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DEPARTMENT OF ENERGY

In the matter of: Implementing the National Broadband Plan by Studying the Communications Requirements of Electric Utilities to Inform Federal Smart Grid Policy	DOE-HQ-2009-0003-0835

COMMENTS OF VERIZON AND VERIZON WIRELESS

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As the Department of Energy (DOE) correctly notes, Smart Grid technology holds significant promise in improving "the reliability, availability, and efficiency of the electric system."[1] The benefits of developing and deploying Smart Grid technology include reduced energy costs, increased security, enhanced durability, and lower greenhouse gas emissions.[2]

But effective communications networks and services are critical to the success of Smart Grid technology. For Smart Grids to function properly, vast amounts of information must be transmitted and processed to and from consumers and electricity producers and distributors, with high levels of security as that data transmission and processing takes place.

Existing commercial broadband networks built and operated by experienced communications providers would best facilitate the implementation of Smart Grid technology. These networks are already in place, and their operators have a vast amount of expertise in providing wireless and wireline communications capabilities in an efficient, reliable, and secure manner. Relying on multi-use broadband networks would leverage the experience and capabilities of existing operators in addressing the interoperability, redundancy, reliability, and security challenges inherent in the implementation of Smart Grid technology. Additionally, reliance upon existing broadband networks would create incentives for more widespread broadband infrastructure investment by increasing demand for broadband service and thereby improving the business case for broadband deployment.

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1 *Implementing the National Broadband Plan by Studying Communications Requirements of Electric Utilities to Inform Federal Smart Grid Policy*, Request for Information, 75 Fed. Reg. 26206, 26207 (May 11, 2010).

2 *See SMART 2020 United States Report Addendum Summary*, http://www.smart2020.org/_assets/files/06_Smart2020UnitedStatesReportAddendumSummary.pdf, at 18-23 (2008) (noting that the power sector accounts for 40 percent of U.S. greenhouse gas emissions and estimating that communications technology could reduce such emissions by eight percent over the next ten years).

Verizon[3] is actively engaged in promoting Smart Grid deployment. From partnering with utilities to deploy smart wireless meters in customer homes to linking its own power-generating facilities to an electrical utility's system to reduce energy costs, Verizon is committed to helping utilities use intelligent commercial broadband networks, data centers, and home automation technologies to implement Smart Grid in an efficient and cost-effective manner.

I. USE OF COMMERCIAL BROADBAND NETWORKS WOULD FACILITATE THE EFFICIENT AND EFFECTIVE IMPLEMENTATION OF SMART GRID TECHNOLOGY.

The implementation of, and resulting benefits from, Smart Grid require incorporating communications technology throughout various points in the electrical grid and consumers' homes. The communications technology essential to the success of Smart Grid exists today and is available from experienced companies that operate nationwide broadband networks. Established communications providers are experienced at providing government and enterprise customers with managed services and are accustomed to the visibility and control such customers require when they rely upon a commercial provider for mission-critical services. The deployment of Smart Grid should strive to leverage these existing networks whenever they can satisfy the requirements for Smart Grid networks—which will most often be the case—rather than building a separate, single-purpose network that taxpayers and ratepayers can ill afford.

For example, Verizon Wireless operates an existing EV-DO wireless broadband network that currently reaches more than 285 million Americans. And its next-generation 4G Long Term Evolution (LTE) wireless network will soon be widely available, serving 25-30 markets by the end of this year, and the rest of its coverage area by 2013. Verizon's wireline operations likewise already reach millions of business and residential customers. A customer can utilize

[3] In addition to Verizon Wireless, the Verizon companies participating in this filing ("Verizon") are the regulated, wholly-owned subsidiaries of Verizon Communications, Inc.

Verizon's wireless or wireline networks to monitor and adjust the electricity use at his or her home while at work or on the road. These existing networks and facilities provide an important resource for the transmission of Smart Grid data and can readily accommodate most Smart Grid applications, such as advanced metering, demand response, and distribution grid management. As discussed below, many such applications require modest throughput and could be readily accommodated by existing broadband networks.

