AMI INTEGRATION FOR ENHANCED OPERATIONS

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ABSTRACT
This paper will review the new concept of Advanced and Automated Metering Infrastructure (AMI) and its interfaces with all the components in the utility business: roll-out, logistics, work-order management,... where a set of operational applications are involved: GIS, OMS, DMS, ...

INTRODUCTION
Today’s electric utility industry is faced with a number of critical challenges. Confronted by the need to increase generation capacity to meet rising demand, utilities must also reduce operational costs while improving management of their existing T&D assets. Regulators are driving the discussion from the need to reduce consumption through energy efficiency and demand response. Customers are being asked to bear the burden of increased rates, accept required demand response, or take the initiative to voluntarily reduce their demand through the use of new efficient appliances, lighting, or installing smart home controls.

The interests of all three of these stakeholders (utility leaders and shareholders, regulators, and customers) are aligned with the need to increase capacity in the most environmentally-friendly way that makes practical economic sense.

Implementing a ‘Smart Grid’ may hold the key to resolving many of today’s electric industry issues. Though definitions vary a bit across the industry, the concept of an electric power delivery system grid that reduces peak demand, optimizes network assets, while giving customers choice of and control over energy usage has garnered the attention of business leaders, regulators and consumers throughout the electric industry.

DEVELOPMENT
The market needs are requesting the creation of the Smart Grid Solutions Suite (SGS). The Smart Grid Solution Suite helps utilities transform their grid into one that distributes electricity more efficiently, economically, reliably, and securely.

SGS suite focuses on business and technical development that creates additional value for customers based on a highly integrated secure infrastructure and advanced applications. It delivers energy efficiency in the grid, improved customer service, reduced duration of outages, and demand response functionality never before possible. The SGS suite consists of three major parts, each leveraging and building on existing technologies in supervisory control and data acquisition (SCADA), distribution management (DMS), enterprise geographic information systems (GIS), outage management, advanced metering infrastructure (AMI), remote terminal units (RTU) and communications:

- Smart Metering Solution: software coupled with industry-leading meters
- Smart Operations Solution: GIS, Distribution Management (DMS), Feeder Management (FMS), OMS, and SCADA
- Smart Network Solution: Substation automation platforms, pole mounted RTUs, and IEDs

All three of these areas will utilize intelligent hardware and software devices creating an order of magnitude increase in the volume of data made available to the utility. The challenge is to provide the applications and the intelligent analysis tools to make use of this data, turn it into information, and make it available to the business areas of the utility to improve their daily operations.

Together with integration skill and experience, the SGS initiative focuses on specific activities designed to aggregate and further integrate specific Energy solutions and utility business knowledge.

As an example, the usage of an AMI in DMS will focus five roles:

- Update of consumer load profiles

Each typical consumer type profile is described by appropriate load profiles in relative units

![Graph of I, cos(φ)]
Update is provided by AMI

\( \alpha \) is typically 5-15%

- Value of consumer load peak
  - Product of consumer load peak and profile gives value of consumption
  - This value defines distribution of load along feeder and it is used in network state estimation
  - Generally distribution of load along feeder can be done by:
    - Rated power of MV/LV transformer
    - Peak loads (better; AMI provides this value)
    - Sold energy (the best; AMI provides this value)

- Addition measurement in network depth

If AMI can provide measurement on feeder periodically (every e.g. 1 hour), this value can be taken in the State Estimation procedure; this will improve significantly network state estimation quality

Improving fault management

Sudden drop of feeder load – may be caused by two ways:

- simply decreasing consumption without fault (significant consumer is turned off)
- more often it means fault; this means that a part of feeder is without energy

How can we check which of these two cases has happened?

- Load management (selective turn off some consumption – A/C, water heater, …)

Reduction of peak load practically without consumer disturbance