G.HNEM: The new ITU-T standard on narrowband PLC technology

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There is today a worldwide interest in the realization of the Smart Grid, and in particular of the communications part of it. Although the Smart Grid will be supported by a heterogeneous set of networking technologies, the use of Narrowband Power Line Communications (NB-PLC) which operate in the (3-500) kHz band provides several unique and fundamental benefits. Several bodies are engaged in the standardization of NB-PLC, including the IEEE and ITU. The ITU has approved the first next generation OFDM-based NB-PLC family of international standards in December 2011. This next generation family of standards finally arrives after a long monopoly of single-carrier NB-PLC technologies, offering much higher bit rates, robustness, and flexibility - which are vital for Smart Grid applications. Recommendations ITU-T G.9955 (Physical Layer) and G.9956 (Data Link Layer) define a family of three separate and self-contained NB-PLC standards:

G.hnem: a new NB-PLC technology developed by ITU-T in cooperation with members of the G3-PLC and PRIME Alliances;
G3-PLC: an established and field-proven NB-PLC technology contributed by members of the G3-PLC Alliance;
PRIME: an established and field-proven NB-PLC technology contributed by members of the PRIME Alliance

These three standards can be used for a variety of Smart Grid applications such as smart metering, distribution automation, electric car charging, demand response, etc. The availability of a family of standards is also important because power grids in different countries have different characteristics and may require a different communications network design. The paper focuses on the specifications of the new G.hnem standardwhich defines a NB-PLC OFDM-based technology that targets multiple Smart Grid applications and also in-home energy management and home automation, using IPv6 as the main networking protocol. G.hnem uses the latest advances in NB-PLC technology, including special means to improve sensitivity and robustness, multiple bandplans, adaptive medium access, simultaneous support of multiple network protocols, and state of the art security. The paper is part of a special issue on ?Power line communications for automation networks and smart grid? that appeared in the IEEE Communications Magazine in December 2011.