United States Department of Energy
Office of Electric Delivery and Energy Reliability

Request for information
Addressing Policy and Logistical Challenges to Smart Grid Implementation

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COMMENTS OF CURRENT GROUP, LLC

CURRENT Group, LLC ("CURRENT") hereby submits these Comments in connection with the Department of Energy's ("Department") Request for Information ("RFI") in the above-captioned proceeding. CURRENT is a provider of low-cost, distribution automation solutions that enable electric utilities to operate and deliver electricity more efficiently than they have traditionally been able to do. Simply stated, these distribution smart grid solutions reduce the amount of electricity necessary to serve the actual level of demand without changing end user behavior. This results in reduced generation needs, freed up capacity on both the transmission and distribution networks, and ultimately reduced electric delivery costs and generation-related greenhouse gas emissions. CURRENT's comments are specifically directed to the Department's request for input on the benefits and challenges associated with smart grid implementation on the utility side of the meter.

CURRENT is deploying its smart grid solutions for several distribution utilities in the U.S. and abroad. These deployments range in size and scope but have one common ingredient – the utility's effort to make its delivery of electricity more efficient. As the Department is aware, the predominant focus by electric utilities in the U.S. has been smart metering, or Advanced Metering Infrastructure ("AMI"). Such AMI deployments, while usually ubiquitous across a utility's footprint, are not initially focused on providing efficiencies in how electricity is actually delivered to end users. AMI efficiency models ultimately require modified rate plans, widespread rate payer adoption of in-home energy management devices, and sustained rate payer adherence to demand side management programs. As a result, as the RFI acknowledges, the timing for attaining efficiencies and the levels of efficiency realizable from such projects can be uncertain and difficult to predict.

Nevertheless, integrating grid-based efficiencies with an AMI deployment can greatly accelerate the achievement of such savings and complement those AMI deployments. Indeed, some U.S. utilities are adding distribution automation components to their AMI/smart grid deployments to provide real time visibility into their distribution systems. Integrating these solutions with AMI deployments reduces the costs of stand-alone, grid-based enhancements and maximizes the investment being made in AMI systems by using the AMI communications and IT components as part of the distribution automation solutions.

For this reason, in several smart grid projects, including American Reinvestment and Recovery Act-funded projects, utilities are integrating technologies that will reduce the amount of electricity needed to serve a given amount of demand without requiring changes in end user behavior. This "consumer less" energy efficiency requires no time-of-use or dynamic pricing tariff changes and no addition of devices by end users in their homes or businesses. In fact, it requires absolutely no change in end user behavior and does not compromise power quality or reliability. Rather, it provides the utility visibility into previously unseen voltage and power quality issues while enhancing reliability through enhanced planning and power delivery tools. Deploying these applications simply entails placing voltage sensors, capacitor banks and associated controllers in strategic locations along the distribution grid – to the extent not already deployed and to the extent the voltage data cannot be collected from smart meters – and installing software analytics to manage electricity flow on the distribution system. These solutions also reduce technical losses and extend the useful life of distribution assets.

CURRENT presently specializes in two distinct applications, each combining software analytics with hardware-based data collection. The first matches distribution line voltage levels to actual demand at any point in time. This real time dynamic voltage optimization works continuously, enabling the utility automatically to adjust voltage levels up or down on each feeder as dictated by conditions on that feeder and as measured by communications-enabled voltage sensors placed at a small number of locations along the feeder. Based on the voltage readings, the utility can adjust the load tap changer at the corresponding distribution substation (or line regulators and capacitors on the feeders), usually downward, to maintain the most appropriate voltage levels along the entire feeder. This application can reduce end-of-line voltages from what is typically found, *e.g.*, 121-122 volts, to levels commensurate with what is actually needed at the end of a feeder line, *e.g.*, 116-117 volts. The corresponding upstream voltage levels, all the way back up to the distribution substation, are likewise reduced, resulting in reductions of distribution load levels of up to 3% or more.[1]

The second of CURRENT's applications is real time, dynamic Volt/VAR control, or power factor correction. This application continuously monitors distribution VARs and enables a utility to control its capacitor banks and manage power factor levels 24 x 7 x 365. By using dynamic Volt/VAR control utilities can identify in real time precisely which capacitor banks to turn on and off to optimize power factor. This solution also helps utilities more effectively determine where to locate new, and relocate existing, capacitor banks, as well as determine which capacitor banks are in or out of service. Today unmonitored and unmanaged capacitor banks can languish out of service or in suboptimal locations or status for lengthy periods of time. Through this application power factors are improved to an average above .99 regardless of the power factor levels already in place. Utilities with comparatively low power factors on their distribution systems can achieve even more significant improvements, which would typically require the addition and/or relocation of capacitor banks. This Volt/VAR control application also can provide VARs upstream to the transmission system, thereby providing significant benefits to those systems as well (again by reducing the amount of VARs that need to be generated). In sum, this real time, dynamic Volt/VAR control application will lead to power factor improvements of 4%-5%, often more, further reducing the need for generated electricity.[2]

