Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	
International Comparison and Consumer Survey Requirements in the Broadband Data Improvement Act	)	GN Docket No. 09-47
	)	
A National Broadband Plan for Our Future	)	GN Docket No. 09-51
	)	
Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion	)	GN Docket No. 09-137

<u>COMMENTS – NBP PUBLIC NOTICE # 2</u>

COMMENTS OF VERIZON AND VERIZON WIRELESS ON

IMPLEMENTATION OF SMART GRID TECHNOLOGY

Michael Glover
Of Counsel

Edward Shakin
William H. Johnson
VERIZON
1320 North Courthouse Road
9th Floor
Arlington, Virginia 22201
(703) 351-3060

John T. Scott, III
William D. Wallace
VERIZON WIRELESS
1300 I Street N.W.
Suite 400 West
Washington, DC 20005

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As Congress recognized in the American Recovery and Reinvestment Act of 2009 (Recovery Act), the development and deployment of smart grid technology hold tremendous promise towards improving the efficiency and reliability of our nation's electrical grids and empowering consumers to make better decisions about the use of electricity. The power sector accounts for about 40 percent of U.S. greenhouse gas emissions, and it is estimated that communications technology can reduce that by eight percent over the next ten years.[1] Given the need for real-time transmission and processing of vast amounts of information to and from consumers and the producers and distributors of electricity in order to make smart grids work – and the need for high levels of cybersecurity as that data transmission and processing takes place – effective communications networks and services will be central to the success of smart grid technology.

The commercial broadband networks built and operated by experienced communications providers offer the most efficient and sensible solution to providing the communications capabilities that will be required to effectively implement smart grid technology. Not only are such multi-use wireline and wireless networks already in place throughout most of the country, but also the providers who manage and operate those networks possess the experience and competence needed to support the required communications capabilities in an efficient, reliable and secure manner. Among other things, by virtue of their experience and capabilities, these providers are uniquely qualified to address the interoperability, redundancy, reliability and security concerns that must be addressed as smart grid technology is implemented. Relying on multi-use broadband networks for purposes of smart grid also would further other national

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[1] *See SMART 2020 United States Report Addendum Summary*, http://www.theclimategroup.org/assets/resources/publications/Smart2020UnitedStatesReportAddendumSummary.pdf, at 18-23 (2008).

broadband objectives – such as increasing broadband availability – by increasing demand and thus improving the business case for more widespread broadband infrastructure investment and deployment.

Verizon[2] is already working in a variety of ways to be part of the smarter grid solution:

- Verizon is working with Con Ed here in New York City to link its own power-generating facilities with Con Ed's system so Verizon can contribute to energy production at times of peak demand.
- Verizon has partnered with more than 20 utilities to deploy smart wireless meters in customer homes.
- Verizon is helping energy companies use its intelligent networks, data centers and home automation capabilities to become more energy-efficient, without having to become communications companies themselves.

Using smarter grids, consumers and businesses will have more control over their energy usage. Energy sensors will send messages to their mobile devices, which will act as remote controls over heating, cooling and lighting systems. And power companies will be able to scan buildings for conservation opportunities during peak usage periods. All of this is made possible by the advanced, highly secure networks built and operated by experienced communications providers and running smarter grid applications.

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

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

Fundamentally, implementation of smart grid technology – and achievement of all of the benefits that this technology promises – relies on the incorporation of communications technologies throughout various points in the electrical grid and consumers' homes. As the National Institute of Standards and Technology (NIST) recently noted in its *Framework and Roadmap for Smart Grid Interoperability Standards*, the "Smart Grid will not only be a system of systems, but also a network of information networks."[3]

As policymakers and industry implement smart grid technology, they should explicitly take into account the significant experience and capabilities that established communications providers offer and encourage generators and distributors of electricity to work closely with such providers in order to hasten the development and deployment of smart grids. Reliance on the networks of experienced communications providers offers the most efficient and cost effective manner of including the necessary communications functions into smart grid implementations, and also will ensure the use of appropriate advanced communications technologies. It makes little sense to expend precious taxpayer or customer dollars to fund the creation of new and separate broadband networks, when widespread, multi-use broadband communications networks – both wireline and wireless – exist today. 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.

