Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	
Comment Sought on the Implementation of Smart Grid Technology	)	GN Docket Nos. 09-47, 09-51, 09-137
	)	
	)	
NBP Public Notice #2	)	
	)	

To: The Commission

COMMENTS OF
ALCACTEL-LUCENT

Michael T. McMenamin
Senior Counsel-Managing Director
1100 New York, Avenue, N.W.
Suite 640 West Tower
Washington, D.C. 20005

October 2, 2009

TABLE OF CONTENTS

SUMMARY

Alcatel-Lucent appreciates the opportunity to contribute to the Federal Communications Commission national broadband plan and this specific proceeding on Smart Grid Technology. ALU sees smart grid as one of several solutions offered by the technological advances and widespread deployment of broadband networks. While in its comments ALU addresses the narrow issues raised specifically in the Commission's Public Notice, these comments also convey broader policy recommendations for the Commission's consideration.

First, smart grid is not an individual application or solution, rather a collection of distinct applications that have varying degrees of latency sensitivity, market availability, interference issues, and power requirements. Alcatel-Lucent recognizes that while many utilities may prefer exclusive networks for smart grid applications, cost considerations will result in utilities using shared and/or commercial networks for many of these applications. In a shared environment, the service provider must be able to provide the resiliency and redundancy that these applications require in order to achieve the energy independence and efficiencies offered by a smart grid solution.

Second, smart grid is platform-agnostic and a wide variety of broadband platforms may be employed (e.g. wireless, wireline, etc.), but Internet Protocol should be the end-to-end network layer. IP will enable the multiple smart grid applications to work in the collaborative and unified manner necessary for utilities to realize the potential efficiencies and control offered by smart grid.

Finally, smart grid efficiencies can be achieved based on a broadband wireless solution, but the Commission must consider whether sufficient spectrum is available to achieve these solutions as well as the broader goals of the national broadband policy. While unlicensed spectrum addresses certain parts of the smart grid solution, such as smart metering, and network

technology can address reliability and interference concerns on a shared network, there is no substitute for more commercially-available, licensed spectrum for all broadband solutions, including smart grid.

Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	
Comment Sought on the Implementation of Smart Grid Technology	)	GN Docket Nos. 09-47, 09-51, 09-137
	)	
	)	
NBP Public Notice #2	)	
	)	

To: The Commission

COMMENTS OF ALCATEL-LUCENT

I. INTRODUCTION AND BACKGROUND

Alcatel-Lucent welcomes this opportunity to respond to the Federal Communications Commission's ("FCC/Commission") *Public Notice* on how best to enable the build-out and utilization of high-speed broadband infrastructure for smart grid technology that ensures "energy independence and efficiency."[1] Alcatel-Lucent provides below specific responses to the *Public Notice* that adheres to the organization and structure of the questions asked therein.

Alcatel-Lucent's market leadership and experience in broadband provides unique insight into policy prescriptions for the broadband era. Alcatel-Lucent is the worldwide leader of broadband access solutions with a presence in 130 countries, and has significant experience in deploying current and next generation wired and wireless broadband under

[1] Comment Sought on the Implementation of Smart Grid Technology-NBP Public Notice #2, *Public Notice*, GN Docket No. 09-47, 09-51, 09-137, ¶ 1 (rel. Sept. 4, 2009) ("*Public Notice*").

a variety of geographical, regulatory, and economic conditions, for private and public entities alike.

Moreover, Alcatel-Lucent has a long history of working with a wide range of utility customers seeking to deploy Smart Grid technologies. Alcatel-Lucent has provided strategic guidance and infrastructure management on Smart Grid Telecommunications to Oncor Electric Delivery ("Oncor"), a large, Investor-Owned Transmission and Distribution System Operator based in Dallas, Texas serving 3,200,000 customers over a 73,000 square mile area of northern Texas. In addition, Alcatel-Lucent has worked with Bristol Tennessee Essential Services ("BTES"), a utility with more than 33,000 electric meters across 280 square mile area, to expand its communications capabilities over a fiber network that passes 99 percent of its customers. Using Alcatel-Lucent's Passive Optical Network System to achieve wide-area communications and distributed computing, BTES has made improvements in real-time energy data collection, transfer and management for current and future smart grid applications. BTES has also upgraded its efficiency by adding demand response and distribution automation, enabling it to reduce the number of customer minutes in power outages. Advanced communications capabilities have also enabled BTES to use real-time communications to improve its pricing schedules through Time-of-Use, Real-Time Pricing and Critical Peak Pricing, and to increase its responsiveness to customer service issues and better educate its consumers.