Besides having the necessary network infrastructure in place, established communications providers also have the expertise integral to Smart Grid deployment and operation. For example, communications companies have significant experience with systems integration, the management of complex, data-intensive programs, and handling the technological evolution of complex systems—experience that will be essential if the benefits of Smart Grid are to be realized.

Communications providers also have the incentive to invest in and upgrade their networks to meet evolving customer demands. For example, Verizon's investments in its FiOS fiber-to-the-home network and 4G LTE wireless technology reflect the deployment of next-generation capabilities necessary to keep pace with the market and, thus, the assurance that existing networks will remain efficient, reliable, and secure into the future. By contrast, if communications networks funded by electric utilities' customers or taxpayers fail to keep pace with technological advances, they would become vulnerable to security breaches or other threats and become less efficient over time.

Also, Verizon and other communications providers devote considerable resources to—and have substantial expertise with—cybersecurity: a critical component of Smart Grid technology. *See, e.g.,* EISA § 1301(2) (noting that Smart Grid should have "full cyber-

security"). For example, Verizon works with government agencies and companies of all types to address security concerns related to communications, including sensitive areas such as national security and financial transactions. Indeed, Verizon has been positioned in the "Leaders" quadrant in leading analyst firm Gartner's report concerning managed security service providers (MSSPs).[4] Verizon was rated highly by each of Gartner's measures based on its suite of managed security services that includes monitoring and management for numerous devices (including anti-virus, anti-spam, anti-spyware, application log monitoring and management); Denial of Service defense, firewall, router, virtual private network, image and content control; intrusion detection and protection; proxy service; and unified threat management. Verizon's ICSA Labs division also provides independent certification of security-related devices, and could do the same for Smart Grid devices. Similarly, Verizon and other established communications providers also devote considerable attention to emergency preparedness to help ensure that communications networks remain in service when they are needed most.

In light of the substantial experience, competence, and resources that communications companies like Verizon provide, policymakers are right to encourage the electricity industry to work closely with established communications companies in implementing Smart Grid. Existing commercial broadband networks offer the most efficient and sensible solution to providing the communications capabilities that will be required to realize the benefits of Smart Grid technology.

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[4] Gartner, Inc., "Magic Quadrant for MSSPs, North America," http://www.tatacommunications.com/downloads/enterprise/Tata_Communications_3053.pdf , at 2 (April 16, 2009).

II. RESPONSES TO SPECIFIC QUESTIONS RAISED IN THE REQUEST FOR INFORMATION.

Verizon provides the following responses to the DOE's Requests for Information:

A. Current and Future Communications Needs of Utilities for the Deployment of New Smart Grid Applications and Use Cases for Such Applications (Q.1, Q.4)

Verizon understands that utilities need access to the following services and applications.

Advanced Metering Infrastructure (AMI) and Automatic Meter Reading (AMR). AMI and AMR aid utilities in predicting energy loads, which enables utilities to save both generated and purchased power. These systems measure, collect, and analyze energy usage, and interact with advanced devices such as electricity meters. These applications also allow consumers to incorporate home energy management systems as part of their home network, which, in turn, could communicate with the electricity meter for purposes of receiving advanced metering signals. AMI further allows for on-demand, two-way communications with "smart" meters, which supports, among other features, net metering with on-grid renewable energy sources, also know as Distributed Energy Resources (DER).

Demand Response (DR). DR applications provide utilities with the ability to directly control load and help manage daily system peaks. DR also enables intelligent "time-of-day" pricing that reflects market conditions and can be used as part of home energy management systems to enable consumers to reduce their usage during peak times.

