Before the
Federal Communications Commission
Washington, D.C. 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, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act.	)	GN Docket No. 09-137

COMMENTS OF UTILITIES TELECOM COUNCIL

Utilities Telecom Council
Brett Kilbourne, Acting General Counsel
Utilities Telecom Council
1901 Pennsylvania Avenue, NW
Fifth Floor
Washington, DC 20006
202-872-0030

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ATTACHMENT A: Survey of Utility Communications Conducted by the Utilities Telecom Council in Preparation for the FCC's Public Notice Seeking Comment on the Implementation of Smart Grid Technology

SUMMARY

Utilities will take a variety of technology approaches to deploy suitable communications for smart grid, which must provide robust reliability, broad coverage, increased throughput, low latency, strong security, and superior survivability. Different smart grid applications will demand different functional requirements, depending on the criticality of the applications. Generally, utilities will rely on private internal communications systems to support critical smart grid applications, such as substation control systems, and they will use commercial systems – if at all -- for secondary, non-critical applications, such as remote meter reading. Utilities must maintain the reliability of the electric grid, and commercial systems generally lack the coverage, availability and survivability to ensure system reliability.

Utilities need to upgrade communications to their substations, intelligent grid devices, and customers in order to support various smart grid applications. While some have basic two-way communications to the substation, they generally lack broadband capability that will be needed for smart grid. They will also need to upgrade their communications systems to support intelligent grid devices beyond the substation. Finally, most utilities do not have suitable communications for smart grid applications to their customers. The availability of suitable communications is a major factor for smart grids, and can significantly add to the cost of deployment if there is insufficient access.

Industry research shows that utilities need access to dedicated spectrum for smart grid. This will cost-effectively provide coverage that is necessary to connect hundreds of substations, thousands of intelligent grid devices and millions of smart meters for various smart grid applications. In addition, it will avoid further harmful

interference and congestion in existing licensed and unlicensed radio bands. Finally, a dedicated spectrum allocation will support broadband capability, and promote interoperability, security and overall reliability.

The Commission should support critical infrastructure industry access to the dedicated spectrum in the 1800-1830 MHz band. This band is already reserved in Canada for utility purposes. A harmonized allocation with Canada would promote interoperability with Canadian utilities that interconnect with U.S. utilities. It would promote equipment development and availability by creating a larger market that would attract manufacturers and investment. In the U.S., this spectrum is allocated for Federal Government use, and could be shared with utilities consistent with Federal policies encouraging spectrum sharing among public and private entities. UTC believes that utilities and Federal users could compatibly share this spectrum. Access to the 1800-1830 MHz band will provide sufficient bandwidth and favorable propagation characteristics to support smart grid performance requirements and reduce infrastructure deployment costs

The Commission should not mandate the use of this spectrum. Utilities and other critical infrastructure entities in the United States are too diverse to make a single technology, let alone frequency band, the only choice in all cases. Instead, dedicated spectrum would provide utilities another technology option, one that will serve as the best choice for many, and one that is desperately needed both to enable the smart grid and allow critical system expansion to support services essential to the nation. The allocation should be made now, during the beginning stages of smart grid deployment to ensure that national goals for the infrastructure can be met and to avoid a piecemeal approach involving disparate systems on disparate bands. This should encourage investment in smart grid, rather than strand investment in it.

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COMMENTS OF THE UTILITIES TELECOM COUNCIL – NBP PUBLIC NOTICE #2

The Utilities Telecom Council is pleased to provide the following comments in response to the Commission's *NBP Public Notice #2*, released September 4, 2009 in the above referenced proceedings.[1] UTC applauds the Commission for its effort to collect data about smart grid as part of its National Broadband Plan. In the Recovery Act, Congress directed the Commission to develop "a plan for the *use of broadband infrastructure and services* in advancing…energy independence and efficiency."[2]

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1 *Comment Sought on the Implementation of Smart Grid Technology*, NBP Public Notice #2, GN Docket Nos. 09-47, 09-51, 09-137, rel. Sept. 4, 2009 ("*NBP Public Notice #2*")..

2 Sec. 6001(k)(2)(D) of the American Recovery and Reinvestment Act, Pub. L. No. 111-5, 123 Stat. 115 (2009) (Recovery Act)(*emphasis added*).

Congress clearly wanted the Commission to find ways to put broadband to work; it didn't want to promote "broadband for the sake of broadband."[3] The ongoing move to the next-generation energy infrastructure is possibly the best example of this concept since smart grid deployment will require "industrial broadband." Utilities must harness the capability of broadband to promote energy independence and efficiency and a host of other enumerated national policy goals, such as "private sector investment, entrepreneurial activity, job creation and economic growth."[4]

The smart grid consists of a series of applications, and can be only as smart as the communications networks on which those different applications run. That is why it is critical that utilities have access to suitable communications capacity to deploy smart grid applications. Utilities will need to upgrade their communications networks to support smart grid, and those networks remain the best home for most smart grid applications. While utilities have extensive communications systems that are highly reliable, those systems need to extend deeper into the grid, provide better throughput, lower latency, and stronger security in order to support smart grid. Key to the debate over smart grid: while utilities may use commercial systems in order to support some non-critical applications, they will rely on private internal networks to support mission-critical applications. Moreover, they need communications that are cost-effective and standardized given the vast array of applications coming forward; they cannot afford to deploy a technology that is overpriced, incompatible or inadequate for the required use.