Communications providers, particularly those with the size, scale and reliability to provide national network coverage, have much to offer as smart grid technology is developed and deployed. This is particularly true in the case of providers that have substantial experience

[3] http://www.nist.gov/public_affairs/releases/smartgrid_interoperability.pdf at 26.

in managing and operating wireline, wireless, and private communications networks; transmitting and processing vast amounts of data; and defending the security and integrity of the networks and data against all manner of threats. Established communications providers offer the benefits of both scale and scope that will be essential to provision smart grid technology in an effective and efficient manner. Taxpayers and customers should not be forced to fund the creation of new broadband communications networks when existing networks – both wireline and wireless – exist today and are up to the task.

Many of the functions that will be required in order for smart grids to achieve their potential fall within the core competence of communications providers like Verizon. For example, smart grids will rely on a combination of real-time, wireless and wireline communications between customers – or more likely, the appliances and other devices on a customer's home network – and the electricity generators and distributors that serve them, as well as real-time communication between elements of the smart grids themselves. This will involve the transport and storage of massive amounts of data, likely over private and secured private IP or other broadband networks. Existing communications providers have experience – and facilities in place – to provide precisely such services and already do so every day in a secure and reliable manner to government entities and businesses throughout the country. Such providers are also well positioned to address the interoperability, redundancy, reliability and security concerns associated with the implementation of smart grid technology.

Communications companies also have substantial, national networks in place that could be used (and supplemented, as necessary) to meet many smart grid needs, without requiring the use of taxpayer or customer funds to build a separate, single-purpose network. For example, Verizon Wireless' existing EV-DO wireless broadband network already reaches more than 280

million people in this country. Moreover, Verizon Wireless will begin its commercial rollout of its Fourth Generation (4G) wireless broadband service, using LTE technology, next year, and will extend this even more advanced wireless broadband network nationwide over the next few years. Verizon's wireline operations likewise already reach millions of businesses and residents, and carry data around the country. A customer could remotely monitor and adjust the electricity use at his or her home from a computer or wireless device while at work or travelling, all over Verizon's networks or anywhere. These existing networks and facilities provide an important resource for the transmission of smart grid data. Moreover, the existing capabilities of these networks are already ample for most smart grid applications. As discussed below, many such applications – such as advanced metering, demand response, and distribution grid management – require modest throughput and could be readily accommodated by existing networks.

Not only do established providers already have substantial network infrastructure in place, but they also have the incentive to continually invest in and upgrade these networks to meet the evolving demands of the market. Verizon's investments in its FiOS fiber-to-the-home network and in 4G LTE wireless technology provide examples of the types of next-generation capabilities currently emerging. Private communications networks funded by electric utilities' customers and amortized over decades would be less likely to benefit from the continued innovation that is occurring in the communications industry. Moreover, if such networks fail to keep pace with technological advances, they would be more vulnerable to security breaches or other threats. As a result, over time such private networks would be less efficient, reliable and secure than the networks otherwise available through commercial communications providers. Indeed, as smart grid requirements and technology evolve, commercial networks will evolve to continue to meet these new demands.

Additionally, established communications companies already have substantial experience with other functions that will be integral to smart grids. For example, communications companies have substantial experience and technical know-how with respect to systems integration and the management of complex, data-intensive programs. They also are experienced at handling the interoperability and technology evolution of complex systems and networks and at administering, collecting, storing, and managing large amounts of data through data centers, as will likely be required by smart grids. In addition, commercial network providers such as Verizon have extensive experience of developing and implementing interoperability standards with other carriers and driving these standards into the system vendor community, particularly as service and requirements evolve and enabling technologies emerge.

