Evaluation of Widely Used Wireless Technologies for AMI Applications in Smart Grids

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Smart Grid applications with appropriate communication technologies can bring about improved and efficient energy consumption. The objective of this study was to identify appropriate wireless communication technologies for Advanced Meter Infrastructure (AMI) in Smart Grid applications. Thus far, no technology has been developed specifically for AMI applications and as such, industry is compelled either to use existing technologies or to take necessary action to develop new technologies or to modify existing technologies to suit the needs of AMI. In this study, we have taken an effort to discuss characteristics of AMI applications and then to analyse and justify the suitability and shortcomings of selected wireless communication technologies for AMI Smart Grid applications.

Among many new Smart Grid applications envisaged, AMI applications operate in an environment where appliances in home or office environments connect to a smart meter and the meter concentrator collects data acquired by these smart meters (backhauling) and provide to the Meter Data Management System (MDMS) in the local distribution to monitor the energy consumption of the region.

Firstly, we consider its bandwidth, latency and reliability to identify technologies that have potential to support the communication needs of AMI applications. Then to classify them as *Best, Good, Average* and *Bad* communication technologies, we consider factors such as stability, spectral efficiency, energy consumption, security, mobility, availability, operating distance, supporting modulation techniques and operating and maintenance cost.

This study considered Long Term Evolution Advanced (LTE-A), Global System for Mobile communications (GSM), Ultra Wide Band (UWB), ZigBee, Bluetooth, Wi-Fi (802.11g), Wireless Mesh Networks (WMN)/ (802.11s), Digital Enhanced Cordless Telecommunications (DECT), Fixed Wi-Max, IEEE 802.16m, Wireless Broadband (Wi-Bro), High Speed Packet Access (HSPA), and IEEE 802.20 wireless communication technologies. Results are summarised in Figure 1.

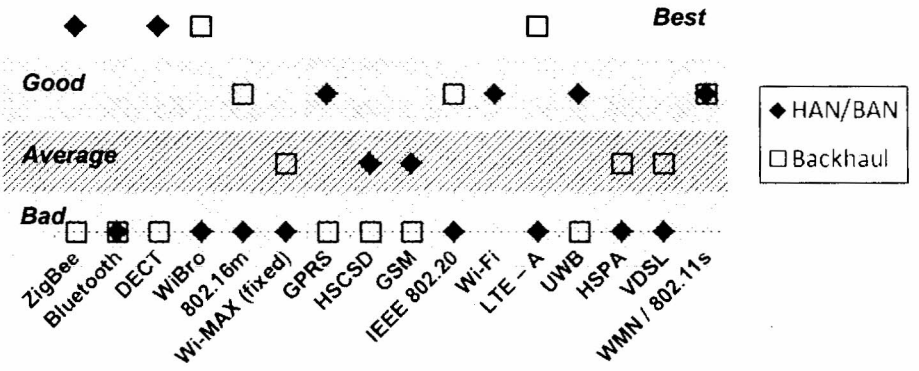

Figure 1. Classification of technologies according to their suitability