The Oncor and BTES experiences demonstrate that as broadband capabilities are expanded and they become more widely available to electric utilities in the United States, we will come closer to achieving the important national goal of achieving energy independence. The Commission's plan for broadband should promote broadband's role in improving energy efficiency and achieving energy independence.

II. ALCATEL-LUCENT'S REPONSES TO THE SPECIFIC QUESTIONS RAISED IN THE PUBLIC NOTICE.

1. **Suitability of Communications Technologies.** Smart Grid applications are being deployed using a variety of public and private communications networks. We seek to better understand which communications networks and technologies are suitable for various Smart Grid applications.

It is Alcatel-Lucent's experience that most utilities prefer exclusive ownership of their networks that would be void of interference issues caused by outside users. We believe that ownership by multiple parties of the segments of an integrated network impacts network architecture in physical and logical connectivity, routing, reliability, and security among other factors. Owning a dedicated utility network, however, may not always be possible because of the cost, availability of network assets including spectrum, and/or the need for deploying applications in an expedient manner. Moreover, owning a dedicated network would likely result in longer technology refresh cycles and issues surrounding management of the network versus sharing ownership of network segments with a service provider that will update and run the network. Ultimately, the choice will be based on each utility's application and network requirements and those associated costs.

a. What are the specific network requirements for each application in the grid (e.g., latency, bandwidth, reliability, coverage, others)? If these differ by application, how do they differ? We welcome detailed Smart Grid network requirement analyses.

Alcatel-Lucent submits the following table listing a few of the most important smart grid applications by category, as well as other utility applications carried over the network and their qualitative requirements.

Application	Data Rate / Data Volume (at endpoint)	(One way) Latency Allowance	Reliability	Security
Smart Metering	Low/V. Low	High	Medium	High
Inter-site Rapid Response (*eg* teleprotection)	High/Low	V. Low	V. High	V. High
SCADA	Medium/Low	Low	High	High
Operations data	Medium/Low	Low	High	High
Distribution Automation	Low/Low	Low	High	High
Distributed Energy Management and Control (inc. ADR, Storage, PEV, PHEV)	Medium/Low	Low	High	High
Video Surveillance	High/Medium	Medium	High	High
Mobile Workforce (Push to X)	Low/Low	Low	High	High
Enterprise (corporate) data	Medium/Low	Medium	Medium	Medium
Enterprise (corporate) Voice	Low/V. Low	Low	High	Medium

ADR: Automated Demand Response
P(H)EV: Plug-in (Hybrid) Electric Vehicle
SCADA: Supervisory Control and Data Acquisition

An important consideration when looking at the chart are instances where the application requirements may be different from those in the table, depending on the context. For example, in the case of smart metering application, active demand response and emergency load management will require higher reliability and lower latency as an integrated system than it does as a stand alone application.

b. Which communications technologies and networks meet these requirements? Which are best suited for Smart Grid applications? If this varies by application, why does it vary and in what way? What are the relative costs and performance benefits of different communications technologies for different applications?

Alcatel-Lucent believes that it is not possible to provide a single answer for which communications technology is best suited for smart grid applications because of the diverse applications on the market. In addition, requirements of some of the applications are dynamic and evolving *e.g.* smart metering application. Further, we believe that an application-specific individual network such as Supervisory Control and Data

Acquisition ("SCADA")[2] will be far too expensive and unmanageable with many current and new smart grid applications. It is necessary that an integrated network support all applications with proper implementation of quality of service, reliability, and security for individual application traffic carried over the network.

