Optimizing Smart Grid Investments via EDD's Integrated System Model (ISM)

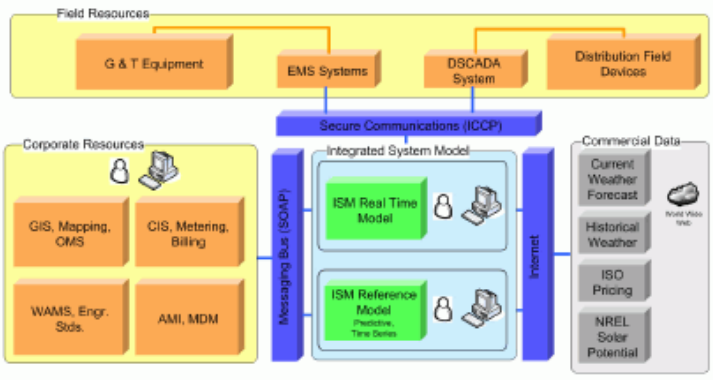
The Integrated System Model (ISM) enables the paradigm shift needed by the utilities industry to move Smart Grid from concept to reality.

The Smart Grid potential is promising:

- Build self healing networks to improve reliability and lower storm restoration costs.
- Integrate distributed energy resources (including Solar, Wind, PHEV, Storage, Biomass, etc) into the distribution grid to reduce dependency on centralized, large-scale generation and transmission lines.
- Increase the ability of customers to manage their energy use through advanced demand side management programs to shift peak demand, and make smarter energy use decisions.
- Improve load forecasts to reduce over-subscription of generation resources by resource planners and schedulers.
- Utilize hourly load consumption data in planning capital improvements, allowing optimized design and operation of distribution system assets, while saving hundreds of millions of dollars in capital costs.
- Balance distribution feeders and manage power quality, reducing system losses by 1-3%, with corresponding reductions in cost and carbon levels.

While each utility's smart grid deployment may vary, the implementation will consist of installing common devices at substations, on distribution feeders, and at customer premises. The deployment will include:

- Additional SCADA controlled substation breakers.
- Automated distribution sectionalizers, capacitors, voltage regulators, fault indicators and data recorders.
- Automated customer meters.
- Customer Home Area Networks and device controllers.
- Telecom infrastructure to communicate information from field devices to back¬office monitoring and control systems.
- Distributed generation resources at the distribution system and customer premise level.
- Major investments in information technology systems, including CIS, AMI, DMS, GIS, OMS, Mobile, TLM, Power Flow, Real-time Data Management, Resource Planning, and Web Services.



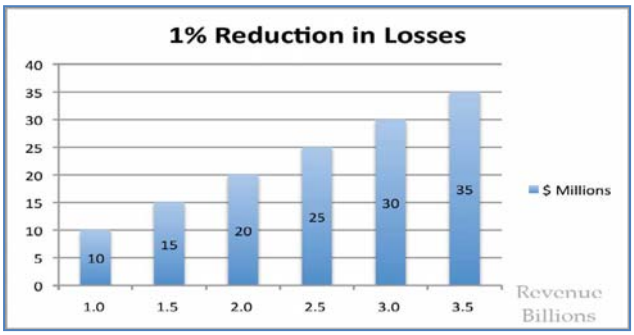
The Integrated System Model provides a comprehensive network model of the entire distribution system that substantially enhances the smart grid solution. It can model all of the utility devices comprising the smart grid, supplementing or replacing portions of the legacy information technology solution needed to support smart grid. Topological data derived from legacy GIS and CAD, engineering data derived from engineering standards and asset records, and customer data derived from CIS and metering are utilized to populate the ISM model. This methodology establishes a paradigm shift from what most utility engineers, operators, and managers believe is possible in today's market. The ISM becomes the single source network model that channels all users through one system of record, modeling the entire distribution network from the substation/generation elements through to the end customer.

