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Progress Towards Better Demand Response: A Review of the FERC/NARUC Demand Response Collaborative Meeting

By Daniel Schnitzer

Many independent analyses point to a near future in which electricity demand is outpacing installed capacity. With nuclear and coal plants becoming more expensive due to rising commodity and construction costs, and environmental concerns leading the latter being cancelled or deferred, there is now an opportunity to release the potential of the demand side. It has long been known that energy efficiency is available at a lower cost than the baseload supply it replaces, and increasing amounts of demand response (DR) in electricity markets reveals that it can be less expensive than peaking power. These demand resources provide the additional benefit that, just as the cheapest kW (or kWh) is derived from the one that is never built, so too is the cleanest.

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Inside

Did You Hear?

Pertinent Market News Over the Last Month

- ESCO Technologies Inc. today announced that the City of New York's Department of Environmental Protection (DEP) has selected and formally contracted with ESCO's Aclara RF Systems Inc. to provide its Citywide AMI solution for the city's entire water service territory. This contract will allow the City of New York to automate its meter reading capabilities and to improve customer service for its approximately 875,000 metered endpoints serving nearly eight million customers, representing the largest municipal water utility in North America. The total value of purchase orders anticipated to be issued under this contract is approximately $68.3 million and the system is expected to be deployed over a three-year period with the initial orders expected later this month.

- Duke Energy Corp. and General Motors Corp. are teaming up to smooth the way for a future of electric vehicles. General Motors Corp. said the partnership, which also includes the Electric Vehicle Research Institute and other large utilities such as Southern California Edison, will deal with myriad complicated issues from tax incentives to where and when the cars can be recharged. GM is working to bring the Chevrolet Volt rechargeable car to showrooms in late 2010. The Volt is being designed to run on an electric motor powered by lithium-ion batteries. When fully charged,

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At the core, each of the presentations at the Federal Energy Regulatory Commission (FERC) and the National Association of Regulatory Utility Commissions (NARUC) Demand Response Collaborative meeting extolled the rise of demand response, and that its implementation at high penetration is very much desired and within our reach. The meeting was evidence that the collaborative is providing a forum to frame and outline a well thought out process for reaping the benefits from the deployment of DR. The first of the presentations, by David Kathan and Ray Palmer of FERC, outlined the commission's upcoming assessment report, National Action Plan, and implementation proposal. Rick Sergel, CEO of NERC, discussed the progress NERC has made in collecting DR data and advocated that high targets to be set. Liz Hicks of KEMA and the author of this article presented the preliminary research they are leading for the collaborative on barriers to demand response and policy options to mitigate them. Together, these three presentations framed ongoing efforts to ensure that demand response is developed under well-informed guidelines.

KEMA's work on barriers and policy options is being complemented by another study, lead by the Brattle Group, which aims to quantify the national DR potential. Elements of both of these reports will be used in the 2009 FERC assessment of Demand Response. Specifically, the parts of the assessment that will be most influenced by these studies are:

- State by state data on potentials
- Methodologies for annual updates
- Barriers
- Policy recommendations

The assessment is to be completed by June 17, 2009. FERC's next major DR publication, the National Action Plan, is to be published by June 17, 2010, with an implementation proposal due in December 2010. The National Action Plan will be formed through an inclusive process, with FERC reaching out to stakeholders to identify existing resources, programs, tools and measures of DR. A preliminary, revised and draft plan will each be released for input between revisions. Ideally, the plan will provide "optimal solutions" on points where no consensus exists.

Did you hear?
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the car will be able to travel 40 miles on battery power. Duke has been working on its Utility of the Future project for several years with future widespread production of electric cars in mind.

- Echelon Corporation announced that the Danish utility SEAS-NVE has awarded an AMI project to Echelon Networked Energy Services value-added reseller partner Eltel Networks A/S, with meter data management system and enterprise software tools from NES VAR partner Goerlitz AG. Under the project, which is targeted to begin in Q408 and complete by the end of 2011, Eltel will deploy NES advanced metering infrastructure to approximately 390,000 SEAS-NVE customers. Revenue to Echelon over the life of the project is expected to be approximately $40 million.

