Before the
Department of Energy
Washington, D.C. 20585

In the Matter of	)
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Implementing the National Broadband Plan by Studying the Communications Requirements of Electric Utilities To Inform Federal Smart Grid Policy	))))

NBP RFI: Communications Requirements

COMMENTS OF ONCOR ELECTRIC DELIVERY COMPANY LLC

I. Introduction

Oncor Electric Delivery Company LLC (Oncor) Is an electric transmission and distribution utility that operates in Texas within the Electric Reliability Council of Texas (ERCOT) region, serving about three million customers (or points of delivery) representing about seven million people. Its operations include about 117,000 miles of high voltage transmission and distribution lines and 1,050 transmission switching and distribution substations.

Retail competition for customers of investor-owned utilities was implemented in ERCOT on January 1, 2002. The market structure for ERCOT required formerly integrated electric utilities to separate their business functions into three distinct companies: a power generation company (PGC), a transmission and distribution utility (TDU), and a retail electric provider (REP). The pricing of PGCs' sales of electricity to REPs and REPs' sales of electricity and related products to end-use consumers are not regulated. Approximately 75 active REPs in ERCOT sell electric energy to retail customers and compete in the marketplace for customers. TDUs, such as Oncor, own, operate, and maintain the electrical network infrastructure that transmits or distributes electricity to consumers in their service territories. The rates charged by TDUs to REPs for that delivery service are regulated by the Public Utility Commission of Texas (PUCT). The PUCT is also responsible for approving the smart meter deployment plans proposed by TDUs.

II. Smart Grid Communications at Oncor

Oncor presently uses a mix of both private and public communication schemes. This diversity of communication technologies will need to be continued in the future to ensure the security of mission-critical communication applications. Oncor realizes that appropriate communication technologies are essential to implementation of the Smart Grid. Oncor also agrees with the DOE, other utilities, and electric industry organizations that there is no one-size-fits-all communication technology for the Smart Grid, nor are all public or all private networks necessarily the appropriate avenue for grid communications.

III. Answers to RFI Questions

It is with this background that Oncor provides the following comments regarding Smart Grid communication requirements. The attached matrix also provides additional Oncor responses to the following questions from the RFI.

1. ***What are the current and future communications needs of utilities, including for the deployment of new Smart Grid applications, and how are these needs being met?***

   Oncor's current and future communication needs are summarized in the attached matrix. It is obvious that the communication needs for any utility go well beyond Smart Grid to include basic transmission grid monitoring and control, mobile workforce management, routine dispatch of field personnel, and emergency response during extensive outages or major blackouts (including electrical system black start events). The criticality of many of the applications, including automated switching and emergency response, requires that utility communication technologies be secure and available at all times, even during blackouts.

2. ***What are the basic requirements, such as security, bandwidth, reliability, coverage, latency, and backup, for smart grid communications and electric utility communications systems in general-today and tomorrow? How do these requirements impact the utilities' communication needs?***

   As the attached matrix indicates, each communication application has a unique set of basic requirement priorities. For example, smart meter communications gathered by data collectors require a moderate bandwidth to accommodate the data volumes, while transmission and distribution automation applications require high reliability and minimal latency. All applications require extensive cyber security to provide protection to both command and control systems, as well as customers' private information. With respect to priority of communications, certain critical monitoring and control functions (such as SCADA) require that they receive service priority for communication over shared media, whether that communications service is private or public circuits.

3. ***What are other additional considerations (e.g. terrain, foliage, customer density and size of service territory)?***

   Oncor has an extensive service territory, including the pine forests of East Texas, the rolling hills of Central Texas, the vast plains of West Texas, and the dense urban areas of Dallas and Fort Worth. Different communication schemes will need to be considered and investigated for each of these areas. As noted above, probably no one particular communications approach currently available can be used across this large geographic area. Oncor will use various public and private technologies to ensure that customer expectations are met and safe and reliable service is maintained.

