July 12, 2010

Via Electronic Delivery
U.S. Department of Energy
Office of the General Counsel
1000 Independence Avenue, S.W.
Room 6A245
Washington, DC 20585

RE: NBP RFI: Communications Requirements

Introduction and Tropos Networks Company Background

Tropos Networks is pleased to submit the following commentary and information to the DOE regarding the communication requirements of utilities for Smart Grid applications based on its experience with utility customers.

Tropos is a venture backed private company based in Sunnyvale, CA and was founded in 2000. In the 10 years since Tropos was founded, we have developed IP wireless meshing technologies and systems that provides customers a broadband foundation for multiple mission critical applications. Tropos has been granted 29 patents (30 more pending) and has taken a leadership position in the metro-scale wireless broadband market with more than 750 customers around the world in a wide variety of industries including municipal government, utilities, and Internet service providers. Our hardware and software systems have successfully helped customers create greener, safer, smarter communities, and are helping utilities build a communications foundation for intelligent power grids.

1) What are the current and future communications needs of utilities, including for the deployment of new Smart Grid Applications, and how are these needs being met?

The National Broadband Plan recognized that to build the Smart Grid vision requires significant changes to the power grid of today. These changes include the addition of two-way communications which are required throughout the Smart Grid from power generation to transmission to distribution and point of consumption.

Today, electric utilities which number over 3,000 in the United States do not have pervasive communications throughout their coverage area nor many of the sensors and other devices and systems with communications enabling centralized control and monitoring. Their communication networks are comprised of a patchwork of networking technologies -- wired and wireless, licensed and unlicensed, private and commercial, fixed and mobile, broadband and narrowband, including private wireless broadband from Tropos[1].

Traditionally, electric utilities built private networks to support applications with a high level of reliability, such as those for grid control and protection. These systems have operated separately from commercial networks, often utilizing privately owned, proprietary solutions. While the amount of data moving across smart grid networks is modest today, the National Broadband Plan sites that this is expected to grow significantly because the number of devices, frequency of

[1] Connecting America: The National Broadband Plan, Chapter 12.1, footnote 20, citing Tropos Networks, available at www.broadband.gov

communications and complexity of data transferred will all increase with the rollout of the Smart Grid.[2]

To achieve the vision of the Smart Grid requires a communications network is needed, in fact a network of networks. In addition to a multi-tiered network, it's clear that multiple networking technologies are required and utilities will need to asses which technologies are the best fit for each network layer based upon current and anticipated future smart grid applications. There are a broad range of solutions available today which area are proven to be capable of meeting utilities' current and future network requirements.

Typically, a hierarchy of networks for smart grids extends from the Home Area Network through the Neighborhood Area Network and the Distribution Area Network back to the Core. At each of these network layers there are distinct networking requirements and, correspondingly, different networking technologies that most appropriately meet those requirements.