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[3] Remarks of FCC Commissioner Michael J. Copps at the Joint Center for Political and Economic Studies, U.S. Capitol Visitor Center, 2009 WL 3030184, Sept. 22, 2009; *and see* Bench Remarks of Commissioner Michael J. Copps on Presentation of National Broadband Plan Process, FCC Open Meeting, Washington, DC, 2009 WL 1916532, July 2, 2009.

[4] *Id.*

Therefore, utilities need to be smart buyers of smart networks for smart grids. They cannot hand over the security of the nation's power grid to create a new business opportunity for communications companies. The Commission must recognize that, in spite of the claims of carriers, commercial networks are not the best place for vital energy industry functions.

Unfortunately, utilities lack access to the dedicated spectrum that would reduce costs, improve performance, and promote reliability for smart grid. Access to dedicated spectrum would reduce costs in two ways. In general, wireless systems are less expensive to deploy where – as here -- there are thousands of substations, hundreds of thousands of intelligent grid devices and millions of smart meters to connect to the network. In addition, dedicated spectrum would promote the development and production of equipment that is designed to use that spectrum, which would fuel competition and drive down price. Dedicated spectrum would also improve performance by avoiding additional harmful interference, congestion, and incompatibility in existing licensed bands, and by providing better throughput, security, latency and range than is available from many unlicensed operations. Most of the small amount and scattered spectrum to which utilities have access is crowded, where available at all, and is allocated in narrow channels that are incompatible with most smart grid applications. Finally dedicated spectrum would promote reliability, because utility wireless systems tend to be less affected by hurricanes and other natural disasters, and that are robustly built to support compliance with industry reliability regulations.

The Commission can play an important role in helping to shape smart grid by supporting utility access to dedicated spectrum. To be clear, the Commission should not mandate the use of dedicated spectrum. Utilities across the United States number in the thousands and are of widely differing size and service territory. They will investigate and use a variety of technologies as they deploy smart grid applications over the coming years. Instead, the FCC should support utility access to dedicated spectrum in order to give utilities at technology option that will be more suitable for many that what they currently can access. Access to dedicated spectrum now, during the opening stages of smart grid deployment, enables utilities to design and deploy smart grid application from the ground up, rather than having to improvise using disparate bands and disparate systems. It also allows the vendor community to focus on a specific band to develop radios that the utilities need for utility-specific applications. Now is the time; if smart grid systems are deployed on a scattered or piecemeal basis there will be too much sunk investment and reengineering cost to allow the smart grid to be deployed as it should be and as national energy policy envisions: with reliability, interoperability and at reasonable cost.

I. Background and Introduction

UTC is an international trade association for the telecommunications and information technology interests of electric, gas and water utilities and other critical infrastructure industries, including pipeline companies. Its members include investor-owned, municipal and cooperatively organized utilities. These utilities can range in size from large combination electric, gas and water utilities that serve millions of customers in a region to small distribution companies that serve a few thousand customers in isolated communities or rural areas. Although they differ in size and services, they all rely on communications to deliver essential services to the public at large safely and effectively. These critical infrastructure communications systems are designed, built, operated and maintained at extremely high standards that exceed those of commercial systems for reliability, survivability, availability and coverage. Utilities demand this functionality because -- as the Commission itself recognized -- "[a]ny failure in their ability to communicate by radio could have severe consequences on the public welfare."[5]

The importance of these critical infrastructure systems was demonstrated during Hurricane Katrina in 2005, the 2003 Northeast Blackout and the September 11, 2001 terrorist attacks. "Electric utility networks (including utility-owned commercial wireless networks) appeared to have a high rate of survivability following [Hurricane] Katrina."[6] By contrast, commercial cellular and push-to-talk networks were down for days after the storm, and in many areas there was no service at all.[7] In the aftermath of Katrina, the

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[5] Replacement of Part 90 by Part 88 to Revise the Private Land Mobile Radio Services," PR Docket No. 92-235, *Second Report and Order,* 12 FCC Rcd. 14307,14329 (1997).

[6] In the Matter of Recommendations of the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks, Notice of Proposed Rulemaking, EB Docket No. 06-119, 21 FCC Rcd. 7320, Appendix B, at 12-13 (2006). *See also* UTC Research Report, "Hurricanes of 2005: Performance of Gulf Coast Critical Infrastructure Communications Networks" at 2 at http://www.fcc.gov/pshs/docs/advisory/hkip/public-comments/utc.pdf (finding that "the private, internal networks (radio, microwave and fiber) of electric, gas and water utilities for the most part continued to function throughout and immediately after the storms.") Other case studies demonstrating the survivability of critical infrastructure communications systems can be found attached to UTC's comments in WT Docket No. 05-157, filed Apr. 28, 2005. *See e.g*. "Southern LINC Helps Gulf Coast Weather Hurricane Ivan: Communities rely on LINC for response, recovery and restoration." at http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6517587530.

