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 TACOMA PUBLIC UTILITIES
3628 S. 35TH ST. TACOMA WASHINGTON 98419

I. Introduction

a. Identification/description of your company.

Tacoma Public Utilities (TPU) is owned by the City of Tacoma. TPU management reports to a separate Public Utility Board that is accountable to the Tacoma City Council. The Utility comprises three main operating divisions: Water, Power and Rail.

b. Overview of communications networks

i. Tacoma Public Utilities (TPU), operates several Private radio networks. Tacoma Power (TPWR), uses an extensive private Microwave system, a private wide-area VHF land mobile radio system at all Hydro facilities with VHF paging, and a private trunked-900 MHz voice radio system. Tacoma Rail operates a wide-area VHF radio system on licensed Rail frequencies. Tacoma Water (TW), uses a private wide-area VHF simulcast network using four RF tower sites and also a private VHF digital paging system at the main Water Headworks area.

ii. Why private networks?

1. TPU, as a Critical and/or 'First Responder', has significant reliance on licensed private radio communication that cannot be met using commercial carriers. The critical nature of a public utility demands 100% availability, especially during emergencies.

   Additionally, TPU requires immediate, coordinated, and specially trained responses to outages and maintenance, especially during emergencies. TPU maintains very high AC power independence and tertiary redundant power supplies at all sites and includes diesel generators and redundant

backup battery systems. All data paths are fully loop protected, employing both fiber optics and microwave systems with computer controlled automated switching.

The high-reliability nature of TPU cannot tolerate interference, delays, poor or NO access, poor or NO coverage, denials of service, “busies”, competition from other non-essential communications, or any other prioritization. TPU also complies with FERC Requirements for wide-area “*one-to-many*” radio communication for all power switching and dispatching.

Although TPU uses a variety of commercial carriers, several major risks and drawbacks make commercial carriers unsuitable for critical Utility business operations. Common, non-critical, usages for carrier systems include personal and private telephone calls, personal text messaging, limited email access, and limited internet access. TPU also employs carrier systems for non-critical mobile data dispatch sent as a “one-to-one” messaging.

TPU also conducts some non-critical business traffic on a “*one-to-one*” basis. However, there are increasing liabilities and safety issues including driving while texting or operating a cell phone.

The service area of TPU ranges from sea level to several thousand feet elevation, in very tough topography. The service areas are often NOT within coverage areas of carriers, simply because there are limited people living in these areas and no fixed businesses.

In addition to difficult topography, TPU experiences high reduction to radio signals due to dense forestation and losses from evergreen trees. Typical losses for coverages include more than -30 dB in loss for a point-to-multipoint RF path. The losses are much higher at carrier frequencies.

iii. What technologies are used?

1. As indicated above, TPU uses licensed microwave on 6 and 11 GHz, VHF voice radio, and 900 MHz trunked radio. Also, TPU uses licensed digital SCADA radio for telemetry on 450-900 MHz, and VHF digital paging for alarms. TPU uses localized private radio systems to control personnel carriers or “gondolas”, with emergency communications, at hydro plants.
2. Attached to TPU’s VHF simplex private radio system, is a wide-area paging system, accessible from any PSTN phone system. The paging coverage areas often have no commercial coverage and in very rough terrain.

3. TPU also has an in-house cablevision and broadband division with extensive fiber optic cable covering much of the TPU service area. This network also carries critical Protection and Control of substations and generation facilities.

c. Overview smart grid deployment plans

i. Currently, TPU has no clear designs, including RF or backhaul, for smart grid. TPU does however, have a pilot AMR program for testing meters for water users.

ii. **Types of applications and number of devices** N/A

iii. **Timeframe for deployment** N/A

d. Overview of communications requirements For smart grid: unknown

i. Current

ii. Future

e. Assessment of existing networks to meet current and future communications needs

i. Current TPU communications systems are designed to be highly reliable for both fixed data and voice. However, the systems are not designed to operate a wide-area integrated Smart Grid system including meters to hundreds of thousands of homes. Although the TPU fiber network covers much of the service area, RF backhaul and RF to the meter are required, but no frequencies available.

ii. **What are the communications gaps?** Unknown or too difficult to quantify.

iii. **What do you need to fill those gaps?** There are no (or very limited) FCC licensed RF frequencies available to meet TPU's requirements. New private, licensed frequencies are required to expand TPU's communications systems including any AMI/Smart Grid.

f. Commercial services

i. Do they currently meet utility needs?