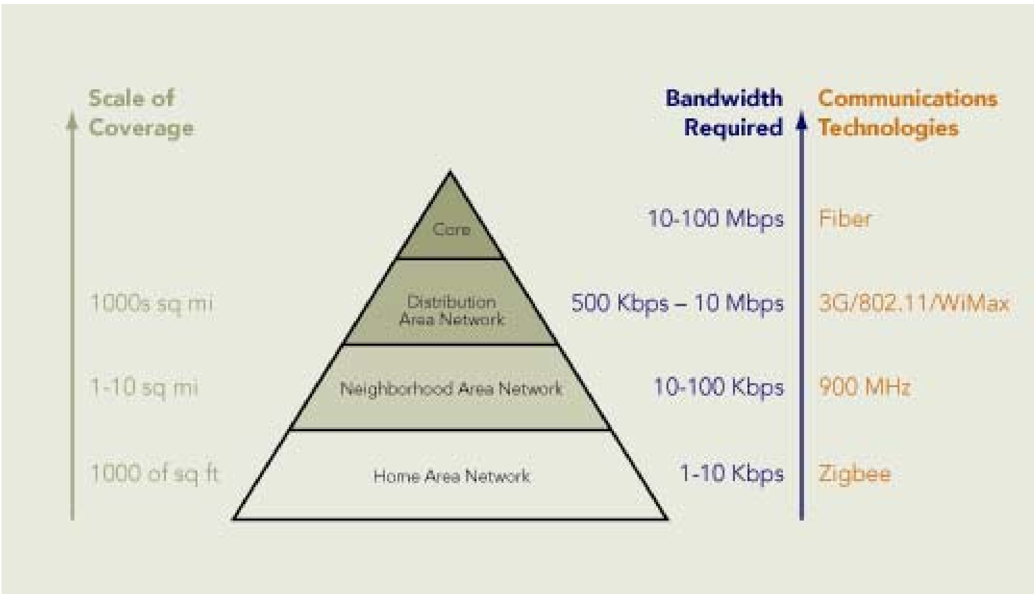

Figure 1. Smart Grid Communications Network of Networks Hierarchy (source: Tropos Networks)

Home Area Network (HAN) - a multi-vendor environment composed of appliances and devices that need to network together seamlessly using open standards. Bandwidth requirements are low (1-10 Kbps) but ease-of-configuration, plug-and-play and low power consumption are essential. Home Area Networks cover areas of 1000's of square feet. Zigbee and HomePlug are examples of standards that meet these requirements.

Neighborhood Area Network (NAN) - requires higher bandwidths (10-100 Kbps) and two-way communications capability (for meter reading, demand response, remote disconnect, etc.). The network needs to cover thousands of homes and businesses, typically offering coverage over a few square miles. The architecture needs to be resilient

---

[2] See Tropos Networks Comments to Federal Communications Commission, NPB Public Notice #2 Docket Nos. 09-47, 09-51, and 09-137, regarding National Broadband Plan PN #2, filed on Oct. 2, 2009, http://fjallfoss.fcc.gov/ecfs/document/view?id=7020040355

and protocol needs to support meshing between meters. Radio technology used at this layer needs to offer low latencies (<10s) and excellent propagation in challenging RF environments. 900 MHz mesh networks have emerged as a common way to meet these requirements at the metering network layer, in addition to such alternatives such as Power Line Carrier (PLC) and licensed fixed RF systems.

Distribution Area Network (DAN) - aggregates communications from multiple applications including metering, distribution automation and control, and SCADA. The network requirements must accommodate the needs of all the applications at this layer, which translates higher bandwidths (500 Kbps-10 Mbps), low latencies (<100 milliseconds) and ability to scale to cover large geographical areas, from tens of square miles to thousands of square miles. Given the broad coverage area, a DAN will typically be comprised of wireless technologies rather than wired. It needs to extend the utility's fiber out from the substations into the broader territory to provide wide coverage at reasonable cost. It needs to offer standards-based interconnections to the diversity of applications and endpoints. It also needs to support Quality of Service guarantees for delay-sensitive applications and multi-layer security. 802.11, WiMAX and 3G data networks are mature proven technologies capable of meeting these requirements at the distribution area network layer.

Core Network - connects back to the utility enterprise network and is frequently backhauled today through utility-owned fiber or high-speed microwave point-to-point links at substation locations that offers 100+Mbps of capacity.

2) What are the basic requirements such as security, bandwidth, reliability, coverage, latency, and backup, for smart grid communication and electric utility communication systems in general – today and tomorrow? How do these requirements impact the utilities' communication needs?

Smart grid communications networks will be comprised of multiple layers; the Distribution Area Network (DAN) has some of the most stringent requirements as it supports multiple applications with varying requirements. Two examples of utilities using Tropos for their smart grid DAN are highlighted below.

Avista

Avista, an investor owned utility serving over 356,000 electric and 316,000 gas customers across 30,000 square miles in eastern Washington, northern Idaho and Oregon, selected Tropos' GridCom™ for its Smart Grid distribution area communications network (DAN).[3] The network is part of Avista's Smart Circuits Project planned for the Spokane service area that will reduce energy losses, lower system costs, increase reliability, and enhance the utility's ability to integrate distributed renewable generation resources. In addition, the Project is targeted to provide energy savings of 42,000 MWh and a reduction in carbon emissions of 14,400 tons annually. Avista has indicated the same network, will be used in the Avista pilot Smart Grid project for Pullman.[4]

