

ABSTRACT

South Africa's power utility, Eskom Holdings SOC Limited, is currently working towards implementing aspects of a Smart Grid with the initial introduction of an Advanced Metering Infrastructure (AMI), similar to utilities internationally. The primary reasons for transitioning towards a Smart Grid could be attributed to the challenges of unprecedented capacity constraints experienced on the power networks in 2008, continually increasing demand, aging infrastructure and the need for improved asset management.

The global definition of a Smart Grid may however vary for utilities around the world; and can be defined as embedded intelligence through hardware infrastructure built into the existing electrical network to provide visibility, automatic control and intelligent decision making over the entire electrical architecture from generation to the end user with the aim of increasing efficiency, improving reliability and enhancing decision making.

AMI provides the foundation for any utility's vision towards a Smart Grid, as it promotes the direct interaction between a specific customer and the utility. An AMI system is a hardware infrastructure which provides the customer the ability to either pay more for electricity in known peak demand periods or communicates the actual grid demand in real-time to customers so the electricity price increases proportionally with the demand on the grid. This then influences the customer to either manually move electric loads to lower demand periods or implement automated systems that has the ability to make use of electricity according to their preferences. All of this ensures that electricity is used at the lowest possible cost to the customer and that the grid adapts to its constraints at that point in time. AMI incorporates functionality such as time-of-use tariffs, automated meter reading, remote connect or disconnect, bi-directional communication infrastructure, integration with utility backend systems for improved customer care and, has the ability to improve existing operations and maintenance processes.

This research focuses on a comparative analysis of the value propositions of AMI in developed and emerging countries, analysing market driving forces and the challenges associated with AMI deployment. The research will also provide for a case study to evaluate Eskom's AMI deployment and the customer's reaction and acceptance to the technology, such as behavioural changes, changes in energy usage and relationship with the utility. A qualitative and quantitative analysis of the case study questionnaire responses will be reviewed to determine customer perceptions, behavioural changes, comparative consumption patterns for the traditional conventional meter to that of the AMI smart meter, and the acceptance of the AMI solution in an emerging economy focusing on South Africa.