GE Digital Energy
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NBP RFI: Communications Requirements

DEPARTMENT OF ENERGY
Implementing the National Broadband Plan by Studying the Communications Requirements of Electric Utilities to Inform Federal Smart Grid Policy
AGENCY: Department of Energy
ACTION: Request for information (RFI)

SUMMARY: The Department of Energy (DOE) is seeking comments and information from interested parties to assist DOE in understanding the communications requirements of utilities, including, but not limited to, the requirements of the Smart Grid. This RFI also seeks to collect information about electricity infrastructure's current and projected communications requirements, as well as the types of networks and communications services that may be used for grid modernization. Specifically, DOE seeks information on what types of communications capabilities that the utilities think that they will need and what type of communications capabilities that the communications carriers think that they can provide.

DATES: Comments must be postmarked by no later than July 12, 2010. Reply comments must be postmarked by no later than July 26, 2010.

Respectfully submitted for GE MDS, LLC

By:
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GE Digital Energy MDS believes it is essential for the DOE to support the FCC in allocating a dedicated wireless spectrum for the exclusive use of national utilities[1]. The arguments and reasons in support of this position are detailed in the present document.

For further information, please contact:

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RELEVANCE OF GE DIGITAL ENERGY MDS TO THE DEBATE

General Electric Company (GE) (NYSE: GE) is a diversified infrastructure, finance and media company taking on the world's toughest challenges. From aircraft engines and power generation to financial services, medical imaging, and television programming, GE operates in more than 100 countries and employs about 300,000 people worldwide.

GE Digital Energy, a division of GE Enterprise Solutions, protects and connects the world's critical equipment to ensure safe, reliable power. It is a global leader in protection and control, communications, power sensing and power quality solutions.

GE MDS, LLC ("GE MDS"), a business of GE Digital Energy, is an industry leader in mission critical communications serving a variety of applications in the energy sector for over 20 years. GE MDS provides oil & gas, electrical utility and heavy industrial companies worldwide with wireless solutions for monitoring and controlling vital processes in the production, gathering, processing and delivery of energy products. Data from these processes, such as wellhead measurements, gas pressure and flows, temperatures, calorific values, kilowatt monitoring, and leakage monitoring are sent wirelessly via GE MDS radio modems. Users are also able to control facilities remotely, in response to system demands, or to deal with emergency situations.

GE MDS holds current professional memberships in UTC, ENTELEC, API, RABC and other associations active in the spectrum field.

[1] For the purpose of this document, national utilities are defined as the national electric grid, national oil and gas production, pipelines and distribution and water treatment facilities (both fresh and wastewater).

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This paper has two objectives:
1) Define the need for dedicated wireless spectrum for Utilities.
2) Provide information to support Utilities' communication needs.

Definition of Broadband

Broadband refers to a communication networks that allow access to voice and/or Data services equal to or exceeding 768 kpbs per subscriber. For the purpose of the FCC's National Broadband Plan. Broadband data can refer to wired, (i.e. cable), or wireless networks.

Broadband in data telecommunications is frequently used in a more technical sense to refer to data transmission where multiple pieces of data are sent simultaneously to increase the effective rate of transmission, regardless of data signalling rate. In network engineering this term is used for methods where two or more signals share a medium. Broadband Internet access, often shortened to just broadband, is a high data rate Internet access via wired or wireless.

GE MDS strongly supports the DOE and FCC's dedication of a portion of wireless spectrum for broadband use for Utilities. We also support the open commenting period so that pertinent information can be shared to benefit the public utilities.

Arguments in favor of exclusive wireless spectrum for national Utilities

The wireless spectrum is extremely congested with limited options for use by national utilities. With the release of the 3650MHz spectrum, the Federal Communications Commission (FCC) recognized the need for a dedicated spectrum for utility use. Access to spectrum is more important than ever, as national utilities and other entities embrace many different types of wireless technologies that require high data throughput and broadband spectrum use.

Currently, national utilities have two options when deciding what type of spectrum to use for their activities: they can either use license free spectrum, or they can use licensed spectrum for a fee. In both cases, they face problems that undermine their capability to carry out their activities effectively and in the best interest of the final consumers.

For example, as it relates to national utilities use of license free spectrum, there are potential interference issues in many cases. All license free radio-based devices are subject to interference from other wireless devices, such as other utility systems, wireless WISP's, pagers, cordless telephones, cordless baby monitors, cordless headphones, and cordless speakers. This interference can - and often does - directly affect the reliability of the public utility system.

While national utilities using "purchased spectrum" do not suffer from interference from external devices, they generally face data throughput issues, because most of this spectrum is "narrowband" (i.e. it is data rate limited, not broadband). Also, there is a large cost associated with the purchase of the necessary spectrum, which will likely be passed onto consumers, in order for the utilities to recoup them.

On the basis of the problems highlighted above, GE MDS advocates for the designation by the FCC of dedicated wireless spectrum for the exclusive use of the national utilities.

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The reasons in support of dedicated wireless spectrum are summarized as follows:

1. **National utilities must always use secure and reliable spectrum frequencies, in order to minimize possible disruptive or criminal activities.** America's electric, gas and water utilities are operating under potentially damaging radio spectrum shortfalls. These shortfalls threaten the reliability of utility services and leave essential services vulnerable to external attacks. The US Congress has made it abundantly clear in the Energy Policy Act of 2005 that critical infrastructure should not be forced to compete for spectrum at auction. Should national utilities be forced to pay through auctions for the spectrum they need, this will delay the deployment of Smart Grid[2] implementations. Additionally, it may force utilities to deploy Smart Grid infrastructure on a less secure and less reliable public infrastructure. Allocating wireless spectrum to national utilities would provide an interference free spectrum that will allow them safe, reliable, and secure wireless communications, enhancing the infrastructure's efficiency, security and reliability.

