Testimony
Of

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My name is Dan Delurey and I am Executive Director of the Demand Response and Advanced Metering Coalition (DRAM). DRAM is the trade association for companies that provide technologies, products and services in the electricity industry segments known as demand response and smart grid. Its members[1] include the leading providers of smart metering systems, communications and control technologies, meter data management systems, smart thermostats and other "smart" equipment. Its members also include companies that use these technologies to provide services, including the provision of "negawatt" blocks of demand response. DRAM welcomes the opportunity to provide testimony to the Energy, Natural Resources and Infrastructure Subcommittee of the Senate Finance Committee on why demand response needs to be included in electricity policy, planning and operations, and to offer comments on how demand response and its enabling technologies, such as smart meters, not only relate to but are in fact necessary for the development of the smart grid.

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[1] DRAM members include Cellnet, Comverge, Echelon, Elster Electricity, eMeter, EnerNOC, EnergySolve, Esco Technologies, Itron, Landis + Gyr, Sensus, Silver Spring Networks, SmartSynch, and Trilliant

Our testimony seeks to do several things:

1. Provide a brief explanation as to what demand response is, why it is important to national energy policy, and why it is an important element of a "smart grid".
2. Provide a brief overview and explanation of demand response technologies such as smart meters.
3. Discuss the many and varied benefits that demand response and its enabling technologies deliver to various parties.
4. Discuss specific ways that demand response, smart meters and other smart grid technologies and applications can support energy efficiency and renewable energy and address climate change.
5. Put forth tax policy options that the Congress can consider and act upon to accelerate the deployment of demand response technologies, increase the amount of demand response resources in the national electricity mix, and put the foundation in place for the smart grid.

What is Demand Response?

Demand response refers to the policy and business area whereby electricity customers reduce or shift their peak demand usage in response to price signals or other types of incentives. At present, the vast majority of electricity customers, and virtually all residential customers, are on rates or prices that have them paying the same unit price for electricity at any time of day and any time of year, no matter how much the cost to produce or deliver electricity fluctuates as demands on the system rise and fall. These existing "flat" rates do nothing to stem peak electricity usage, which continues to grow unconstrained across the U.S. The lack of any disincentive to on-peak consumption does nothing to address the reliability of the electricity system, which continues to be threatened by the rapid growth in peak demand. When demand response is introduced, and when even a small percentage of customers modify their peak usage, outages can be prevented, overall prices to all customers can be reduced, and customers, utilities and many other stakeholders can reap significant benefits.

For example, in 1999 in California, if only 20% of the state's retail demand had been subject to time-based pricing, and if there had only been a moderate amount of price responsiveness, the state's electricity costs would have been 4%, or $220 million, lower. The following year, in 2000, electricity prices were more than four times as high and the same amount of demand response would have saved California electricity consumers about $2.5 billion – or 12% of the statewide power bill.

In 2001, McKinsey and Company estimated that on a national basis, electricity consumers could potentially realize benefits of $10 to $15 billion per year if demand response programs were employed, with the result being the avoidance of 250 peaking power plants (at 125 MW each) for a total of 31,250 MW and $16 billion in plant costs. These and other estimates of benefit potential were presented to Congress in a Senaterequested Report by the General Accounting Office in 2004.[2] More recently, PJM Interconnection estimated that during the heat wave of August 2006, demand response reduced real-time prices by more than $300 per megawatt-hour during the highest usage hours, estimated to be equivalent to more than $650 million in payments for energy.

More discussion of benefits will be provided in a later section of this testimony.

As with any new field, definitions of demand response are still in development within the policy and business community. One definition that many policy makers have accepted was developed by the non-profit U.S. Demand Response Coordinating Committee (DRCC), a diverse group exclusively dedicated to the development of new content and information on demand response. Its definition is as follows:

> *Providing electricity customers in both retail and wholesale electricity markets with a choice whereby they can respond to dynamic or time-based prices or other types of incentives by reducing and/or shifting usage, particularly during peak periods, such that these demand modifications can address issues such as pricing, reliability, emergency response, and infrastructure planning, operation, and deferral.*

An examination of this definition reveals that there are a number of different facets to demand response. While this can make an appreciation of demand response more challenging, it also means that the amount and type of benefits can collectively be very high. Each of these facets will be discussed in the benefits section below, but it is worthwhile to note that key to this definition, and to any definition of demand response,

[2] The GAO Report on Electricity Markets: Consumers Could Benefit From Demand Programs, but Challenges Remain, August 2004, is available at http://www.gao.gov/new.items/d04844.pdf.

is that it is focused on customers and providing them with new options to manage their energy use and reduce their energy bills.