Technology Choice. Although there is no single answer to this question, there is a general agreement as to the technology path that the smart grid networks will take. We believe that path leads to Internet Protocol ("IP") as the overall end-to-end network layer technology of choice. The IP suite of technologies offers the needed levels of reliability, redundancy and availability, and can leverage an extensive ecosystem of products and services designed for telecommunications.[3]

IP networks must continue to support legacy systems and networks including proprietary smart metering technologies that have already been deployed. In addition, some applications and some North American Electric Reliability Corporation ("NERC") requirements may not be supported by IP connections or current implementations of the technology for some time, *e.g.* the teleprotection application between substations.[4]

These substation applications such as teleprotection and SCADA may need to be treated differently, as they have special requirements. For instance, if it is not feasible in a particular network to use IP-enabled teleprotection or SCADA, an end-to-end layer 2 network will have to be deployed. Depending on the requirements, it may be possible to

---

[2] Supervisory Control and Data Acquisition systems are used extensively by power, water, gas and other utility companies to monitor and manage distribution facilities.

[3] It must be noted, however, that IP networks do not necessarily imply the use of the Internet.

[4] Teleprotection refers to detection of the fault at a substation remotely at another substation and then remotely taking action (such as tripping the circuit breaker) at the substation where the fault has occurred. This needs to be done within a few milliseconds.

tunnel these protocols through IP, using technologies such as Internet Protocol/Multiprotocol Label Switching ("IP/MPLS") Pseudowires.[5] This is a proven technology that is broadly deployed in carrier networks and is undergoing adoption by the utility industry. Low latency requirements of <10ms in Teleprotection may require connectivity over direct physical wired or wireless connection between substations. In order to achieve high reliability in Teleprotection it may require two or more such connections between substations.

Physical Network. In a typical utility network, the physical network itself will be divided into an access and a core portion. The technology choices for the access portion will require the most tailoring for individual utilities in order to meet their specific requirements. Where a utility is publicly owned, and can offer additional services, such as internet access and Internet Protocol Television ("IPTV"), they may choose to lay fiber, such as a Gigabit Passive Optical Network ("GPON") systems. Where a utility is limited from offering additional services, they may choose to either use a customer's existing broadband connection or deploy a broadband wireless access infrastructure. Since it is far from certain that a customer will have or consistently maintain an existing broadband connection, due to coverage and subscription issues, in our observation, utilities prefer to own their broadband wireless access networks.

Core Level. The core of the smart grid network will be centered on carrier-grade IP/MPLS routers, optical systems and microwave transmission equipment. The core will be fiber where it can and microwave where it does not make economic sense to lay fiber.

---

[5] Pseudowire is point to point layer 1 or layer 2 connection over IP/MPLS. There are many protocol options between the two end points such as TDM (often called VLL-Virtual leased line), Ethernet, Frame relay, and so forth. Pseudowire basically emulates the corresponding protocol over IP/MPLS. (TDM: Time division multiplexing. Example: T1).

We believe even higher capacity can be realized using wave division multiplexing ("WDM") technologies and systems.

Devices that are part of the distribution grid can be attached to the larger smart grid network using either an access-style attachment or a core-style attachment. Smaller elements, such as SCADA remote terminal units at the remote transformer will likely be attached over the access infrastructure. Large substations, on the other hand, could be connected via microwave or fiber. The specific choice will depend on the node needing attachment and the specific utilities network.

Access Level. Alcatel-Lucent believes that both wireless and wireline broadband technologies can be configured to meet most of application requirements at the access level – either from the endpoints or from data concentration points concentrating traffic to/from its endpoints using proprietary technologies. Examples of wireless technologies over licensed spectrum include WiMax, LTE, CDMA 2000 EvDO, and HSPA[6]. Wireline examples would include DSL, DOCSIS, and GPON and PLC ("Power Line Carrier"), including BPL.[7] In the end, we believe that the choice of access technology will mostly depend on the cost effectiveness and ability of the technology to provide suitable coverage.

Moreover, RF mesh over unlicensed spectrum at 900 MHz ISM[8] (wireless) and PLC (wireline) are other options as these technologies are cost effective for carrying low

---

[6] WiMAX: Worldwide Interoperability for Microwave Access; LTE: Long Term Evolution, CDMA 2000 EvDO: Code Division Multiple Access 2000 Evolution Data Optimized; HSPA: High Speed Packet Access.

[7] DSL: Digital Subscriber Line; DOCSIS: Data over Cable Service Interface Specifications (for cable internet connection); GPON: Gigabit Passive Optical Network); PLC: Power Line Carrier (communication over power lines as the medium carrying digital traffic). BPL: Broadband over Power Line (broadband connection with at least the last mile over PLC).

