Before the
Department of Energy
Washington, D.C. 20585

In the Matter of	)
	)
Implementing the National Broadband	)
Plan by Studying the Communications	)
Requirements of Electric Utilities To	)
Inform Federal Smart Grid Policy	)

NBP RFI: Communications Requirements

COMMENTS OF AVISTA CORPORATION

I. Introduction

Founded in 1889, Avista engages in energy production, transmission and distribution, as well as other energy-related activities.

An investor-owned utility (New York Stock Exchange ticker symbol: AVA) with annual revenues of more than $1.5 billion, Avista provides electric service to 356,000 customers and natural gas to 316,000 customers in a service territory of more than 30,000 square miles.

We serve those customers with a mix of hydro, natural gas, coal, biomass, wind and other generation delivered over 2,600 miles of transmission line, 17,800 miles of distribution lines and 7,600 miles of natural gas distribution mains.

Avista is headquartered in Spokane, Washington, and our nearly 1,600 employees work in four western states advancing our company's five strategic priorities: operational excellence, responsible resource mix, customer orientation, environmental stewardship and community partnership.

II. Current and Future Communication Needs

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?

Avista utilizes a combination of private internal communications systems and commercial communication systems in order to support our System Operations, Emergency Response, and Business Enterprise components.

The private internal systems employ fiber-optic and microwave transport, SONET, Ethernet, and Power Line Carrier technologies among others. The commercial systems used are leased TDM, 4-wire analog, 2-wire phone, GPRS, CDMA, and MPLS over local loop among others.

Avista is the recipient of two smart grid grants under ARRA funding. Our Smart Grid Investment Grant (SGIG) project seeks to build out a DA network throughout metropolitan Spokane, WA. This project requires an extensive build-out of communications networks overlaying our electrical distribution infrastructure – monitoring and controlling an estimated 400 endpoints. Our Smart Grid Demonstration Project (SGDP) seeks to build out a similar DA network throughout Pullman, WA and neighboring vicinity. There is also an AMI overlay, as well as enhanced voltage and fault monitoring on the electrical distribution infrastructure – monitoring and/or controlling an estimated 21,000 endpoints.

Avista faces challenges in its existing communications networks. A primary concern is adequately covering its service territory (30,000+ square miles). In order to accommodate voice communication needs and meet FCC narrow-banding requirements, an extensive multi-year project is underway that includes over 20 sites being converted to new spectrum. In order to accommodate voice and operational communication needs to its more than 200 distribution and transmission substations, Avista employs a combination of private and carrier solutions. Challenges encountered with carrier solutions include lack of coverage, costs associated with accessing high-voltage locations, accessibility of sites for carrier repair and troubleshooting, hardening of carrier equipment to utility specifications, and service offerings, among others.

Avista faces challenges with its proposed communications networks purposed for our smart grid initiatives. The challenges are similar to those encountered in our existing networks: wide-area coverage, scalable solutions not prone to interference with existing systems, hardening of equipment to utility specifications, and low-cost options to address an exploding number of applicable endpoints, among others.

III. Basic Requirements

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

Avista's communication system in general has a number of functional requirements before smart grid applications are taken into consideration. These include reliable operation during power failures, dedicated 12.5 kHz spectrum for land mobile radio, licensed long-haul microwave transport, high-speed fiber optic networks with sub-50ms protection switching times and end-to-end latencies of less than ¼ of a power cycle. Avista has a need for ubiquitous coverage throughout a largely rural service territory with reliable network configurations employing physical and logical redundancy for critical applications.

I. Additional Considerations

What are other additional considerations (*e.g.* terrain, foliage, customer density and size of service territory)?

As previously mentioned, Avista is challenged in addressing coverage throughout its service territory for an increasing number of applications endpoints. Additionally, Avista's service territory has a number of diverse terrain features ranging from mountains, forests, waterways, to plains and river canyons. Typical customer density does not position Avista advantageously for highly-meshed and redundant communications infrastructure. The distribution of customers skews our electric grid infrastructure toward a highly radial configuration. Weather within our service territory can experience extreme conditions on both ends of the spectrum with significant wind, ice, snow, and fire events all within the realm of possibility.

II. Use Cases for Various Communication Needs

What are the use cases for various smart grid applications and other communications needs?

Avista's use cases for various smart grid applications can be summarized according to the following industry-wide approximations:

Application	Functional Requirements					
	Security	Bandwidth (kbps)	Reliability (%)	Coverage (%)	Latency (ms)	Back-up Power (hrs)
AMI	High	14-100 per node	99.0-99.99	90-100	2000	0-4
Distributed Generation	High	9.6-56	99.0-99.99	90-100	300-2000	0-1
In-home displays	High	9.6-56	99.0-99.99	100	300-2000	0-1
Automated feeder switching	High	9.6-56	99.0-99.99	100	300-2000	0-1
Capacitor bank control	High	9.6-100	96.0-99.00	90	500-2000	0
Fault current indicator	High	9.6	99.00-99.999	90	500-2000	0
Transformer Monitoring	High	56	99.00-99.999	90	500-2000	0
Voltage and current monitoring	High	56 – 100	99.00-99.999	100	2000-5000	0-8
Network protection monitoring	High	56 – 100	99.00-99.999	100	2000-5000	0-8
AMI network management	High	56 – 100	99.00	100	1000-2000	0-4
Remote connect/disconnect	High	56 – 100	99.00	100	2000-5000	0
Meter data management	High	56	99.00	100	2000	0
Distribution Asset Management	High	56	99.00	100	2000	0
Outage management	High	56	99.00	100	2000	0
Demand response	High	56	99.00	100	2000	0
Synchrophasors	High	600 – 1500	99.999-99.9999	100	<200	24
Line protection and control	High	600 – 1500	99.999 – 99.9999	100	8-200	24-72
Billing	High	56	99.00	100	2000	0
Customer information management	High	1544	99.00	100	40-65	0
Customer web portal	High	56	99.00	100	2000	0
Emergency response	High	45-250	99.99	95	500	72
Routine dispatch	High	9.6-64	99.99	95	500	72
Workforce automation	High	256 -1024	99.90	90	500	8