The ISM includes a comprehensive set of applications that are state of the art tools for planning, maintaining and evaluating performance of the system. The ISM has the ability to support calculations from any user desiring to relate data to the connected electrical model. Target users include engineers, financial analysts, maintenance planners, resource planners, marketers, storm teams, dispatchers, operators, and customer representatives, i.e. virtually all personnel in a distribution company.
ISM is the intelligent scheme for managing data and providing the analysis needed to put the "smart" into smart grid.

Reduce losses 1-3% of Energy Delivered

Visit www.edd-us.com for more information

Evaluate & Reduce Losses



Distribution Company Savings

The ISM provides capability to pinpoint distribution network losses and to develop a practical plan for loss reduction, by determining a set of voltage dependent loss factors for each feeder. Using these factors, feeders are sorted from least efficient to the most efficient. The feeders operating at their optimum voltage levels provide a benchmark for efficiency improvement opportunities.

Utilize ISM to establish potential benefits from:

- Optimum voltage control
- Phase balancing
- Reactive compensation location and sizing
- Substation load balancing
- Upgrading heavily loaded single phase conductors
- Reconductoring
- Adding new feeders
- Improved equipment sizing
- Coordinated control of capacitors/regulators

Once the recommended reconfiguration has been completed, the distribution system can be routinely operated at maximum efficiency, excepting the few peak demand periods when operation at maximum capacity is required.

In some states, line loss reduction programs require a utility to meet specific Energy Efficiency goals. ISM provides the ability to establish a baseline and measure subsequent line loss reduction to ensure credit is received within a utility energy efficiency plan. Every Megawatt-Hour reduction in use of coal-fired generation results in an average carbon footprint reduction of 1,970 pounds of carbon dioxide production. Resource generation cost savings in capacity and energy will pay for the loss reduction program in less than one year.

Improve Reliability

The ISM provides engineers and planners with a study tool that allows users to run many simulations including Monte Carlo analysis studies. With this capability, planners can identify weak points in networks, identify poor performing equipment, look at maintenance trends and perform complex storm modeling. Accuracy in reliability reporting will replace outdated manual processes and provide better information to drive decision making.

Automated Control

Self-healing networks require the expansion of automated control schemes across the distribution system. While the core technology has been around for many years, the ability to deploy the technology across the network has been limited, primarily from the lack of a detailed model and analytical capability. The ISM provides analysis and control functions:

- Coordinated control to increase off-peak efficiencies
- Coordinated control to increase peak period capacities
- Manage Distributed Generation to control low voltage or overload conditions
- Fault Analysis to locate momentary or permanent faults,
- Reconfiguration Analysis to automate reconfiguration and restoration.

Day-Ahead Forecasting

The ISM uses historical load data, the current up-to-date network configuration, and weather data to produce accurate Day-Ahead Load Forecasts. Improved forecasting allows utilities to purchase only the capacity and energy needed to meet load and reserve requirements.

Real Time Model

The ISM real time model was developed with next generation programming and architectural concepts, resulting in the capability to evaluate extremely large networks with the speeds required by real time analyses. Distribution network models (if done at a detailed level) will contain millions of nodes. Traditional matrix-based programming will not support detailed analysis of these models. The choice is to simplify the model and reduce the accuracy of results, or transform to the ISM and maximize benefits of the smart grid solution.

With ISM, planned and emergency switching operations can be determined and executed rapidly. Switching recommendations include power flow analysis run in real time, avoiding costly errors and improving system reliability indices. ISM supports advanced applications, such as operating distributed generation resources.

Analyze Before You Invest

The ISM provides the ability to evaluate capital projects in simulation mode, determining by circuit the effect that planned projects will have on performance, reliability, and losses. Analyzing capital projects by circuit over the entire system allows users to avoid conflicts and prioritize projects based on projected costs/benefits and returns on investment.

EDD

Electric Distribution Design (EDD) developed the ISM software and provides associated support, consulting, and customization services. Visit our website or contact us at solutions@edd-us.com for more information.

Visit www.edd-us.com for more information