[8] Mesh connections between meters and their concentrator over unlicensed 900 MHz ISM (Industrial Scientific, and Medicine) band in a neighborhood.

bit rate, high device density smart metering traffic from individual meters to their meter concentrators. Technologies like 900 MHz, however, are cost-effective only in high-density urban and suburban environments where signal coverage can take advantage of shorter hops between meters and/or numerous towers unlike rural areas. It is expected that as real-time demand response begins to become a reality these low bite rate, unlicensed network systems will require migration to other technologies that support broadband communications such as WiMAX and LTE. Also, as latency sensitive real-time telemetry control applications are deployed across the distribution grid, such as syncrophasor control and other real time sensors, spectrum interference in unlicensed bands or across commercial networks will inhibit the deployment and usefulness of these systems.

> c. What types of network technologies are most commonly used in Smart Grid applications? We welcome detailed analysis of the costs, relative performance and benefits of alternative network technologies currently employed by existing Smart Grid deployments, including both "last mile," backhaul, and control network technologies.

There may be a choice of more than one network technology for connecting every smart grid element in the network. In addition, even within a class of network technologies, multiple choices may exist, as there are many wireless and wireline access technologies.

We expect that the utility network will be an integrated IP network that supports data traffic for smart grid applications, as well as traffic for utility enterprise voice and data applications. The network must support connectivity to legacy systems and applications by providing the necessary gateways and protocol conversion. For some time, it may not be possible to carry a few grid applications (such as teleprotection) directly over an IP connection due to their latency requirements and/or due to NERC CIP[9] compliance.

Typical smart grid architecture may include an IP core network in the metro area(s) in utility coverage. The utility data and control center, utility offices, bulk generation sites, substations in the metro areas, and market entities such as independent system operators may connect directly into the core network. The substations in remote areas, (mostly renewable and alternate) generation sites, and electric storage sites will connect to the core over broadband wireless and/or wireline access networks. The choice of access will depend on network availability and their suitability for carrying the application traffic. A substation is a natural data concentration point for communication traffic from consumer buildings (residential, industries, business), other power consumption locations, as well as for the SCADA traffic generated at the electricity distribution points on distribution "feeders" such as at utility poles. Neighborhood area networks such as the 900 MHz RF mesh or PLC are the low cost choices for connections to the substation. Over time it is also possible that the broadband wireless or wireline access networks will be used to connect these buildings and feeder locations to substations or directly to the core network.

In addition to a smart meter, a building may have local generation (*e.g.* PV cell, UPS) and storage (*e.g.* PHEV) facilities. They may be connected along with the meter over a local area network ("LAN") or a Home Area Network ("HAN") for building energy management. HAN communication technologies include Zigbee and HomePlug. As buildings also gain smarter grid capabilities, their bandwidth needs will increase.

---

[9] NERC: North American Reliability Council; CIP: Critical Infrastructure Protection.

This will put pressure on 900 MHz FR and PLC technologies and accelerate the need for broadband wireless or wireline connections.

The voice and data systems deployed for the utility mobile workforce will connect to the network over wireless access. Gateways will be necessary until broadband VoIP is used for mobile work force voice communication, *e.g.* push to talk.

Finally, enterprise voice and data communication will also be carried over the integrated IP network, including those from the substations.

Like most IP networks, implementing MPLS will also provide added advantages of traffic separation with MPLS virtual private networks ("VPN"), streamlined quality of service and security implementation, and virtual leased lines and virtual private LAN service implementation if necessary.

d. Are current commercial communications networks adequate for deploying Smart Grid applications? If not, what are specific examples of the ways in which current networks are inadequate? How could current networks be improved to make them adequate, and at what cost? If this adequacy varies by application, why does it vary and in what way?

We believe that many smart grid applications being deployed today can adequately operate on current commercial communication networks, but most utilities seek exclusive access arrangements out of concern that quality of service and prioritization requirements that are a challenge in a shared network environment. Commercial providers will need to support utility mission critical applications and their performance, reliability, and security requirements in a shared environment of commercial networks. Priority access and priority flow management could also be an issue for critical smart grid applications, with preemption ability. Moreover, State PUC's electrical regulations require that acceptable communication network performance, security, and reliability requirements must be met during wide scale power outages and the resulting "black start" processes for restoration and should be considered by potential commercial providers and smart grid policies developed by the Commission.