[7] *See "*Hurricane Katrina: A Nation Still Unprepared" S. Rpt. 109-322, at 289-290 (2005)(describing the outages on commercial wireline and wireless communications networks), http://www.gpoaccess.gov/serialset/creports/pdf/sr109-322/ch18.pdf (visited Sept. 30, 2009). Meanwhile, the same report found that:

> The Mississippi Power public utility recognized the importance of communications to an effective response, particularly the ability to communicate with thousands of additional workers brought in from outside the region to help with restoration and repairs. Mississippi Power relied on its only viable form of communication – its internal system

FCC required commercial wireless providers to implement extended battery backup capability;[8] and tellingly the industry appealed those rules, rather than complying with them. Critical infrastructure communications systems were also credited for limiting the spread of the 2003 Northeast Blackout, because the protective relay systems operated as designed to isolate the fault to the Northeast.[9] Finally, during the September 11, 2001 terrorist attacks, commercial communications networks were swamped and calls could not get through, illustrating why utilities need private internal systems during emergency scenarios.

In its *NBP Public Notice #2*, the Commission makes inquiries regarding the suitability of communications, the availability of communications networks, and the spectrum used by utilities for smart grid. Within each of these three general areas, the Commission asks *inter alia* about the functional requirements for smart grid, the extent to which utilities lack access to communications that meet these functional

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> Southern Linc Wireless. This system was designed with considerable redundancy and proved reliable despite suffering catastrophic damage. Within three days, the system was functioning at nearly 100 percent. Mississippi Power told the Committee that it "also installed its own microwave capability to 12 remote staging areas in order to transmit material inventory data into our automated procurement process." The company said, "When communication circuits of another company were down, our information technology group would find a way to bypass those circuits and restore critical communications."

Id. citations omitted.

[8] *See Recommendations of the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks*, EB Docket No. 06-119, WC Docket No. 06-63, Order, 22 FCC Rcd 10541, ¶¶76-78 and Appendix B (2007) (*Katrina Panel Order*); *see also* 47 C.F.R. § 12.2.

[9] *See* "Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations" U.S. – Canada Power System Outage Task Force, Chapter 6 "The Cascade Stage of the Blackout: Why the Blackout Stopped Where it Did, p. 91 (stating that [p]rotective relay settings on transmission lines operated as they were designed and set to behave on August 14.), available at http://www.google.com/url?sa=t&source=web&ct=res&cd=1&url=https%3A%2F%2Freports.energy.gov%2F&ei=F1fASrSwEdPT8Qbt2IipAQ&usg=AFQjCNF2uoBfepGrjfZ8nE1V4gbk2lMn2Q.

requirements; the extent of RF interference and the solutions that exist. The Commission also generally inquires about access to data and home networking. While access to data and home networking are important issues; UTC's comments focus on the first three areas, regarding suitable communications, available communications and spectrum.

In response to the *NBP Public Notice #2*, UTC surveyed its members to obtain data on the degree to which there is suitable communications for smart grid to reach substations and customers. In addition, UTC sought explanatory information about utilities' plans for deploying smart grid communications networks. UTC received responses from 66 utilities, large and small, serving almost 34 million customers (i.e. 24% of all electric customers nationwide). Therefore, the survey represents a substantial sample of utilities; however, UTC cannot make a determination as to the representativeness of the sample. The results of the survey are attached to these comments as Attachment A.[10]

II. Suitability of Utility Communications for Smart Grid

The Commission asked a variety of questions regarding the degree to which communications networks are suitable for various smart grid applications. The following sections provide answers to those questions, based on the data in the UTC survey.

A. Functional Requirements and Technologies

Utilities are taking a variety of technology approaches towards implementing smart grid across their networks, but practically all incorporate the use of wireless

[10] "Survey of Utility Communications Conducted by the Utilities Telecom Council in Preparation for the FCC's Public Notice Seeking Comment on the Implementation of Smart Grid Technology," Report, Oct. 2, 2009 ("UTC Survey Report").

communications, either as an end-to-end or hybrid solution. These technology approaches are driven by various factors, including the geographic service territory, the types of applications, the availability of spectrum and cost. For example, utilities traditionally use licensed spectrum solutions (e.g. microwave) for long-haul and middle-mile backhaul as this is generally deployed in a point to point basis, while using unlicensed radio solutions (e.g. wireless mesh) for last-mile communications to the customer premises since this requires point to multipoint links which are expensive when done with licensed spectrum. Some utilities may take an integrated approach of running multiple smart grid applications over a single communications network. while others may take a layered approach of using different communications networks for certain applications.