The DAN will deliver 24x7, real time communications between substation controllers and grid devices including reclosers, switches and faulted circuit indicators. Avista will be able to quickly pinpoint faults in its distribution network, significantly improving system reliability. Fault location

[3] Tropos Press Release, "Avista Selects Tropos GridCom Network for Spokane Smart Grid Project", April 6, 2010; http://www.businesswire.com/portal/site/home/permalink/?ndmViewId=news_view&newsId=20100406005720&newsLang=en

[4] The Spokesman Review, "Avista selects open-standards wireless system for smart grid communications in Spokane" April 6, 2010; http://www.spokesman.com/blogs/officehours/2010/apr/06/avista-selects-open-source-wireless-system-smart-grid-deployment-spokane/

and isolation in distribution feeder lines in the Spokane area has always been problematic and time consuming – often resulting in extended outage times. The DAN will enable distribution automation devices to report the location of faults and gives the utility the ability to dispatch line crews to the site faster.

Avista chose the Tropos GridCom wireless distribution area network based upon its open standards-based, scalable architecture; its multi-layer security; high reliability; and centralized management. It provides a solid foundation upon which they can build additional applications such as AMI, demand response, distributed generation, plug-in hybrid electric vehicles and other smart grid applications in the future.

The Spokane Smart Circuits Project received the largest matching grant in Washington State from the Department of Energy, totaling $20 million. Avista will contribute $22 million for a total planned project investment of $42 million. The overall project includes the deployment of a distribution management system, intelligent end devices and a communications network along 59 distribution circuits and 14 substations, benefiting more than 110,000 electric customers.

Glendale Water & Power

Glendale Water & Power (GWP) is a municipal power and water utility serving the community of Glendale, California. The utility provides water to 32,500 customers. It also generates, transmits, and distributes electricity to 89,500 residential, commercial, and industrial customers. GWP selected Tropos' GridCom wireless broadband mesh network system for its Smart Grid Initiative as the private distribution area network (DAN), delivering high-speed communications between the utility, utility applications and utility customers.

The smart meter portion of GWP's Smart Grid Initiative includes replacement of 84,500 electric and 33,400 water meters with smart meters. GWP's DAN will provide ubiquitous wireless communications across the utility's 30 square mile service area, connecting the meters to the utility's core network for centralized monitoring and management

"The high throughput, extremely low latency and network security features of the Tropos network enables it to provide secure communications for multiple Smart Grid applications," said Craig Kuennen, GWP Project Sponsor. "It will enable us to extend the system way beyond meter reading and help us build our vision of Glendale's Smart Grid – a power system which can automatically balance power supply and demand, conserve and optimize resources, reduce our carbon footprint, and reduce cost for our customers."[5]

Investments in GWP's Smart Grid Initiative total $51 million, $20 million of which is being funded by the U.S. Department of Energy (DOE) under the American Recovery and Reinvestment Act. The DOE Smart Grid funding has enabled GWP to accelerate its implementation and expand the project scope which will eventually include other Smart Grid applications such as distribution automation and power outage management.

Rock Hill, South Carolina

The City of Rock Hill selected the installation of a Tropos wireless broadband network as part of a strategic plan that included building a citywide network foundation that would be cost-effectively leveraged by city departments, including the municipal utility for smart grid applications. Today

---

[5] Joint Press Release – Tropos Networks and Glendale Water & Power, "Glendale Water and Power Selects Tropos GridCom for Smart Grid Initiative", April 14, 2010; http://www.businesswire.com/portal/site/home/permalink/?ndmViewId=news_view&newsId=20100414005578&newsLang=en

the network is used by virtually all city departments and facilities and has resulted in resource conservation, improved customer service, and comprehensive internal efficiencies.[6]

Lompoc, California

Lompoc, a city of 41,000 residents, initially selected a Tropos wireless broadband network in to provide unserved and underserved residents with Internet access services. Since rollout of the network, the municipal utility in Lompoc has decided to leverage the same network foundation for communications and is in the process of installing smart power and water meters to approximately 15,000 households.[7]

Communication Network Requirements for Distribution Area Networks

Tropos has reviewed and responded to Request for Information (RFIs) related to distribution area communication networks for smart grids from multiple IOU and MOU utilities across the United States. As these documents are not public information, below is a compilation of requirements identified by these utilities.