Further, while Investor-Owned Utilities may face regulatory hurdles in providing services other than power delivery, we believe that the many local government and cooperative utility owners may want to serve as a conduit or as a provider of broadband services for their under-served citizens. In that case, there may not be any regulatory conflict in network ownership; however, the business case and /or public/private partnerships to support such activities will need to be evaluated on a case by case basis by the grid operators.

e. How reliable are commercial wireless networks for carrying Smart Grid data (both in last-mile and backhaul applications)? Are commercial wireless networks suitable for critical electricity equipment control communications? How reliably can commercial wireless networks transmit Smart Grid data during and after emergency events? What could be done to make commercial wireless networks more reliable for Smart Grid applications during such events? We welcome detailed comparisons of the reliability of commercial wireless networks and other types of networks for Smart Grid data transport.

Reliability will depend on the application, its relative timing in the marketplace, and the specific technology deployed to provide service for the application. Today, applications such as meter reading can and do reliably run over commercial wireless networks with adequate reliability for individual meter or a small distributed energy resource ("DER"),[10] but use of the wireless network for aggregated/concentrated traffic from many meters in a neighborhood, demand response, network control, and other

[10] Distributed Energy Resource: These are the power generation units at consumer locations. For examples, at residences they may be solar (PV-photovoltaic cells) . Examples at commercial and industrial locations they may be PV cells, wind turbines, CHP (Combined Heat and Power, UPS (Universal Power Supply.

“core” smart grid applications would need to be addressed in the network. While some commercial carriers are beginning to offer Service Level Agreements to utilities and other customers, commercial wireless networks today were built and continue to operate using the “best-effort” standard for consumer applications. Commercial carriers will still need to offer service availability under environmental and security event conditions that they would not expect to provide to consumers.

Moreover, due to safety concerns and regulatory constraints regarding the ability to manage the grid, a State PUC’s electric power regulations in all likelihood will require on average 72 or more hours under “lights out” conditions. In order to support core grid control applications wireless networks will need to be constructed with power systems that meet the applicable State PUC requirements of supporting communications equipment without direct power from the distribution grid.

2. Availability of Communications Networks. Electric utilities offer near universal service, including in many geographies where no existing suitable communications networks currently exist (for last-mile, aggregation point data backhaul, and utility control systems). We seek to better understand the availability of existing communications networks, and how this availability may impact Smart Grid deployments.

a. How does the availability of a suitable broadband network (wireless, wireline or other) impact the cost of deploying Smart Grid applications in a particular geographical area? In areas with no existing networks, is this a major barrier to Smart Grid deployment? We welcome detailed economic analyses showing how the presence (or lack) of existing communications networks impacts Smart Grid deployment costs.

Due to the ubiquitous nature of power line infrastructure that resides everywhere, the utility needs to procure communications capabilities to cover territory where other communications options may not exist. As such, the utility must currently consider the use of alternative low-bandwidth or high-cost technologies to provide themselves with service. The use of power line carrier ("PLC") and satellite communications must be considered where there are no other network access technologies. Except for short distances such as up to the secondary of the distributing transformer, PLC technology may be expensive and may not afford large data rates. But with emerging Institute of Electrical and Electronics Engineers ("IEEE") P1901 standard and new product development, higher rate PLC solutions with Orthogonal Frequency Division Multiplexing ("OFDM") will be possible. Further, the use of RF mesh over unlicensed spectrum with data concentration at the substation should be considered even though it is not cost effective in areas of low device concentration. Satellite services are frequently used in very remote circumstances and will continue to be part of the utility infrastructure. But as new smart grid applications are deployed and technologies become available, broadband wireless and wireline technologies will provide the most suitable access options.

3. Spectrum. Currently, Smart Grid systems are deployed using a variety of communications technologies, including public and private wireless networks, using licensed and unlicensed spectrum. We seek to better understand how wireless spectrum is or could be used for Smart Grid applications.

a. How widely used is licensed spectrum for Smart Grid applications (utility-owned, leased, or vendor-operated)? For which applications is this spectrum used? We welcome detailed analyses of current licensed spectrum use in Smart Grid applications, including frequencies and channels.