III. Technology Options

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

Avista’s technology options under consideration for smart grid applications include, but are not limited to, unlicensed mesh radio, fiber-optic transport, CWDM, MPLS, and commercial wireless (CDMA and GPRS). Some disadvantages of these networks can be cost, lack of wider-area coverage, and reliability.

Avista’s network architecture will dictate the appropriateness of various considered technologies according to the following proposed framework:

Enterprise Core: the core infrastructure consisting of the utility data center and data processing infrastructure. This is architected using self-healing rings with full DR capabilities. Facilities include business offices and integral substations.

Backhaul Distribution: the distribution tier will aggregate field network devices such as metering collectors, RF access points, data concentrators and provide access to the enterprise core. This is architected in distributed configurations using wired and predominantly wireless technologies. Facilities include distribution poles and substations.

Premise Networks: these are the endpoint devices, typically meters or HAN access points. This is architected using predominantly wireless technology. Facilities will typically be the customer premise.

IV. Recommendations for Requirements

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?

Avista's recommendations for meeting current and future requirements are again tied to the following framework:

Enterprise Core: the core infrastructure needs high capacity, reliable communications with low latency. It should be highly redundant and tied to enforceable SLAs that ensure high availability and prioritization of critical application traffic.

Backhaul Distribution: the distribution tier needs a highly scalable communications technology that allows for the most ubiquitous coverage throughout a wide range of operating conditions. It should redundant and tied to enforceable SLAs that ensure high availability and prioritization of critical application traffic. It should allow for flexible deployments with minimal registration requirements or interference concerns.

Premise Networks: this tier needs low throughput unlicensed wireless mesh technologies for short and long range communications. This tier also contains a tremendous number of endpoints, so minimal capital and operating expenses are very important.

V. Commercial systems

To what extent can existing commercial networks satisfy the utilities' communications needs?

a. Do they meet your needs?

Avista's experience with commercial systems has had varying degrees of success. There have been very successful deployments of commercial systems in our Business Enterprise components. Workforce automation employs commercial wireless systems but not without wide-area coverage challenges. Telemetry pilots utilizing commercial wireless systems have experienced challenges both in terms of cost, throughput and wide-area coverage. We have been unable to successfully get commercial wireless systems to prioritize our private traffic within their infrastructure network. Outages and maintenance events are not communicated with the appropriate level of visibility in order for us to migrate critical application traffic to that system.

What, if any, improvements to the commercial networks can be made to satisfy the utilities' communications needs?

b. What improvements would meet your needs?

Avista's deployment of commercial systems in mission-critical applications could be persuaded with the following modifications:

i. Increased Coverage

Avista has an extensive portion of its customer and distribution tiers that are not reachable by convention commercial wireless systems. These gaps of coverage lead to hybridization of networks – increasing maintenance costs and challenging the limited resources available for network operations.

ii. Increased Reliability

Avista's experience with commercial wired and wireless systems has shown that much of the carrier infrastructure is not sufficiently hardened to withstand typical utility operating environments, extreme weather conditions, and independence from AC power. In order to migrate critical applications with operations impact to commercial systems, network resiliency during emergency events must be guaranteed through enforceable SLA.

iii. Traffic Prioritization

Avista's framework ties criticality of application to traffic prioritization. Until SLAs providing this service are made widely available throughout all commercial systems, truly mitigating all risk of network congestion's anomalous effects on application performance, it will be difficult to migrate all application tiers to commercial systems.

iv. Shared Liability

Avista must meet a number of stringent requirements for security and reliability; requirements that include regulatory rules that pose stiff fines for non-compliance. Avista needs contractual provisions to protect against liability from regulatory penalties and legal damages resulting from commercial network outages.

VI. Communication Needs Expanding

As the Smart Grid grows and expands, how do the electric utilities foresee their communications requirements as growing and adapting along with the expansion of Smart Grid applications?

Avista's communications needs for voice and data will increase over the next five years, driven by the sheer volume of data from existing applications as networks are fully deployed and by new applications, driven by new customer expectations and smart grid initiatives, which will be increasingly pervasive across the grid. Avista is beginning to build out our smart grid networks now with target deployment by 2012.

While increasing communications demands can be met in part by new technologies and increased efficiencies, access to additional spectrum could be needed as well. The UTC estimates that at least an additional 30 MHz of spectrum in bands below 2 GHz will be necessary to meet utility communications needs in the next five years. This includes spectrum for both voice and data applications for emergency response communications, as well as smart grid. This spectrum would fill the gap that currently exists at the backhaul layer of the network for wide area, high capacity communications. Much more spectrum may be needed, particularly at the core layer of the network for fixed point-to-point communications to handle gigabit speeds. These spectrum requirements may need to be increased further to account for network redundancies and additional traffic from yet to be developed applications.

Respectfully submitted,

Avista Corporation

_ss____________________

Jacob Reidt, Network Engineering Manager
Avista Corporation
1411 E. Mission Ave
Spokane, WA 99252-0001

July 2, 2010