The impact of these applications for any given utility is dependent upon the level of efficiencies and automation the utility already has in place. Voltage level efficiencies will depend on the voltages already distributed at the utility's substation as well as voltage drops and feeder loads. Power factor improvements will largely depend on the extent of capacitor bank installation, automation, and VAR management schemes already in use by the utility. A utility that has efficiently deployed capacitor banks throughout its distribution system would, with relatively low capital investment required, stand to improve its power factors by as much as 4%-

[1] *See, e.g.*, http://www.techadvantage.org/conference/2010/Documents/7DMarkMcGranaghan.pdf. This also correlates to reduced generation and transmission requirements and also includes reduced technical line losses associated with the reduced load.

[2] A one percent power factor improvement equates to a one percent reduction in generation and transmission capacity requirements. CURRENT's experience is that, while some utilities have relatively high power factors, in the range of .94 or .95, many are much lower, either in the low .90s or even below .90. In the latter cases, improving power factors to above .99 would constitute an improvement of nearly 10% or more.

5%. A utility that has only nominally deployed capacitor banks or substation VAR management could improve power factors by much larger degrees, although with higher capital investment required (in the form of additional capacitor banks). In either case the energy savings created from these investments more than pay back for the investment in as little as a single year and at most within approximately two years.

In the RFI the Department asks for input on the perceived hurdles for smart grid implementation on the utility side of the meter and notes that many commentators have already noted that utilities may lack the incentives to invest in true smart grid infrastructure that promotes efficiencies. CURRENT concurs with this view and suggests that the main hurdle for utility adoption of low cost, high return grid efficiency efforts lies in the regulatory landscape. Unlike large infrastructure deployments that produce little efficiency gains but, upon regulatory approval, reward the utility with a fairly predictable rate of return, the energy savings from grid-based "smart" solutions will often eviscerate the utility's return on the capital investment. Under traditional rate of return regulation, savings would necessarily be passed onto rate payers (in the form of reduced consumption due to lower voltage levels) or assumed by the utility in the form of lower distribution operating costs that ultimately result in lower authorized revenue targets. Indeed, the savings – upwards of 5%-10% of total load – can reduce a utility's revenue to a point where it is in danger of failing even to recover all of the costs (let alone the return) authorized in its previous rate case.

In short, utilities should be incentivized to maximize their operational efficiencies (subject to maintaining minimum service level requirements). Some state regulatory commissions have sought to create such incentives by enabling utilities to retain, or share with its rate payers, a certain portion the savings attained through demand response programs, but such "decoupling" has generally not been applied to grid-based energy savings programs or a utility's overall rate structure. In contrast, both federal and state regulators introduced "price caps" in the 1980s and 1990s for monopoly providers of telecommunications services and that incentive-based regulation significantly contributed to the increases in efficiency attained and services provided by telecommunications utilities.

The RFI asks what regulatory changes are needed to spur desirable smart grid investments. It also posits that "a truly smart grid should achieve environmental goals at lower cost than the traditional grid, be able to respond more quickly to natural or man-made outages and, overall, operate the electrical system more efficiently without reducing system cyber security or reliability." Although CURRENT concurs, it is notable that electric utilities are not regulated in a way that encourages the development of this type of grid. Nor are they incentivized to improve grid performance in many of the other ways described in the RFI. To the contrary, the traditional rate of return regulation applicable to investor-owned utilities actually discourages them from selling or distributing less electricity or improving their own operating efficiencies, and certainly provides no tangible benefits to a utility or its shareholders for investing in technologies that improve environmental impact of electric delivery.

CURRENT submits that the Department must encourage state regulatory commissions to provide utilities the regulatory and economic certainty that their earnings will not diminish as they introduce grid-based efficiencies. At a minimum, electric utilities need incentives to engage in innovation truly designed to improve operational and network efficiencies; present regulatory structures often push utilities to find defensible capital investments that do not necessarily produce many such efficiencies. Indeed, such efficiencies, if attained, traditionally would have to be passed on to ratepayers, so utilities need incentives to reward them for lowering their revenues. Several state regulatory commissions have previously implemented decoupling efforts in connection with demand reduction programs and requirements. While doing so in connection with grid-based efficiency measures may not lend itself to a one-size-fits-all approach, it is essential that the respective state regulatory commissions ultimately authorize utilities to retain a portion of the savings they create in order to accelerate and maximize the adoption of available efficiency technologies. The extent of such retained savings can be determined in conjunction with a validation of a particular utility's savings achieved in a pilot of the particular solutions deployed, as described below.

