BEFORE THE
DEPARTMENT OF ENERGY
WASHINGTON, D.C. 20585

In the Matter of	)	
	)	
Implementing the National Broadband	)	
Plan by Studying the Communications	)	**Docket ID: DOE-HQ-2009-0003-0819**
Requirements of Electric Utilities to	)	
Inform Federal Smart Grid Policy	)	
	)	
Request for Information	)	
	)	

COMMENTS OF HUGHES NETWORK SYSTEMS, LLC AND INMARSAT INC.

Hughes Network Systems, LLC ("Hughes") and Inmarsat Inc. ("Inmarsat") hereby submit these comments in response to the Department of Energy's Request for Information ("RFI") in the above-referenced proceeding.[1] Hughes and Inmarsat are global leaders in providing satellite networks and services and satellite services, respectively. Hughes and Inmarsat, both global satellite communications leaders, have a long-standing commercial relationship and have worked together in various roles on a variety of satellite communications projects over many years, including in the area of Smart Grid projects. The companies submit these joint comments to explain the benefits and important role of satellite communications technologies for Federal Smart Grid Policy. For the reasons outlined below, Hughes and Inmarsat urge the Department of Energy ("DOE") to recognize that satellite networking technology will play a critical role in Smart Grid efforts for the utility industry and to ensure that, in developing communications requirements for Smart Grid, DOE and other federal, state and local government agencies

[1] *Implementing the National Broadband Plan by Studying the Communications Requirements of Electric Utilities to Inform Federal Smart Grid Policy*, Request for Information, 75 Fed. Reg. 26,206 (May 11, 2010) ("Smart Grid RFI").

develop Smart Grid policies that are technology-neutral and do not favor a particular communications or networking technology over another. Satellite technology options should be allowed to compete on an equal footing with other communications and networking technologies.

1. *INTRODUCTION*

Hughes and Inmarsat support the initiative of the Department of Energy ("DOE") in issuing this RFI "to create a dialogue that will help DOE study the communications requirements of electric utilities in order to better inform Federal Smart Grid policy."[2] Hughes is the global leader in providing broadband satellite networks and services for large enterprises, governments, small businesses, and consumers, providing satellite connectivity to more than 530,000 consumer, small business, governmental and enterprise customers in the U.S. market. Hughes launched its two-way consumer satellite broadband service in 2001. Utilizing satellite broadband data networking capabilities and an investment of over $1 billion in capital and research and development in broadband satellite networks and technology, Hughes has developed a consumer broadband service that reaches all 50 states, Puerto Rico and parts of Canada. Hughes has over 30 years of experience managing large-scale, mission-critical, private networks for enterprises and developing and supplying over 1 million satellite terminals worldwide and is recognized by the Yankee Group as a top-tier managed network provider. Hughes is also a leader in the development and supply of advanced mobile satellite systems and terminals. Hughes has developed and supplies a wide range of mobile satellite terminals, including broadband mobile data terminals for Inmarsat's BGAN network, such as the award-winning Hughes 9201 mobile satellite IP terminal. Hughes has experience in developing,

[2] *Id.* at 26,207.

operating and managing consumer-scale and enterprise grade networks and providing satellite terminals, all of which are applicable to Smart Grid.

Inmarsat has provided satellite services for over 30 years. It has invested well over $1.5 billion in the deployment of its fourth-generation, Inmarsat 4 ("I-4") satellite network, which is today providing innovative mobile satellite services to the United States and globally on one of the most advanced mobile commercial communications satellite constellations now in orbit. In order to remain competitive in the dynamic market for satellite services, Inmarsat's I-4 satellite fleet has been designed and adapted to support a new class of novel Internet Protocol ("IP")-based communications, including a service known as Broadband Global Area Network ("BGAN"). Using highly portable and easily deployed "notebook sized" antennas, BGAN provides voice and broadband service at speeds of almost half a megabit per second.[3] A satellite-based low data rate ("LDR") solution is also under development to target high-end Supervisory Control and Data Acquisition ("SCADA") users, meeting requirements for an IP data only service supporting low payload, high frequency data transmission. LDR hardware will accommodate end-user integration into existing platforms (i.e. AMI collection points and substation management for utilities) and special LDR pricing packages are expected to address the fixed monitoring and SCADA markets, where a typical customer uses a high number of devices with low average throughput.

For the reasons stated below, Hughes and Inmarsat believe that satellite networking technology will play a critical role in Smart Grid efforts for the utility industry.