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2. **Spectrum requirements for Smart Grid implementation should be addressed in a manner that does not create security vulnerability or interference.** With the advent of Smart Grid, infrastructure operators will need broadband capacity to enable a variety of applications across electric, Oil, and Gas transmission and distribution systems. This will entail both wire line and wireless technologies to support fixed and mobile services. It will be important to make sure that these communications are shielded from interferences and possible cyber attacks.

3. **The Department of Homeland security (DHS) has increasingly recognized the importance of a secure utility infrastructure, through numerous initiatives**. In an effort to enhance the protection of their infrastructure, operators and owners are installing new or upgraded security and/or surveillance systems, which require the use of broadband spectrum. Allocating dedicated spectrum to the use of national utilities, and ensuring appropriate encryption, would help enhance the security of US infrastructure.

Utility Communication Needs

The DOE asks the following specific questions:

1. What are the current needs of utilities, including for the deployment of new Smart Grid applications
    - The smart grid is a large complex system made up of many interdependent applications. Often the needs of smart grid application are driven by latency and the need to cover large geographic area. At a high level the application can be grouped into four categories as follows:

i. **Instantaneous** control such as substation protection requiring high reliability communication with latencies < 1 ms.
ii. **Real-Time Control** with latencies < 100 ms. These applications can be used to adjust the performance of the grid where data needs to travel with latency low enough to react quicker that cascading events on the grid.

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iii. **Near-Real-Time** with latencies of < 5 seconds. These are for applications requiring human intervention such as an AMI Meter read, service disconnects, manual opening of a reclosure where a user takes an action and get needs to get feed back that the action has taken place.
iv. **Non-Real-Time** with latencies measured in hours. For example, bulk transfer of AMI usage data, which is typically posted daily, or background down load of files or firmware.

2. How are Smart Grid communication needs being met?
   - Smart Grid communications are being met with plethora of communication solutions as follows:
     i. **Instantaneous Control:** Fiber or high capacity microwave
     ii. **Real-Time-Control:** Point to multipoint broadband radio using technologies such as WiMAX.
     iii. **Near- Real-Time-Control:** Cellular, unlicensed spread spectrum, and Licensed narrow band radios
     iv. **Non-Real-Time:** Runs in the back ground or on an as needed basis

3. What are the future communications needs of utilities, including for the deployment of new Smart Grid applications, and how are these needs being met?
   - Future needs of utilities is mobile communications allowing customers to dynamically buy and sell electricity needed for their home or car. Given the potentially large incremental load to the grid devices will need to participate in real time with varying grid conditions.

4. What are the security requirements for smart grid communications and electric utility communications?
   - Security requirements must meet NERC CIP 001-009 cyber security standards.

5. What are the bandwidth requirements for smart grid communications and electric utility communications?
   - While high bandwidth may be necessary the driving need is high reliability low latency messages that enable real time control. The messages have latencies as described above with message size ranging from 50 bytes to several thousand bytes.

6. What are the reliability requirements for smart grid communications and electric utility communications?
   - The reliability for real time control > 99.99%
   - The reliability for near-real-time control is 99.5%

7. What are the coverage requirements for smart grid communications and electric utility communications?
   - The networks need to cover the entire service area of a utility with > 99% coverage of all fixed points.

8. What are the latency requirements for smart grid communications and electric utility communications?
   - See above.

9. What are the backup requirements for smart grid communications and electric utility communications?

- All mission critical real-time control systems require fully redundant systems. These system need to be built to deal with emergency / disaster conditions. Public carriers are not able to include force majeure events in their service contracts mandating utilities use private infrastructure for mission critical control systems.

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10. What are the coverage requirements with respect to terrain, foliage, customer density and size of service territory)?
    - Networks need to cover more than 99% of the service territory. This mandates the need for significant tower and right of way access on polls for mesh and star radio infrastructure configurations.

11. What are the use cases for various smart grid applications and other communications needs?
    - Use cases are called out in the UCAIUG: SG NET SRS Smart Grid Networks Systems Requirement Specification which can be found in the supporting document *"SG Network System Requirements Specification v3.doc"*

12. What are the technology options for smart grid and other utility communications?
    - Mesh radio in the ISM 902-928MHz, 2.4 GHz and 5.8 GHz bands
    - 3.65GHz Band using WiMax
    - Narrowband licensed technologies (5kHz to 50 kHz channels) in the 100MHz to 960 MHz bands
    - Cellular 2G and 3G
    - Proprietary point to point
    - Unlicensed in the 20 GHz bands +

13. What are the recommendations for meeting current and future utility requirements, based on each use case, the technology options that are available, and other considerations?
    - Provide a minimum of 30MHz of non-exclusive licensed spectrum below 2 GHz dedicated specifically to critical infrastructure applications similar to the 3.65GHz band with out the encumbrances of the Fixed Satellite Services (FSS). The 30 MHz of spectrum would allow for multiple 5 MHz or 10 MHz channels for broadband wireless connectivity using standards such as WiMAX / IEEE 802.16e.

14. To what extent can existing commercial networks satisfy the utilities' communications needs?
    - Existing networks don't have the latency performance, QoS and reliability to meet mission critical needs of utilities.

GE MDS respectfully submits these comments in response to the Department of Energy's Request for Information on Utility Communications Needs.

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