more active choices.

It is important to recognize that much of what has been written about the active aspect of Smart Grid is slowly being realized and will be even more so at some time in the future. No one today really *knows* what consumers will want (in the sense of being willing to pay for), how they will react to a variety of streams of new information, nor what forces may most effectively encourage them to modify their behavior with respect to their energy usage. We are still in the very early stages of experimentation, and it is likely to be some years before today's significant uncertainty is meaningfully reduced. This has important policy implications, as it implies that there is significant risk to extrapolating from today's limited knowledge base.

Nevertheless, based upon early tests, known reactions of consumers to related programs (e.g. existing demand response and energy efficiency programs), and prior behavioral observations, it is possible to offer hypotheses that may be of use to policymakers. In particular, our current knowledge is enough to suggest caution with regard to consumer acceptance of change that requires significant behavioral modification and/or a significant perceived reduction in 'quality of life.' To the extent that Smart Grid capability can be seamlessly integrated into consumers' lifestyles without a perceived reduction in quality of life, it is much more likely to prove successful.

For practical purposes there are three principal attributes of the electric delivery system that consumers generally care about: reliability, cost, and customer service interactions. (We take as a given that safety will remain the high priority that it is today. We also note that consumers today generally are unwilling to pay more than a small premium for energy that is considered to have superior environmental characteristics (i.e., clean or renewable energy) and that in any case the environmental characteristics are primarily driven by power generation technology and are unaffected by Smart Grid). All three of these attributes can be affected by the transparent aspects of Smart Grid; however, the active aspects primarily affect only cost, which is an important factor not to be overlooked.

What is equally important not to overlook is that smart meter applications and infrastructure are but a subset or aspect of Smart Grid and its benefits must be viewed in that vein. Smart Grid and its benefits must be viewed holistically and not only by its subparts. To that end, there are two ways in which consumer actions can affect cost: (1) consumers can shift the timing of their consumption; and (2) they can change their total consumption. As far as we are aware, all Smart Meter applications are designed to affect either timing or total consumption or both.

It is worth noting parenthetically that in this respect electricity is quite different from telecommunications, a sector with which it is frequently compared. In the latter case, technological advances in the world of digital ‘bits’ have enabled not merely greater efficiency but also fundamentally new service offerings, giving consumers capabilities that they did not previously have (e-mail, document sharing, web browsing, video streaming, to name a few). In contrast, however ‘smart’ we make the transmission and distribution grid, it does not change the fact that electricity is simply a useful form of energy, capable of supporting numerous end uses without requiring much if any modification or adaptation. Thus, from a consumer perspective, the benefits of the active aspects of Smart Grid are limited to extracting greater efficiency from the combined production-distribution-use system, thereby resulting in potentially lower cost to consumers.

The essence of the active side of Smart Grid is therefore that the consumer should change behavior in exchange for savings on his or her electricity bill. Policymakers should be aware of the existing evidence around this topic. FPL’s own experience with demand side management programs, which extends over thirty years, suggests that there are both opportunities and constraints when it comes to inducing consumer behavioral change. While consumers certainly value economic trade-offs, they also tend to be quite reluctant to change long-standing patterns of behavior and may require substantial price effects in order to do so. In addition, their ex post reactions to a particular offering may be different from their ex ante expectations – for better or worse.

For example, for many years FPL has deployed a direct load control program, in which customers receive a rebate on their monthly bill in exchange for providing FPL the ability to control major appliances (air conditioning, water heating and pool pumps) in times of resource need. Our research shows that customer satisfaction with this program changes considerably depending upon the extent to which the load control option is exercised. On the other hand, behavioral change that may have seemed unappealing ex ante (such as running a dishwasher at night) may become a new norm after a transition period.

Early evidence from customer awareness tests also suggest we should be cautious in our expectations of the difficulty of systematically changing consumer behavior. It is generally recognized, as the RFI suggests, that most consumers have little awareness of the composition, timing and major drivers of their electricity consumption. A not so unreasonable hypothesis is therefore that offering customers more information to increase their awareness will induce behavioral change leading to more efficient patterns of consumption. Practical tests, however, also indicate that while there can be a strong initial effect this tends to fade with time, unless strongly reinforced with direct price signals.