[3] Inmarsat's BGAN services are used because of their unique land mobile features by agricultural, media, relief agencies, and critical infrastructure industries such as energy extraction and utilities. Government organizations, civil and military, are also heavily reliant on BGAN services for mobile and secure last mile communications, especially when no other method of communication is reliably available. Government users often require time-critical communications with an exceptional level of availability, security and reliability. BGAN meets these requirements while offering greater speed, portability and versatility because it is able to offer simultaneous broadband data and voice services in a single device.

2. *SATELLITE NETWORKING TECHNOLOGIES WILL BE INTEGRAL TO SMART GRID COMMUNICATIONS AND ELECTRIC UTILITY COMMUNICATIONS SYSTEMS*

Hughes and Inmarsat agree with DOE that "[o]ne of the key technology areas of the Smart Grid is integrated two-way communications, which make the Smart Grid a dynamic, interactive, real-time infrastructure."[4] Communications requirements "will be a critical component of both the Smart Grid and the other technologies that will evolve and change how electricity is produced, consumed, conserved and distributed."[5] An effective Smart Grid depends on a robust network and communications infrastructure. The requirements of the communications network that must be considered are scalable bandwidth, robust security, high network reliability and availability, and cost-effectiveness. In the midst of all the new and exciting options available to utility providers, communications infrastructure remains one of the most important decisions companies must make when implementing smart grid initiatives. Hughes and Inmarsat agree that one "cannot expect any 'one-size-fits-all' communications solution to accommodate all reasonable Smart Grid implementations and applications."[6]

Hughes and Inmarsat believe that the most pragmatic approach to meet these requirements is to leverage the wide range of transport technologies available while relying on common open standards, such as the Internet Protocol ("IP") standard, to integrate into a single, overall network architecture. As many commenters noted in the public comment process for the Federal Communications Commission's ("FCC") National Broadband Plan ("NBP"), Smart Grid is platform-agnostic and a wide variety of broadband platforms may be employed (e.g., wireless, wireline, satellite), but a common open standard such as the IP standard should be used for the end-to-end network layer. Using the IP standard will allow the Smart Grid network to be

[4] Smart Grid RFI, 75 Fed. Reg. at 26,207.
[5] *Id.*
[6] *Id.*

interoperable and multiple smart grid applications to work in a collaborative and unified manner.[7] IP is a recognized international standard for data networking and data communications and is readily supported by terrestrial wireless, wireline, and satellite operators. The National Institute for Standards and Technology ("NIST") has already recognized that IP will be an important technology for the Smart Grid.[8] Its use permits flexible equipment and system configuration and secure data connections for customers using the IP standard. In addition, Congress has expressed an intention to enable IP-based networks for Smart Grid demonstration projects.[9]

Hughes and Inmarsat applaud DOE for recognizing that satellite is one of "many communications and networking technologies that can be used in Smart Grid applications . . . ."[10] Satellite networking technology has developed rapidly and now delivers the combination of high performance, availability, and security that can greatly aid smart grid efforts for the utility industry. Satellite networks have evolved at a similar or even faster pace than other networking technologies, making huge strides in improving performance, reliability, and cost. In fact, some of the highest availability networks in the enterprise market, such as for lotteries and emergency preparedness/recovery, are based on satellite and its fundamental advantage -- ubiquitous coverage. Very high network availability, in excess of 99.99 percent, can be achieved through innovative dual frequency, dual access solutions by utilizing Ku- or Ka-band satellite service in

[7] Comments of Alcatel-Lucent, at ii and Comments of AT&T, at 6, *Implementation of Smart Grid Technology*, NBP Public Notice #2, GN Docket Nos. 09-47, 09-51, 09-137, DA 09-2018 (rel. Sept. 4, 2009) ("NBP Public Notice #2").
[8] NIST Interoperability Framework, Release 1.0, § 3.3.3 at 39 (Feb. 2010), *available at* http://www.nist.gov/public_affairs/releases/upload/smartgrid_interoperability_final.pdf.
[9] Comments of AT&T at 4, NBP Public Notice #2 (citing Recovery Act, Sec. 405(3), amending Section 1304(b)(3) of Title XIII of the Energy Independence and Security Act of 2007 (42 U.S.C. §17381) to add subpart (F) ("The Secretary shall require as a condition of receiving funding under this subsection that demonstration projects utilize open protocols and standards (including Internet-based protocols and standards) if available and appropriate.")).
[10] Smart Grid RFI, 75 Fed. Reg. at 26,207.

conjunction with L-band satellite service as a primary or backup communications path. Smart Grid network elements, such as remote substations and distribution elements, can now be connected using satellite without compromising on the expected benefits driving the Smart Grid. When combined with high performance IP and other standards-based capabilities, satellite networks today deliver high-quality, secure, broadband connectivity.