One more background item is worth noting. Just as energy efficiency was at one point referred to as “energy conservation,” early forms of demand response were known as load management. Under that name, a number of utilities have operated successful programs over the years where in return for some incentive, customers allowed utilities to put controls on certain of their appliances and turn those appliances off when peak demands on hot summer days or cold winter days threatened the reliability and integrity of the system. These programs have functioned well in years past and many continue today. The difference between demand response and load management is that new technologies in the area of metering, communications and controls means that many new types of demand response options are available to customers. These options are “smarter” and allow customers to maintain and share control of appliances and equipment or to employ automated controls that can respond to price and other signals. These options also allow other demand response options to be provided such as time-based rates.

Demand Response Technologies

The most ubiquitous demand response and smart grid technology is the meter, and some background on metering can be helpful in understanding demand response, its benefits and how it plays a role in the development of the smart grid.

The vast majority of electricity customers in the U.S. do not have a smart meter on their home or business. (The Federal Energy Regulatory Commission, in its 2006 Report to Congress on Demand Response and Advanced Metering, which was required by EPACT 2005, estimates only 6% have smart meters[3]; the Department of Energy's Assessment of Demand Response Potential, submitted to Congress in February 2006 pursuant to an EPACT requirement also discusses the lack of penetration of smart metering[4]). Many customers still have the basic type of meter that has been in use for decades. This meter has one function—to "count" the units of electricity that the customer consumes and to maintain a cumulative total of that usage that at some point is multiplied by the price of that unit to produce a total electricity bill. In a modern society where customers can easily and quickly obtain information about the things they purchase, such meters and the information they provide are anomalies. Customers with basic meters get no informational feedback on how and when they are using electricity or information they can apply to their future electricity purchases. They also are unable to take advantage of any time-differentiated rates or prices that could help them reduce their electricity bill.

A smart metering system does two important things. First, it measures and stores electricity usage in intervals, on at least an hourly basis. This time-based measurement allows time-based pricing and rates to be offered and accepted. Second, the smart meter is part of a communications network that allows the data measured and stored to be

[3] The FERC Report to Congress is available at the following link: http://www.ferc.gov/legal/staff-reports/demand-response.pdf.
[4] The DOE Report to Congress is available at the following link: http://www.oe.energy.gov/documentsandmedia/congress_1252d.pdf

collected and retrieved on a timely basis—at least daily—for use by the utility and other parties and for presentation to the customer. This communications network and connectivity with the customers' premise provides other non-demand response benefits to utilities and customers alike, as is described below.

Smart meters are not the only new technologies that enable demand response and that help create the smart grid. "Smart" advances have been made in remote controlled and price-sensitive thermostats and lighting systems that allow these technologies to be utilized in demand response applications. Energy management systems (EMS), formerly only used for energy efficiency purposes, are being made smarter and thus capable of empowering demand response applications. New in-home display devices are available that can transmit information from the meter to the customer in real time. New building automation and management technologies are available that allow optimization of energy use with respect to time of use. New thermal and battery storage systems are available that allow dynamic storage and release in concert with peak demand management. Even automobiles are developing into dynamic storage media in the case of the Plug-In Hybrid Electric Vehicle (PHEV), where the replacement of petroleum with electricity has been shown to have net environmental benefits as well as help optimize grid management.

It is important to note that it is not just the technology but also how it is employed and applied that creates demand response. For example, some demand response companies have a service, or resource-based business model, whereby they contract with utilities to provide a block of demand response (e.g. 10, 20, 30 or even 40 MWs) in the same manner as if they were offering a peaking power plant to the utility. The demand response provider takes on the responsibility for enrolling and aggregating customers and controlling the peak loads of those they enlist so as to create a “negawatt” resource for the utility that is a substitute for additional power generation.

Demand Response and the Smart Grid

It is perhaps intuitive to understand why demand response technologies such as smart metering are an integral part of the Smart Grid. In the context of the smart grid, demand response and its enabling technologies such as smart meters are the place where the smart grid touches the customer. The vision of a smart grid is that of an intelligent, dynamic “organism” that allows the electricity system to be planned and operated in a way that optimizes all of its components to lower costs, increase reliability and utilize new informational and communications technologies. That vision includes an optimization of not only supply side options but also demand side options, and demand response is the way for demand side resources to effectively and dynamically be engaged.

