Intelligent Grid Technology in the Utility Transmission Industry
Vision of the Intelligent Grid

- **Self-Healing** to correct problems early
- **Interactive** with consumers and markets
- **Optimized** to make best use of resources
- **Predictive** to prevent emergencies
- **Distributed** assets and information
- **Integrated** to transform data into Information
- **Secure** from threats & hazards

*IntelliGrid Architecture Report: Volume 1, IntelliGrid User*
Intelligent Grid – Enterprise Drivers

Financial Performance
- Reduced T&D capital expenditure
- Reduced T&D operational & maintenance costs

Customer Service
- Improved customer service through better access of operational and non-operational data
- Reduced service downtime for greater customer satisfaction

Organizational Effectiveness
- Modern IEDs are data mining devices on the network, allowing access to data for SCADA and enterprise wide data repositories
- Modern automation improves asset optimization and utilization
- Humans become more effective through the transformation of data into actionable information
Industry Trends & Expectations

**Trends**
- Cost pressures
- Aging infrastructure & increased load demand
- Reduced outage durations
- Shrinking workforce

**Expectations**
- Cost reduction in total life cycle investments
- Accelerated equipment, expansion & retrofit schedules
- Simpler solutions with smaller deployment time
- Less labor & relaxed skill-set requirements
Intelligent Grid - Application Domains

• Market operations
• Transmission operations
• Distribution operations
• Customer services
• Generation at the transmission level
• Distributed resources at the distribution level

Intelligent Grid – Technology Enablers

- Intelligent Electronic Devices
- Synchrophasors
- Communications
- Distributed Generation Interconnection
- Intelligent Facilities and Homes
Distributed Generation

• DG applications will evolve as the electric industry moves through the process of divestiture and deregulation.

• Reciprocating engines and gas turbines have been rapidly building a presence in the electricity-production industry since 1990s, to provide back-up power.

• Reciprocating engines and gas turbine DG applications continue to grow at 7% per year.

• Other DG applications to meet base load and peaking requirements are growing even more rapidly at 11% and 17% per year.

Source: Distributed Generation: Technologies, Opportunities, Participants. 5th Edition
Intelligent Home

Real-time & trended…
• Electricity use
• Solar power production
• Water use

Plus…
• Programmable thermostats
• Lighting control interface
• Full integration with Security, intercom, home audio
Micro-Grids: Local Power for Local Loads

Main Grid

Substation

Solar / Wind Farm

Micro Turbine

Controllable Loads

Conventional Loads

Energy Storage
Traditional Switchyard Construction

1. Traditional Breaker Wiring
2. Traditional Cable Trench
3. Thousands of Copper Wires from Switchyard
4. Labor Intensive Copper Wiring on Relay Panels
Traditional Switchyard Solution
Project Cost Breakdown

- Labor: 75%
- Construction: 20%
- Engineering: 20%
- Drafting: 10%
- Commissioning: 25%
- Materials: 25%
The Future is Bright

The path is starting to unfold now with the deployment of . . .

- Modern IEDs…data mining tools
- Monitoring and diagnostics devices
- Modern communication infrastructure
- Availability of information across the power grid

Heavy lifting . . .

- Unprecedented levels of co-operation among the industry’s diverse stakeholders to lead us into the 21st century
- High-end software applications that turn more data into information
- Vision to make the system predictive, self-healing and secure
- Continued investments from all stakeholders
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Larry Sollecito
President and General Manager
GE Digital Energy