

## **Benefits of the 700 MHz Spectrum**

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Until recently, the electric power industry faced the challenge of incorporating applications and technologies in a complex field infrastructure that was constructed over decades. Utilities today deploy a variety of siloed networks that originally were selected based on a variety of needs. For example, some utilities urgently needed applications, others had budget constraints and many were looking for carriers that could function in remote regions. The field communication networks then became clustered together rather than engineered or architected. The end result is a tangled infrastructure of terrestrial and wireless systems.

Mission-critical processes are measured by their ability to meet uptime and performance requirements, especially with wireless infrastructure deployments. Carrier-grade wireless equipment and 700MHz licensed high-speed spectrum is now available, for the first time, to deploy for communications in many industries. In order to deploy a digital broadband wireless network, spectrum is required. Spectrum can be either unlicensed or licensed. Unlicensed spectrum is available regardless of the application, location or use. Therefore, like any public place, anyone can access it. Licensed spectrum, however, is exclusive to the owner of that spectrum much like owning real estate. The 700 MHz licensed spectrum (versus unlicensed) provides a predictable RF environment protected from external interference, thus improving control over band management, security and speed. In addition, it provides privacy and extraordinary propagation. The broad propagation characteristics reduce the number and height of towers needed, resulting in a more cost-effective deployment.

### The 700 MHz Spectrum

The 700 MHz band is divided into two categories – the lower 700 MHz band and the upper 700 MHz band. The lower band covers 48 MHz and the upper band covers 60

MHz. In 2002, the FCC re-allocated the lower 700 MHz band because it was pushing hard for a switch to digital television. In February 2006, congress approved a budget package that required analog television broadcasters to clear the remaining 700 MHz airwaves by 2009. Of the total 60 MHz from the upper band to be re-allocated, 24 MHz of the spectrum is reserved for public safety. In 2008, the FCC auctioned off the remaining 700 MHz band that will be freed after the transition. Soon, all television stations will switch over to digital this year eliminating the use of analog television releasing a large amount of 700 MHz spectrum.

### The Smart Grid Solution

A main objective when building a wireless network is to establish a dependable communications link between field assets and a central management control system. In many cases, field assets have been deployed over a period that dates back many years. The need for a communication infrastructure that connects these assets to a central management control system is built little by little as pieces are needed, which compounds the problem. Users are then forced to rely upon aging and obsolete technologies which results in few opportunities to build a private, secure and integrated communication system. With the new technologies available for the 700 MHz, it is possible to replace these multiple pieces with a single consolidated platform.

Many companies and municipalities have realized the benefits of using the 700MHz band. It is the choice of the federal government for first responders and now is available for use in SCADA operations for electric utilities to incorporate the industry's most advanced ISM band radio technology and wireless data solutions on a 700 MHz private, licensed and secure communication platform as a single, seamless and integrated "Smart Grid" or "Smart Field" solution. This capability provides electric utilities companies with greater equipment diversity and flexible bandwidth and deployment options. Essentially, it helps untangle the wireless infrastructure outlined above by providing a single communications solution.

Several different industries, including electric power, share the common challenge to incorporate new technologies with the ones that were assembled several years ago. Today, utilities deploy a large variety of siloed networks that were selected for a variety of reasons. The result, however, is multiple bunched communication networks. These networks are extremely difficult to manage and the result is a tangled mess. One of the key ways to clean up the mess is to update an electric grid to a Smart Grid. Some of the benefits that the industry will see from a Smart Grid include less expensive electricity and utilities, more reliable service, a greener environment and improved control and consumption. The success of a company's Smart Grid relies on the ability to leverage the latest applications and devices and to create a platform for future innovations. With a converged, wireless network this is possible. A Smart Grid includes:

- Grid Visualization
  - Secure SCADA / DCS and Telemetry
  - Substation Automation (Last Mile)
  - Distribution Automation
  - AMI / AMR
- Demand Response / Management
- Condition-Based Maintenance
- Physical Security & Access Management
- Fieldforce Empowerment & Mobility
  - Internet
  - VoIP
  - TMR / AVL / GIS
- Governance & Compliance
  - NERC, FERC & EPACT2005

Engineers have seen an increased performance in accuracy, cost and timeliness of designs for new customer facilities. All of these factors lead to an improvement of design in technologies made for the 700 MHz spectrum. Both board level and enclosed radios used in the 700 MHz licensed spectrum provide exceptional performance and versatility in a

small footprint that is ideal for internally mounted applications. These radios also offer a cost-effective solution which allows users to incorporate wireless communications into electric power applications. Additional benefits of using a wireless radio in the 700 MHz spectrum include having a private, secure network with advanced, reliable and robust radio communication technology.