Multiple applications and subsystems can utilize a single distribution area network infrastructure making it important that a utility to take a strategy approach in its design. The DAN technology selected should take into account the communications requirements of all the applications that will utilize the network for communications rather than taking a piecemeal approach and identifying communication requirements for each individual applications which can result in significant duplication of efforts and higher operational and capital expenses. Different vendors should be supportable over a single distribution area network infrastructure through the use of standards-based interconnections (e.g., 802.11 or 802.3 Ethernet) at the system interfaces. This flexible approach allows the utility to select vendors for individual applications while consistently leveraging their communications infrastructure investment. The network must support bidirectional communications enabling data flow in both directions.

Standards-based – To ensure interoperability between the multiple networks, systems and applications that comprise the smart grid, industry standards for communications are a fundamental requirement and National Institute of Standards and Technology (NIST) has been assigned responsibility to coordinate development of a framework that includes protocols and model standards for information management to achieve interoperability of Smart Grid devices and systems. NIST will be working with existing standards bodies including ANSI, IEEE, IEC, etc.

"Standards are critical to enabling interoperable systems and components. Mature, robust standards are the foundation of mass markets for the millions of components that will have a role in the future Smart Grid. Standards enable innovation where components may be constructed by thousands of companies. They also enable consistency in systems management and maintenance over the life cycles of components."[8]

Resilient and fault-tolerant - The DAN with multiple critical applications relying on it for communications should provide 99.999% reliability. To meet this stringent reliability metric, the solution must be architected for high resiliency with multiple redundant communications pathways along with the ability to automatically reroute traffic around failures without disruption in service -- no single point of failure. In addition, the ability to leverage multiple radio frequency bands (e.g.,2.4 GHz and 5 GHz) and to failover between them helps ensure that localized interference on any one frequency band can be routed around. Automated recovery of each network node in

[6] See Tropos Networks Comments to Federal Communications Commission, NPB Public Notice #7 Docket Nos. 09-47, 09-51, 09-137, regarding National Broadband, filed on Nov. 6, 2009, http://fjallfoss.fcc.gov/ecfs/document/view?id=7020247050

[7] IBID

[8] NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 1.0, http://www.nist.gov/public_affairs/releases/upload/smartgrid_interoperability_final.pdf

the event of power loss is a requirement to ensure communications continues. Dynamic RF channel selection, adaptive noise immunity and other advanced RF resource management techniques are proven be useful to add resiliency to the network.

A wireless network such as commonly used for DANs can be affected by environmental and changes in radio frequency (RF) or interference. The technology should be interference-resistant and be able to self-recover with any changes so that operations reliably continue.

As the wireless network nodes are hung outdoors, they need to be capable of withstanding harsh weather conditions – cold, heat, moisture, salt air, etc.

Broad coverage – In many cases, a utility's footprint covers very large geographic areas, often several thousands of square miles and the utility needs to provide coverage throughout their service territory.[9] As stated in a recent PG&E presentation, 85% of PG&E's customers reside within 10% of their coverage area but, since the utility is required to provide 100% coverage, the remaining 15% of their customers (and the economics associated with serving them) drive the networking technology decisions. DAN solutions need to be scalable to provide adequate coverage in the diverse areas the utility needs to cover from sparsely populated to suburban and highly populated and dense urban areas.

The following example from a private broadband mesh network of a Middle Eastern utility, which provides an example of a large coverage area and some of the applications deployed.

The network covers over 5,000 square kilometers and comprises over 3,000 mesh nodes servicing a wide range of utility applications including water and electric AMR/AMI, street lighting control, mobile broadband for field workers, remote SCADA control and security monitoring for distribution and transmission assets. When the meter rollout is completed, there will be 1.4 million meters on the network, in addition to 750,000 street lights and 5,000 control cabinets as part of the street lighting control project. 2,100 utility vehicles and 7,200 field workers will have mobile access to the network. Video surveillance and monitoring will also be deployed to monitor critical facilities including substations.