Viewed another way, given that the smart grid will not arrive in one instant in time or in one fell swoop, smart meters and other related communications and control technologies are, collectively, the building blocks of the smart grid that will provide the foundation upon which the rest of the smart grid will be built. Timely, and in some cases, on-demand information from customers will help smart grid operators better monitor grid conditions and assess potential threats to the reliability and/or security of the electricity system. By providing information, including price signals, to customers, those operators will in turn be able to deploy customer reductions as a resource. Demand response technologies allow information and control over the demand side to be individually addressed yet aggregated into sizable blocks of capacity that will be key to the success of smart grid development. Not only will the deployment of demand response technologies help avoid electricity outages, but also will help utilities and regional operators restore electricity faster than otherwise when outages do occur. In the case of the last major Northeast Blackout, New York State, where a substantial number of demand response technologies are deployed with large customers, was able to use those technologies and customer connections to do a controlled restoration which resulted in power being restored a full day earlier than expected.

Benefits of Demand Response and its Enabling Technologies

Demand response and its enabling technologies offer many different benefits in many different areas. In terms of reliability, a reduction in peak electricity demand reduces the threat of outages. In terms of electricity markets, demand response and its technologies allow dynamic demand reductions to be deployed instead of resorting to additional power production, with the result being lower wholesale prices, which all customers pay one way or the other. Also related to markets, reductions in peak demand serve as a means of mitigating market power of suppliers, which can otherwise occur when demand increases unconstrained during peak periods due to consumers not paying prices anywhere near the cost of producing the electricity during that critical peak period.

In almost all cases, technology is required to enable demand response even if it is only for time-based measurement purposes. In the case of the smart metering system, however, non-demand response benefits are introduced when the technology is deployed for demand response. A good example is grid outage management and restoration. At present, many utilities rely on customers who lose service due to a storm to make a telephone call to let the utility know of the outage. In other cases, utility truck crews drive around to identify which homes and businesses are out. With the communications and connectivity abilities that come with smart metering systems, a utility customer service operator can instantly know when a customer is out and can optimize dispatch of crews to address the situation, increasing the speed and decreasing the cost of restoration. Other types of benefits in the areas of customer service, outage management, system planning, system operations and security maintenance are possible when demand response technologies are deployed.

Environmental Benefits of Demand Response and the Smart Grid

It is only now beginning to be understood that demand response can make important contributions to addressing climate change and other environmental issues. One way that it does this is by enhancing and reinforcing customer energy efficiency, the accepted cornerstone of emission reduction policies. With demand response and smart grid technologies, customers will get information on their electricity usage that they have never had before and get it in a timely manner such that it acts as feedback to reinforce their energy management efforts. Furthermore, they will have price and rate options that will stimulate them to be more efficient energy consumers. Demand response technologies will be the answer to the question "how can you manage what you cannot measure?" Studies have shown that even where customers are not on time-differentiated rates, they may reduce their electricity usage by 11% just as a result of being more informed and understanding better how and when they are using electricity[5] Other new government-funded research from the United Kingdom, where smart metering is becoming an official part of the Government's climate change strategy, shows that businesses with smart metering achieved a 5% reduction in CO2 emissions and that there was more than double that in identified potential for future savings.[6] Indeed, demand response control and information technologies such as smart meters can be the platform upon which the U.S. moves to an entirely new, more expansive and effective era of energy efficiency.

Demand response technologies and practices will not only lead to greater energy efficiency but also to greater accountability of reductions, something that will be increasingly important under any policy where emissions are constrained and reduction-based offsets are monetized. Indeed, the smart electricity meter, while not an energy efficiency device in and of itself, may prove to be not only a smart meter, but also a green meter, as it helps to not only improve overall energy efficiency but also track and verify energy savings.

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[5] "The Green Effect – How Demand Response Programs Contribute to Energy Efficiency and Environmental Improvement", Nemtzow, Delurey and King, Public Utilities Fortnightly, March 2007

[6] Advanced Metering for SMEs – Carbon and Cost Savings, Carbon Trust, London, England, www.carbontrust.uk.co

In the case of some pollutants such as NOx, time-based emissions (e.g. during hot summer afternoons) can lead to ozone non-attainment. In the case of NOx and ozone, demand response holds out the potential to be a dynamic emissions tool that can be used to reduce power plant emissions precisely when they contribute the most to non-attainment.

Finally, the potential contribution that demand response can make to renewable energy development should be noted. In the case of wind energy, a particular geographic wind resource may not be available during peak demand periods. By matching that wind resource with demand response during the period that wind is non-available, the wind resource may become more viable. The result is a greater chance that less environmentally friendly resources can be avoided through a combination of wind and demand response.