1. Mission critical applications? No not at all.

2. Non-mission critical applications

a. There are limited non-critical applications used at TPU—only those that can tolerate significant failure, no access, or without any loss or risk to personnel or safety.

ii. How can they be improved? Carrier systems cannot be improved to meet critical Utility requirements.

II. Smart grid and communications requirements today

a. **Detailed description of smart grid applications (e.g. AMI, DA, and DR).** TPU currently has no clear engineering designs for Smart Grid. The decision to risk DA on a new Smart Grid system has not been made, and there are significant in doing so. However, TPU recently initiated a new SmartGrid section within TPU that consists of professional staff who are

SME's in Communications Engineering, System Maintenance, Energy Management Systems, AMI, Utility Business Systems, and Workstation Support. The section is sponsoring an RFP to guide a SmartGrid implementation plan that will be implemented through 2013.

   i. **Describe the types of applications, the extent of their deployment and whether they are mission critical.**

b. Functional requirements needed to support those smart grid applications.

   i. What are your specific requirements with regard to cost, Coverage, Capacity (Bandwidth), Latency, Reliability, Back-up power (AC Independence), and Security for each of these applications?

III. Smart grid and communications requirements of tomorrow

a. Detailed description of future smart grid applications

   i. **Describe the types of applications, the extent of their deployment, and whether they are mission critical.**

b. Functional requirements needed to support those smart grid applications.

   i. **What are your specific requirements with regard to cost, Coverage, Capacity (Bandwidth), Latency, Reliability, Back-up power (AC Independence), and Security for each of these applications?**

IV. Technology Options and Other Considerations

a. What technology options are available to meet your needs?

   i. **Wireless**
      1. **Licensed;** primarily all communications need to be private FCC licensed
      2. **Unlicensed;** only used in remote areas for non-critical paths
   ii. **Wireline**
      1. Fiber; TPU utilizes significant private fiber; commercial fiber is cost prohibitive and not as protected
      2. **PLC or other private wireline**

b. What other considerations come into play in terms of choosing a technology option for your utility?

   i. **Terrain, Foliage, Customer Density, Size of Service Territory, Overhead/Underground Grid Topology, etc.**
      1. As noted above, TPU has hugely varied topography, steep mountains, and heavily forested areas. TPU's path requirements, along with these important factors dictate what RF paths are selected; NOT locations of freeways or highly populated areas. The site locations that carriers use are fundamentally contrary to TPU site location requirements**.**

V. Recommendations

a. Based on your functional requirements and applications, what technology options would you prefer to use for your utility?

   i. Current; increased use of FCC licensed private RF frequencies; microwave and LMR, and also private owned fiber cable.

VI. Commercial systems

a. Do they meet your needs? Commercial carriers, by definition, cannot meet critical Utility needs. There is significant document to show the problems with carriers, including the lessons learned from Katrina/Rita and recent earthquakes.

- **Carrier 'stories' and experiences from TPU departments:**

1. One of the primary reason we're not using commercial wireless service is our concern that it won't be available to when it's needed most; the 2001 Nisqually earthquake for example. Multiple wireless carriers were either not working or their systems so congested they were unusable for much of that day. If power and water utilities would have been using commercial networks they would have lost communications. People could have been seriously hurt on work that was in progress and the ability to coordinate/carry out system restoration would have been impossible. As it was, the private radio system they were using was designed, built and maintained to utility industry standards. There was absolutely no interruption of service. Without robust and redundant systems communication systems, dedicated to power and water utility industry, the ability to maintain critical infrastructure will be marginalized.