Scalable – A DAN needs to be able to scale as the utility expands and population density changes, new power lines are added, etc. A DAN network architecture should be flexible enough such that communications network capacity and coverage area can easily be added such that it is not disruptive to the rest of the network as modifications are being made, and seamlessly integrates.

Millisecond latency – RANs need to support end-to-end latencies (round-trip message time) less than a single 60 Hz cycle (<17 milliseconds) to meet the requirement of some smart grid applications such as Distribution Automation. Distribution automation applications require responses times from a few seconds down to a few milliseconds depending on the specific application and location within the distribution network. An example of such a critical distribution automation device that requires low latency is circuit reclosers. Reclosers are used to sense overcurrent and interrupt fault currents and then automatically restore service after momentary outages. The recloser needs to be able to take quick action to avoid more serious outages hence the need for response time in milliseconds.

In addition, utility field workforces employing bandwidth-intensive productivity application such as mobile GIS, need a communications network that provides high capacity two-way communications and support seamless mobility for standards-based wireless devices.[10]

---

[9] See Tropos Networks Comments to Federal Communications Commission, NPB Public Notice #2 Docket Nos. 09-47, 09-51, and 09-137, filed on Oct. 2, 2009, http://fjallfoss.fcc.gov/ecfs/document/view?id=7020040355

[10] See Tropos Networks Comments to Federal Communications Commission, NPB Public Notice #2 Docket Nos. 09-47, 09-51, and 09-137; filed on Oct. 2, 2009, http://fjallfoss.fcc.gov/ecfs/document/view?id=7020040355

Security – Smart grids will include millions of new endpoints, applications and systems and will include massive amounts of data including customer information as well as data critical to the operation of the smart grid infrastructure.[11] The National Institute of Standards and Technology (NIST) has acknowledged the critical nature of security for the smart grid and has established the Cyber Security Working Group (SGIP–CSWG)[12] which is tasked with developing a comprehensive set of cyber security requirements for end-to-end smart grid communications. All communication networks, devices, and applications will have a role in ensuring the security of the smart grid.

High capacity - A DAN aggregates traffic for multiple applications and needs to provide broadband capacity in the megabits-per-second of data range. Utilities should consider capacity for both current and future applications to ensure the technology selected will meet their needs. Somewhere in the range of 1-10 Mbps of throughput capacity is typically specified.

Application QoS – As a DAN aggregates communications for multiple applications, the ability to prioritize traffic based upon application is necessary. Some applications are more critical and time sensitive and therefore should receive a higher priority relative to more delay-insensitive communications such as metering data. A DAN solution should utilize industry standards-based QoS standards such as IETF (DiffServ) and IEEE (802.11e, 802.1p, 802.1q).

Mobility support - The DAN needs to support utility mobile workforce applications such as field reporting, scheduling, GIS, and many others. To do this, the DAN needs to support broad coverage and seamless mobility as well as the ability for workers to utilize off-the-shelf devices and technologies to access the network such as 802.11-based devices.

Control – The utility needs to have end-to-end visibility and control in near real-time to the entire network and all network connected devices. Geographical location and mapping of all network nodes and network connected devices is also necessary for asset management and fast pinpointing of problems. Network management technology should be compliant with industry standard SNMP for consolidation of information, reports, alerts, etc. Firmware and software upgrades should be centrally managed and pushed out while ensuring integrity and coordination of the update without compromise to service availability. Centralized system event logs and alert management is needed for problem identification and troubleshooting.

Cost-effective – In addition to finding technologies that meet the requirements of multiple smart grid applications that utilize a DAN, utilities will consider the business model to ensure it's cost effective to acquire and operate over the life of the network.

5) What are the technology options for smart grid and other utility communications?

Smart grid communications networks will be comprised of multiple layers and with varying technologies applicable at each. The table below compares many of the public and private technologies typically considered for smart grid communications.