4. ***What are the use cases for various smart grid applications and other communications needs?***

   Advanced Metering System (AMS)

   Oncor is currently deploying an Advanced Metering System that will consist of over 3 million smart meters when completed in 2012. The meters collect time differentiated energy usage data at 15-minute intervals for residential and commercial customers located in Oncor's service territory. Oncor has already installed more than 1 million smart meters and is executing a deployment plan that installs approximately 75,000 additional meters each month. It is anticipated that the deployment will be completed by the end of 2012. Oncor's

AMS also includes the construction of a highly secure infrastructure to enable two-way communication of REP-initiated pricing and Demand Response (DR) data to smart meters. Oncor's smart meters also provide operational services via a "last gasp" indication when the meter looses power for outage management purposes, voltage measurement for feeder voltage profiling and monitoring of other electrical characteristics for power delivery and quality purposes. The existing smart meter communication method is a multi-layered process that generally includes private wireless RF mesh communication between end devices (meters) and data collectors, an access connection between the collectors and the back-haul system, private microwave back-haul or public network bulk transportation to the core network, and private fiber rings within Oncor's core network.

In a related initiative, the new Smart Meter Texas Portal (SMTP) (https://www.smartmetertexas.com) was recently established as an information gateway between the TDUs, REPs, end-use customers, and third parties. The initial phase of the information gateway included the provision of application programming interfaces (APIs) that were made available to all REPs in Texas to retrieve 15-minute data for their customers from the portal on a day-after basis and to interact with the customer's in-home devices (IHDs) for functionality that includes text messaging, pricing signals, and direct load control. A Graphical User Interface (GUI) allows end-use customers, REPs, and TDUs to access the 15-minute usage data and to provision/de-provision IHDs at the customer premises. It is Oncor's AMS that links SMTP-initiated energy management and load control signals to smart meters in Oncor's service territory.

Distribution Automation

Regarding distribution automation, Oncor has installed several hundred automatic switches (in coordinated "teams") for fault isolation and feeder reconfiguration to restore service, an additional several hundred remotely controlled feeder switches, and several thousand capacitor bank controllers on selected circuits. The automatic switch "teams" communicate with each other and with a "captain" switch via a private RF mesh system. The captain switch is the gateway to allow two-way communications between individual switches and the distribution SCADA via access and backhaul networks. These distribution automation systems are designed to operate intelligently even if communication with the SCADA system is unavailable. All remotely controlled feeder switches have a direct data connection between the switch and the distribution SCADA system. The data communications allow the remote operation of the switches to speed outage isolation and restoration. The VAR management system presently uses a paging scheme for one-way messaging to capacitor controls, but it will be updated to a two-way messaging communication system leveraging the AMS wireless RF mesh and backhaul infrastructure (where it is available). Oncor also plans to soon automate voltage regulators and install fault indicators and street light monitors as part of its distribution automation system. Like the capacitor controls, voltage regulators and fault indicators will leverage the AMS wireless mesh and backhaul infrastructure where it is available. The RF mesh will also provide the ability to assign higher priority to communications for these grid monitoring and control functions than is assigned to basic meter data. The street light monitors will be installed using a private, or unlicensed, "element to collector" short distance wireless communications system (similar to the AMS communications architecture) with backhaul from the collectors being provided by cellular wireless modems or other means as shown in the attached matrix.

Transmission Operations

Transmission grid monitoring and control are achieved using a centralized management system with SCADA connections to each switching station and substation. These connections provide voltage and current measurements at each critical node of the power grid every four seconds. Oncor also is beginning to deploy synchrophasor technology, with an attendant increase in bandwidth requirements due to the technology and its expected expanded use in the near future. These synchrophasor units will communicate back within the broadband data streams from the field stations where they are located. Their data streams will be carried within the appropriate virtual local area network (VLAN) (see Substations use case below). The synchrophasor units will be utilized to support the following activities on Oncor's transmission system:

- State estimation validation
- Short circuit model validation
- Wide area control

Other transmission sensors, such as dynamic line rating sensors, are also being installed on Oncor's transmission system. These devices will use unlicensed wireless communications to the nearest field station for inclusion in the broadband data stream located within the appropriate VLAN.

Substations

Oncor is currently finishing the development of communications standards to deliver broadband IP-based communications (600 kbps to 5 Mbps) securely to many Oncor substations. Four key elements of these communication network standards are the VLANs, which are inherent in Oncor's typical substation equipment, and their communications and security needs:

- Transmission SCADA (T-SCADA) VLAN - for substation equipment control and monitoring;
- Distribution SCADA (D-SCADA) VLAN - for distribution equipment control;
- AMS VLAN - for Advanced Metering System communications; and
- Enterprise VLAN - for general uses like email, security, video, etc.