- KEMA has promoted Rob Wilhite to senior vice president of KEMA's global intelligent networks and communications practice. This promotion supports KEMA's continued growth of its global smart grids practice and focus on grid modernization and utility of the future initiatives. Wilhite joined KEMA in 2004, building a successful practice in AMI. In 2007, Wilhite helped expand the global intelligent networks and communications practice, leading an integrated team of business strategists and deep technical experts from an array of direct utility and equipment supplier backgrounds. As senior VP, Wilhite will continue to coordinate KEMA's experts in developing and delivering comprehensive solutions to help clients achieve smart grids and AMI deployments worldwide.
  www.kema.com/press_releases

DR stakeholders should be excited by the progress made with NERC's Demand Response Availability Data System (DADS). The system will help quantify the value of demand response to reliability. Much like NERC's generation and transmission availability databases, demand response event analysis will provide a foundation for measurement of its capacity, energy

and ancillary service benefits. Mr. Sergel also emphasized the potential for demand response to realize greater delivered amounts of renewable-based electricity. Variable generation, such as wind and solar, often need a "dancing partner," a resource that can complement increasing penetration of wind and solar and provide operational flexibility to maintain reliability during the sharp down-ramps that can be experienced with these resources. DR has many qualities that make it particularly well-suited to play this role, which it has already shown plausible by, for example, being used in ancillary services markets. In addition to its ability to target peak demand growth, communications technologies have made the resource more dispatchable than ever before, in many cases available to operators in a matter of minutes. NERC's most recent data on DR in ancillary services markets indicates that operators are beginning to count on the resource with more certainty than in years past.

While demand response has gained momentum from improvements to communications and metering technologies and lower costs in recent years, many barriers remain to increasing the overall level of DR as a percentage of peak load, and its effective use. As part of the FERC/NARUC DR Collaborative, KEMA was asked to produce a research report to identify barriers and outline options to coordinate retail and wholesale policies that would mitigate or remove barriers and stimulate greater amounts of demand response.

The KEMA presentation identified many barriers and compared several existing DR taxonomies. Some of the key barriers include:

- High thresholds to default service on a dynamic rate
- Lack of metering and enabling technology infrastructure
- Regulator reluctance to expose customers to market volatility

Other barriers that were identified were at a much more specific or "micro" level. In the discussion that followed, there was strong consensus that barriers should be sequenced in such a way to illustrate the interconnectedness of some and to serve as a stepping stone to developing a chronological policy "roadmap" that regulators could follow. Part of this conversation on the interplay of certain barriers addressed the question of "what is optimal participation." This question alludes to the idea that policies should be developed that will not only mitigate barriers, but that will do so in the best possible way.

Commissioner Paul Centolella had an interesting take on the "optimal participation" question. He proposed an alternative question: "what is the optimal level of hedging?" He reasoned that regulators have assumed the optimal level to be 100 percent, or fixed rates, because fixed rates protect customers from market volatility and therefore maximize consumer value. However, recent studies have shown that the "insurance premium" embedded in fixed rates far exceeds those of dynamic rates, which calls into question the comparative amount of consumer value generated by fixed vs. dynamic rates. Furthermore, dynamic rates have also been shown to benefit the retailer by creating a less costly resource to meet peak demand, which in turn benefits all customers – under dynamic rates or not.

Regulators are saddled with the difficult task of providing an environment that allows for healthy returns on investment while protecting consumer value. However, for many customers, the insurance premium is simply not worth it. Premiums of 15 to 40 percent for fixed rates far exceed the 3 to 8 percent premium for dynamic and RTP rates, implying that price responsive customers could significantly reduce their electricity bills.[1] Because not all customers are willing or able to shift their load, or use less electricity during periods of higher marginal cost, some would not benefit from the dynamic rates. Therefore, the commissioner's question of "what is the optimal level of hedging" cannot be answered with a single quantity – it varies for every individual customer.

Instead, the answer is for retailers to offer a portfolio of dynamic rates on a spectrum from more to less hedging that best match individual consumption patterns to yield the greatest producer and consumer surplus. In that way, a customer would be able to pick one rate from many choices that delivers the greatest savings while allowing him to be comfortable with the amount of risk he is willing to take on. Increasing the amount of DR in the system will have the added benefits of lowering wholesale prices while improving reliability. The value of these benefits is delivered not just to those under dynamic rates, but to all consumers and the utility.

