

Experimental License Application Justification

AVANGRID is a leading, sustainable energy company with approximately \$36 billion in assets and operations in 24 U.S. states. With headquarters in Orange, Connecticut, AVANGRID has two primary lines of business: Avangrid Networks and Avangrid Renewables. Avangrid Networks owns eight electric and natural gas utilities, serving more than 3.3 million customers in New York and New England. Avangrid Renewables owns and operates a portfolio of renewable energy generation facilities in the United States. AVANGRID employs approximately 6,600 people. AVANGRID supports the U.N.'s Sustainable Development Goals and was named among the World's Most Ethical Companies in 2019 and 2020 by the Ethisphere Institute

Avangrid is committed to the digitalization of the network business, with the evolution of the electrical grid towards the Smart Grid as the most relevant example. Smart Grid services need to rely on an evolved telecommunications infrastructure, blending both public and private, wireless and wireline access telecommunication technologies. Specifically, Private Wireless access technologies are needed in ambitious and pervasive deployment schedules.

I BACKGROUND

Named one of America's best corporate citizens on the 2020 Forbes JUST 100 list, Avangrid is pursuing this experimental license to help further its goal of deploying environmentally friendly energy sources and innovations in the U.S. Avangrid will use the experimental license to test and evaluate the use of a 900 MHz private LTE network to help integrate distributed energy resources—particularly renewable energy resources—into Avangrid's power transmission and distribution systems.

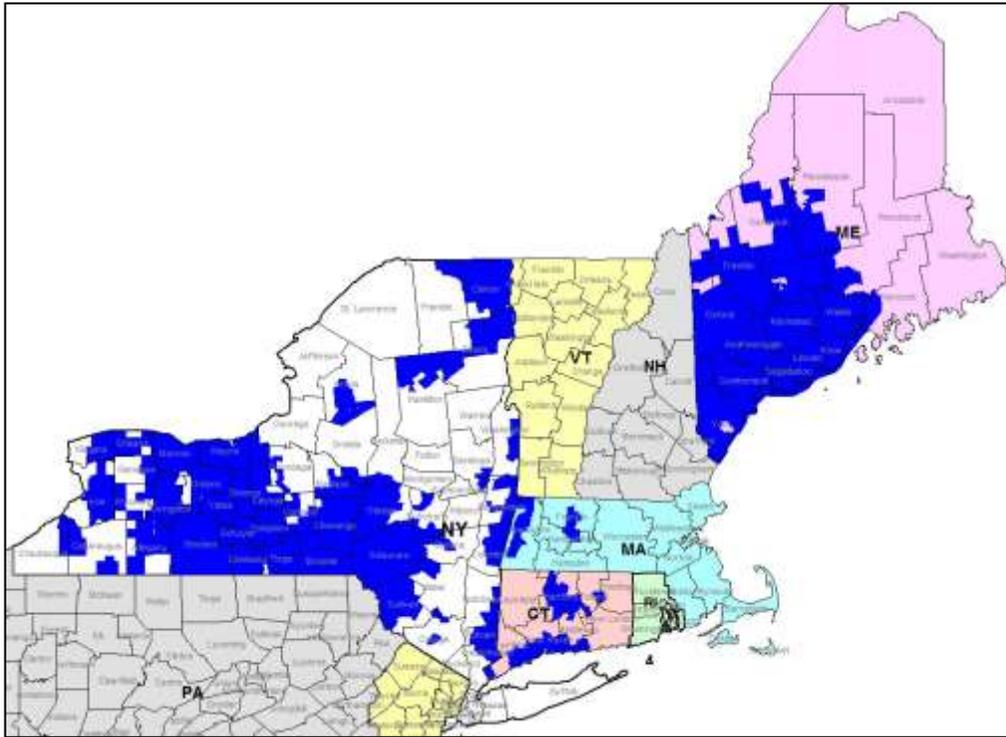
Avangrid has pledged to become carbon neutral by 2035. In order to achieve that goal, we know we must increase our renewable energy reliance, which means strengthening our overall renewable energy ecosystem including power storage and grid modernization. Under this experimental license, we will investigate the performance and resiliency of 900 MHz private LTE for smart grid use cases like source and load management to maintain grid voltages and reduce carbon emissions.