Policymakers have also recognized repeatedly the significance of cybersecurity to future smart grids. *See, e.g.*, Energy Independence and Security Act of 2007, 110 P.L. 140, § 1301(2) (noting that smart grids should have "full cyber-security"). Verizon and other communications providers devote considerable resources to – and have expertise at – promoting cybersecurity and defending against all manner of network threats. Verizon works with government agencies and companies of all types to address security concerns related to communications, including in such sensitive contexts as national security and financial transactions. Indeed, Verizon was recently positioned in the "Leaders" quadrant in leading analyst firm Gartner's report concerning managed security service providers (MSSPs).[4] Verizon 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

[4] Gartner, Inc., "Magic Quadrant for MSSPs, North America," at 2 (April 16, 2009).

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 same for smart grid devices. Similarly, Verizon and other established communications providers also devote considerable attention to emergency preparedness to ensure that communications networks remain in service when they are needed most.

Given the substantial experience, competence and resources that communications companies such as Verizon potentially bring to the table as smart grid technology is developed and implemented, policymakers should encourage the electricity generators and distributors to work closely with established communications companies towards the development and deployment of smart grid technology. Such an approach will help to hasten advances in smart grids, as well as the many societal benefits that will flow from them, in an economical, scalable, repeatable and secure manner.

Moreover, putting commercial broadband networks to use for purposes of smart grid also will further other national broadband goals. As the Commission has repeatedly heard in the course of this proceeding, an essential aspect of encouraging private investment in broadband infrastructure is increasing the demand for services riding that infrastructure, and smart grid applications have the potential to be an additional source of demand. Any revenue associated with these smart grid communications would improve the business case for broadband investment and deployment, including in the areas currently lacking broadband service.

II. RESPONSES TO SPECIFIC QUESTIONS FROM PUBLIC NOTICE

As requested in the Public Notice, Verizon provides the following responses to the Commission's questions concerning the implementation of smart grid technology:

A. Suitability of Communications Technologies

1. Network Requirements for Smart Grid Applications (Q. 1.a)

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

Application	Frequency	Throughput	Latency	Availability
Advanced Metering Infrastructure (AMI)	15 ⇒ 5 min per meter	10 kbps per meter	500 ms	99.9%
Demand Response (DR)	2-4 times per day; 35 days per year	120 Bytes per message	5 min	99%
Distributed Energy Resources (DER)	5 min per resource	9.6 kbps per resource	500 ms	99%
Grid Optimization Field Monitoring Points	5 min per point	9.6 kbps per point	500 ms ⇒ 50 ms	99%
Grid Optimization Substations	Continuous Streaming	1 Mbps per substation	10 ms	99.9%
Wide Area Situational Awareness (WASA)	Continuous Streaming	28-128 kbps	20 ms for real-time control situations	99.9%

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 both flexibility and control. As discussed below, experienced communications providers are in the business of meeting such demands, including in the most sensitive of contexts faced by business and government entities.

2. Communications Technologies and Networks Meeting These Requirements (Qs. 1.b and 1.c)

A variety of communications technologies and networks could be used to satisfy most of the requirements set out above, including in many cases either wired, wireless, or even satellite connections. As a result, the establishment of appropriate standards that facilitate interoperability will be important in order to allow the use of a variety of network approaches that may accommodate the varied circumstances that will exist in the field.

While many networking options may be possible for most smart grid applications, certain networks will be better suited for particular purposes. So, for example, the advanced metering and distribution management communications noted above could be efficiently handled in most places over an Multi Protocol Label Switching (MPLS) service travelling over a wireless EV-DO or LTE network or over existing wireline broadband networks. The performance parameters noted above would be within the capabilities of these networks.

