

Celergy Smart Grid Communications Capability

Overview

Introduction

In essence, Smart Grid implementation encompasses the modernization of the delivery of electricity from suppliers to consumers utilizing new technologies. Smart Grid technologies cover power sources, power storage, power distribution and improvements in energy efficiency. Undoubtedly, Smart Grid will be the most significant transformation to the electrical grid infrastructure that has happened in the last fifty years. In fact, a speaker at Connectivity Week 2009, Bob Metcalfe, likened the magnitude of the required changes in the electricity grid as comparable to the development of the Internet since the early Eighties!¹ The potential benefits of Smart Grid to consumers, industry, the environment and the electrical utility promise to revolutionize how power is distributed and electricity consumption is managed.

One of the technology areas requiring the greatest level of innovation is the communications systems at the core of every Smart Grid deployment. Each end-point device (e.g. power breaker, Smart Meter, mobile workforce unit, etc.) in the Smart Grid must be able to reliably and securely communicate with applications that manage the processes, these typically being located at one or more central locations.

To serve the emerging needs of the Smart Grid, these grid communications solutions must be pervasive, rapid, robust (even in emergency conditions), scalable, and most of all secure. Considering the varying operating environments, the vast number of systems involved and the locations where end-points may exist, the challenge of establishing a suitable Smart Grid communications network is immense.

Smart Grid Communications Requirements

The Smart Grid communications network implemented by the Utility will potentially be subject to many demanding communication needs, including but not necessarily limited to the support of:

- Advanced Metering Infrastructure (AMI);
- Supervisory Control And Data Acquisition (SCADA) equipment;
- Fault management equipment;
- Grid-to-vehicle applications;
- Critical asset management;
- Mobile workforce;
- Synchrophasor monitoring;
- Security communications and surveillance.

¹ From a presentation by Bob Metcalfe presented at Connectivity Week 2009.

The complex interaction of the Smart Grid communications network with the many systems that make up a typical Smart Grid is illustrated in Figure 1.

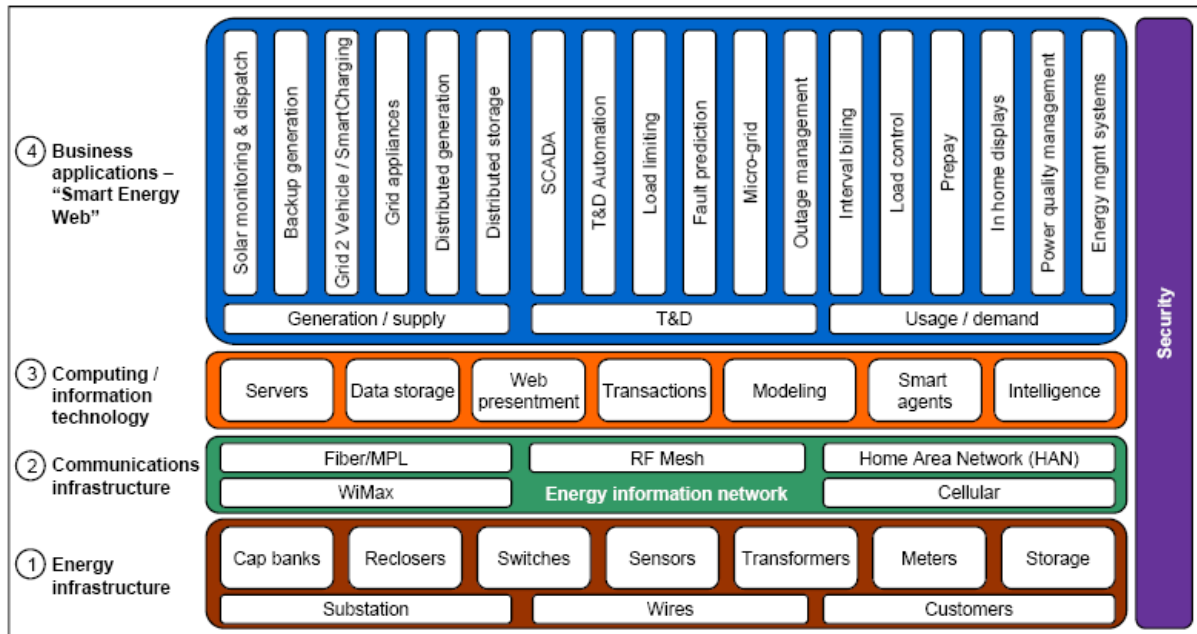


Figure 1: Example Components of a Smart Grid²

Challenges Faced By the Utility

In addition to the diverse communications requirements that the Smart Grid communications network must support, the Utility faces a number of other potential challenges when implementing such a network. These could include one or more of the following:

- Lack of suitable spectrum to implement the communications solution;
- The wide area, near ubiquitous, extent of required communications coverage across the Utility service territory;
- The demanding requirements of NERC CIP compliance;
- The Utility preference for private rather than public communications networks;
- The Utility requirement to meet the needs of shareholders, Public Utility Commission and Federal and State government;
- The Utility preference for CAPEX centric implementations;
- The fact that standards are not yet fully defined for Smart Grid communications networks;
- Limited equipment ecosystems and the short commercial track record of many suppliers;
- The lack of suitable internal resources and experience within the Utility relating to state-of-the-art communications technologies;
- The migration of users and devices from legacy communications solutions.

² PG&E's Smart Grid Vision by Andrew Tang, Senior Director, presentation April 29 2008.

Meeting these many challenges can be a daunting prospect and the use of experienced external third-party expertise can augment internal skill capabilities, significantly speed up the decision making process and dramatically lower risk factors.

Celergy Networks, Inc.

Founded in 1989, Celergy Networks is a recognized leader in IT and communications network services and was one of the first system integrators to enter the Smart Grid market; where we have been active since mid-2008. Celergy brings a growing range of capabilities relating to the definition and deployment of Smart Grid communications networks including:

- **Technology whitepaper development:** Are you in the early stages of developing forward looking strategies and plans for implementing Smart Grid technologies? We can help define the challenges and document potential solutions in a way that allows key stakeholders within your organization to make effective decisions. Celergy is familiar with the regulatory and grant-assisted environment and has advised and assisted in obtaining Stimulus funding through the Department of Energy.
- **Technology evaluation and guidance:** With extensive knowledge of radio communications (including LMR, 2G, 3G, 4G, WiMAX, Wi-Fi, fixed and mobile satellite, and telematics) and enterprise network systems, we are well placed to provide expert guidance relating to technology choices associated with modern communications networks from the end-point to the core.
- **Network architecture definition and design:** Based on our extensive communications and enterprise expertise, let us help you define the design principles, including the organization of functions and the description of data formats and procedures, used as the basis for the design and implementation of your Smart Grid communications network. We will take account of security, reliability and operational service needs and priorities, and other overlaid services, such as authorization, provisioning, operations and maintenance. From there we can come up with a detailed network topology and site map, specify equipment and set out detailed deployment plans to dovetail network upgrades into existing services and ensure a smooth and even cut-over.
- **Business case development:** We understand the internal processes that lie behind Utilities' technical planning and purchasing decisions and can provide high-quality business planning and analysis services that are solidly based in real life experience of deployments having capital values anywhere up to one billion dollars.
- **Vendor selection:** With extensive knowledge of radio communications and enterprise system vendors, Celergy is well placed to define RFIs, RFPs and RFQs, undertake vendor appraisal and make equipment recommendations.
- **Program/project management and implementation:** Our project management staff range from PMO officers to those who have run PMOs for multinational corporations. Project management lies at the heart of Celergy's competitive strength and we can provide people on a short or long-

term basis. To augment project management, Celergy has developed its own online project management database, Advantage™. Accessible through a web based interface to Celergy and the client, it can manage all aspects of a given project. Advantage™ provides project status, order generation/processing, order tracking/reporting, asset management, operations management, hardware/software inventory, insurance/warranty status, service histories, schematics, manuals, trouble ticket status/management and customized interfaces/reports.

- Site survey and inventory: We have teams experienced in going out into the field to document what equipment and facilities exist at a site, assess what remedial action will be necessary to support the upgrade of a site and document this in a clear and precise fashion.
- Physical site design and construction: Celergy can undertake the design and construction of a wide variety of communication infrastructure ranging from wired systems through wireless systems such as pole, roof or tower mounted WiMAX, Wi-Fi or Advanced Metering Infrastructure.
- Equipment configuration and commissioning: Our engineers can configure equipment and then undertake the appropriate commissioning to ensure your equipment installation is up and fully functional.
- Logistics, operations and maintenance: With are nationwide reach we help you undertake operations and maintenance activities 24/7. From day-to-day installation administration, through warehousing, to depot level maintenance and field support, we provide a wide range of O&M support services that can augment your existing capabilities. We strive to accommodate our customer's changing needs while increasing their capabilities.

Celergy is a project implementer, par excellence. We work with a network of 3,000 subcontractors throughout the USA and Canada to implement and deliver IT and communications projects. With its core business underpinned by systems integration and rollout, we bring advice and knowledge that is rooted in practical experience.

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