2. Electrical Line workers install new transmission and distribution power lines; they often install them on top of existing power lines. When a new panel of wires is installed the lower panel is energized. This is an extremely hazardous operation requiring split second coordination using radio communication. Any problem spotted along the path has to be immediately and clearly reported to the ends points so the machinery pulling wire and machinery paying out wire can be stopped at the same time; otherwise equipment will be damaged or someone will be hurt. A private dedicated radio channel is the only communication option available for this operation.

3. In 2002, after months of radio interference to our private radio system, Tacoma Power struggled to get the cellular providers transmitting near our Graham Hill radio site to clear up their interference problems. The cellular carriers, AT&T, Nextel and Verizon wouldn't respond to repeated complaints. In fact it was difficult to even locate their complaint department and once we did there didn't seem to be much concern on their part. Eventually Tacoma Power filed an FCC complaint and hired a consulting firm to supervise the process of identifying the offending interference. The wireless carrier corrected the problem, but only after we spent an extraordinary amount of time and money forcing the issue.

4. We've been dealing with cell phone carriers for fifteen years and its really been a challenge for us. I'm sure anyone who has dealt with the distribution of headsets and their accessories to a fleet of users understands how time consuming, frustrating and wasteful it is. Clearly the commercial networks are focused on trying to capture the next customer and not taking care of their current customers. The light duty consumer grade equipment they provide doesn't hold up well, or they are constantly trying to add new feature to attract new customers. Consequently carriers are constantly changing or replacing equipment. This forces customers to spend more; purchasing and installing new

equipment and or accessories each year. Billing errors for equipment are a constant headache; many times, we just give up trying to correct mistakes because it requires so much time invested.

5. Monday, January 18, 2010 in the morning we noticed we had lost Cell Phone coverage at our Headworks site. Initially our Cell Phone Provider thought it was a problem on our end and I received a call from our Operators asking how to fix it, after some trouble shooting it was found out to be a problem with the Cell Phone Provider. Our Operators filled out two separate service requests. It wasn't until Thursday, January 21, 2010 when we requested service a third time that we finally got some traction on our outage (we never got any word on our original two requests). The initial estimate for the fix was some time Friday, January 22, 2010. Turns out that there was substantial storm damage and the site wasn't up to full operation until Monday February 1, 2010. The damage was caused by a storm we had Saturday and Sunday before the 18th.

   During the outage the office staff was able to rely on their office phones that are routed through our private microwave system. The field staff used our VHF radios to communicate; luckily, there was no Water emergency. As our Headworks site is where we treat our water, if there was any kind of situation of low or untreated water we would have to mobilize our crews down the pipeline to contain and divert the water. Without private radio communications, this would be next to impossible.

   In general, our Cell Phone Service Provider is the only provider in the area that has coverage to our site due to its remoteness. Even though we have some coverage, it is not great coverage. Many of our buildings at the site get no signal inside and up in our Watershed area there is no Cell Phone Coverage. We rely 100% on private VHF radios.

VII. Conclusion

a. There is already years of published documentation and experience regarding the issues when commercial carriers for critical business communications, including poor reliability, poor hardening, competition for access, poor coverage and lack of back systems. It should be understood, that public carriers are not intended to replace dedicated private networks. The risks and experiences from neglecting this fact are numerous, including failures during emergencies, no access during emergencies, lack of coverage, lack of control and maintenance, inability to correctly design coverage to meet Utility needs, poor emergency repair response, and lack of adequate redundant backup systems. There are several good publications regarding the results and efficacy and we need only learn from recent past experiences.
b. TPU strives to provide the most reliable services to the public. Being located in the Pacific Northwest greatly intensifies this challenge. Experience has taught over the years, which best technologies and designs perform under our extreme conditions. Carrier systems augment the total portfolio of communication systems, but only in non-critical roles.

Respectfully submitted,

Tacoma Public Utilities

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