Communications to coordinate the energy consumption of home appliances likewise could utilize a variety of communications approaches. So, for example, consumers could incorporate a home energy management system as part of their home network and then access that system via their LAN, or remotely via their broadband connection. The home energy management system, in turn, could communicate with 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. The consumer's home energy management system could also 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 wireless and wireline networks would work well for many smart grid purposes, some smart grid applications exhibit network requirements best met by fiber networks. For example, communications with substations would involve continuous streaming of data, with more demanding throughput and latency requirements than for other applications. Therefore, such communications could most appropriately be provided over an MPLS connection delivered

over fiber (*e.g.*, Ethernet over SONET). MPLS is used today by the federal government, states and private industry as both state of the art network technology and an efficient and cost effective way to run communications networks.

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. The use of MPLS would also drive economies of scale that could increase the efficiency of smart grid implementation. Here too, however, existing communications providers have existing networks and substantial experience providing these types of sophisticated enterprise services for other business and government entities, and could do the same in the context of smart grid.

3. Adequacy and Reliability of Current Commercial Networks (Qs. 1.c, 1.d, and 1.e)

As explained above, current commercial broadband networks are well-suited for the full range of smart grid applications and would be capable of satisfying the various bandwidth, latency, reliability and security requirements. In particular, commercial wireless and wireline broadband networks would provide an efficient mechanism for handling advanced metering, demand response, and distribution grid management applications, while commercial fiber-based networks would best accommodate the demands of substations communications and backbone transport.

In addition to satisfying the performance parameters associated with smart grid applications, commercial broadband networks are also sufficiently robust and reliable for purposes of smart grid. Indeed, experienced communications providers devote considerable attention to protecting their networks and to preparing for emergencies, whether natural or man-made, in order to keep critical communications flowing when they are needed most. Effective

and reliable business continuity planning and emergency management are critical to Verizon's core business values.

Verizon has emergency response and recovery plans in place to address business continuity. Indeed, it is Verizon's written corporate policy to establish and maintain plans regarding continuity of operations and continuity of management, together with emergency operations centers, alerting lists, and alternate temporary locations deemed necessary to facilitate the installation, maintenance and restoration of critical telecommunications or information services under conditions ranging from local emergencies to widespread disaster. Verizon's overall emergency response and recovery efforts are managed at a primary emergency operations "hub," the Verizon National Emergency Coordinating Center (NECC). Verizon also maintains a back-up Emergency Operations Center (EOC) in the event that the NECC is affected by a disaster. When activated, the NECC is staffed by members of Verizon's Business Continuity and Emergency Management team, representatives from several Verizon departments and interfaces with Verizon's representatives to the National Coordinating Center for Telecommunications (NCC).

Verizon's business units have also divided the country into specific regions based on their respective business needs and established specific continuity programs and plans that are appropriate for each of its regions. Verizon also manages its response to disasters and emergencies through a Business Continuity Governance Structure. This organization coordinates with Verizon's Cyber and Security teams to establish appropriate business continuity policies, strategies, priorities, and guidelines. Verizon's Business Continuity Governance Structure also coordinates closely with other public and private organizations, including the

Commission, the NCC, the Network Reliability and Interoperability Council (NRIC), and other telecommunications service providers to respond to disasters or emergencies.

Service protection and restoration strategies are an integral part of Verizon's network management and operations. Verizon's networks are comprised of numerous components that are connected using diverse transmission systems, circuits, and network technologies. Verizon's network personnel have the ability to re-route traffic dynamically over Verizon's networks to address outages at a specific location. This capability makes Verizon's 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 Network Operations 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.

The Network Operations Center technicians work with the field operation managers, and personnel are dispatched to the affected site as needed. An inventory of standard spare parts and repair equipment is available to technicians in centralized network locations. Verizon also has standing agreements with critical vendors to get 24 hours a day, seven days a week support from their engineering personnel and obtain replacement equipment if required.

In addition, buildings housing Verizon's switches are designed to provide maximum protection for their systems and services. They have automatic fire detection and suppression systems, back-up power sources, and physical security systems and alarms to prevent entry by unauthorized personnel.

For its networks providing wireless services, Verizon also 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. Through arrangements with vendors, the major components of a cell site -- up to and including the building and tower -- become an immediate priority restoration effort on the part of both Verizon and its vendors. 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. These portable cell sites are strategically located and may be quickly deployed to an area that is affected by a weather-related or other disaster.