Similarly, utilities are developing their own functional requirements for smart grid. While there are general standards for electric reliability, there are no uniform standards for communications on the distribution grid.[11] Utilities will develop their own functional requirements in a manner that ensures electric reliability. Moreover, each utility will have different visions of smart grid: some will be deploying two-way "smarter" systems for AMI[12], while others will be deploying them for demand response and distribution automation. That said, some of these applications are more critical than others -- and communications networks supporting critical applications must meet higher standards for latency, throughput and reliability, among other factors. Finally, some utilities may be deploying smart grid applications on a limited basis, while others may be deploying

[11] Utilities are subject to mandatory reliability standards adopted and enforced by the Federal Energy Regulatory Commission (FERC) and the North American Electric Reliability Corporation (NERC) pursuant to the Energy Policy Act of 2005.

[12] AMI refers to "Advanced Metering Infrastructure"

system-wide; and this may also dictate the extent to which they use their existing communications systems or upgrade them.

The responses to UTC's survey reflect the reality that utilities will take multiple technology approaches towards meeting their individual functional requirements; but the common refrain from the survey responses is that practically all of them will use wireless. And while they may use commercial services for some applications (e.g. AMI), they prefer to use private networks for critical data applications, such as substation monitoring (both video and data) and distribution automation. Whatever technology approach that utilities take, fundamentally the communications systems that support smart grid must be highly reliable.

The technologies to be used appear to depend on the part of the grid that is being served. At substations, most of the "two-way communications" reported included narrowband wireline, and the vast majority of that was commercial (i.e. leased telephone lines). But, other technologies running closely behind narrowband wireline included narrowband wireless and fiber – both of which are predominantly private. Moreover, many utilities expressed their intent to transition from narrowband wireline towards more fiber and broadband wireless, if affordable. For intelligent grid devices beyond the substation, utilities reported that 72% of those intelligent grid devices will need upgraded communications. When asked how they plan to upgrade, many utilities also indicated that they want to transition away from narrowband commercial leased lines toward a broadband wireless alternative, as either a stand-alone or in combination with fiber backhaul. In addition to throughput, others indicated they simply don't have sufficient coverage to those devices or that there are security concerns with interference to unlicensed operations. There again, broadband private wireless was frequently cited as a possible solution. Finally, with regard to AMI/HAN/DSM[13] applications at the customer premises, utilities were more willing to consider commercial and unlicensed solutions such as BPL and 902-928 MHz wireless systems. Still, even at the customer premises there is a strong preference for private internal networks, using various wireless technologies, such as licensed RF, wireless mesh and Zigbee.

Analyzing this data confirms that utilities need broadband wireless at the substation and beyond to the collector points that carry traffic back from AMI meters, using unlicensed operations or commercial wireless systems to communicate to the collector points. Most utilities have simply too many distribution substations to cost-effectively run fiber to each one of them. The same holds true for intelligent grid devices and AMI/HAN/DSM, where there are many more devices to connect. Wireless represents a cost-effective way of doing that – with licensed broadband wireless at the backhaul point and unlicensed broadband and/or narrowband closer to the customer premises. It also enables mobile broadband, which is already increasingly used in the field to enable laptop access from service vehicles. There are some utilities that have extensive fiber networks reaching deeply into the distribution grid, but most lack that level of connectivity – and some lack any at all beyond the distribution substation. In order to support smart grid, most utilities stated that they will need to upgrade their own communications networks in order to provide sufficient coverage, throughput, latency and reliability – which they generally said is <u>not</u> available from commercial providers for critical smart grid applications on the grid.

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[13] AMI/DSM/HAN refers to the various smart grid applications at the customer premises, including advanced metering, demand side management and home area networking.

B. Private v. Commercial

Turning to the issue of commercial versus private internal systems, only two of the utilities responded that they would use commercial networks, and they were both relatively small cooperative utilities (i.e. <16,000 customers) with limited communications systems in place.[14] The remaining respondents who answered the relevant question are roughly divided -- with the majority indicating a strong preference for private systems and the minority indicating a willingness to use a combination of commercial and private, based on economics and other practical considerations.

The survey data emphasizes that utilities prefer to use private internal communications because they are more reliable than commercial systems. There are a variety of reasons for this. Utility private internal networks generally have better coverage, lower latency, and are more secure than commercial systems. Moreover, during emergencies -- when communications are even more critical – commercial networks can become overloaded, meaning that calls cannot go through. And the Telecommunications Service Priority (TSP) program priority restoration criteria only ranks utilities at "Category D' (i.e. the lowest rank) for service restoration priority, so utilities cannot rely on that in an emergency.[15] In addition, commercial wireless systems do not have sufficient backup to remain operational when there is an extended power

[14] One of the utilities stated that it had no two-way communications networks in place; and the other reported that none of their customers had access to two-way communications for smart grid.

[15] See Section 3.6 of "Instructions For Completing TSP Request for Service Users Form (SF 315)" at http://www.google.com/url?sa=t&source=web&ct=res&cd=2&url=http%3A%2F%2Ftsp.ncs.gov%2Fusers%2Finstructions.html&ei=HrHGSuKmG9X_8Aa9yojiCA&usg=AFQjCNHhe6mk59iG7MVmUlcHSCEFN2ahCA (visited Sept. 30, 2009).

outage, while internal utility networks generally are built with generators at each site, and a minimum of one to two weeks of fuel for each. Finally, commercial carriers generally do not provide prompt restoration of service, when their networks are knocked out. And their service level agreements contain force majeure clauses that utilities cannot accept for this reason. For all of these reasons, utilities use private internal systems wherever and whenever possible, particularly for critical control communications.