Dynamic rates have often been categorized as being "non-dispatchable," implying that in times of need,

1 Faruqui, A., Hledik, R. and B. Neenan, "Rethinking Rate Design: A survey of leading issues facing California's utilities and regulators, draft version." Forthcoming 2008.

resources under these contracts would not be as reliable as direct load control (DLC) or demand response "programs" with formal penalties. The latter concern can be addressed simply: the penalty of not responding to high prices under a dynamic rate is a higher electricity bill. As for the dispatchability of dynamic rates, since only customers who respond to prices would choose a dynamic rate, dispatch operators and utilities worried about reliability and high wholesale prices should not fear that the price signal will not elicit a response.

Even greater dispatchability under dynamic rates will be possible when individual customers are able to program price set-points into their appliances and thermostats. Once issues of data availability and privacy are sorted out, system operators will be able to control the demand resource as effectively as with DLC, and retailers will be able to effortlessly choose between generation and demand to meet load. And, unlike interruptible tariffs and emergency programs in which unreliable "baselines" must be quantified to estimate the amount of resource available at a given time of a particular day, dynamic rates with smart appliances and price set-points allow operators to see near real-time consumption and what reduction would result from a given price increase. This dispatchability itself is valuable to firms, and will no doubt be priced in the future.

In the meantime, retailers can work to improve their dynamic rate structures by allowing customers to respond to both day-ahead and hour-ahead (rather just than hour-ahead) prices, and by offering a menu of dynamic rates. Regulators can implement policies to allow the passing through of marginal costs to consumers by lowering the threshold customer load to be placed on default dynamic rates and by educating the public on the benefits of demand response.

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FERC and NARUC Continue Their Smart Grid Collaborative Efforts

By Will McNamara

In February 2008, the Federal Energy Regulatory Commission (FERC) and the National Association of Regulatory Utility Commissions (NARUC) announced that they had agreed to start talking about how state and federal regulators can collaborate on implementing the Smart Grid. Earlier this year, FERC approached NARUC to begin the dialogue on Smart Grid policymaking, recognizing the fact that, based on their relationships with utilities and consumers, and their aim to provide fair regulatory treatment to both, state regulatory PUCs are in a unique position to facilitate grid modernization. Among the goal of consistent policymaking, the Collaborative members clearly believe that increased dialogue among FERC, NARUC and the states should put state regulators in more of a leadership role. This role will give them the opportunity to better understand Smart Grid concepts and help them identify the policy changes necessary to stimulate progress in grid modernization.

The two regulatory agencies - NARUC is also being represented by approximately 18 state Public Utility Commission (PUCs) - continued this dialogue during the NARUC Summer Committee Meetings in Portland July 20 - 23. The Smart Grid Collaborative dialogue is the third such cooperative effort between FERC and NARUC. In the past, state and federal energy regulators have conferred on demand response and competitive procurement, but these new dialogues are specific to helping the Smart Grid happen. The collaborative project is being co-chaired by FERC Commissioner Suedeen Kelly and New Jersey Board of Public Utilities Commissioner and NARUC First Vice President Frederick Butler.

Commitment to Collaboration

Back in February, when the Collaborative was formed as a result of the Energy Independence and Security Act of 2007 (EISA), Butler commented, "[The Smart Grid] is an issue that is coming to the attention of state regulators as local delivery utilities and purveyors of Smart Grid technology are seeking our approval for installing this technology and rate recovery for their efforts. Before we get too far down this road, state and federal regulators must have a better idea of what technologies are out there, how they will benefit consumers, and how they will impact the grid."

At the onset of the July 23 meeting, Commissioner Kelly stated that it is incumbent upon policymakers to "harness the power of technology" to achieve the Smart Grid vision. Many of the regulators participating in the session echoed the sentiment that the Smart Grid is on a "promising path."