#### Who benefits directly from a Smart Grid?

- Consumers benefit from a Smart Grid. The results of deployment include: less expensive electricity, advanced reliability of service, quicker outage management, greener environment and improved control and consumption choices.
- Customer service benefits from a Smart Grid with increased accuracy for meter reading and billing, less call backs due to greater accuracy, identification, and elimination of energy theft and elimination of estimates rather than actual reads.
- When a Smart Grid is implemented in distribution, it will see reduced windshield time/remote turn on/turn off of service; efficient and effective deployment of field resources and reduced O&M; personnel and truck-roll costs; faster outage recovery; improved customer satisfaction; and smarter and less expensive energy.
- Generation and transmission will benefit by cost effectively managing the quality of feedstock as it affects efficiency and emissions. A Smart Grid also results in more reliable dispatching of generation, regulation services and distributed generation, and faster outage recovery. It also will show efficient and effective deployment of field resources, increased resilience and recovery of grid assets, and a basis for improved operations decision making.
- In engineering, the time and effort to design and install new SCADA and RTU equipment is reduced. Accuracy, cost and timeliness of designs for new customer

facilities is improved. It also provides more accurate load forecasting capabilities and improvement in design.

- IT and administration also benefit from a single uniform, standardized and consolidated network infrastructure. The wireless propagation of a Smart Grid minimizes required equipment, interference and cost and maximizes reach and bandwidth. IT and administration also will have more accurate activity-based cost management of field assets and operations, as well as secure, licensed, private spectrum at national economies of scale. Companies will be able to automate broadcasting firmware updates to meters which will make changes in tariffs, improvements in metering algorithms and can save 10,000 man-hours a year for a 500,000 meter utility. The Smart Grid networks includes a managed network operations center (NOC) with 24x7 oversight, which will provide a basis for better infrastructure decision making at a low risk approach.

#### Physical Factors that Contribute to the 700 MHz Value

Additional physical attributes contribute to the superior value of the 700 MHz spectrum, making it an important consideration for wireless radio networks in the utility industry. Signals at this spectrum have better propagation characteristics than higher-frequency signals and also require less power for the same range. A former television frequency, the 700 MHz can penetrate obstacles and foliage with a higher level of success even in the worst environmental conditions. This spectrum also is ideal for rural and dispersed applications due to the fact that it's less dependent on line-of-sight. The FCC also allows higher power limits for 700 MHz than other wireless spectrums. The 700 MHz licensed frequency is not prone to interference from other equipment or broadcasts and also is more resilient to changes in weather conditions and as a managed frequency is unlikely to cause self-interference. According to Arcadian Networks, a provider of wireless carrier services for the energy sector, the 700 MHz has specific additional features that give it an advantage:

- 700 MHz Territory Advantage
  - o Fewer transmission towers to build and maintain

- Fewer right-of-way to secure
- Fewer back haul runs (fiber / microwave) and associated recurring fees
- Coverage for 30 contiguous states
- Fewer assets in the field to maintain and manage
- 700 MHz spectrum reduces the number of base stations needed to broadcast the network—producing more cost savings:
  - Cellular point-to-multipoint and mesh architectures with a 20+ mile range
  - 1,250 square mile coverage per base station enabling cost effective deployments
  - Ideally suited for secure end-to-end commercial and industrial communications from the meter to the control center or for residential meters via a concentrator.
- Licensed 700 MHz Infrastructure Advantages
  - Lower cost antenna and tower builds
  - Lower cost and less vulnerable antenna cable
  - Less vulnerability to lightning strikes
  - Fewer personnel to deploy and maintain
  - Safer field
  - Fewer right-of-way approvals—“easement in the air”
  - Fewer right-of-way requirements
  - Less infrastructure and related costs

### Conclusion

The 700 MHz radio spectrum is a unique value for wireless broadband. Possibly the most significant benefit of having licensed spectrum is that it is exclusive to the spectrum holder. In a way, spectrum is similar to land. If you have and own it, you can keep others from trespassing. The licensed 700 MHz spectrum is exclusive. The result is that the 700 MHz frequency is not prone to interference. Arcadian Networks actually guarantees this and offers attractive SLAs to back it. Licenses for the spectrum are widely available from Arcadian Networks and there are providers that support the 900 MHz, such as

FreeWave Technologies, with wireless communications devices. Spectrum in the 400 MHz band is not nearly as available largely because the spectrum has been available for decades and most of the licenses are already owned or controlled. Many expect the 700 MHz portion of radio spectrum to favorably impact the wireless world. The FCC has called it, “the last beach front property in the wireless world.”

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