The Smart Grid Vision & Smart Meters for the Gas Industry

Terry Mohn
Chief Strategy Officer, General MicroGrids
Vice Chairman, GridWise Alliance
Outline

Why look at smart grid
Defining a smart grid
Three paths to a smart grid
Systems view
Communication network is a corporate strategic investment
Is the Gas Industry ready for smart meters?
Headlines

Environment
- Green House Gas
- Energy Independence
- Economic Recovery

Legislation
- EPACT 2005
- EISA 2007
- EESA 2008
- ARRA 2009
Energy Prices

Electricity prices are a straightforward signal of anticipated price pressures between last year and this year. The map illustrates recent key summer 2008 electricity prices. In almost all, markets are signaling double-digit electricity price increases this summer over last.

- FERC 2009 Market Oversight
Energy Demand Growth

Total electricity sales are projected to continue to increase. Electricity sales are strongly affected by the rate of economic growth.

DOE Report, February 2009
Diverse Stakeholders

- FERC
- DOE-OE (FM)
- NERC
- DOE-OE
- Grid 2030
- NETL Modern Grid Initiative
- GridWise Program
- NW GridWise Testbed
- CERTS
- CPUC AMI
- DOE-OE
- CERTS
- CEC PIER
- CEC PIER
- NYSERDA
- PSERC
- EPRI Intelligrid
- Galvin Initiative
- GWAC
- UtilityAMI
- OpenAMI
- DV 2010
- General MicroGrids
A smart, integrated grid

Detects and fixes emerging problems

Incorporates measurement, diagnostics and feedback

Re-routes power flows

Enables loads and distributed resources

Incorporate advances in IT and communication technologies
Characteristics

**Self-healing**
- A grid able to rapidly detect, analyze, respond and restore from perturbations.

**Empower and incorporate the consumer**
- The ability to incorporate consumer equipment and behavior in the design and operation of the grid.

**Tolerant of attack**
- A grid that mitigates and stands resilient to physical and cyber security attacks.

**Provides power quality needed by 21st century users**
- A grid that provides a quality of power consistent with consumer and industry needs.

**Accommodates a wide variety of generation options**
- A grid that accommodates a wide variety of local and regional generation technologies (including green power).

**Fully enables maturing electricity markets**
- Allows competitive markets for those who want them.

**Optimizes assets**
- A grid that uses IT and monitoring to continually optimize its capital assets while minimizing operations and maintenance costs.
Technologies

Grid-wide integrated communications
• Internet for the power grid

Sensing, metering, measurement
• Digital two-way communication devices
• Enable generation connect and disconnect
• Enhance operator information

Advanced control capabilities
• Computer based grid monitoring
• Enables dispatch of distributed resource

Advance grid components
• Energy storage
• Distributed generation

Decision Support
• Analytics to guide grid operators
• Semi-autonomous agent software
## Characteristics and Key Technologies

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Three paths to starting a regional smart grid

Organic – business as usual
- Huge capital expenditures as assets retire
- New technologies lead to declining costs

Utility of the future
- Spread costs across several projects

Smart Meter
- Communication infrastructure is key
- Digital electric meters are also sensors
Smart Meter - It’s more than meters, it’s foundational

Digital Meters
- Data storage
- Calibrated
- Upgradeable Software
- Bi-directional, secure communication
- “near” real-time rates and energy measurement
Remote connect and disconnect
Home Area Network
Designed for distribution automation, distributed generation, autonomous islanding
Net metering for consumer generation choices
- Hydrogen
- Solar
- Electric vehicles
New utility applications – OMS, DMS, GIS, ERP, SOA
Fiber and wireless everywhere – transmission and distribution
Blurring the lines between IT and Electric T&D
The “Systems View” perspective takes a holistic and objective approach to a subject, including technical, economic, regulatory, political, and societal aspects.

It includes the complete recognition of the power system as one integrated machine having many interdependent parts.

It recognizes that solutions can come from a wide and diverse range of sources.

A “Systems View” also takes account of the full range of costs and benefits to society associated with the provision of reliable power.
Operation Technology Vision to Avoid Vendor Lock-in

Legend

SAP Capability
SAP Partner
Non SAP

Data Repositories
- SCADA
- GIS
- M&I
- WMS
- Data Maintenance
- Graphic Design
- Data Viewing (i.e. Web GIS) (Limited)
- Planning & Analysis (Limited)
- Outage Management

Integration BUS

SAP Materials
SAP Financials
Customer Information
MyINFO HR
Work Scheduling
Crew Dispatching
Timekeeping

Mobile Workforce Management

Work Management

Maintenance & Inspection

Integration BUS
AMI Technology Architectures

AMI Considerations

• Capable to include water & electric meter
• 20 year battery life
• 2-way communications network
• Hourly reads collected daily

Gas reads must pass through electric meter
Summary

Strong commitment to standards development
IT is a partner towards any business strategy
Consider an IP-centric network
Smart Meters could be foundational
Communication systems designed for additional uses
Terry Mohn
Chief Strategy Officer, General MicroGrids
Vice Chairman, GridWise Alliance
Terry.mohn@generalmicrogrids.com