When the Collaborative was originally announced, both FERC and NARUC reiterated their commitment to developing consistent policies for the nation's emerging Smart Grid. For the purposes of policymaking, the agencies stated that the Smart Grid would incorporate technologies providing more sophisticated metering, two-way communications systems, and other technical innovations. Such advances could improve energy conservation through demand response, facilitate storage of electricity, ease grid access for intermittent renewable resources, and enhance electric system reliability.

Commissioner Butler indicated that the Smart Grid is actually the issue generating the most interest from members of the NARUC. Regulators in 30 states have petitions from companies that want to install a smart grid and want to recover the cost.

The Collaborative members recognize that they must first develop a higher level of understanding of the meaning of a Smart Grid, what it entails, and what regulators must do to move it along. The Collaborative is examining issues such as the costs of transitioning to a smart grid, and who will pay those costs, with the stated objective of developing definitions, parameters and a checklist for regulators to consult when evaluating proposed programs.

Defining the Smart Grid

One theme of the Portland meeting emphasized reaching a consensus on terminology. The obvious subtext was that the term "Smart Grid" is an evolving concept meaning different things to different stakeholders, and thus any dialogue focused on developing policy must originate from a shared perspective. Some of the questions the Collaborative indicated they are presently working through include: What is this thing called a Smart Grid and what are its components? Who will pay for it? What should be demanded of communications systems to support the Smart Grid vision? What should be explained to ratepayers, and to what extent should ratepayers become engaged in this policy discussion.

Another common theme among the regulators was the methods that may be used to stimulate consumer involvement. Based on the utilities that submitted formal plans for Smart Grid/AMI deployment, business cases often focus only on benefits that flow to the individual stakeholder group. The Collaborative members appear to agree that, because there is no federal mandate to build Smart Grids, regulatory leadership is needed to ensure all benefits are identified, including those that benefit society in general. For example, such benefits as reducing the huge costs that consumers suffer as a result of power outages, reducing peak demand to mitigate rising energy prices, and enabling the broad penetration of renewable resources not only benefit each stakeholder group but society in general. Inclusion of all benefits will make the value proposition for each stakeholder more clearly understood and appreciated.

Joe Miller, vice president of the Horizon Energy Group and representing the Modern Grid Strategy, discussed how along with defining what the Smart Grid "is" attention should also be devoted to what the Smart Grid enables. To offer real-world perspective to the dialogue, Miller asked the audience to imagine a world with 200 million electric vehicles that, along with providing transportation, are capable of connecting anywhere and acting as storage vessels and generators for the transmission grid. These vehicles would also be powered by renewables, clean nuclear and coal capture, and other distributed generation, and would provide an opportunity for end-users to by and sell kilowatt-hours. This would be the kind of compelling value proposition that help to sell the Smart Grid concept to consumers and illicit consumer involvement.

And this future does not appear to be too far off. General Motor partnered with more than 30 utility companies across the United States to help work out electricity issues that will crop up when it rolls out new electric vehicles in a little more than two years. The Detroit automaker said the partnership, which includes the Electric Vehicle Research Institute and large utilities such as Southern California Edison and Duke Energy Corp, will deal with issues from tax incentives for the vehicles to where and when they can be plugged in for recharging. GM is working to bring the Chevrolet Volt rechargeable car to showrooms in late 2010. It's being designed to run on an electric motor powered by lithium-ion batteries.

Characteristics of a Smart Grid

Miller also established the seven characteristics of the Smart Grid, which apparently has formed the basis for the Collaborative discussion. According to Miller, the Smart Grid will:

- Enable active participation by consumers
- Accommodate all generators and storage options
- Enable new products, services, and markets
- Provide power quality for the digital economy
- Optimize asset utilization and operate efficiently
- Anticipate and respond to system disturbances (self-healing)
- Operate resiliently against attack and natural disaster.

Miller also led a discussion of the milestones that might be used to determine that the development of AMI and the Smart Grid is making progress or has been achieved. He also asserted that the characteristics of the Smart Grid are contingent upon achieving all of these four milestones, as opposed to achieving only one or two of them:

- AMI empowers the customer and establishes communications to the load
- Distribution / Automated Distribution Officer enables self-healing
- Transmission / Automated Transmission Officer addresses congestion
- Automated Asset Management improves performance of asset management.