---

[11] See Tropos Networks Comments to Federal Communications Commission, NPB Public Notice #2 Docket Nos. 09-47, 09-51, and 09-137; filed on Oct. 2, 2009, http://fjallfoss.fcc.gov/ecfs/document/view?id=7020040355

[12] Smart Grid Cyber Security Strategy and Requirements, http://csrc.nist.gov/publications/drafts/nistir-7628/draft-nistir-7628_2nd-public-draft.pdf

Relative Comparison of Smart Grid Communications[13]

	Technology	Bandwidth	Latency (Amount / Variability)	Reliability	Security
Public	**Leased Lines**	Low	Low / Low	Medium – High	Medium
	Wired Broadband	Medium - High	Low / Low	Medium	Medium
	2G/3G Cellular	Low	Medium / Medium	Medium	Medium
	4G Cellular	Medium - High	Medium / Medium	Medium – High	Medium
Private	**Private Fiber**	High	Low / Low	High	High
	Narrowband PLC	Low	Medium / Medium	Medium	Medium
	BPL	Medium - High	Medium / Medium	Medium	High
	RF Mesh	Low	High / High	Medium	Medium
	Metro WiFi Mesh	Medium - High	Medium / High	Medium – High	High
	Private RF Pt-to-MPt	Low	Medium / Medium	Medium	High
	Private WiMAX	Medium - High	Medium / Medium	Medium	High
	VSAT Satellite	Low-Medium-High	High / Medium	Medium – High	High

(Source: Pike Research)

6) 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?

As utilities define their communications strategy for the smart grid, they should consider upfront the communication requirements of as many of their smart grid applications as possible that will connect in at each layer. Why is this important? If you build a network that's designed specifically for just the first application you deploy you will have built a network that is unlikely to meet the requirements of additional applications that might have shared the same infrastructure. Without an upfront communications strategy, utilities run the risk of higher costs (CAPEX/OPEX), increased the complexity of managing the network, and possibly reduced overall network reliability and operational efficiencies.

[13] Pike Research report, "Smart Grid Networking and Communications", July 2010. Pike Research is a market research and consulting firm that provides in-depth analysis of global clean technology markets based upon primary research. http://www.pikeresearch.com/

Exelon[14]

At the UTC Telecom 2010 Conference, Doug McGinnis, Principal Smart Grid Communications Architect for Exelon presented the following information related to their smart grid communications plans.

"The Smart Grid Communications Vision is to provide a secure tiered, robust, deterministic communications architecture with adequate capacity to meet the current and foreseeable future capacity and performance requirements of the Smart Grid Application Portfolio."

Exelon Communication Design Principles

Security – robust end-to-end aligned with industry best practices

Converged Communications – Smart Grid applications will share a converged shared communications infrastructure but will be logically isolated

Interoperable – Industry standard open protocols

Privately Owned Communications – enables Exelon to maintain governance and control over all aspects of the technology

No Unanalyzed Single Points of Failure (self-healing)

Maintenance Management & Monitoring – inherent to the communication architecture is communications maintenance management and monitoring

Defined Standards – Architectural design standards to embody and enumerate the details of the fundamental design principles

*Lower Colorado River Authority (*LCRA)[15]

At the UTC Telecom 2010 Conference, Jimmy Don Havins, Manager-Telecommunications, LCRA, presented as to why private radio systems are part of LCRA's communications strategy and how they their private network is effectively used by a number of organizations:

[14] Exelon has one of the industry's largest portfolios of electricity generation capacity, with a nationwide reach and strong positions in the Midwest and Mid-Atlantic. It is the largest owner/operator of nuclear plants in the United States. Exelon delivers electricity to approximately 5.4 million customers in northern Illinois via ComEd and southeastern Pennsylvania via PECO, as well as natural gas to 486,000 customers in the Philadelphia area via PECO. http://www.exeloncorp.com/Pages/home.aspx

[15] LCRA supplies low-cost electricity for Central Texas, manages water supplies and floods in the lower Colorado River basin, develops water and wastewater utilities, provides public parks, and supports community and economic development in 58 Texas counties. http://www.lcra.org/

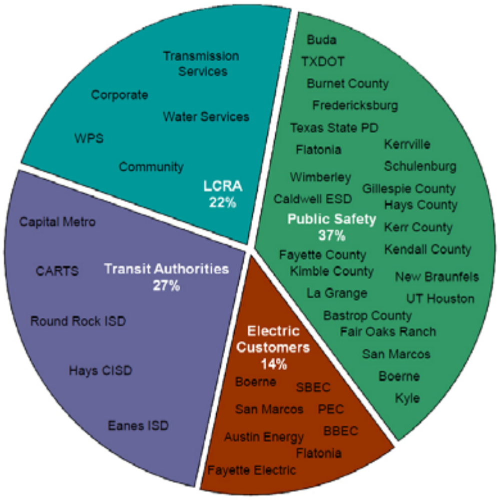

Figure 2: LCRA Shared Private Network (Source: LCRA)

For LCRA, communications is considered a critical element in meeting their mission of supplying low-cost electricity to their customers.