Grid Optimization (GO): Transmission and Distribution Automation, Substation and Feeder Automation. Transmission and Distribution Automation is a GO application that gives utilities the ability to balance load distribution and to avoid outages. Another GO application, Substation and Feeder Automation, enhances the reliability of utility systems by monitoring

primary equipment at substations and feeder Intelligent Electronic Devices. By using this application to detect degraded conditions and faults in power lines, utilities can employ auto-restoration to provide power through an alternate circuit.

Wide Area Situational Awareness (WASA). WASA provides for the monitoring and display of power-system components and performance across interconnections and over large geographic areas in near real-time. The goals of situational awareness are to understand, and ultimately optimize, the management of power-network components, behavior, and performance, as well as to anticipate, prevent, or respond to problems before disruptions can arise. WASA further allows utilities to monitor facilities for theft and vandalism using highly-networked video surveillance.

Field Service Communications. Utilities need the ability to communicate with employees operating "in the field." For example, access to communications infrastructure could improve customer service by providing access to real-time client information. In addition, automatic vehicle locating information would result in better routing and job optimization, and utilities' workforces could be better connected with push-to-talk services.

Secure Data Centers. Utilities need secure data centers to manage, correlate, and share data. These data centers also need enhanced security using hardened routers, firewalls, and virtual private networks.

Additional Future Needs. Utilities will need proven and reliable communications and control networks beyond the grid in the future. Though all utilities, including water systems, sewer systems, gas pipelines, and transportation systems, would benefit from such control networks, electricity utilities would particularly benefit. As various electricity-powered technologies, like electric vehicles, become more common, electric utilities will need access to

information on regional and system-wide energy needs and the capability to track electric vehicles, which may connect to different utilities at different points in the day, similar to cell phone users roaming from one carrier's network to another.

Utilities' communications needs are currently being met by both commercial broadband networks and utility-owned networks. Highly scalable and secure commercial broadband networks support Smart Grid applications, data center management, field service communications and customer care. Considering the many evolving communications needs of utilities, established communications providers with ubiquitous, interoperable networks are well-positioned to create and implement smarter energy infrastructure most efficiently.

B. Basic Network Requirements for Smart Grid Applications (Q.2)

Based on discussions with electricity producers and distributors, and from participation in Smart Grid standards-setting activities, Verizon understands the network requirements of emerging Smart Grid applications to be approximately as follows:

Application	Bandwidth	Latency	Frequency	Reliability	Security	Primary	Backup
AMI	10 kbps per meter	< 15 s	5 – 15 min per meter	Medium	High	Wireless	Satellite
DR	120 bytes per message	< 500 ms	35 days per year	High	High	Wireless	Wireline
DER	9.6 kbps per resource	< 15 s	5 min per resource	Medium	High	Wireless	Wireline
GO: Field Monitoring	9.6 kbps per point	< 5 s	5 min per point	Medium	High	Wireless	Wireline
GO: Substations	1 Mbps per substation	< 50 ms	Continuous	High	High	Wireline	Wireless
WASA	300–500 kbps per location	< 50 ms	Continuous	High	High	Wireline	Wireless

In addition to meeting these technical parameters, communications networks used for Smart Grid also must be secure and scalable, while providing electricity producers and distributors with both flexibility and control. Experienced communications providers currently meet such needs for government and business customers.

C. Communications Providers Can Readily Meet Many Additional Network Considerations (Q.3)

Although additional factors such as terrain, foliage, customer density, and size of service territory may affect utility communications' needs, existing commercial broadband networks can readily adapt to these factors. Nationwide communications providers own and operate standards-based, highly secure, reliable, and scalable networks that can address specific network needs, whether due to environmental, population, or geographic factors. Virtually every other industry and every level of government rely on commercial communications providers and their networks for even the most sensitive communications—electricity producers can do the same.