Tax Policy Considerations

There is presently no policy in the U.S. Tax Code designed to foster the development of demand response and the deployment of smart technologies. Federal tax policy has been used for almost two decades to accelerate and enhance the development and deployment of energy efficiency and renewable energy technologies and activities. Efficiency and Renewable Energy are closer to maturity as a result of this tax policy. These areas obviously still deserve consideration for preferential tax treatment as more of each is needed, but the opportunity now exists for the Congress to provide similar support for important new areas such demand response and the smart grid, i.e. to provide the important lift that tax policy can provide such that the amount of demand response resources is increased, and the deployment of the smart grid happens faster than it otherwise would. By doing so, not only will Congress be expanding and enhancing efficiency and renewable energy as outlined in the previous section of this testimony, but also it will also be delivering the many other benefits that occur in many other areas, as also outlined above. In passing EPACT 2005, the Congress adopted the following policy statement in the Smart Metering provisions of Section 1252 (f):

> *(f) Federal Encouragement of Demand Response Devices- It is the policy of the United States that time-based pricing and other forms of demand response, whereby electricity customers are provided with electricity price signals and the ability to benefit by responding to them, shall be encouraged, the deployment of such technology and devices that enable electricity customers to participate in such pricing and demand response systems shall be facilitated, and unnecessary barriers to demand response participation in energy, capacity and ancillary service markets shall be eliminated. It is further the policy of the United States that the benefits of such demand response that accrue to those not deploying such technology and devices, but who are part of the same regional electricity entity, shall be recognized.*

If this policy goal is to be realized, the Congress must turn its attention to use tax policy to support demand response and smart grid technologies. DRAM offers four recommendations:

1. Modify Depreciation

Congress should recognize that smart meters represent new, high-technology hardware and software and should be treated as such for tax and regulatory purposes. Currently, electricity meters are depreciated over periods of as much as 20 to 30 years. Depreciation policy should be permanently changed to five years to bring these new technologies in line with other modern technologies. This policy recommendation was officially endorsed by the National Association of Regulatory Utility Commissioners (NARUC) at its recent meeting; that Resolution can be found as Attachment A to this testimony.

2. Investment Tax Credits

While the smart grid is not all about technology – e.g., it is also about changing the relationship between consumers and their electricity usage and purchasing habits – new smart technologies are key to demand response and the modern grid. Most of these technologies are not ones that will be purchased by or invested in by individual consumers. For example, there is an experienced-based consensus that smart meter deployment is most effectively, economically and rapidly achieved via mass deployment through utility distribution companies (the cost of deployment on an ad hoc consumer-by-consumer basis has been shown to be up to 10 times as high).

Most of the technology investments made to enable demand response and "construct" the smart grid, whether they are by utilities or by other parties, will be capital intensive. Providing appropriate tax incentives such as investment tax credits would support the acceleration of such investments.

3. Reduction Tax Credits

The functionality and capabilities of demand response and smart grid technologies opens up entirely new possibilities for performance-based tax incentives. Unlike traditional energy efficiency, these technologies allow more precision in the measurement and verification of energy reductions. Because of this, Congress should consider putting in place a reduction tax credit (RTC), similar to the production tax credit (PTC) that has allowed the renewable energy industry to gain traction and grow over the past decade. Such a credit would only be granted when reductions are measured and verified using demand response technologies and applications, in recognition of the capabilities of such.

4. National Smart Grid Fund

In total, a considerable capitol investment needs to be made to develop demand response resources and the smart grid. Congress should consider following the example of the many states that have implemented "wires" charges to collectively raise funds for expenditures on energy efficiency and renewable energy. Unfortunately many of these "System Benefit Charge Funds", as they are known, do not allow funds to be spent on demand response and smart grid technologies or activities. That fact, and the fact that much of the development of the smart grid requires a nationally or at least multi-state coordinated effort, means that Congress should consider instituting a National Smart Grid Fund that is enabled via the introduction of an assessment on the transmission system. Even an extremely small "wires charge" of $.0005 per kilowatt-hour, a size that is used with the State Funds, could generate billions of dollars in revenue earmarked for smart grid investments, yet not be an additional cost burden to any individual consumer.[7]

Conclusion

As with any major endeavor such as the transformation of the nation's electric system into a smart grid, it is important to consider the timing and nature of the transition. In the case of the smart grid, it is easy to always see it as something that is out in the future somewhere, just out of reach. It is easy to see it as something that requires substantial research and development and that can only be accomplished if new technologies, not necessarily yet invented, are developed and made available. Some aspects of the smart grid may indeed meet this future-oriented test. But in the case of demand response, smart meters and other smart technologies and applications, the future is now. These technologies, as with any modern technology, especially in the computer or telecommunications area, will be on a continual path of evolution and will continue to improve over time. Yet those businesses and consumers do not wait for the next great product to be developed before deploying a computer or cell phone so as to capture the