Most utility Transmission System Operators and Distribution System Operators have access to some licensed spectrum, primarily in narrow-band frequencies intended only to support Land Mobile Radio, but these licensed frequency assignments are not adequate for Mobile Workforce, video surveillance, or the future real-time grid control applications. There are currently very few, if any, TDSOs in the United States that currently have sufficient spectrum to support these applications.

In addition, we are aware of metering products in the 220MHz and 900 MHz licensed spectrum, and many meter manufacturers are working with wireless service providers for access to individual smart meters, often without local concentration. While smart metering is the primary application, smart grid traffic from many SCADA elements that will be widely deployed at utility poles and other locations can also be used for network deployments.

b. How widely used is unlicensed spectrum? For which applications is this spectrum used? We welcome detailed analyses of current unlicensed spectrum use in Smart Grid applications, including frequencies and channels.

Currently, unlicensed spectrum is the dominant solution for private network communications of wireless meter applications in the United States. Many current smart metering solutions use 900 MHz unlicensed spectrum with channels in the 902-928 MHz band with several hundred kilohertz per channel. Zigbee (2.4 GHz) is generally used in home area networks in the United States but has been used for smart metering in other countries. We also believe that the use of WiFi mesh is another possibility, along with WiMax in 3.65 the GHz space that is being deployed today.

c. Have wireless Smart Grid applications using unlicensed spectrum encountered interference problems? If so, what are the nature, frequency, and potential impact of these problems, and how have they been resolved?

Frequency interference is a growing problem. While most vendors of unlicensed spectrum equipment today provide mechanisms to circumvent interference such as channel hopping or by increasing power, as more systems use these frequencies, the problem is compounded and results in a growing problem with latency. As real-time smart grid applications come online, this latency will pose a significant threat to grid stability and reliability.

d. What techniques have been successfully used to overcome interference problems, particularly in unlicensed bands?

Careful RF studies and planning for the deployment in unlicensed bands help to offset problems with interference. However, the unlicensed RF environment is subject to change at any time as other entities add or remove equipment operating in the same band. This can ultimately affect the network performance. As noted above, equipment manufacturers use different techniques to work around interference when it occurs including frequency hopping and increasing power, however, these techniques do provide additional latency that may not be acceptable in some Smart Grid applications.

e. Are current spectrum bands currently used by power utilities enough to meet the needs of Smart Grid communications? We welcome detailed studies and discussion showing that the current spectrum is or is not sufficient.

A recent study by Alcatel-Lucent for a large TDSO with 20 x 12.5 kHz channels at 896 MHz concluded that the utility will require 3-5 Mb/s of wireless throughput per sector for smart grid, mobile workforce, and substation security applications. Clearly the 20 channels of narrowband LMR spectrum will not be sufficient for this level of application data throughput.

A summary of the results from the Alcatel-Lucent study are stated below:

- Today's throughput requirements are quite low
  - AMI traffic measured by vendor at 2GB/month at each collector which translates to ~ 6kb/s at a constant data rate - peak rates are probably higher, but not by much
  - Limited SCADA, but has even lower bandwidth requirements at this time
  - Primary bandwidth user is the IP network's routing protocols
- Near-term throughput requirements are projected to increase with AMI roll-out
  - AMS traffic has been predicted by vendor to be in the order of ~700kb/s at metropolitan substations with multiple collectors - this will be the heaviest user
  - SCADA not a significant contributor at this stage
  - Mobile Data usage is expected to escalate, however, still able to be served by cellular coverage with a peak data rate of 500kb/s and very occasional usage
- Long-term requirements introduce higher throughput requirements
  - Team predicts increasing use of low-rate video surveillance at substations and other critical assets requiring 1mb/s to 2mb/s of peak throughput to be useable
  - Mobile Data usage is expected to escalate significantly to include e-mail, voice, map data, pictures, and other traffic needing 1mb/s peak throughput to be useable.
  - AMI traffic is expected to increase to over 1mb/s per sector near constant throughput in metropolitan service area
- Predicted 10-year horizon requirement is 3mb/s at a near constant bit rate with 5mb/s needed to handle peak traffic conditions

f. Is additional spectrum required for Smart Grid applications? If so, why are current wireless solutions inadequate?

ii. Throughput: What is the expected throughput required by different communications nodes of the Smart Grid, today and in the future, and why will/won't commercial mobile networks and/or private utility owned networks on existing spectrum be able to support such throughputs? We welcome detailed studies on the location and throughput requirements and characteristics of each communications node in the Smart Grid.