Policymakers should also be aware that tests may sometimes yield counterintuitive results. For example, tests involving the installation of programmable thermostats, which have generally been expected to result in lower consumption, have often resulted in either little change or in fact an increase in consumption. Such tests suggest that real world consumer decision making is much more complex than simple economic models might imply.

Finally, existing data from tests of time-of-day pricing and critical peak pricing have produced results that are susceptible to different interpretations. While it is clear that behavior can be influenced by varying pricing over the course of the day, the sensitivity of behavior to price and the sustainability of behavioral change are by no means clear. What does seem clear is that there is substantial 'inertia' in customer behavior, which will be overcome only with significant, sustained price signals or longer-term cultural change. For example, the recent PowerCentsDC Program conducted by PEPCO showed peak demand reductions averaging 34% for summer peak reduction among customers enrolled in the critical peak pricing element of the pilot. This was associated with critical peak pricing of approximately seventy-five cents per kilowatt-hour, or about seven times the average retail price. This pricing was applied for the equivalent of about 0.7% of the hours of the year. However, average demand reduction for customers enrolled in the critical peak rebate element of the pilot, who faced the same seventy-five cent marginal cost of demand reduction, was only 13%. This variability of response to design and rate structure is consistent with the Brattle Group 2009 synthesis.[1]

The wide variations in consumer response to different demand response and energy conservation programs suggest, among other things, that policymakers should continue to encourage a wide array of pilots and tests, as long as they are thoughtfully constructed and generate data susceptible to sound analysis. The existing body of evidence clearly shows that it is not possible to design a "one size fits all" approach. Consumer responsiveness to the introduction of active Smart Grid capabilities will clearly be affected by knowledge, enabling technology (e.g. thermostats linked to pricing signals), price signals and social norms, as suggested by the RFI, as well as other factors, some of which are likely not well understood today. Thus, it is important that future tests continue to expand our knowledge of the effects and interactions of these factors. To the extent that these or other factors constitute barriers to adoption today, the best policy response is to support continued experimentation and innovation.

Furthermore, policymakers should be suspicious of <u>any</u> market participant – whether an energy management firm, device manufacturer or utility – that claims it has figured out the "right" solution to introducing programs to modify customer behavior. In particular, policymakers should carefully consider two interrelated factors about which relatively little is known today: customer satisfaction and sustainability of

[1] "National Assessment of Demand Response Potential," FERC Staff Report, Prepared by The Brattle Group/Freeman Sullivan & Co./Global Energy Partners LLC, June 2009.

response. With respect to customer satisfaction, policymakers should recognize that longer term policy objectives having to do with the efficiency and environmental performance of the nation's electricity supply system may not entirely align with consumers' preference functions. While consumers clearly value lower cost, they also value convenience. With the average residential bill on the order of $100 per month, a potential savings of, say, 5% could leave a customer to question whether it will likely offset the perceived inconvenience. Correspondingly, the imposition of pricing structures that effectively force (through high marginal costs) policymakers' desired behaviors, without the appropriate customer education, may generate consumer dissatisfaction. Utilities and their state regulators need to think carefully about customer satisfaction in the design of their Smart Grid programs and they need to probe this subject carefully in their analysis of pilots.

Customer satisfaction is closely linked to sustainability. It is hard to avoid the element of consumer novelty in any pilot, and this potentially affects consumer response. Response levels seen in the first year or two of a program may not be indicative of long term behaviors. To the extent that poor program design generates customer dissatisfaction, behavior over time will likely change. Conversely, a well-developed Smart Grid program will yield consumer benefits and likely lead to program sustainability. Accordingly, we suggest that extra effort be placed on exploring the related issues of customer satisfaction and sustainability in future tests.

C. Interactions with Large Commercial and Industrial Customers

As the RFI notes, large Commercial and Industrial (C&I) customers generally show greater sophistication than residential customers. Perhaps more important, they tend to be more strictly economically motivated, and considerations of convenience hold much lower weight. As a consequence, it is important to be careful not to assume that lessons from large C&I customers will carry over to other segments.

Broadly speaking, Smart Grid initiatives that enable greater transparency of pricing, as long as the pricing structure is consistent and stable over time, will be the principal requirement of sophisticated customers. From a policy perspective, therefore, pricing structures not firmly grounded in underlying economics are likely over time to induce aggregate inefficiencies, as sophisticated customers adapt their own operations to accommodate whatever electricity pricing structure is enabled. Current technology enables the core requirements for sophisticated customers to be met today. Future benefits from Smart Grid initiatives are likely to be primarily in the form of greater efficiencies in meeting these customers' needs.

