DOE Quadrennial Energy Review
Second Installment
Electricity: Generation to End-Use
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Good afternoon. I am Karen Lefkowitz, Vice President, Smart Grid and Technology, Pepco Holdings. I have overseen the deployment of smart meters in Maryland, Delaware and Washington, DC. This work was partially financed through the Smart Grid Investment Grant program launched by DOE as part of the stimulus package. As a part of that deployment, we have implemented many customer facing programs that take advantage of AMI data, such as critical peak rebates; provided Green Button functionality for customers (both residential and commercial) to understand their usage and encourage energy efficiency. In addition we have also expanded our ability to better understand and manage the grid by mining the AMI and sensor data for a multitude of internal uses in planning, maintaining and operating the grid and as a result have improved the reliability of the electric system for our customers. We have found that our investment in smart grid has not only allowed us to offer new benefits to our customers, including the integration of renewable resources, but also helped us to improve our event recovery and resilience.

We are facing a time of change that is unprecedented in the electric utility industry. With this change we also need changes in rate design that will enables utilities to continue to make the necessary investments in the grid to achieve the sustainable future we all want, while equitably allocating the resulting costs to everyone that is receiving benefits from the use of the grid.

Pepco Holdings serves an area of the country that has seen a significant growth in distributed renewals, electric vehicles, and of course, has an active retail choice program. Our customers are knowledgeable of the benefits from the new technologies and will likely be first adopters of the advanced technologies being offered to them.

In this environment, the distribution utility is becoming the system integrator for developers of other goods and services. These services range from more sophisticated thermostats and other home energy management devices that want to communicate with the smart meter to electric vehicle chargers, energy storage, microgrids and of course distributed energy resources.

Increasingly we are expending resources to enable the integration of these resources and devices and asking all customers to pay for that as part of our cost of service. The direct benefits, however, flow to a relatively small subset of customers. This is causing the customers that can afford to install the new technologies to reduce their energy cost, while others are experiencing higher energy cost to maintain the grid so that it is available for all. This cost shifting can have a negative result that causes those customers that have the least, to pay for grid improvements for the customers that can afford the devices to reduce their energy usage.

The grid has value for all customers and therefore all customers should expect to pay their fair share. Rate fairness is grounded in the principle that costs are allocated to all customers based on their need for the grid and that no customer should be expected to pay more than their fair share for use of the grid. While providing these integration services to our most sophisticated customers is consistent with our mission, as an electric utility, we are still uniquely required to provide an essential service to all customers – regardless of income or technological sophistication. Is it fair that all customers share the cost of enabling a penetration of renewable energy and managing the resulting voltage fluctuations, even if they don't have solar energy mounted on their property? Who should pay for upgrades of distribution transformers to accommodate increased EV charging? While the new service providers only need to 'sell' their wares to a customer, the distribution utility has to ensure the integrity of service to all customers. Everyone is dependent on the grid, when snow covers the customer's solar system or on a cold winter night when we experience our system peak at six o'clock in the morning. All of our customers expect the grid to be there to serve the load whatever it may be and under any system or weather condition.

At other points in history, utilities and their regulators did socialize the costs of upgrades that were caused by new, significant uses of energy – one notable movement was central air conditioning which led to increasing capacity to accommodate that increased load – and certainly not everyone installed central air conditioning. But the difference between then and now is simple, but hugely significant – all of that occurred during a time of significant load growth; today we experience little to no growth so customers choosing to self-generate and treat the grid as a large battery, when solar energy is not available should be expected to pay their fair share to maintain and utilize the grid. Likewise all customers are receiving benefits from the growth in renewables by having lower load growth and less infrastructure additions being required. The growth in infrastructure today is being driven from the need to replace aging equipment and not the growth in new customers that we experienced in the past.

In other words, the same customers whose actions may force greater investments are increasingly not paying for their proportional share of those expenses. While some have correctly labeled this "cross-class subsidization" – sometimes referred to as haves and have-nots, I would point out that the economics of solar energy and EVs are quickly changing. What we see more today, in addition to differences in options available to low income customers is the difference between home owners and renters; suburban and urban dwellers.

We need to develop grid management systems that are effective in a highly decentralized grid.

Operating the grid is becoming more challenging – utilities spent the 20th century building an infrastructure that permitted grid operators the ability to 'see' conditions and react to them to ensure stable grid operations. We installed SCADA system and designed algorithms and systems to achieve that end. We trained operators to take the appropriate emergency actions.

But the economics of supply is changing and we are starting to see high to very high penetration of renewable energy. In most cases, the utility doesn't have any visibility into the output of these distributed resources. When an operator takes emergency actions to shed load, it is quite possible that

the impact will be as if they shed generation, if there is sufficient over-generation from behind the meter. This situation occurred on the Iberian Peninsula not too long ago, to almost disastrous results. Even where we do not own generation, utilities must be able to have telemetry, and in many cases, control, in order to appropriately operate the grid. While it could be argued that it isn't necessary to have visibility and control over every residential solar installation, we need to understand what the minimum visibility for effective grid management is. Our experience to date may not be sufficient to predict the future needs for grid operation. More study and modelling are needed; new algorithms and predictive models have to be developed to aid in operating this new decentralized grid.

So, in summary, utilities have long been bound by a social contract to serve ALL customers safely, reliably and affordably. This continues to be our central mission even as the energy systems we operate rapidly evolve. As the owners and operators of the systems to which so many new resources and services attach and depend, utilities have a unique ability and capacity to facilitate the integration of these systems at the least cost by serving as the system integrator. Significant utility investment in the grid and the systems that manage the flow of energy within the grid is needed in order for us to be able to meet this system integration challenge. Rate designs must be adjusted to assure that the costs associated with this investment are affordably and equitably distributed across the utility's customers and no customer is asked to pay more than their fair share. Additionally, as the system integrator, the utility must have visibility into, and perhaps control of, the resources attached to the system so that we can continue to serve all customers safely and reliably.