Further complicating the regulatory equation is that many of the savings from these distribution grid solutions, both financial and societal (such as environmental savings from reduced green house gas emissions) emanate directly upstream or downstream from the distribution grid itself. For instance, the distribution utility will need less energy from its suppliers, therefore generation and transmission costs will be reduced or deferred. In addition, by managing and optimizing power factors and voltage/load levels in real time on the distribution system, the utility can better absorb the volatility and intermittency of distributed and renewable energy sources coming onto their systems now and increasingly in the coming years.

These solutions therefore facilitate the safe and efficient introduction of distributed and renewable energy resources.

To help utilities (and regulators) gauge the costs and benefits from such solutions, CURRENT has developed a real time grid estimation application that enables utilities to measure and verify the savings achieved from efficiency measures specifically conducted on the distribution grid. In addition, in collaboration with utilities and others, CURRENT has developed a value model that can demonstrate the value proposition for particular smart grid applications.[3] Such tools are crucial to the evaluation of any smart grid offering and, particularly if validated in a small-scale project to vet a particular technology, will help provide the regulatory certainty needed by regulators, rate payers, and utilities. As a result, to evaluate the potential impact of various smart applications CURRENT recommends that the Department either fund or coordinate with state regulatory commissions to authorize utilities to pilot specific applications, either on a standalone basis or integrated into their existing AMI and other systems. Given the ability of these applications to achieve repeatable savings in a small scale environment they can be deployed at low costs, *e.g.*, on a small number of distribution substations or feeders.

These grid-based, or "consumer less," energy efficiency measures can be deployed in moderation, feeder by feeder or substation by substation, and overlaid on most any communications or backhaul system, including wireless and other AMI systems. Indeed, this is how some utilities are beginning to deploy such applications today, sometimes adding sensors and capacitor banks to their networks and sometimes maximizing existing deployed hardware. Further, these devices need not be deployed everywhere, *e.g.*, at every single distribution transformer within a substation service area. Rather, the voltage sensors and capacitor banks described above as part of CURRENT's solutions would be deployed (to the extent they are not already deployed) only at a handful of locations within a substation service area. These applications begin providing data immediately from which the utilities can lower the distribution voltage levels and improve their power factors. These improvements are measurable and verifiable and the savings from such pilots can easily be extrapolated to other areas within the utility's service area. All this can be done without having to predict consumer adoption rates or

[3] While no value model will be perfect or work uniformly for every application (since the costs, benefits, and assumptions will always vary), the costs, benefits and assumptions should be demonstrable or based on actual trials of the technologies under consideration.

the availability of consumer home energy management devices and without having to determine end user price sensitivity to different tariff structures.

Upon completion of a sufficient length pilot, a utility can then demonstrate to its regulator the potential savings and help shape an appropriative regulatory scheme that both benefits rate payers and rewards the utility for implementing increased efficiencies. These types of projects also would alleviate the concerns acknowledged in the RFI of how to assess when predicted smart grid benefits will materialize and how to address such uncertainty when calculating the potential benefits of a smart grid implementation and making associated decisions about risk sharing. They also avoid the need to risk a system-wide implementation based upon presumed benefits that may not materialize because the technological upgrades in question can be made serially, and can be limited to certain portions of the grid, based upon proven value in the preceding limited deployments.

While AMI presents some immediate quantitative benefits, utilities can achieve significant conservation benefits from grid-based efficiency measures today at significantly lower investment levels and without relying upon consumer behavior changes to realize the identified value. CURRENT encourages the Department to consider allocating available funding for small pilots to evaluate these technologies. While such small projects do not necessarily create thousands of jobs, one of the Administration's goals, they will validate technologies for each utility that will subsequently create jobs while also reducing energy costs, consumption and greenhouse gas emissions. Moreover, the small size of these projects makes them much more "shovel ready" for both vendors and utilities than any ubiquitous infrastructure project that requires a hard-fought regulatory approval.

Respectfully submitted,

/s/ Jay L. Birnbaum

Jay L. Birnbaum
SVP & General Counsel
20420 Century Blvd
Germantown, MD 20874
301-944-2702
jbirnbaum@currentgroup.com

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