[7] For example, in the case of one New England state with such a charge, the $0.0005 amount per kwh translates into 20 cents per month on the typical bill, representing only 1/3 of 1% of the total monthly bill amount.

many benefits that present technology provides, even while recognizing that new technology will certainly replace what they have at some point. It is important to take this perspective with the smart grid and not in all cases wait for future technology. The threshold to greater demand response and the smart grid is not increased R&D. Demand response and smart technologies are available today which can deliver immediate benefits to utilities, customers, other stakeholders and the nation as a whole. With a greater commitment by state and federal policy makers to deploying these technologies now, expressed through changes to federal tax policy that will accelerate their deployment, the construction of the smart grid can begin now instead of in the future.

For questions regarding this testimony, please contact:

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Attachment A

Resolution on Smart Metering Adopted by the National Association of Regulatory Utility Commissioners (NARUC) at its February, 2007 Meeting in Washington, DC

WHEREAS, the Energy Policy Act of 2005 amended the state ratemaking provisions of the Public Utilities Regulatory Policies Act of 1978 (PURPA) to require every state regulatory commission to consider and determine whether to adopt a new standard with regard to advanced metering infrastructure (AMI); and

WHEREAS, advanced metering, as defined by FERC, refers to a metering system that records customer consumption hourly or more frequently and that provides daily or more frequent transmittal of measurements over a communication network to a central collection point; and

WHEREAS, the implementation of dynamic pricing, which is facilitated by AMI, can afford consumers the opportunity to better manage their energy consumption and electricity costs through the practice of demand response strategies; and

WHEREAS, effective price-responsive demand requires not only deployment of AMI to a substantial portion of a utility's load, but also implementation of dynamic price structures that reveal to consumers the value of controlling their consumption at specific times; and

WHEREAS, AMI deployment offers numerous potential benefits to consumers, both participants and non-participants, including:

- greater customer control over consumption and electric bills;
- improved metering accuracy and customer service;
- potential for reduced prices during peak periods for all consumers;
- reduced price volatility;
- reduced outage duration; and
- expedited service initiation and restoration.

WHEREAS, the use of AMI may afford significant utility operational cost savings and other benefits, including:

- automation of meter reading;
- outage detection;
- remote connection/disconnection;
- reduced energy theft;
- improved outage restoration;
- improved load research;
- more optimal transformer sizing;
- reduced demand during times of system stress;
- decreased T&D system congestion; and
- reduced reliance on inefficient peaking generators; and

WHEREAS, sound AMI planning and deployment requires the identification of tangible and intangible costs and benefits to a utility system and its customers; and

WHEREAS, AMI will be a critical component of the intelligent grid of the future that will provide many benefits to utilities and consumers; and

Whereas, it is important that AMI allow the free and unimpeded flow and exchange of data and communications to empower the greatest range of technology and customer options to be deployed,

WHEREAS, the deployment of AMI technology may require the removal and disposition of existing meters that are not fully depreciated and may require replacement of, or significant modification to, existing meter reading, communications, and customer billing and information infrastructure; and

WHEREAS, regulated utilities may be discouraged from pursuing demand response opportunities by the prospect of diminished sales and revenues; now, therefore, be it

RESOLVED, that the National Association of Regulatory Utility Commissioners, convened at its February 2007 Winter Meetings in Washington, DC, recommends that commissions seeking to facilitate deployment of AMI technologies consider the following regulatory options:

- pursue an AMI business case analysis, in conjunction with each regulated utility, in order to identify an optimal, cost-effective strategy for deployment of AMI that takes into account both tangible and intangible benefits;
- adopt ratemaking policies that provide utilities with appropriate incentives for reliance upon demand-side resources;
- provide for timely cost recovery of prudently incurred AMI expenditures, including accelerated recovery of investment in existing metering infrastructure, in order to provide cash flow to help finance new AMI deployment; and
- provide depreciation lives for AMI that take into account the speed and nature of change in metering technology; and be it further

RESOLVED, that the Federal tax code with regard to depreciable lives for AMI investments should be amended to reflect the speed and nature of change in metering technology; and be it further

RESOLVED, that NARUC supports movement towards an appropriate level of open architecture and interoperability of AMI to enable cost-effective investments, avoid obsolescence, and increase innovations in technology products.