UTC does not criticize commercial networks with these statements; the reality is based on economics. Commercial communications networks are designed for profit from consumer services and wireless networks, especially, are concentrated in higher-density population centers. They simply are built to a different economic model. Utilities are not in the business of telecommunications services to the public; their networks are built to meet their own specialized needs. In the past, this has meant lower capacity, but ubiquitous coverage everywhere there are power lines and crews servicing them, with ultra-reliability because they support absolutely critical services. With the advent of the smart grid, capacity needs, too, are rising: thus, more access is needed, but the requirements of ubiquitous coverage and reliability – and, therefore, private networks – have not changed. The FCC must recognize that its responsibility to regulate the nation's communications networks entails more than one economic model and more than one kind of "highest and best use."

III. Availability of Communications for Smart Grid

In response to the Commission's questions about the availability of communications for smart grid, UTC surveyed utilities about 1) communications at the substation, 2) communications for intelligent grid devices beyond the substation and 3) communications at the customer premises. The following sections provide answers to the Commissions questions based on the responses to the UTC survey.

A. Communications at the Substation

By definition, smart grid requires two-way communications, but the utilities in the survey reported that only 46% of their distribution substations have two-way communications.[16] Of those substations with two-way communications, only 29% use or have access to any type of broadband.[17] To break that down by technology: only 5% use or have access to wireless broadband; only 5% use or have access to wireline broadband; only 14% use or have access to fiber; and only 5% use or have access to some other form of broadband.[18] Most utilities explained that they do intend to bring two-way communications to those substations that do not currently have it, and many plan to use broadband technologies including fiber and wireless in all of their substations.[19]

B. Communications for Intelligent Grid Devices

Intelligent grid devices will play a big part in utilities' broadband plans. In fact, many utilities explained that they intend to deploy broadband to the substation in order to provide the bandwidth at the "head-end" to support intelligent grid devices further

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[16] UTC Survey Report, Attachment A, Table 1 at 2.

[17] *Id.* at 2

[18] *Id*., Table 2 at 2.

[19] Only two utilities responding stated that they would not be implementing two-way communications at the substations that didn't have it. Notably, those utilities already had 91% and 93% of their substations enabled with two-way communications. As one of them explained, "[mo]st of the remaining substations are either at customer sites or have less than 200 customers fed from the station so no connectivity is planned for those. There are two substations that will be connected via private narrow band wireless this year. The primary focus of our deployment now is on the downstream devices and meters." UTC Survey Report at 2.

down the grid.[20] That is because utilities plan to deploy literally thousands of intelligent grid devices on average, and 72% of those devices will need upgraded communications, including multi-megabit throughput to backhaul all of the data from those devices.[21] Most intend to upgrade using a combination of technologies, including fiber, WiMAX, point-to-point microwave and wireless mesh; but several expressed a specific interest in wireless broadband. Most intend to use private internal networks, particularly for critical communications, but many reported that they would be using a combination of private and commercial systems.[22]

C. Communications at the Customer Premises

At the customer premises, utilities will also need upgraded communications for AMI/HAN/DSM. The utilities responding to the survey reported that 91% of their customers would need upgraded communications to support smart grid applications.[23] Generally, utilities explained that there was either no communications at all to the customer, or that higher-throughput communications systems were needed. From a technology standpoint, most utilities reported that they would be using wireless to

[20] For example, one utility stated that it would, "[i]mprove broadband to our substations and add broadband connectivity to our substations that currently do not have broadband access. Increase the throughput and bandwidth on the backbone that is used to connect our substations. Then determine the method of communicating to smart grid devices." UTC Survey Report at 7.

[21] Utilities responding to the survey reported collectively that they plan to deploy a total of 10,161,042 intelligent grid devices. Estimates for throughput ranged from 2.5 Mbps to 10 Mbps, while one utility estimated that it would need to upgrade throughput to 600 - 3000 kbps per device. UTC Survey Report, Table 4 at 5-6.

[22] Utilities explained that they would use commercial leased circuits, or they would use commercial systems on a temporary basis or to cover small areas that were not covered by private systems. UTC Survey Report at 7.

[23] UTC Survey Report, Table 5 at 7.

communicate from the collector points to the customer premises, and they primarily listed throughput and coverage as the biggest issues. Several utilities report that they are using cellular for their AMI deployments; and while several oppose using commercial systems citing security reasons, many utilities state that they would use a combination of commercial and private systems in order to support smart grid applications to their customers.[24] Looking to the future, several utilities also report concerns about congestion and interference in unlicensed systems as more customers purchase wireless devices in the 902-928 MHz band; and they recognized that more bandwidth will be needed for HAN than was necessary for AMR.[25]

D. Impact of Suitable Communications on Cost of Deployment

Clearly, the availability of a suitable broadband network is a major factor in the cost of deploying a smart grid network.[26] Of course, the actual cost will vary between utilities due to geography, topography and other factors. But, the communications component represents a significant percentage of the cost of a smart grid deployment. For example, Commonwealth Edison recently filed an application for smart grid funding from the Department of Energy, and in the application, it estimates that almost one-third of the cost of its 250,000 meter AMI project will be related to communications to support

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[24] UTC Survey Report at 9-10.

