The Open Geospatial Consortium, Inc. (OGC) Response to FCC document titled, "COMMENT SOUGHT ON THE IMPLEMENTATION OF SMART GRID TECHNOLOGY," (NBP Public Notice #2, GN Docket Nos. 09-47, 09-51, 09-137)

Submitter:
Louis Hecht, Jr.
Executive Director, Global Business Development
Open Geospatial Consortium, Inc. (OGC)
483B Carlisle Drive
Herndon, VA 20170 USA
lhecht@opengeospatial.org
Phone: +1 301 365 5907
Cell phone: +1 301-204-7375

Response Introduction

The Open Geospatial Consortium, Inc. (OGC) (http://www.opengeospatial.org) is the world's leading standards development organization (SDO) focused on geospatial information technologies. The OGC's role in the Smart Grid effort is to ensure the availability of information technology standards that rely on location information for effective and efficient communication. Smart grid devices and actors of all types, including the telecommunications infrastructure elements, have a location, and location is a critical cross-cutting capability (not unlike E911) in virtually all Smart Grid scenarios.

Agreeing to make Smart Grid communications IPv6-based is believed necessary for all of the usually-stated reasons, but also because location standards will make effective use of IPv6 across all location-based requirements among the many diverse Smart Grid devices and systems and between the Smart Grid and neighboring domains (emergency response, facilities management, homeland security, etc.).

The Smart Grid standards framework will clearly be based on: open, distributed processing; loose coupling; multiple diverse communicating but purpose-tailored and service-oriented information architectures. It is clear from the Smart Grid's latest standards document (NIST Framework and Roadmap for Smart Grid Interoperability Standards Release 1.0 (Draft)) that envisions a not too distant future in which there will be many more smart devices of many kinds that manage energy and energy markets using Information, Communications and Technology (ICT) in ways we cannot yet imagine to meet market requirements we cannot yet imagine. In this context, the OGC's role is to work with users, vendors and others including other standards development organizations (SDOs) to ensure interoperability among devices and systems that communicate parameters such as location and area and to enable devices and systems to respond to requests for geoprocessing services, such as "determine proximity" and "return list of specified devices in specified area."

Because telecommunications infrastructure will be part of the Smart Grid information infrastructure, we believe it is imperative for the FCC, as it works with ICT SDOs going forward, to be aware that geospatial parameters are more complicated than simple latitude/longitude pairs. OGC provides the framework (embraced in standards) for geospatial data and services that will be used not only by Smart Grid stakeholders, but also by current and future telecommunications industry stakeholders.

OGC's responses, referenced by specific numbered items in the FCC document:

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.

OGC RESPONSE:

Every Smart Grid device — transformer, meter, air conditioner, power plant, electric car, solar panel, etc. — has a location on Earth. Every grid event or phenomenon — brown-out, demand variability, power surge, regulation, transmission loss, etc. — occurs within some time interval and at some location in space along the grid's physical network. The same is true for every external event or phenomenon that affects the grid, such as earthquake, cloudy day, calm wind or flood. Every Smart Grid scenario involves spatial parameters such as:

- Latitude/Longitude
- Presence/absence
- Street address and property description
- Location within a building
- Region of aggregation
- Route
- Jurisdictional boundary
- Proximity to hazard
- Affected corridor
- Depth underground, elevation
- Temperature reading
- Loss per mile
- Time to reach a location

The network protocol stack must support communication of such data and related service requests in a consistent way to provide interoperability. Some applications require very low latency response, such as phasor management. Some may require a linear location on network node, and for a particular application that location may or may not need to be associated with geospatial location. But for most applications, services will require Earth coordinates along with other data about the device type, status, connection, ownership, service contract, etc. Communications networks and technologies need to be able to accommodate these information flows.

It is important to note that communicating location often involves complexities not addressed by simple lat/lon coordinates, and experts have accounted for the complexities over the last fifteen years in the OGC standards process. It is also important to note that a functioning Smart Grid will depend on a variety of spatial operations that can no longer be thought of as functions of a centralized GIS, and the necessary Internet-based and Web service-based interface and encoding standards for spatial operations in service-oriented architectures are largely in place in the OGC Web Service (OWS) standards suite. OWS standards are international, some have been adopted by the ISO, and virtually all commercial geospatial technology software vendors have implemented the key standards. OGC standards are becoming an essential part of the information infrastructure for meteorology, hydrology, disaster management and other activities that provide information about and management of the physical environment in which telecommunications

infrastructure and the Smart Grid exist. OGC standards will surely be employed in the Smart Grid's service-oriented architectures eventually, but it would be wise for this determination to be made at the outset.

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.

