BEFORE THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

IN THE CONSIDERATION OF THE NEW PURPA STANDARDS

Docket No. EL08-028

DIRECT TESTIMONY OF NATHAN SOLEM ON BEHALF OF COMMISSION STAFF

Introduction

Staff conducted research on smart grid investments including:

- Review of the Reference Manual and Procedures for Implementation of the "PURPA" Standards in the Energy Independence and Security Act of 2007.
- Detailed study of Duke Energy smart grid docket in Indiana (IURC Cause Number 43501)
- Review of investor owned utilities' testimony

Summary and Analysis of Research Findings

From the Reference Manual, the national policy for the development of a smart grid system provided in the 2007 Act is:

It is the policy of the United States to support the modernization of the Nation's electric transmission and distribution system to maintain a reliable and secure electricity infrastructure that can meet future demand growth and to achieve each of the following, which together characterize a Smart Grid:

1. Increased use of digital information and controls technology to improve reliability, security, and efficiency of the electric grid.
2. Dynamic optimization of grid operations and resources, with full cyber-security.
3. Deployment and integration of distributed resources and generation, including renewable resources.
4. Development and incorporation of demand response, demand-side resources, and energy-efficiency resources.

5. Deployment of "smart" technologies (real-time, automated, interactive technologies that optimize the physical operation of appliances and consumer devices for metering, communications concerning grid operations and status, and distribution automation).
6. Integration of "smart" appliances and consumer devices.
7. Deployment and integration of advanced electricity storage and peak-shaving technologies, including plug-in electric and hybrid electric vehicles, and thermal-storage air conditioning.
8. Provision to consumers of timely information and control options.
9. Development of standards for communication and interoperability of appliances and equipment connected to the electric grid, including the infrastructure serving the grid.
10. Identification and lowering of unreasonable or unnecessary barriers to adoption of smart grid technologies, practices, and services.

The Reference Manual suggests that the term "smart grid" refers to a system that incorporates a range of technological options that provide certain enumerated functions or values. The ten items listed above are one listing of those functions or values. The DOE has another separate list which is:

- Enabling active participation by consumers
- Accommodating all generation and storage options
- Enabling new products, services, and markets
- Optimizing assets and operating efficiently
- Anticipating and responding to system disturbances in a self-healing manner

- Operating resiliently against physical and cyber attack and natural disasters
- Providing the power quality for the range of needs in a digital economy

Some of the basic components of a smart grid system include:

- Smart appliances
- Advanced meter infrastructure (AMI)
- Transmission and distribution automation equipment
- Digital communications technology

The Act asks states to consider requiring utilities to examine smart grid technologies before investing in traditional transmission and distribution systems:

1. Consideration of Smart Grid Investments – Each State shall consider requiring that, prior to undertaking investments in non-advanced grid technologies, an electric utility of the State demonstrate to the State that the electric utility considered an investment in a qualified smart grid system based on appropriate factors, including:
    - Total costs
    - Cost-effectiveness
    - Improved reliability
    - Security
    - System performance
    - Societal benefit
2. Rate Recovery – Each State shall consider authorizing each electric utility of the State to recover from ratepayers any capital, operating expenditure, or other costs of the electric utility relating to the deployment of a qualified smart grid system, including a reasonable rate of return on the capital

expenditures of the electric utility for the deployment of the qualified smart grid system.

3. Obsolete equipment – Each State shall consider authorizing any electric utility or other party of the State to deploy a qualified smart grid system to recover in a timely manner the remaining book-value costs of any equipment rendered obsolete by the deployment of the qualified smart grid system, based on the remaining depreciable life of the obsolete equipment.

Some of the benefits possible from smart grid investments include:

- Smart meters allow two way information flow allowing price signals to be sent to customers allowing for more sophisticated rates and reduced demand response.
- Down-line automation such as fault location, isolation, and service restoration would allow utilities to operate their systems more efficiently improve reliability and reduce outage time.
- Advance automation would allow for better integration of distributed generation, microgrids and electricity storage.

Issues identified in the Reference Manual include:

- Providing for timely cost recovery of prudently incurred AMI expenditures
- Accelerated recovery of investment in existing metering infrastructure, in order to provide cash flow to help finance new AMI deployment
- Whether revenue decoupling could be considered
- Some components of smart grid are not yet widely available like smart appliances or local electric storage
- Since smart grid is not the responsibility of any one entity, interoperability becomes an issue.

- Smart grid requires a great deal of consideration of technology.

A review of the Reference Manual revealed the following key demonstration smart grid projects:

- Pacific Northwest GridWise Testbed Demonstration Project: demonstration involving 112 residential customers, several commercial buildings, municipal water pumps and distributed generators which saved customers about 10 % on their bills.
- Edison SmartConnect: 5.3 million AMI meters with time of use and critical peak pricing rate options which is expected to mitigate up to 1 MW of capacity additions.
- TXU: 3 million smart meters in the Dallas-Ft. Worth area by 2011 intended mainly to improve reliability.