[25] *Id.*

[26] See "San Diego Smart Grid Study Report," SAIC Smart Grid Team, at 3 (Oct. 2006) at 27 (Identifying "Gaps to Implementation" and putting at the top of the list the need for a "[l]ow-cost, ubiquitous, secure communications infrastructure which can reach all system nodes with the ability to flexibly adapt to new system configurations and additions of new communication nodes.) http://www.sandiego.edu/EPIC/publications/documents/061017_SDSmartGridStudyFINAL.pdf (visited Sept. 30, 2009)

smart grid.[27] The communications upgrades include a fiber ring/backbone through 85 substations; IP enabling substations Remote Terminal Unit (RTU) communications; analog phone upgrades to digital IP at various substations; and Supervisory Control and Data Acquisition (SCADA) master expansion and communications standardization.[28] Therefore, "the presence (or lack) of existing communications networks" can significantly impact Smart Grid deployment costs.[29]

IV. Spectrum for Smart Grid

The Commission asked a number of questions about utilities' use of licensed and unlicensed spectrum, interference issues and solutions, and the degree to which existing spectrum is suitable for smart grid. It also asked for reasons -- based on throughput, coverage, latency, security, coordination, and spectrum allocation – why existing spectrum is inadequate for smart grid. The following sections answer those questions, based on the data in the UTC survey.

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[27] *See* "ComEd's AMI/Smart Grid Stimulus Proposal," Appendix B at 1, http://www.ilgridplan.org/ComEds%20AMISmart%20Grid%20Stimulus%20Proposal/ComEd%20Stimulus%209%20Budget.pdf (visited Sept. 30, 2009)(budgeting $107,355,042 for communications out of a total $350,000,000 project). *See also* "Project Plan" at 38-39 (describing the communications systems costs and benefits in more detail, including 100% conversion of old leased lines and relays to new fiber lines, as well as 100% conversion of RTUs and multiplexer nodes) http://www.ilgridplan.org/ComEds%20AMISmart%20Grid%20Stimulus%20Proposal/ComEd%20Stimulus%208%20Project%20Plans.pdf (visited Sept. 30, 2009)

[28] *See* "ComEd's AMI/Smart Grid Stimulus Proposal," "Project Plan" at 9, http://www.ilgridplan.org/ComEds%20AMISmart%20Grid%20Stimulus%20Proposal/ComEd%20Stimulus%208%20Project%20Plans.pdf (visited Sept. 30, 2009)

[29] *See NBP Public Notice #2* at 2 (inquiring how the availability of a suitable broadband network (wireless, wireline or other) impacts the cost of deploying Smart Grid applications in a particular geographical area).

A. Utility Use of Licensed and Unlicensed Spectrum and Related Issues

Utilities use licensed spectrum for various smart grid applications,[30] and they report that they would use it more, if suitable licensed spectrum was available and affordable. Unfortunately, existing licensed spectrum is in short supply, due to spectrum sharing, congestion and regulatory decisions that have led to rebanding and reallocation of formerly available spectrum.[31] Moreover, other than in the fixed services, nearly all spectrum available to utilities is narrowband. Thus, existing spectrum bands will be unsuitable for many utilities.[32] To be sure, utilities use unlicensed spectrum, particularly for AMI applications and particularly in the 902-928 MHz range.[33] However, utilities prefer to use licensed spectrum for critical operations, because unlicensed operations are subject to interference – if not today, at some point down the road.[34]

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[30] All CI entities depend on reliable and secure communications to assist them in carrying out their internal system operations and obligations to provide service to the public. UTC's members rely on technology implemented in the Private Land Mobile Radio Service (PLMRS), the Multiple Address Service (MAS), Fixed Wireless Services and others to provide a variety of critical services, including voice and data communications and control and monitoring of power, water and pipeline distribution systems. These systems utilize allocations in the frequency bands below 50 MHz, 150-174 MHz, 450-470 MHz, 470-512 MHz, 800 MHz, 900 MHz and 2.4 GHz bands. Microwave systems can be located on various bands between 900 MHz and 19 GHz or higher.

[31] Because there is a shortage of available spectrum, some telemetry systems in the 217-220 MHz band and some SCADA systems in the 150-470 MHz PLMRS bands must operate on a secondary basis, which means they are subject to interference – or worse, shut down – at the hands of primary users in those bands..

[32] See e.g. San Diego Smart Grid Study(concluding that "[t]he existing utility communication infrastructure will not support the requirements of the future Smart Grid scenario.") http://www.sandiego.edu/EPIC/publications/documents/061017_SDSmartGridStudyFINAL.pdf (visited Sept. 30, 2009)("San Diego Smart Grid Study").

[33] Unlicensed AMR/AMI systems are widely deployed and have been used extensively; while more recently, utilities have been using WiMAX for high-bandwidth WAN and NAN communications to aggregate AMI traffic and to support distribution automation.