Below are the reasons LCRA sited as to why they selected a private radio network for communications:

Reliability – A multi-use network afford more reliable technologies the utility would not be able to afford on their own and benefits all constituencies

Coverage – Advantage of larger footprint affordable by partnering with external customers (public safety agencies, transportation companies, wholesale electric customers, school districts)

Emergency Response – Critical agencies can communicate with each other during emergencies improving response time and service to the community

Accessibility – Multi-use network lowers cost of operating and maintaining network by providing more funding for its support

7) To what extent can existing commercial networks satisfy the utilities; communications needs?

A survey of 20 utilities conducted by Pacific Crest Mosaic[16] regarding smart grid communications technology preferences was conducted July 1 – July 23, 2009. All of the utilities identified private communications networks as their preferred choice for smart grid deployments.

Key reasons utilities highlight as to why the preference for private networks are:

Resiliency – With a private network, a utility can control what and where they want to build-in communication system redundancy.

[16] Utility survey about smart grid communications technologies conducted by Pacific Crest Mosaic, http://www.smartgridnews.com/artman/publish/Technologies_Communications_News/Mesh-Networks-Is-Communications-Winner-in-Utility-Survey_printer.html

Reliability – With a private network, a utility can measure and control end-to-end system reliability.

Control and Visibility – With a private network, a utility has fast visibility into problems and can quickly respond to make appropriate corrections themselves. In addition, a utility can prioritize applications over the network so more critical ones such as distribution automation take priority over lower priority ones such as meter reading, providing better grid stability and reliability.

Cost – Deploying a private network will provide the utility with substantial cost savings and provide them with a foundation to add additional applications without incurring additional fees per endpoint, application, or bandwidth used.

Coverage - With a private network, the utility decides where, when, and how much bandwidth they need to best service customers and deliver the level of reliability needed.

Security – A private network assures that utility communications remain private as the network is not shared by the general public. While privatization of wireless communications alone does not guarantee security, it does provide another layer of protection for the grid.

Pike Research[17]

"Pike Research has found that most of the utilities interviewed use, and planned to increase use of, private network technologies in their communications deployments for the smart grid. The reasons for not using existing public network technologies most often cited include:

- Most existing telecommunications technologies do not (yet) have assured 100% coverage over the grid (especially meter) deployment footprint.
- For meter and/or home-based networks, not all customers, especially those who may be economically disadvantaged, have access to typical telecommunications connections (such as broadband).
- Direct use of a consumer's telecommunications connection (broadband DSL, cable, and so on) would raise issues of who is responsible for paying for used bandwidth, and assuring reliable access (everything beyond the basic modem is usually customer-owned and managed, and therefore cannot be assured).
- Telecom technologies are evolving faster than desired for metering deployment cycles, and therefore utilities fear forced, accelerated hardware upgrade cycles.
- These technologies often carry higher costs, both for initial installation and more important, recurring operating charges.
- Telecom companies often cannot articulate the operational guarantees (security, reliability, guaranteed access, control) required by utilities, especially under adverse conditions.
- A (sometimes vague) desire by the utilities for full ownership and control of all aspects of the grid, including communications.
- Often, the regulatory cost-recovery framework favors capital expenditures by the utility versus ongoing operating costs, favoring network build-outs and self-management, even if outsourcing the communications would be lower in cost over the long-term."