Data volume and data rates for most smart grid control applications are not expected to be very high. Real time monitoring of wave forms, aggregated demand response and video surveillance and some enterprise data applications will require higher data rates. Of interest is that for many smart grid applications the downlink traffic is less than the uplink traffic.

iii. Latency: What are the maximum latency limits for communications to/from different nodes of the Smart Grid for different applications, why will/won't commercial mobile networks be able to support such requirements, and how could private utility networks address the same challenge differently?

Latency requirements for smart grid and other utility applications vary from less than 10 ms for teleprotection, to about 20 ms for some synchrophasors applications, to 100-200 ms for most smart grid control, SCADA and VoIP applications, to up to several seconds for smart metering and some SCADA applications. Unlike most other data networks, support for applications with latencies less than 100 ms is required in the smart grid and can be very challenging. Other than these very low latency applications, we believe that most current wireless services can satisfy the requirements of smart grid applications with latency requirements of 150ms or greater.

iv. Security: What are the major security challenges, and the relative merits and deficiencies of private utility networks versus alternative solutions provided by commercial network providers, such as VPNs? Do the security requirements and the relative merits of commercial versus private networks depend on the specific Smart Grid application? If so, how?

Alcatel-Lucent believes that commercial cellular network operators are able to meet the security requirements for Smartgrid applications. It is unclear, however, whether NERC CIP accountability standards will evolve to a level that will require the utility to be accountable for end-to-end security of data, regardless of the network owner. The primary issue today regarding use of commercial carrier networks is ultimately one of availability, not security.

v. Coordination: Are there benefits or technical requirements to coordinate potential allocation of spectrum to the Smart Grid communications with other countries? What are they?

The primary benefit of harmonizing spectrum allocations with other countries is to create large enough markets that allow vendors to make and sell equipment in a cost effective manner in the competitive world marketplace.

vi. Spectrum allocation: Are there any specific requirements associated with Smart Grid communications that require or rule out any specific band, duplexing scheme (e.g., FDD vs. TDD), channel width, or any other requirements or constraints?

Alcatel-Lucent believes that there is no need for specific requirements or the need to rule out a specific band or duplexing scheme for smart grid technology. Although caveats do exist as the current commercial networks using time division duplex ("TDD") are biased backwards from the perspective of utility application requirements. For most applications, the downstream traffic is substantially less than the upstream traffic, suggesting TDD ratios should either be even or biased upstream. In addition, utilities operating in dense urban environments need building penetration while utilities operating in rural environments need cost-effective coverage; therefore we believe that lower spectrum bands would be preferred for smart grid technology.

g. If spectrum were to be allocated for Smart Grid applications, how would this impact current, announced and planned Smart Grid deployments? How many solutions would use allocated spectrum vs. current solutions? Which Smart Grid applications would likely be most impacted?

Alcatel-Lucent believes that a contiguous spectrum allocation completed in a timely manner providing at least 3-5 Mb/s of wireless throughput per sector or greater would rapidly speed up deployment of smart grid networks either through a utility dedicated or public/private network. If the FCC does not act within the next two years, the market place will likely have either committed to deploying suboptimal solutions that may need to be replaced prior to end-of-life, or developed other means of satisfying these requirements through subleasing of existing "under-utilized" spectrum assets or further development of unlicensed spectrum solutions.

III. CONCLUSION

For the foregoing reasons, Alcatel-Lucent supports the Commission's commitment to a national broadband plan and urges consideration of the answers to the questions presented herein regarding the implementation of smart grid technologies.

Respectfully submitted,

ALCATEL-LUCENT

By: _______________________
Michael T. McMenamin
Senior Counsel-Managing Director
1100 New York, Avenue, N.W.
Suite 640 West Tower
Washington, D.C. 20005

October 2, 2009

.