These VLANs ensure both the secure transport (with several layers of network security) and reliable delivery of data across the wide area and backhaul networks (via Quality of Service (QoS) parameters). The VLAN communication standard is structured in such a way that the most critical information (T-SCADA) takes priority over D-SCADA which, in turn, takes priority over AMS data. Enterprise data is transported on a "best effort" level of priority.

Other

Other key communication considerations include those for critical voice and mobile data. Critical voice communications are presently via a 900 MHz licensed trunked radio system with private microwave backhaul infrastructure. Mobile data communications are primarily provided by cellular modems installed in Oncor's vehicle fleet that communicate with Oncor's enterprise mobile work management system.

Oncor also must provide secure and widespread communications to facilitate command and control voice communications during blackout events. These voice communications must be delivered for at least 72 hours AFTER loss of the power grid to both mobile employees and to key facilities. Oncor maintains a small inventory of satellite phones for black start communications to support key command and control needs.

5. ***What are the technology options for smart grid and other utility communications?***

The Smart Grid and other utility options are outlined on the attached matrix. They include private and commercial fiber, digital circuits, power line carrier, and various forms of wireless communications. As has been described above, Oncor presently uses multiple communication options depending on factors such as the terrain, population density, latency, critical need, etc.

6. ***What are the recommendations for meeting current and future utility requirements, based on each use case, the technology options that are available, and other considerations?***

   Oncor's recommendations for meeting current and future utility requirements are shown on the attached matrix. As can be seen, Oncor presently uses, and plans to continue to use, diverse communication options to ensure that the overall Smart Grid communication scheme is optimized.

7. ***To what extent can existing commercial networks satisfy the utilities' communications needs?***

   Oncor plans to continue to use both public (commercial) and private communication networks as appropriate to ensure optimal Smart Grid communications. With (1) adequate business and technical commitments, (2) significantly improved pricing, (3) enhanced facilities and services, (4) priority service for a portion of the utility applications, (5) competitive long term price certainty, and (6) a willingness to provide the customer visibility into the telecommunication designs and associated system vulnerabilities and risks, commercial carriers could possibly meet all of Oncor's requirements.

8. ***What, if any, improvements to the commercial networks can be made to satisfy the utilities' communications needs?***

   The commercial networks need to:
   - become more reliable (hardened) with better availability, especially for critical utility needs, such as distribution automation and emergency response;
   - provide some level of priority service to ensure some level of service remains available to utilities regardless of other telecommunication loading demands;
   - provide some level of long term (1 week) select service for black start events of the electrical grid; and
   - to the extent that these commercial networks can better support non-interrupted data connectivity versus the "start-stop" characteristics of voice communications is an area of beneficial improvement for utility communications needs.

   Additionally, the telecommunication service providers must provide a much higher level of operational service response to address communications degradations or interruptions.

9. ***As the Smart Grid grows and expands, how do the electric utilities foresee their communication's requirements as growing and adapting along with the expansion of Smart Grid applications?***

   Oncor's continual expansion into more and higher order Smart Grid activities will be done with a balanced approach that compares the system benefit and customer benefit of the expansion to the costs of the expansion. It is anticipated that the Smart Grid devices and systems and the associated communication systems will continue to increase in functionality while significantly decreasing in cost. If this is the case, substantial expansion may occur in Smart Grid above our present commitments and trajectory. If this is not the case, the expansion will be significantly slowed or stopped.

IV. Conclusion

There is presently a mix of both private and public communication schemes in use by Oncor to meet Smart Grid communications needs. Oncor also expects to be utilizing a similar mix well into the future. This diversity of communication technologies is required to ensure the security of mission-critical communication applications while optimizing services, reliability, and costs for each communications requirement. Therefore, Oncor agrees with the DOE, other utilities, and electric industry organizations that there is no one-size-fits-all communication technology for the Smart Grid, nor are all public or all private networks necessarily the appropriate avenue for grid communications. Each communications need must be carefully studied to determine the appropriate communications solutions for the urban, suburban, and rural areas of our diverse service area in Texas.

Respectfully submitted,

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