The Modern Grid Initiative also has proposed to the Collaborative that regulatory policy should incentivize investment in the Smart Grid by supporting time-based rates and net metering; more favorable depreciation rules; clear policies on cost recovery; and consideration of societal benefits when evaluating utility business cases.

Some Policy Issues Remain Contentious

While the California ISO is not a member of the FERC/NARUC Smart Grid Collaborative, recent comments from the corporation charged with operating the majority of California's high-voltage wholesale power grid, revealed some potential cracks into the guise of policy consistency between FERC and state agencies on Smart Grid issues. H. Walter Johnson, head of the CAISO Corporation's Technology Strategies, publicly stated FERC should not develop new interoperability standards for Smart Grid technologies, arguing that the existing standards are sufficient and that new standard would drive up electricity rates. FERC was directed to developed interoperability standards under the 2007 Energy Independence and Security Act.

In addition, Johnson said that because the electricity regulatory landscape is already awash in standards, and stakeholders already trying to overcome a variety of compliance hurdles, the new energy law standards would not be helpful. Instead, he offered the alternative of using existing standards rather than creating entirely new ones.

Johnson said that his office within CAISO is trying to develop ways to lower the cost of electricity and, with regard to that goal, new standards would not help because they would be costly. A variety of ratepayers, especially the large industrial consumers, have complained that standards raise the cost of electricity. They do so because system operators must integrate a compliance strategy into the rate base in trying to adhere to standards, creating higher operating costs and electricity prices, according to industry sources. Johnson also asserted that the "surplus" of standards, both established and proposed, should be used to the advantage of FERC in meeting the demands of the EISA.

Under EISA, Congress directed the Department of Energy Secretary to create a Smart Grid advisory committee and a Smart Grid task force that would function through 2020. The task force will be headed up by the assistant secretary and include at least one representative from FERC and the National Institute of Standards and Technology. The institute is to coordinate the development of a smart grid framework and its protocols and model standards. Once there is sufficient consensus, FERC is to adopt standards to ensure smart grid functionality and interoperability in interstate transmission of power, and in regional and wholesale electricity markets.

"In the meantime, initial steps are being taken to deploy smart grid technologies, and that's a good thing," Commissioner Kelly has previously said. "The California Public Utilities Commission has started to implement advanced metering infrastructure and a number of state regulators primarily in the PJM Interconnection region are working on a Mid-Atlantic distributed resources initiative. I think it's wise of state and federal public utility regulators to begin a parallel process that stays abreast

of what NIST is doing and coordinates information among the regulatory community."

Additional members of the Smart Grid Collaborative are:

- Commissioner Garry Brown of New York
- Commissioner Paul Centolella of Ohio
- Rachelle Chong of California
- Commissioner Robert Clayton of Missouri
- Commissioner Sherman Elliott of Illinois
- Commissioner Wendell Holland of Pennsylvania
- Commissioner Colette Honorable of Arkansas
- Commissioner Orjiakor Isiogu of Michigan
- Commissioner Jon McKinney of West Virginia
- Commissioner Katrina McMurrian of Florida
- Commissioner Rick Morgan of the District of Columbia
- Commissioner Pat Oshie of Washington
- Commissioner Sharon Reishus of Maine
- Commissioner James Tarpey of Colorado
- Commissioner Harold Williams of Maryland
- Commissioner Dallas Winslow of Delaware

The next meeting of the Smart Grid Collaborative can be expected to occur at the NARUC Annual Meeting in November.

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Who Governs the HAN - Controlling the Future

By Ron Chebra

A few weeks ago, in an unceremonious manner, a 40-year milestone was reached. On June 29, 1968, the Federal Communications Commission (FCC) ruled that the monopoly that the Bell system held on telephone equipment should be broken. In what has become known as the Carterphone Decision, this ruling opened the door for any telephone equipment provider to connect to the "Bell System." Since then any number of "certified" devices that are manufactured and marketed from any number of sources can be connected to the standard telephone line. However, to ensure that these devices do not cause harm to the network, they must undergo a series of tests that are specified by the FCC.