D. Commercial Broadband Networks Provide a Wide Range of Technology Options for Smart Grid and Other Utility Communications. (Q.5)

A variety of communications technologies and networks could be used to satisfy Smart Grid and other utility communications requirements, including wired, wireless, and even satellite alternatives. Wireline options include fiber, Ethernet, T1/T3, Frame Relay, Digital Subscriber Line (DSL), cable, Power Line Communications (PLC), and Broadband over Powerline (BPL). Wireless communications technologies include LTE, EV-DO, 1xRTT, High Speed Packet Access (HSPA), General Packet Radio Service (GPRS), WiMAX, ZigBee, wireless mesh networks, WiFi, and private radio networks.

While many networking options may be possible for most Smart Grid applications, certain networks will be better suited for particular purposes. For example, advanced metering and distribution management communications could be efficiently handled in most geographic areas utilizing a Multi Protocol Label Switching (MPLS) service travelling over a wireless EV-DO or LTE network or over existing wireline broadband networks.

In the related area of Smart Home technology, communications to coordinate the energy consumption of home appliances with the Smart Grid could utilize a variety of communications

approaches. For example, consumers could incorporate a home energy management system as part of their home network and then access that system via their local area network, or remotely via their broadband connection. Such a Smart Home energy management system, in turn, could communicate with Smart Grid via the electricity meter for purposes of receiving advanced metering or demand response signals using low-frequency wireless protocols such as ZigBee. And based on those signals, the home area network could communicate with appliances or other end-points within the home using standard wireless technologies such as ZigBee or WiFi and/or a powerline alternative. Also, the consumer's home energy management system could use the consumer's broadband connection to communicate with the electric utility or with a third-party energy management portal. Existing wireline and wireless broadband networks would be well-suited to provide the necessary connectivity for any of these purposes.

Although existing commercial wireless and wireline networks would work well for many Smart Grid purposes, some Smart Grid applications would function most effectively over fiber networks. For example, communications with substations that require continuous streaming of data, and thus more demanding throughput and latency requirements, could most appropriately be provided over an MPLS connection delivered over fiber (*e.g.*, Ethernet over SONET). Likewise, the backbone communications necessary for Smart Grid would likely work best using MPLS protocols capable of meeting specific quality-of-service requirements and providing robust security capabilities. Established communications providers already have substantial experience providing these types of sophisticated enterprise services for other business and government entities over commercial broadband networks and could do the same for Smart Grid.

E. Commercial Broadband Networks Operated by Established Communications Providers Would Meet Current and Anticipated Future Utility Requirements and Satisfy Utilities' Communications Needs (Q.6, Q.7)

Verizon and other established communications providers have the facilities, systems, and expertise to implement the most cost-effective and efficient Smart Grid technology solutions. As an initial matter, commercial wireless and wireline broadband networks are widely available. Approximately 95 percent of homes and businesses in the United States currently have access to broadband over wireline networks.[5] Moreover, as the Federal Communications Commission (FCC) has recognized, commercial wireless carriers currently cover 99.6 percent of the U.S. population,[6] 77 percent of whom have access to 3G services.[7] Additional broadband platforms, including fixed wireless, are also available in many areas. The Verizon Wireless EV-DO Rev. A. network, for example, already reaches more than 285 million Americans, and this robust network would be suitable for many Smart Grid applications. And Verizon's 4G LTE network will be widely available in the near future. In those limited areas that lack broadband coverage, commercial providers are able to develop or deploy solutions to extend higher capacity services, including satellite or wireless mesh alternatives.

In addition to satisfying the performance parameters associated with Smart Grid applications as discussed below, commercial broadband networks are also sufficiently robust and reliable to meet the needs of Smart Grid. Indeed, experienced communications providers devote considerable attention to protecting their networks and preparing for emergencies, whether

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5 *See Connecting America: The National Broadband Plan*, http://download.broadband.gov/plan/national-broadband-plan.pdf, at 20 (Mar. 16, 2010) ("*National Broadband Plan*").

6 *Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless and Commercial Mobile Services*, Fourteenth Report, WT Docket No. 09-66, FCC 10-81, ¶ 4 (May 20, 2010).