This level of experience and preparation means that existing communications providers are well-suited to operate, maintain, protect and secure the networks in the context of smart grid. Indeed, these providers already do so when providing communications services for the critical functions of other business and government entities, and these same capabilities and experience apply in the smart grid context as well.

B. Availability of Communications Networks (Qs. 2.a, 2.b, 2.c, and 2.d)

The widespread availability of commercial wireless and wireline broadband networks weighs heavily in favor of their use for smart grid purposes. More than 90 percent of homes and businesses have access to broadband,[5] and the vast majority already has access to at least two wireline broadband networks, three or more mobile wireless broadband networks, and two

[5] A recent presentation by Commission staff suggests that approximately 96 percent of households have access to broadband services capable of at least 768 kbps. *Commission Open Meeting Presentation on the Status of the Commission's Processes for Development of a National Broadband Plan*, http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-293742A1.pdf, at 35 (Sept. 29, 2009).

satellite broadband providers. Moreover, as the Commission has recently recognized, commercial wireless carriers already cover 99 percent of the U.S. population.[6] 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 280 million Americans, and this robust network would be suitable for many smart grid applications. The even more advanced LTE wireless network will likewise be widely available in coming years. Verizon plans to offer service next year in 25-30 markets that include over 100 million people, and to continue an aggressive nationwide rollout that will extend LTE to its entire nationwide wireless network by the end of 2013. Millions of consumers also have access to Verizon's fiber and DSL networks. And Verizon operates robust fiber networks around the country that could be effectively used for smart grid purposes – including the more demanding applications associated with substations and backhaul. Given that substations and most field monitoring points with electricity distribution networks generally are located in areas where there exists the need for service-level power for commercial and residential customers, suitable commercial broadband networks (generally wired and wireless) are already in place most of the time. And even where they are not, commercial providers are able to develop or deploy solutions to extend higher capacity services to these locations, as they do for other enterprise customers today.

While certain gaps in broadband availability continue to exist, solutions are available or are being developed to address those isolated areas short of building redundant new private networks dedicated to smart grid. For example, Verizon is considering the use of satellite or wireless mesh alternatives for reaching locations currently lacking wireline or wireless broadband access. A wireless mesh network could, for example, deliver data to an aggregation

[6] *Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services*, Thirteenth Report, 24 FCC Rcd 6185, ¶ 2 (2009).

point where backhaul capacity exists or could be installed. Moreover, in some cases, fiber already deployed within the electrical grid could be accessed and used to reach otherwise unserved areas. In other cases, new construction of wireline or wireless facilities could potentially be required. But given that existing, commercial broadband networks already serve well over 90 percent of homes and businesses it would be wasteful to spend taxpayer or customer dollars to build whole new (mostly redundant) networks for purposes of smart grid.

C. Real-Time Data and Home Area Networks (Qs. 4 and 5)

Consumers' access to real-time energy consumption data, and the method and ability of consumers' home area networks to access and use such data to coordinate the activities of in-home devices, will be key to the effective implementation of smart grid. In order to encourage innovation and widespread use of smart grid capabilities in consumers' homes, policymakers should encourage the development of interoperable, open standards. Among other things, such standards should be compatible with the full range of wireline and wireless broadband services in order to encourage their adoption and use. But within the framework of these basic standards, policymakers should leave it to innovators to develop products, services, and applications that will allow consumers to make full use of smart grid technology.

III. CONCLUSION

Verizon and other established communications providers have the facilities, systems and expertise to help implement smart grid technology at lower cost and greater efficiency than private communications networks dedicated to smart grid.

* * *

Michael Glover
Of Counsel

Edward Shakin
William H. Johnson
VERIZON
1320 North Courthouse Road
9th Floor
Arlington, Virginia 22201
(703) 351-3060

John T. Scott, III
William D. Wallace
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1300 I Street N.W.
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