[17] Pike Research report, "Smart Grid Networking and Communications", July 2010. Pike Research is a market research and consulting firm that provides in-depth analysis of global clean technology markets based upon primary research. http://www.pikeresearch.com/

Southern Company
Southern Company came to the conclusion that utilities build utility-grade networks that provide substantially higher levels of reliability than public networks. Southern Company, an Atlanta-based IOU servicing 4.4 million customers, filed a formal recommendation with the FCC on February 5th, 2010[18], related to the development of the National Broadband Plan and specifically about Smart Grid communication technologies. In the filing, Southern compares the performance of commercial cellular networks post Hurricane Katrina with that of its wholly owned subsidiary, Southern LINC Wireless. The primary focus of Southern LINC Wireless is to deliver reliable communications for utility operations; secondarily it offers commercial wireless service.

SouthernLINC's network was designed to meet utility-grade standards for network reliability with multi-level redundancy and back-up power built into the design…attributes not designed into typical commercial cellular communications networks. Why? Fundamentally building in this layer of protection is more costly and incompatible with public network business plans. An industry study referenced in the filing states "…such construction would be cost-prohibitive for a commercial system."

Some additional highlights from the Southern filing …within three days of Katrina making landfall, SouthernLINC had restored 98 percent of its operations. USA Today reported on October 10, 2005, that "for the first 72 hours, [SouthernLINC Wireless] radios were virtually the only way to communicate on Mississippi's Gulf Coast." A week post-Katrina, other commercial cellular carriers were still hampered by extensive loss of service in many areas. Even two weeks later, public cellular services were not restored in many areas.

Public Comments on Public vs Private Network Use by Utilities
In a separate statement from a DOE roundtable discussion held as part of DOE's RFI on utility communication needs, Southern Company CIO Becky Blalock stated her company needs to work more closely with technology partners. "One of the concerns I have is that we can't do everything ourselves and we need partners." But, the real question when it comes to telecom providers is reliability. "The reliability standards that utilities operate under are much more stringent than those for public carriers," she said.[19]

Vermont Electric Power Co. and Vermont Electric Cooperative said their smart grid needs are satisfied by regional grid reliability policies. Commercial communications companies aren't up to the task. "A private communication network will better serve the requirements of the power grid and smart grid applications," they said.[20]

Donato Cortez, VP CenterPoint Energy wrote, "We believe that a private exclusive licensed broadband wireless system meets the needs for reliable Smart Grid Applications. Commercial wireless networks for smart grid data are not an option for the company, which is in the process of installing 2.2 million smart electric meters in its territory."[21]

---

[18] Southern Company's formal recommendation (GN Docket Nos. 09-47, 09-51, 09-137) filed with the FCC dated February 5th, 2010, "A National Broadband Plan for Our Future: Implementation of Smart Grid Technology"; http://fjallfoss.fcc.gov/ecfs/document/view?id=7020386029

[19] UTC Industry Intelligence Newsletter, June 17, 2010, **"**DOE Roundtable: More Productive Dialog Needed on Utility Communications Needs"

[20] **"**GRID: Anxiety builds among utilities over the communications part of 'smart' grid**"** ClimateWire, 05/25/2010; http://www.eenews.net/public/climatewire/2010/05/25/1

[21] "Anxiety builds among utilities over the communications part of 'smart grid'", ClimateWire, 5/25/10; http://www.eenews.net/public/climatewire/2010/05/25/1

Doug McGinnis, Principal Smart Grid Communications Architect for Exelon, highlighted "Privately Owned Communications" as one of their smart grid communication design principles at the UTC Telecom 2010 Conference. In his conference slides it states "privately owned communications enables Exelon to maintain governance and control over all aspects of the technology."

9) As the Smart Grid grows and expands, how do the electric utilities foresee their communications requirements as growing and adapting long with the expansion of Smart Grid Applications?

Most smart grid rollouts by utilities involve the integration of multiple systems, applications, and end points and will take place over multiple years. Communication networks for smart grids therefore will inevitably evolve over time. The smart grid communications network is a strategic decision as utilities will need to determine the requirements of current systems, applications and end points as well as those out into the future. In order to build such a set of requirements, they will consider the following attributes in evaluating technologies and vendors:

- Standards-based
- Scalability
- Manageable
- Controllable
- Field-proven track record

_________/s/________

Tom Ayers
President and CEO
Tropos Networks
555 Del Rey Avenue
Sunnyvale, CA 94085
(408) 331-6811
(408) 331-6530 (fax)

Dated: July 12, 2010