Grids are the evolution of traditional grids, where the ICTs (Information and Communication Technologies) are integrated in electricity assets and processes to improve electricity services. Additionally, ICTs are integrated into Smart Grids to support the new enabling technologies that arise connected to the new uses and applications in the grid including Electric Vehicles, the different Distributed Energy Resources and grid edge technologies in general.

Utilities have always used available technologies. These technologies have evolved from pure electromechanical domain into the ICT world. . In the telecommunications arena, some utilities have developed their own private network in the areas where commercial networks were not available, convenient or fit for purpose. As an example of this, private narrowband wireless (VHF/UHF) networks have traditionally been used by utilities for mission critical applications such as Supervisory Control and Data Acquisition (SCADA), Distribution Automation (DA) and operational voice.

AVANGRID consists of electric and gas franchise operating companies (OPCOs) located throughout the north-eastern portion of the United States. The map below shows the boundaries of the AVANGRID OPCOs in blue shading.

AVANGRID Operating Companies



As the population increases and technology advances, the demand for utilities changes with it. To move utilities forward, a new kind of electric grid is needed. An electrical operations grid that is built for reliability to handle the increasing demand of digital, computerized, and automated equipment.

The last decade has seen extensive advancements in wireless communications. Analog radio systems have been replaced by digital technologies. Narrowband wireless channels (6 - 30 kHz) were primarily deployed for voice communications but also support low-speed data. However, application and throughput requirements have led to nationwide demand for broadband spectrum and its ever-increasing data bandwidth and throughput.

The recent technology advances in broadband wireless communications makes it possible for utility companies to control and monitor large amounts of data associated with their transmission lines, gas lines, generation plants, sub-stations, transformers, meters, etc. Broadband wireless networks can operate over large geographic areas, providing a conduit to move high volumes of critical data without relying on hard-wired point-to-point circuits.

Broadband radio systems, like any other wireless communication system, require frequencies to operate. Most, if not all, of the broadband radio systems in operation today make use of spectrum that was not available a decade ago.

AVANGRID is exploring the potential for a private LTE (PLTE) network in the 900 MHz spectrum in conjunction with, and under, FCC licensing by Anterix to reliably serve critical operational voice and critical operational data needs to meet today's smart grid reliability requirements, as well as future initiatives to reliably transport energy from diverse sources to achieve the renewable energy goals.

A 900 MHz PLTE solution will be evaluated to determine if it is suitable to provide reliable communications for: SCADA, secondary and redundant connectivity for critical operational telephony requirements, electric and gas sensors, control abilities, automation and monitoring, mobile voice, push-to-talk (PTT), workforce mobility solutions, and to meet other essential service delivery requirements. Additional uses may include unmanned aerial vehicle (UAV) inspections of critical assets and other modernization and efficiency initiatives. AVANGRID continues the hardening of grid assets to improve reliable delivery of gas and electric to the public.

With advancements in Smart Grid and "smart" utility technology, a demand for private broadband radio systems in the utility sector has emerged. The newly available spectrum in the 900MHz band allows AVANGRID to deploy a private LTE broadband wireless network providing AVANGRID capabilities and features that commercial broadband radio systems commonly lack.

1. **Hardened Network** - The ability to deploy features, functions and equipment that make the PLTE network reliable and resilient to essential services. This includes related vertical infrastructure, private network core transport, enhanced site-based battery backup, redundant backhaul, security improvements, video surveillance, etc.
2. **Capacity & Coverage** - The ability to efficiently design and deploy a PLTE wireless broadband system with 4G technology provides abilities for meeting challenging coverage and capacity requirements in strategic rural areas needed for the utility network, which is often different from commercial requirements.
3. **Data Security** - The ability to control, monitor and encrypt critical data for NERC CIP compliance without risk as if placed on a public use commercial system.