The Duke Energy docket involves a rather advanced smart grid deployment including AMI meters, energy data management systems, distribution management system, circuit breaker and other distribution automation upgrades with a capital outlay of $436 million over the first five years and operational savings of $75 million over the same five years. Benefits expected by this project include:

- Voltage reductions
- Reduced outages
- Improved reliability
- Improved usage information to customers
- Improved billing accuracy
- New services such as remote disconnects and reconnects
- More options for lower income customers to lower bills
- Reduced callbacks on service requests

- Energy efficiency program enhancement

Duke Power has proposed to the Indiana Commission that adequate cost recovery of this smart grid investment is possible with the following types of rates:

- Lost fixed revenue cost recovery from reduced energy sales
- Recovery of obsolete assets regulatory asset

A review of the utilities' testimony revealed the following potential benefits from smart grid investments:

- Black Hills Power
    - Less premise visits to customers
    - Automatic power outage detection with less phone calls from customers
    - Load reduction incentive payment options
    - Peak demand reduction by control of smart appliances
    - Mitigation from higher rates from compliance with the Waxman-Markey bill
    - Eventually a fuel source shift from peaking natural gas to base load coal at a lower cost
- Montana-Dakota Utilities
    - Time of use rates or critical peak pricing rates can be used on a broader scale
    - More timely usage information to customers
- Xcel Energy
    - Better information to customers so they can better utilize rate designs such as time-of-use or curtailable rates
    - Lower cost method of water and air conditioning control
- NorthWestern Energy

- Reduced operating costs, improved customer satisfaction and better system monitoring
- Improved reliability and reduced outage time
- Improved system performance deferring system upgrades
- Decreased peak demands through load reductions

- MidAmerican
  - Improved reliability and improved information gathering
  - Expanded demand side management
  - Improved outage response
- Otter Tail Power
  - Better outage management
  - improved meter reading
  - revenue protection
  - improved demand response
  - better management of distribution assets

A review of the utilities' testimony revealed the following potential issues from smart grid investments:

- Montana-Dakota Utilities
  - May be premature to adopt smart grid standards as technology is not mature enough to establish a standard.
  - Smart Grid technical standards currently under development should be complete before a smart grid standard is implemented.
- Xcel Energy
  - More information needs to be gathered on the costs involved before this work can be advanced further

- Too soon to predict how and where Xcel will implement smart grid technology

- NorthWestern Energy
  - A smart grid implementation on the entire NorthWestern system would put upward pressure on rates.
  - Costs associated with smart grid technology have not been completely developed for the South Dakota operations.

- MidAmerican
  - The standard does not provide certainty as to what existing utility systems would be included in "non-advanced grid technologies". Utilities may delay or slow down the appropriate replacement of existing systems where smart grid alternative are clearly not yet viable because of the proposed studies described in section A of the PURPA standards. The resulting use of systems beyond their normal effective life could decrease reliability and service to customers. In addition to project delays, the studies would also result in increased costs and time burden to the utilities, the Commission and Commission Staff.
  - The standard does not provide a definition of "qualified smart grid system".
  - The standard could be read to require a complex justification for all grid investments, no matter how small or mundane, that must be pre-approved by the Commission.
  - If the Commission wishes to encourage early adoption of smart grid technologies, it is essential that provision also be adopted for recovery of both the costs of smart grid equipment and any related costs for

obsolescence in order to help eliminate utility barriers to cost-effective investment in smart grid technologies.

- Otter Tail Power
    - The difficulty for Otter Tail regarding smart grid is the uncertainty with the wide range of potential installation costs and benefits, especially due to the size and expansiveness of our service territories in Minnesota, North and South Dakota.

Several of the utilities are already piloting smart grid technologies including Black Hills Power, Montana-Dakota Utilities and Xcel Energy. Black Hills Power and Xcel Energy are piloting systems in more urban areas in Colorado where economies of scale may help.

Conclusions

- Numerous upside benefits exist with the potential for large improvements in system performance, demand reduction and quality of service to customers
- Since several of the utilities are already piloting smart grid technology, it may not be necessary to mandate consideration to encourage such investment in South Dakota
- Several of the utilities noted that costs are not well developed, possibly indicating that it is premature to consider such investments in a rural area where economies of scale may not contribute to holding costs down
- Rate designs not currently employed in South Dakota may be necessary to encourage full scale implementation
- Technology standards are not yet developed indicating that the technology is yet in the emerging stage with rapid obsolescence possible and interoperability issues a concern

- Further study by the Commission over the next few years may help determine whether mandating smart grid investment review is the right policy for South Dakota

Recommendation

Staff's recommendation is to defer mandatory consideration of smart grid technology for several years until:

- the technology is more developed
- costs are better developed allowing for better decisions
- the IEEE smart grid technology standard is developed
- The results of the Black Hills Power and Xcel Energy pilot projects are available

In a few years, the information available should be more accurate allowing smart grid investment decisions that have less risk than would happen with the current information level. If desired, the Commission could establish a Task Force to more closely review the development of smart grid technology and make recommendations regarding mandating smart grid technology review to the Commission in the future.