Using this telephone system ruling parallel as precedent, utilities that are pursuing AMI or are in process of creating a communications infrastructure to support metering and Home Area Networks (HAN) traffic must have an active role in defining the characteristics that would be supported in their infrastructure. These would include establishing a service level delivery requirements that must be properly evaluated and characterized. While bandwidth and speed are important, considerations must include security, latency and transparency and monitoring metrics to ensure growth of these services as anticipated are properly managed.

In last month's article on Home Area Networks (HAN) the concepts of the Utility HAN (uHAN) and Consumer HAN (cHAN) were explored, as well as the overlapping area of these two networks that form the Joint HAN (jHAN). While there may be some challenges establishing the bridge or gateway system that would manage the interflow and interoperability of these networks, there still needs to be significant work to establish the rules within each of these respective networks.

On the consumer side, the growing proliferation of WiFi in the home has been fostered by standards such as 802.11(b), 802.11 (g) or even 802.11 (n) that are governed by the Institute of Electrical and Electronic

Engineers (IEEE). It is through the standards accreditation and monitoring that devices manufactured by any number of vendors are able to interoperate and cohabitate without harm to other devices on the network.

While there is a plethora of other HANs in use today, many of these have experienced varying levels of adoption. These include X-10, Home Plug, Z-wave, Home Plug Command and Control, 6LoWPAN. However, there is great interest in ZigBee as the emerging Home Automation and Sensor control network that would be directly linked to utility AMI systems.

Recently, the ZigBee Alliance released the Smart Energy Profile Specification Revision 14 on May 29, 2008. This comprehensive document covers a number of devices including the traditional uHAN devices shown in the following table extracted from this specification:

Devices Specified in the Smart Energy Profile		
	Device	**Device ID**
Generic	Range Extender	0x0008
Smart Energy	Energy Service Portal	0x0500
	Metering Device	0x0501
	In-Premise Display	0x0502
	Protrammable Communicating Thermostat (PCT)	0x0503
	Load Coontrol Device	0x0504
	Smart Appliance	0x0505
	Prepayment Terminal	0x0506
	Reserved	0x0507 - 0x5FF

This specification has established an extensive set of common message types that are generic across all devices. These include basic messaging, identification, key establishment. Optional common data clusters would include alarms, power consumption, reporting, commissioning.

Each of the devices identified above has a defined set of mandatory and option data clusters. Typically these messages are small in size.

Of particular interest is the Energy Service Portal, which is defined in the specification. This is excerpted below:

> *"The Energy Service Portal connects the energy supply company communication network to the metering and energy management devices within the home. It routes messages to and from the relevant end points. It may be installed within a meter, thermostat, or In-Premise Display, or may be a standalone device, and it will contain another non-ZigBee communication module (e.g. power-line carrier, RF, GPRS, broadband Internet connection)."*

As noted the specification gives a number of options for this service, including, but not limited to the meter end device. The metering device is defined:

> *"The Metering end device is a meter (electricity, gas, water, heat, etc.) that is fitted with a ZigBee device. Depending on what is being metered, the device may be capable of immediate (requested) reads or it will autonomously send readings periodically. A Metering end device may also be capable of communicating certain status indicators (e.g. battery low, tamper detected)."*

For many implementations, the meter will serve as both the service portal and the metering device.

One of the key cluster types that the meter will need to optionally support is complex metering and the tunneling capability which, as of yet undefined in the specification.

Clusters Supported by the Energy Service Portal

Server Side	Client Side
Mandatory	
Message	
Price	
Demand Response/Load Control	
Time	
Optional	
Smart Energy Tunneling (Complex Metering)	Smart Energy Tunneling (Complex Metering)
Prepayment	Prepayment
Simple Metering	Simple Metering

Because of the lack of specificity surrounding this cluster type, one of the most difficult challenges facing utilities may be trying to determine the extent and impact that this requirement may have on the overall LAN data requirements of the AMI system.

While it is anticipated that the Smart Energy Tunneling will be used for load profile reporting, power quality management and C&I metering. The flexibility that now exists in residential meters is soon approaching the functionality of many current C&I meters.

Therefore, it essential that utilities need to take an active part in ensuring that devices, such as metering devices, energy service portals and uHAN devices properly communicate in harmony, and that they individually and collectively do not cause harm to the AMI network utilities are now deploying.

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