Ambient Corporation's response to NBP RFI: Communications Requirements

1) Understand the communications requirements of utilities, including but not limited to, the requirements of the Smart Grid.

The implementation of smart grid technologies is a long-term investment into operational cost savings through the realization of operational efficiency and increased reliability. Smart grid applications available today involve a wide array of approaches to improving utility performance, from truck roll reduction to volt-var control and demand response technologies. For cost efficiency, these smart grid applications will require shared two-way communications between field devices and the utility head end.

The variety of two-way smart grid applications deem a holistic look at the communications needs of the smart grid. But to ask what the communications requirements are for the smart grid today is akin to asking about the internet's bandwidth requirements in 1990. Regulators, utilities and vendors must take a holistic, long-term view of smart grid communications, in order to avoid repeating past mistakes which led to stranded assets and outdated legacy systems.

As AMR has evolved to AMI, and now to Smart Grid, it is important that we take into consideration the long-term communications needs of all smart grid technologies and applications that will be incorporated into the smart grid in the next ten years.

Functional requirements such as speed / bandwidth, latency and frequency of communications, reliability, security, adaptability and cost, are all key considerations that must be taken into account for any smart grid communications deployment; however, functional requirements of a smart grid will differ from utility to utility, as well as within any given utility. Utility's footprints often encompass different topologies, population densities and even state regulatory policies. As a result, there is no single underlying communications technology that will meet all the functional requirements of the smart grid. Having a unified and flexible communications platform, however, allows a utility to pick and choose various technologies and vendors while ensuring the most comprehensive and cost effective smart grid communications are delivered to utilities, end smart grid applications, and end customers.

As it is ultimately responsible for defining what the utility work force and the smart grid will be capable of for the entirety of the communications infrastructure's life expectancy, the communications platform is the backbone of the smart grid. As such, it should be built out to meet the long-term requirements of smart grid, not just the requirements of today's driving applications such as metering. This sentiment is made clear in the NYC ordered in CASE 09-M-0074 regarding the minimum functional requirements for AMI.

The utilities must consider how their deployments of AMI can be integrated into other Smart Grid capabilities, so that the communications backbone and data management systems can be leveraged to provide both AMI and Smart Grid capabilities. Further, it is essential that deployment of communication facilities for AMI does not result in stranded facilities, incapable of being expanded for broader Smart Grid applications. Therefore, AMI systems must be designed to meet future requirements of the Smart Grid, and in particular must contain communications systems that are scalable and expandable, to accommodate sensors in multiple locations throughout the grid.

Deploying silos of communications, each dedicated to a single smart grid application, results in higher operational cost due to redundancies and inefficiencies, as well as promotes proprietary systems. Thus, we believe the backbone of a long-term cost effective smart grid deployment is a flexible and open architecture communications platform that aggregates the communications needs of all smart grid applications. A single enabling smart grid platform that can mix and match enabling communication technologies to meet site-specific and application-specific functional requirements will enable all smart grid applications to function in the most cost effective way possible.

2) Collect information about electricity infrastructures' current and projected communications requirement.

Many utilities operate radio systems, which have been selected as a compromise between coverage, reliability scale and their lower cost. These systems in operation today meet many of the current AMI requirements, but will not be able to handle the flood of data expected of a true smart grid; neither do they incorporate the interoperability that will be required to allow for evolving smart grid systems, rather than stranding smart grid assets. While a practical solution for today's needs these radio solutions will quickly become obsolete. The life expectancy of smart grid communications systems requires more long term thinking. . It is expected that workers in the emerging utility world will require as much connectivity as access to 1 megabit per second, 30 times the bandwidth of most 800/900MHZ that offer about 40kbs.

It is our belief that the future electrical infrastructure will be reliant upon high-speed two-way communications enabled by a flexible and open communications platform, aggregating and controlling data traffic between the utility network operation center (NOC) and end smart grid devices and applications (meters, sensors, distributed automation equipment, consumer portals etc.).

The larger picture of a smart grid communications includes not only the grid itself, but also the utility worker maintaining the grid through mobile hotspots and wireless workstations, and customer facing applications. When new grid technologies are combined, the Smart Grid is expected to create one of the largest data floods ever, with some daily information generation estimates as high as 2% of the total data that a utility keeps in all of its other systems. To support such large volumes of data, high-bandwidth communications will be needed to aggregate and transport application data. A single communications platform and data pipeline should be leveraged to connect all smart grid applications and allow for data traffic management, and should be robust enough to meet the total volume of traffic predicted.

3) Discuss types of networks and communications services that may be used for grid modernization

Today many utilities have some form of private communications network, ones often based on narrow bands of RF communications. RF has useful characteristics of low-latency and signal distance but often lacks bandwidth. While adequate for past uses, the data and connectivity demands of the smart grid will tax – and quickly surpass – the functionality of these networks.

Smart grid devices and applications run on a wide variety of communication technologies, and utilize an even wider array of protocols. The communications technologies to be considered for today's smart grid devices and applications include Radio Frequency (typically in the 900 MHz unlicensed spectrum), Wi-Fi, Power Line Carrier (PLC), WiMAX, cellular, and Zigbee amongst others. Backhaul mediums include fiber, cellular, cable, microwave, point-to-point wireless, WiMAX, and Wi-Fi. A true smart grid communications solution should have the flexibility to incorporate any and all of these technologies, and as cost effectively as possible.

The most practical approach to building out a smart grid communications network is to capitalize on the public carriers' infrastructure investments, of both past and future, and utilize this cellular network wherever possible. By leasing connectivity from a public carrier, the utility is guaranteed to evolve best in class services at a far lower cost and recognize a faster ROI due to the ability to deploy smart grid nodes rapidly. Also, the utility customers will not be burdened with the full capital costs associated with ownership of a private network. Utilities need to accept the benefits of the public option, as well as the loss of potential revenues associated with the regulated rate of return that would be associated with a private networks capital costs.

Technologies that embrace an open communications platform can leverage the public carriers, and existing fiber assets where already available, and extend the smart grid communications network out from the edge of existing connectivity by using one of many available "last-mile" technologies (PLC, RF, Wi-Fi, etc.). In doing so, the utility acquires a cost efficient "private network" that covers their entire service footprint. Thus, a hybrid solution allows the utility to reduce needed capital expenditures associated with building redundant communications infrastructures, while also offering the greatest stakeholder value.

Smart grid communications comprise a very costly component of a smart grid deployment, whether it be those costs associated with leasing connectivity from a public carrier, or the expenditures incurred from building and maintaining a private communications network. It is important, then, that private and public networks support as many applications as possible, to ensure that the cost of the communication network will be distributed to, and offset by, the broad array of benefits derived from the applications it enables.

4) Discuss types of communications capabilities do communications carriers think that they can provide?

Public carriers alone cannot meet the functional requirements of every aspect of the smart grid communications space. It is important to note that they need to work through equipment vendor partnerships to enable their capabilities for the smart grid market. Open smart grid communications platforms can help carriers extend connectivity throughout the last mile using multiple cost effective technologies.

Data generated by new and emerging smart grid devices is expected to overwhelm today's typical utility communications infrastructures. Incumbent carriers, with their ability to transport the large volumes of data in a timely manner, will play a major role in smart grid communication architectures. Carriers can partner with communication platform providers to extend their reach to the last-mile of device connectivity enhancing carrier coverage while playing a vital role to smart grid deployments.