[34] Interference is a real concern for utilities using unlicensed operations for smart grid, because of saturation of the unlicensed bands by consumer applications such as cordless phones and

Utilities need to be able to guarantee that the major investments they are making in smart grid – and the critical services these applications support -- won't be rendered unusable by interference in unlicensed operations.[35] Even in existing licensed spectrum, utilities are suffering from interference, because they must share parts of the spectrum with a variety of incompatible users. Meanwhile, other parts of the existing licensed spectrum are being reallocated, forcing utilities to relocate to other bands. Utilities need dedicated spectrum, as an alternative to unlicensed and existing licensed spectrum options in order to support smart grid applications.

B. Additional Spectrum to Meet Utility Needs for Smart Grid

Utilities need access to dedicated spectrum that provides favorable propagation – preferably below 2 GHz -- and that is relatively unencumbered. That will provide better coverage and accelerate the deployment of smart grid, by reducing costs and delays associated with infrastructure build-out and relocation of incumbents. Unfortunately, there is very little unencumbered spectrum below 2 GHz, particularly spectrum that would support broadband communications. As noted above, utilities are estimating they will need multi-megabit throughput to support current and future smart grid applications. They also need spectrum that will remain interference-free into the future in order to protect the investments they are making today in smart grid systems. Therefore, utilities need access to at least 30 MHz of dedicated spectrum, preferably below 2 GHz.

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garage door openers, along with wireless ISP, RFID and other growing new uses. Interference is also inherently difficult to trace and mitigate, and UTC is unaware of any "solutions" that utilities have used to resolve it.

[35] For more information on the extent and nature of the use of unlicensed operations by utilities and other critical infrastructure industries, see Comments of the American Petroleum Institute and the Utilities Telecom Council in ET Docket No. 03-201 (filed Oct. 15, 2007).

That amount – equivalent to just one standard commercial wireless license -- should provide suitable spectrum to ensure that utilities and other critical infrastructure entities throughout the country can deploy smart grid applications with both sufficient throughput and low latency. Utilities need extremely low latency (e.g. <30 ms) for some of their smart grid applications, and current generation commercial mobile networks specifications for latency range from 150 ms to 50 ms.[36] Hence, current generation commercial systems won't meet smart grid latency requirements. In addition, utilities also need highly secure communications, and they prefer to use private internal networks for that reason, as well.[37] Finally, utilities would prefer a spectrum allocation that is coordinated with international allocations. This would promote interoperability among utilities, and it would encourage manufacturers to develop equipment to operate in this spectrum. Therefore, dedicated spectrum for smart grid should be coordinated with international decisions, and it should enable utilities to meet their security and latency needs.[38]

C. How Additional Spectrum Will Affect Existing & Planned SG Deployments

For the reasons explained above, UTC believes that the 1800-1830 MHz band is uniquely suited to support smart grid applications. It is already reserved in Canada for

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[36] *See* 3G LTE Tutorial – 3GPP Long Term Evolution at *http://www.google.com/url?sa=t&source=web&ct=res&cd=1&url=http%3A%2F%2Fwww.radio-electronics.com%2Finfo%2Fcellulartelecomms%2Flte-long-term-evolution%2F3g-lte-basics.php&ei=by3DSrnfIIT8tgflnODoBA&usg=AFQjCNH7iWGnjHzxCWsMM1xxkkZ6iFU1MQ* (visited Sept. 30, 2009).

[37] Utilities must meet NERC CIP requirements for physical and virtual security. There are strict penalties of up to $1 million per day per violation for failure to comply with these requirements. Carriers are unwilling to assume liability, if their networks should happen to fail to meet these CIP requirements.

[38] *See NBP Public Notice #2* at 3 (inquiring why current spectrum is inadequate based on coverage, throughput, latency, security and coordination).

utility purposes,[39] and it would make sense to adopt a harmonized allocation in the United States as the electric grid is regulated on a North American basis. This spectrum is allocated in the U.S. for Federal Government use for fixed and mobile services, and could be shared with utilities for smart grid, consistent with various Federal spectrum sharing initiatives. Such an allocation would also advance the overriding national public policy goals associated with smart grid, including speed of deployment and interoperability.[40]

Utilities lack suitable spectrum for smart grid, and they need spectrum in order to upgrade their communications networks to extend two-way broadband to cover thousands of distribution substations, hundreds of thousands of intelligent grid devices and millions of smart meters. This spectrum is suitable for smart grid because it has good propagation characteristics; it supports broadband throughput for fixed and mobile applications; and it can be configured for low latency and high security.

UTC surveyed its members for quantitative and qualitative information on how much more quickly or less expensively utilities might be able to deploy smart grid technology if they had access to dedicated spectrum. One utility responded that, “Smart Grid implementation would essentially explode if we had dedicated, private

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[39] See http://www.ic.gc.ca/epic/site/smt-gst.nsf/en/sf08971e.html for more information on this proceeding.

