World's First LTE Based Wireless Broadband Network for Power Distribution Automation

China Southern Power Grid Chooses Huawei's eLTE for 'Smart Grid' Project

Background
China Southern Power Grid Co., Ltd. (China Southern Power Grid) is a large state-owned enterprise in charge of the investment, construction and management of power transmission, transformation, distribution, etc.

The company wanted to upgrade automatic control of its power distribution network with wireless communications technologies. From mid of 2011, the China Southern Power Grid has started the construction of small-scale wireless smart grid pilot.

Key Challenges
The construction of a power distribution communication network faced the following challenges:

• Unreachable wired network for some areas
• Short-distance wireless communications technology is only suitable for simple business application in a small range, unable to meet the full-service demands of power distribution automation.

Solution
Huawei submitted an ultra-bandwidth wireless automatic distribution communication network according to the service requirements of China Southern Power Grid. This solution is based on 4G eLTE technology, and it was designed to meet the needs of distribution automation, metering automation, and distribution network video surveillance services.

The solution provides the following features:

• High-bandwidth services with wide coverage and large capacity: For base station part, Huawei puts the RRUs on towers and uses multi-antenna technology; as to terminal part, Huawei provides LTE outdoor data collection terminals which can support IP67 protection level, and they can connect with highgain antenna, and offer multiple modes specific to a variety of deployment scenarios. For example, in dense cities where 10 MHz bandwidth is used, Huawei's solution is below:

  - The average throughput of a single carrier can reach 20 Mbps, and coverage radius is as large as 4 km. The solution can satisfy the high-bandwidth transmission requirements of distribution automation and smart metering.
  - A single carrier could support up to 1,200 online users, and the number of online users is up to 10,800 for one cell. The features well meet the requirement of large capacity for smart grid.
  - Minimal access latency for precise control
  - An automatic power distribution system must precisely control the power distribution services. Especially for remote control, the E2E delay should less than 1s. Take the application layer, network management system and other protocols into consideration, the maximum acceptable wireless access latency is 100 ms. To ensure efficient power distribution, Huawei eLTE uses a minimum access latency solution to ensure it is less than 100 ms. Under “live” conditions, downlink access latency does not exceed 11 ms (average 8.8 ms), and uplink access latency does not exceed 59 ms (average 36.9 ms), which fully meets the requirements of mission-critical applications, such as SCADA.
  - Multi-level QoS
  - Different service applications have different priorities. The LTE system centralizes radio resource management to ensure end-to-end Quality of Service (QoS) based on service levels. Huawei's LTE QoS mechanism develops priority strategies for multiple service levels, which ensures that important data, such as remote control data, is transmitted before other services. Huawei combined the LTE QoS mechanisms and power service needs together, and designed the specific priority strategy. The solution could fully support all the services; meanwhile, it can ensure the priority transmission of some important data such as distribution automation remote control data.

Customer Benefits
Huawei's ultra-bandwidth smart grid solution provided three key benefits to the China Southern Power Grid:

• Verified new mode for power distribution network
• Reduced deployment and maintenance costs
• Improved customer satisfaction

Huawei's wireless communication solution improved customer satisfaction by enhancing power supply reliability and delivering optimal services.