4. Real-time data. The Smart Grid promises to enable utility companies and their customers to reduce U.S. energy consumption using a variety of technologies and methods. Some of the most promising of these methods use demand response, in which utility companies can directly control loads within the home or business to better manage demand, or give price signals to encourage load shedding. Other methods reduce energy consumption simply by providing consumers access to their consumption information, via in-home displays, web portals, or other methods. Central to all of these techniques is energy consumption and pricing data.

OGC RESPONSE:

In discussions of bandwidth and latency requirements in Smart Grid applications, it is important to note that not all of the OGC's standards are Web service standards. For example, the OpenGIS® Geographic Objects Interface Standard (GOS) provides an open set of common, lightweight, language-independent abstractions for describing, managing, rendering, and manipulating geometric and geographic objects within an application programming environment. It provides both an abstract object standard (in UML) and a programming-language-specific profile (in Java). The language-specific bindings serve as an open Application Program Interface (API). GOS might be useful, for example, in the context of NASPInet Class A and Class B standards development work that involves real-time applications.

Many "medium low" bandwidth/latency Smart Grid applications will require only very basic geospatial information, and yet this information will be ideally communicated in an efficient way to systems and devices that read XML. The OGC Geography Markup Language (GML) Encoding Standard is an XML extension that can be used to encode all types of geospatial data and can also be scaled down dramatically for lightweight applications. A key example is the GML application schema in the Internet Engineering Task Force (IETF) Presence Information Data Format (PIDF-LO) standard for location payloads. PIDF-LO, designed for communicating privacy-sensitive presence information, is being incorporated into numerous other Internet standards. One such standard is the Session Initiation Protocol (SIP), currently documented as RFC 3261 from the IETF Network Working Group, which will likely play in important role as part of the Smart Grid standards framework. GML is already part of the International Electrotechnical Commission (IEC) Common Information Model (CIM) standard.

Also, OGC "Sensor Web Enablement" (SWE) standards have a role to play. These standards for Web-based discovery, access, and use of sensors, transducers, and sensor data stores have been harmonized with IEEE Technical Committee 9's "smart sensor" standards. They are being used in the intelligence and defense communities because the standards perform well in secure environments. They are being used in emergency management and Home Land Security because they make it easy to leverage sensor feeds from a range of sources and because they are compatible with the guidelines of the Federal Geographic Data Committee, an interagency committee coordinating nationwide best practices and standards for government use of geospatial

information for decision making and critical infrastructure protection. It is worth noting that Smart Grid standards may, in the future, be extended to enable management of other kinds of sensors and controls involving not only electricity but also pipe networks of various kinds and perhaps emissions. The SWE standards provide a comprehensive framework of standards for communicating with all types of sensors and actuators and encoding all types of sensor outputs.

5. Home Area Networks. We seek to understand the ways in which utilities, technology providers and consumers will connect appliances, thermostats, and energy displays to each other, to the electric meter, and to the Internet.

OGC RESPONSE:

Much thought has been given to competing communication technologies for HAN, but the in-building device location information requirements have not been adequately addressed. With respect to Smart Grid applications in homes and other buildings and also in larger capital projects such as airports, we pose two questions that we believe must be answered soon through collaborative standards initiatives: What will be done about standard encodings for indoor location of Smart Grid actors and standard interfaces for services that use indoor location data? And what other building-related data will be necessary in Smart Grid scenarios, which might depend, for example, on location-coupled energy parameters such as light and heat?

Owners and operators of buildings and capital projects are beginning to push for Building Information Model (BIM) standards that will provide the means to answer these questions. Proprietary BIM solutions are not sufficient because they are not interoperable. OGC, through its recent AECOO Testbed Activity, has begun to work on these issues with the buildingSmart alliance of the NBIMS Committee (the National Building Information Model Standard Project Committee), a project of the National Institute for Building Sciences.

Much work remains, however. The AEC industry's Industry Foundation Class (IFC) standards will need to be adapted for open distributed processing on the Web platform. It would be worthwhile for FCC, DoE, IEEE, and NIST experts to consult with the OGC and buildingSmart alliance about expanding this effort.

We would like to suggest ways of sharing the costs and expediting the development and deployment of in-building location standards that are necessary for the Smart Grid and for other purposes that are important to Smart Grid stakeholders. We believe other BIM stakeholders will recognize the value in working together with the aforementioned agencies and SDOs. Notably, the building finance communities, and particularly the appraisal segment of the community, have an urgent need for related BIM standards as they struggle to meet the government-imposed requirement for greater accuracy, transparency and consistency in descriptions of properties that are the collateral for mortgage-backed securities. And federal agencies with responsibility for large portfolios of buildings and capital projects have much to gain from BIM standards as they participate in the Smart Grid rollout, work to meet their building energy efficiency goals, and work to reduce the costs and liabilities involved throughout the life cycles of buildings and capital projects.