D. Assessing and Allocating Costs and Benefits

As the above comments suggest, it is impossible to make generally valid claims about the costs and benefits of Smart Grid initiatives. Program environments and designs vary significantly, and there is at present still too little known to support generalizations except at a very high level. Nevertheless, important distinctions can be made between the transparent aspects of Smart Grid and the active ones.

Transparent, or ‘before the meter’ initiatives, while they vary greatly and may be more or less successful, differ conceptually only modestly from initiatives that regulated utilities and their State regulators have been accustomed to handling for many years. They can be subject to the normal conditions of regulatory treatment, including prudence, and since their benefits are likely to be broadly distributed across all customer groups, their costs can be recovered through conventional ratemaking. Such initiatives, if well designed and managed, will generate operational benefits in the form of greater network efficiencies, better reliability and higher customer service through features like outage notification and remote connect/disconnect.

Different considerations, however, apply to active (or ‘beyond the meter’) Smart Grid initiatives. Because there is still a very high degree of uncertainty about customer acceptance, responsiveness, and satisfaction, it is appropriate to be much more cautious when considering possible benefits and costs. As indicated above, policymakers should actively encourage well-designed experiments; conversely, we believe they should be very skeptical at this stage of broad claims supporting initiatives involving, for example, a utility’s entire customer base.

By their nature, pilots, experiments, and tests can present challenges to the conventional ratemaking paradigm, which presumes a relatively stable environment and typically excludes unusual or non-recurring items. Accordingly, special ratemaking consideration for active Smart Grid initiatives is appropriate, such as with the use of a clause or rider.

The primary aim of active Smart Grid programs at this stage should be additional learning. Since results from existing tests vary widely depending on design, pricing and other conditions, it is important to extend our understanding of how consumer behavior changes in response to these and other variables. In particular, additional emphasis on: (i) the sustainability of customer response; (ii) the degree to which behavioral shifts result in peak shifting versus aggregate usage reduction; (iii) the magnitude of shifting and conservation behavior as a function of specific pricing programs and marketing tactics; (iv) the impact of social norms and peer pressure; (v) the variability of response across different customer segments; and (vi) especially, the impact on customer satisfaction over time as function of all these variables, represent important areas where greater understanding is required before the full potential value of active Smart Grid initiatives can be judged.

When considering costs and benefits, it is important for policymakers to take a total system perspective. Thus, for example, economic evaluation should consider the full cost of additional infrastructure needed to support particular applications – the installation cost of electric vehicle charging stations, as well as their capital cost, for instance. Economic analysis should reflect the fact that in a period of rapid technological change, device and system design may change rapidly, leading to early obsolescence of recently installed equipment. Equipment designed for an easy upgrade path, even though it may cost more initially, may well be more economical over the long haul. To reiterate, technology is destined to advance in a Smart Grid environment as in many other environments, so it is important to underscore that equipment designed for an easy upgrade path, even though it may cost more initially, may well be more economical over the long haul. Smart Grid enabled infrastructure, like all electric power system infrastructure, must be upgraded and enhanced over time to meet the new demands and challenges to the system--Smart Grid is no different.

Additionally, regulators should be particularly alert to situations in which there are likely to be differential adoption rates across customer segments, leading to cross-subsidization. One simple method to control this possibility is to limit the aggregate rate impact of energy efficiency and active Smart Grid programs to a given percentage – for example, all programs taken together shall not increase customer rates more than 2%.

E. Utilities, Device Manufacturers and Energy Management Firms

Please refer to EEI's comments to this section of the RFI as representative of FPL's position.

F. Long-Term Issues: Managing a Grid with High Penetration of New Technologies

Please refer to EEI's comments to this section of the RFI as representative of FPL's position.

G. Reliability and Cybersecurity

Please refer to EEI's comments to this section of the RFI as representative of FPL's position.

H. Managing Transitions and Overall Questions

Please refer to EEI's comments to this section of the RFI as representative of FPL's position.

Thank you for consideration of these comments.

Respectfully Submitted,

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