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Paving the road toward Smart Grids through large-scale advanced metering infrastructures

G. López, J.I. Moreno, H. Amarís, F. Salazar

Abstract— Upgrading current electricity grid to the so-called Smart Grid represents one of the major engineering challenges ever. Hence, the road toward the Smart Grid will be long and needs to be paved gradually, certainly driving the next wave of research and innovation in both the energy and the ICT (Information and Communications Technologies) sectors. Currently, the earliest stages of such a complex project are being undertaken and AMI (Advanced Metering Infrastructures) stand out as the first steps toward the Smart Grid. The Spanish R&D (Research and Development) demonstration project PRICE-GEN aims to be a flagship AMI project at both national and international level. It is focused on increasing the awareness of the status of the low voltage power distribution network through an optimal and interoperable communications architecture which provides detailed information on customers' consumption and generation. The project entails the deployment of over 200,000 smart meters in the area of Madrid, such a pilot scheme being also used as reference in other European R&D projects, such as the IGREENGrid (IntegratinG Renewables in the European Electricity Grid). This paper presents the communications architecture and technologies which are deployed in the field, analyzing how they fit some specific Smart Grid communications requirement. In addition, the paper describes in detail the pilot itself along with the services which are currently been delivered as well as with the foreseen ones. Finally, the main trends in AMI from the ICT perspective are also discussed.

Index Terms— Advanced Metering Infrastructure (AMI); Distribution Management System (DMS); Information and Communications Technologies (ICT); Machine-to-Machine (M2M) Communications; PoweRline Intelligent Metering Evolution (PRIME); Smart Grid

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