[40] *See also* The Utility Spectrum Crisis, A Critical Need to Enable Smart Grid, Utilities Telecom Council, January 2009 at http://www.utc.org/fileshare/files/3/Public_Policy_Issues/Spectrum_Issues/finalspectrumcrisisreport0109.pdf. (describing the need for dedicated spectrum and the allocation of the 1800-1830 MHz band).

frequencies."[41] Another responded that it is still in the early stage of its technology review, but it explained that:

> Interference is a major concern when we look at RF technologies in the unlicensed spectrum band. The very possibility that communications to our substations could be interrupted periodically could force us to eliminate RF as an option. This may cause us to use more expensive landline options (i.e. fiber) for broadband applications. An RF solution allows for quicker deployment and should be less expensive when you factor in installation costs of fiber and BPL equipment. Therefore, dedicated spectrum will have advantages for us in any future deployment of Smart Grid.[42]

Still others were more specific where they needed dedicated spectrum. One utility explained that:

> Smart grid is more than just communication with substations. We need dedicated spectrum to be able to communicate with distribution automation devices. This means either long haul communications at lower frequencies or spectrum for us to build coverage areas that include ALL of our distribution system.[43]

Another utility agreed that:

> Our problem is not in the substation. It is on the distribution system where we could use dedicated spectrum. We are a three service [Electric, Gas, & Water] utility - the same comment applies to our water and gas distribution systems.[44]

Utilities lack alternatives to dedicated spectrum. They cannot afford to acquire spectrum at auction, because commercial providers have more money to spend at auction and the geographic area licenses that are being auctioned do not conform to utility service territories. Moreover, utilities have been classified as providers of "public

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[41] UTC Survey Report at 13.

[42] *Id*.

[43] *Id*.

[44] *Id*.

safety radio services," which are auction-exempt.[45] Congress and the FCC have agreed that they should have access to spectrum without participation in an auction.[46] This promise, however, has never been fulfilled.

Access to the 1800-1830 MHz band should be *in addition to* the existing spectrum utilities currently use. Utilities will continue to need to use their land mobile and microwave systems, and should not be required to vacate any spectrum in existing bands in exchange for access to additional spectrum. Moreover, access to the 1800-1830 MHz band should not prejudice utility access to additional spectrum in other bands. For example, UTC and Winchester Cator, LLC have filed a Petition seeking secondary access to the 14.0-14.5 GHz band.[47] Utilities will still need access to this and other spectrum, even if utilities are able to share the 1800-1830 MHz band with Federal government users.

For all of these reasons, UTC respectfully requests that the Commission support the allocation of, or access to, at least 30 MHz of spectrum to critical infrastructure industries (CII), as defined previously by the FCC.[48] The Commission could serve an important role in promoting the use of this band for CII purposes by coordinating with the Federal agencies that are using the spectrum, as well as coordinating with energy

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[45] *See* 47 U.S.C. § 309(j)(2).

[46] *See* Pub. L. No. 103-66, Title VI, § 6002(a), 107 Stat. 312, 387 (1993). See also *Implementation of Sections 309(j) and 337 of the Communications Act of 1934 as Amended***,** First Report and Order, WT Docket No. 99-87, 15 F.C.C.R. 22709 at ¶¶77-78 (2000)(agreeing with UTC that critical infrastructure industries provide public safety radio service).

[47] *Utilities Telecom Council and Winchester Cator, LLC, Petition for Rulemaking to Establish Rules Governing Critical Industry Fixed Service Operations in the 14.0-14.5 GHZ Band*, RM-11429.

[48] *See* 47 C.F.R. §90.7.

regulators at all levels of government, including the Department of Energy, the Federal Energy Regulatory Commission, and state public utility commissions. The Commission should also coordinate with industry organizations such as the North American Electric Reliability Corporation (NERC) and agencies such as the National Institute of Standards and Technology (NIST), which are working to develop standards for infrastructure reliability and smart grid interoperability.[49] Importantly, the spectrum must allow flexible use to permit CII to select appropriate bandwidths for certain CII applications, and it must be made available in a timely manner so as to enable harmonization with Canada, which will promote economies of scale that will drive down costs and promote interoperability at the opening stages of smart grid implementation. UTC looks forward to assisting the Commission in these efforts.

[49] NIST is required under Section 1305 of the EISA07 to develop a framework for smart grid interoperability. It recently released version 1.0 of its interoperability roadmap. *See* http://www.nist.gov/smartgrid/. *See also*, "Locke, Chu Announce Significant Steps in Smart Grid Development" at http://www.energy.gov/news2009/7408.htm.
("Smart Grid is an urgent national priority that requires all levels of government as well as industry to cooperate.")

CONCLUSION

WHEREFORE, the premises considered, UTC respectfully requests that the Commission act as requested herein. Specifically, the Commission should support the allocation of at least 30 MHz of spectrum for critical infrastructure industries, which will advance the national policy interest in the promotion of smart grid, as well as the safety, reliability and security of the nation's critical infrastructure industries.

Respectfully submitted,

Utilities Telecom Council

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Brett Kilbourne, Acting General Counsel
Utilities Telecom Council
1901 Pennsylvania Avenue, NW
Fifth Floor
Washington, DC 20006
202-872-0030

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