Satellite has an important role for Smart Grid applications because it can be used for substation connectivity, distribution automation, advanced metering infrastructure ("AMI"), mobile work force and disaster recovery. In any case, satellite solutions are an essential part of the multi-technology approach required by the utility industry to achieve an end-to-end, smart grid communications infrastructure -- one that is reliable, fast, secure, and cost-efficient. Accordingly, DOE must develop policies that are technology-neutral and that do not favor a particular communications or networking technology over another.

3. EXISTING SATELLITE NETWORKING TECHNOLOGIES SHOULD BE USED TO MEET CURRENT AND FUTURE UTILITY COMMUNICATIONS REQUIREMENTS

Existing satellite communications network technologies can be leveraged immediately to satisfy communications needs for utilities and Smart Grid. As described below, substation connectivity, distribution automation, AMI Smart Meter backhaul, mobile work force and disaster recovery are five key areas in which a satellite solution can provide the most cost-effective communications solution. Satellite solutions offer high availability, ubiquity, and path diversity -- key characteristics of a Smart Grid communications solution -- and they are reliable, fast, secure, and cost-effective.

3.1 Substation Connectivity

Satellite connectivity has been used for years to provide SCADA applications for remote locations in the oil and gas industries and other energy exploration areas. The data requirements are generally low in volume but regular in frequency or periodicity. Secure commercial satellite networks have served this need well by delivering resilient, custom network bandwidth profiles and ubiquitous coverage. The solution has worked well, both technically and economically, for hard-to-reach SCADA and SCADA-like requirements in these industries.

This still holds true today. Satellite is a great fit for these types of applications and is in use to support SCADA and other applications at substations. The performance of the applications is consistent and effective. In addition, one hundred percent availability can be achieved with a satellite-only solution by using an L-band based service that backs up the primary Ku- or Ka-band satellite connection. L-band satellite service operates in the 1-2 GHz frequency range and is not susceptible to degradation during precipitation. So when the primary Ku- or Ka-band satellite service fades during rain, the backup path, L-band, will be available to pass traffic. It is also very cost effective compared to traditional, alternative solutions.

Additionally, satellite provides another significant inherent advantage -- 100 percent nationwide coverage. This is because satellites can typically cover large portions of the Earth's surface, including the entire continental and other parts of the United States, with a single footprint. Furthermore, satellite supports broadband applications such as Voice over IP (VoIP) and video surveillance. Network bandwidth can be tailored to specific requirements, such as by dynamically reallocating spectrum from less active beams to those with higher demands, and the solution is secure, delivered entirely over a private network or using strong encryption when transported via the public Internet.

3.2 Distribution Automation

Similar data requirements as those for substation connectivity exist to support monitoring elements along distribution lines. A single, high-availability connection at an access point that is fed by distribution devices may be a better solution for monitoring and control. Satellite supports the traffic profile, high availability, ubiquity and form factor requirements for Distribution Automation. Satellite solutions offer a very small form factor, are hardened, can be mounted anywhere, and are easy to install and point. Satellite service also can offer the advantage of fixed operating costs. In most cases, availability can be designed to 99.9 to nearly 100 percent.

Looking forward, satellite holds the potential to facilitate Distribution Automation, meaning utility companies can proactively monitor their distribution elements for voltage fluctuations, outages and service demands. Utility managers, technology decision-makers and regulators should take into account the benefits satellite technology can deliver for these applications and the benefits they can deliver to Smart Grid efforts, extending the network to reach 100% of the utility's customer base.

3.3 AMI Backhaul

Advanced Metering Infrastructure ("AMI") requires communication between a smart meter at a customer's location and the data center. Common practice in today's deployments and pilots is to use carrier cellular solutions from the collection point onward to serve the wide area network ("WAN") needs in the AMI end-to-end solution. However, various challenges and considerations with the cellular service need to be considered by utilities and regulators such as congestion, loss of coverage during disaster, and limited range.

Satellite technology presents a high-quality, low-cost alternative. Enterprise satellite solutions provide ubiquitous, continent-wide coverage and, since they are secure networks, they are not susceptible to public usage as they do not traverse the Internet or other public network. Furthermore, advanced antenna designs allow for easier installation to accommodate mounting on pole tops. Privacy, scalability, flexible bandwidth, ease of deployment and reach are all significant benefits satellite provides as a comprehensive end-to-end AMI solution or at the least as a fill-in for the dark spots of a cellular network solution. In the United States, based on feedback from the utility industry, Hughes and Inmarsat estimate that that 3-5% of utility customers (or smart meters) are unreachable by cellular or other terrestrial technologies, and for these areas last-mile satellite connectivity is a viable, and maybe only, cost-effective alternative to a local wireless solution.