LTE (Long-Term Evolution) as a wireless technology standard is commonly referred to as 4G (i.e. 4th generation) technologies by commercial carriers.

LTE has become the wireless technology standard most suitable for the private broadband sector.

AVANGRID Grid Modernization projects and goals:

- Distribution and Substation Automation
 - Improved grid resilience and reliability
 - Increase remote outage visibility
 - Faster restoration of critical services
 - Detect
 - Isolate
 - Restore
 - Decrease truck roles, reduce emissions, reduce employee risks
- Increased network optimization
 - Remotely monitor health parameters of grid network elements
 - Proactive preventative maintenance measures
 - Remote management grid system parameters
 - Reduce operational expenses preventatively recognize fatigue or failures of grid equipment
- Integration of Distributed Energy Resources (DER)
 - Solar
 - Wind
 - Hydro
 - Other i.e. digesters

AVANGRID 900 MHZ Private LTE Pilot details.

- **Goals to be evaluated:**
 - Efficiency of 900 MHz broadband spectrum capturing performance characteristics, latency, throughput and packet loss information from remotely deployed field devices
 - Reliability for substation communications redundancy and backhaul
 - Reliability for Distribution Automation communications for SCADA Data transport
 - Area Coverage and penetration Band 8 vs. Band 48
 - Reliability and protection of interference free operations in band 8
 - Ease of integration and deployment of 900 MHz Broadband services
 - Economics of spectrum and Equipment ecosystem
 - end-to-end QoS implementation and traffic prioritization
 - Maximum coverage range (in miles and km) for different traffic profiles) in different scenarios (Urban, Semi urban, Semi Rural, rural)
 - RSRP at cell edge for different traffic profiles in different scenarios (Urban, Semi urban, Semi Rural, rural)
 - Evaluation to support MCPTT applications for PLMR

II REQUEST FOR CONVENTIONAL EXPERIMENTAL RADIO LICENSE

A Purpose of Test

AVANGRID requests a conventional experimental radio license to test LTE equipment on spectrum in the 900 MHz band for the purpose of conducting technical radio research. AVANGRID's research will determine if the use of private broadband service of up to 3 MHz can be deployed on 900 MHz band spectrum using LTE-certified equipment. AVANGRID's internal testing and planning methodology will be utilized in determining if the 900MHz band can support critical operational needs within required capacity and latency parameters for substation SCADA and distribution automation SCADA, AMI backhaul, critical operational voice (PLMR with PLTE backhaul and supplemental elements), and remote monitoring and control applications and use cases in support of electric and gas franchises.

Testing efforts will also confirm whether such operations may be conducted reliably in the 900 MHz band without causing interference to systems operating in adjacent spectrum bands.

The testing will be conducted on 900 MHz channels currently licensed to PDV and are to be assigned for AVANGRID's pilot effort use by PDV upon FCC consent of authorization for an experimental radio license.

The testing efforts will comply with Section 5.84 of the Commission's Rules and will not cause interference to either cochannel or adjacent channel licensees authorized pursuant to the current 900 MHz band plan.

B Technical Parameters of Test

The testing will involve wireless connectivity to devices within this field pilot. Details on the transmitting equipment are provided in the technical sections of this application. It should be noted that this is experimental equipment only to the extent that it has not yet been certified for use on Part 90 spectrum; the models Avangrid plans to test are LTE Band Class 8 equipment that have been deployed worldwide at 900 MHz.

While most of the monitored testing will take place during normal business hours (9AM-5PM), Avangrid anticipates that some data transmissions will occur throughout the 24-hour day. Consistent with the requirements of Rule Section 5.107, system management and monitoring will be supported from Avangrid's Rochester NY office location, except for setup and any equipment adjustments that will be conducted by qualified personnel in Ithaca, Rochester, Newark, and Binghamton NY.

C An estimate of the length of time that will be required to complete the program of experimentation proposed in the application

Avangrid requests a 24-month term for the experimental license for a valid product development trial and to adjust the testing as needed.