7 *National Broadband Plan* at 22.

natural or man-made, to help maintain the flow of critical communications when they are needed most. For example, Verizon has emergency response and recovery plans in place to address continuity of operations. These plans provide for emergency operations centers, alert lists, and alternate temporary locations to facilitate the installation, maintenance, and restoration of critical telecommunications or information services under emergency conditions. Verizon's overall emergency response and recovery efforts are managed at a primary emergency operations hub, and in the event this hub is affected by the disaster, Verizon maintains a back-up emergency operations center. Verizon also coordinates with other public and private organizations, including the FCC, the Network Reliability and Interoperability Council, and other telecommunications service providers in responding to disasters or emergencies.

Further, service protection and restoration strategies are an integral part of communications providers' network management and operations. For instance, Verizon's network personnel have the ability to re-route traffic dynamically over Verizon's networks to address outages at a specific location to make the networks more resistant to the impact of a local weather emergency or disaster. Verizon also maintains network operations centers that monitor all network facilities, including transmission facilities, switches, and cell sites across Verizon's networks. These centers are staffed 24 hours a day, seven days a week with experienced personnel who work closely with regional and local field operations teams and with vendors to coordinate and expedite the restoration of service in the event of outages. For its wireless networks, Verizon protects its cell site operations in many ways, including redundancy in the equipment, automatic power back-up systems, automatic fire detection systems, and physical security systems and alarms. Verizon also maintains and utilizes portable cell sites referred to as

cells-on-wheels (COWs) and cell-on-light-trucks (COLTs), which are fully functional generator-powered cell sites that can replace or enhance network coverage and capacity in a given area.

In short, established communications providers have the requisite level of experience and preparation to operate, maintain, protect, and secure Smart Grid communications over commercial networks to meet utilities' communications needs.

F. Commercial Networks Could Be Further Enhanced Through Expansion of the Wireless Priority Service. (Q.8)

Existing networks are well-positioned to meet most, if not all, of the electricity industry's needs in implementing Smart Grid, and they could, to the extent necessary, be enhanced to ensure that service is being provided in the most efficient and cost-effective manner going forward. Once such enhancement is Wireless Priority Service, which is a system whereby third parties under a federal government contract provide priority telecommunications services according to priority levels prescribed by the Department of Homeland Security's National Communications System.[8] Wireless Priority Service could be extended to cover critical-infrastructure Smart Grid communications, which would maximize the benefits of Smart Grid technology.

Additionally, stakeholders should work cooperatively to integrate the use of next-generation satellite services in Smart Grid implementation. In certain remote areas, satellite may be the only broadband platform available. Smart Grid technology should incorporate satellite delivery mechanisms in order to ensure that residents in rural areas are not denied the benefits of Smart Grid.

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[8] *See generally The Development of Operational, Technical and Spectrum Requirements For Meeting Federal, State and Local Public Safety Agency Communication Requirements Through the Year 2010; Establishment of Rules and Requirements For Priority Access Service*, Second Report and Order, 15 FCC Rcd 16720 (2000); 47 C.F.R. § 64 Appendix B, Priority Access Service (PAS) For National Security And Emergency Preparedness (NSEP).

G. Communications Providers Have the Requisite Expertise to Ensure that Utilities' Future Communications Requirements Are Met As Smart Grid Technology Evolves. (Q.9)

As Smart Grid expands and evolves, established communications providers can bring to bear their significant experience to ensure that utilities' communications needs are met. In particular, communications providers have the expertise in handling the interoperability and technology evolution of complex systems and networks as well as administering, collecting, storing, and managing vast amounts of data, as Smart Grid deployment will require. In addition, communications providers like Verizon have extensive experience in developing and implementing interoperability standards with other carriers and manufacturers, particularly as service and requirements evolve and new technologies emerge.

III. CONCLUSION

Verizon and other established communications providers have the facilities, systems, and expertise to help utilities implement the most cost-effective and efficient Smart Grid technology solutions.

Respectfully submitted,

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