To cite one example, Hughes and Inmarsat have launched a pilot project with a major electric utility to provide satellite backhaul for smart meters that are not able to be connected through existing terrestrial technologies. The solution utilizes a Hughes 9201-M2M BGAN terminal to connect an AMI collection point to the utility's data centers via Inmarsat's satellite network. Each collection point is linked to multiple smart meters via a local radio network. On completion of a successful pilot, the utility plans to deploy BGAN terminals at remote access points to connect up to 100,000 meters. The same utility has started deployment of the first of more than 350 Hughes 9350 BGAN land mobile terminals to support communications for service vehicles working in remote locations within the utility's coverage area.

3.4 Mobile Workforce

While terrestrial wireless serves many requirements of the mobile workforce, if personnel are out of range, they typically would have to drive somewhere to find connectivity -- not an

ideal situation if those personnel are on location supporting customers in need or providing restoral efforts outside of a utility company's immediate service region. New satellite technology can cost-effectively deliver benefits such as on-the-move vehicle connectivity, allowing those out in the field to connect directly with headquarters and eliminate costly trips to the office to transmit or obtain information. Vehicles can be equipped with fixed mobile or on-the-move satellite technology. For example, a vehicle can be equipped with a router which first tries to connect *via* cellular service, then private radio, and lastly, satellite. The router automatically finds the service that is available, so field personnel are constantly connected. The solution supports all data needs -- work orders, dispatch, and repair support. Satellite also supports higher bandwidth requirements than other technologies can, such as multi-Mbps downloads -- an attribute unique to satellite technology in mobile applications. Finally, the same satellite infrastructure can be used for other aspects of an organization's communications infrastructure, mobile or otherwise.

3.5 Disaster Recovery

Satellite networking technologies will be integral to disaster-recovery plans of utilities and the continuing operation of Smart Grid in the event of emergency crises and disasters. In fact, the National Broadband Plan recommended the "use of broadband fixed and mobile satellite service for emergency preparedness and response activities, as well as for national security, homeland security, continuity and crisis management."[11] Because terrestrial networks are more vulnerable to failure in the event of a disaster and can be down for hours, days or even weeks, a satellite network offers an alternate communications path enabling organizations to maintain

[11] Federal Communications Commission, *Connecting America: The National Broadband Plan*, 144-45, 149-50, at 320 (rel. Mar. 16, 2010).

communications and critical applications when terrestrial networks fail and may prevent or minimize disruptions to Smart Grid.[12]

Satellite provides an affordable, highly available, diverse-path solution that ensures reliable, secure communications for all Smart Grid locations. Satellite communications can address numerous emergency communications needs, such as emergency preparedness and rapid emergency response/disaster recovery. Satellite provides instant infrastructure wherever needed, allowing organizations to continue conducting day-to-day operations in the event of terrestrial network failure. Satellite solutions are scalable and can be deployed quickly. Bandwidth requirements are sized to the specific requirements for efficient management of resources and budget. A range of both fixed and mobile satellite solutions are available, allowing for on-the-move deployment and temporary service while primary communications are being restored. Satellite also provides a fully secure, end-to-end network to protect Smart Grid data and resources. Satellite could serve as an insurance policy for continuity of operations and Smart Grid communications during emergencies.

4. *CONCLUSION*

Hughes and Inmarsat believe that satellite networking technology will play a critical role in Smart Grid efforts for the utility industry. Satellite solutions offer high availability, ubiquity, and path diversity -- key characteristics of a Smart Grid communications solution -- and they are reliable, fast, secure, and cost-efficient. Existing satellite communications network technologies can be leveraged immediately to satisfy utilities' communications needs. Satellite solutions can provide the most cost-effective communications solution in a number of key Smart Grid areas, including substation connectivity, distribution automation, AMI Smart Meter backhaul, mobile

[12] *Emergency Solutions*, Hughes White Paper, Doc. # H43297 (May 21, 2010), *available at*: http://government.hughes.com/resources/emergency-solutions.

work force and disaster recovery. Accordingly, in developing communications requirements for Smart Grid, it is imperative that DOE and other federal, state and local government agencies develop policies that are technology-neutral and that do not favor a particular communications or networking technology over another.

Respectfully submitted,

HUGHES NETWORK SYSTEMS, LLC

By: */s/ Sean Fleming*
Sean Fleming
Senior Counsel
Hughes Network Systems, LLC
11717 Exploration Lane
Germantown, Maryland 20876
(301) 428-5500

INMARSAT INC.

By: */s/ Diane Cornell*
Diane Cornell
Vice President, Government Affairs
Inmarsat Inc.
1101 Connecticut Ave, NW, Suite 1200
Washington, D.C. 20036
(202) 248-5150

Dated: July 12, 2010