

Intelligent Grid Technology in the Utility Transmission Industry

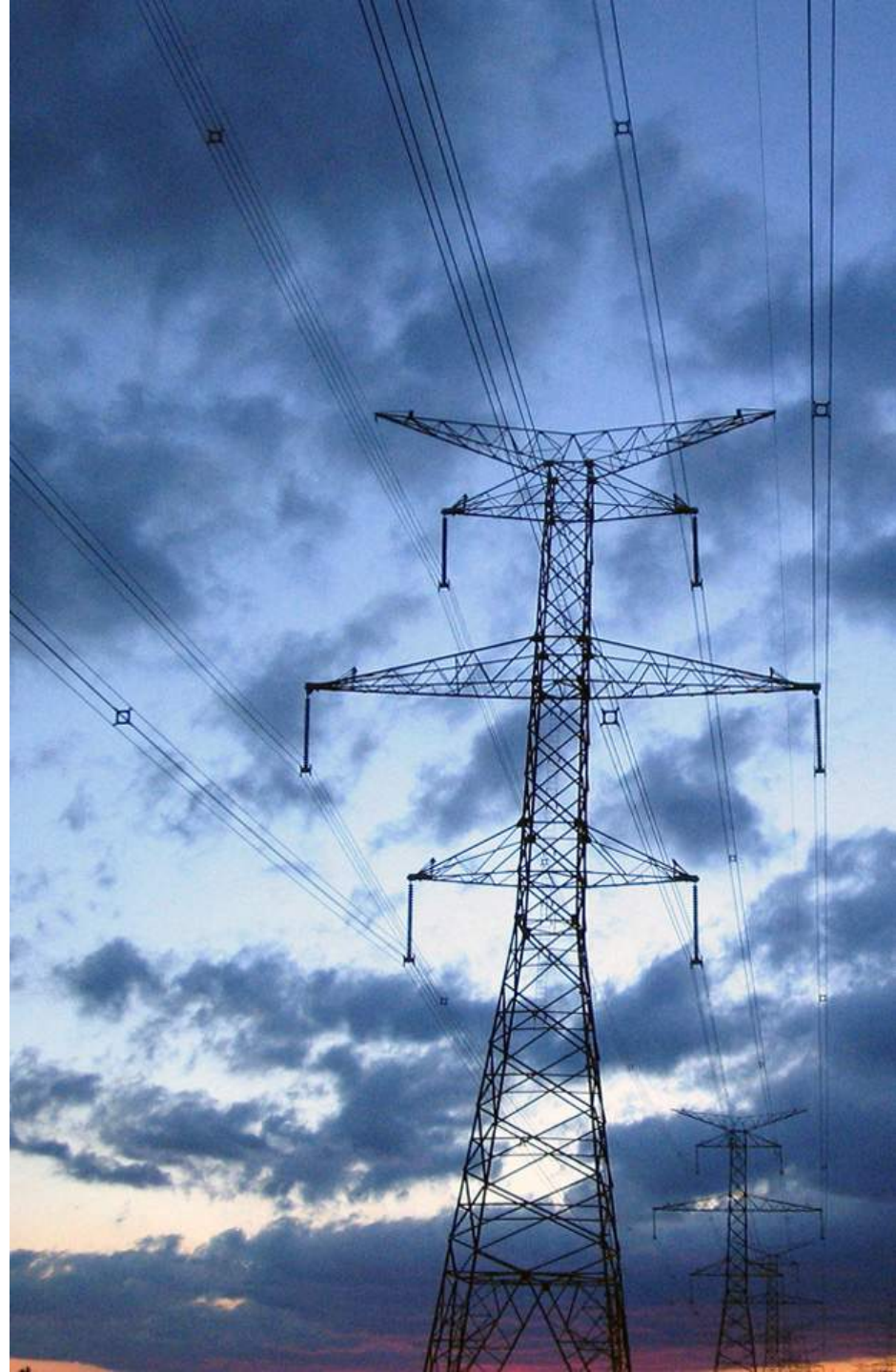


imagination at work

Larry Sollecito
President and General Manager
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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



Intelligent Grid – Enterprise Drivers

Financial Performance

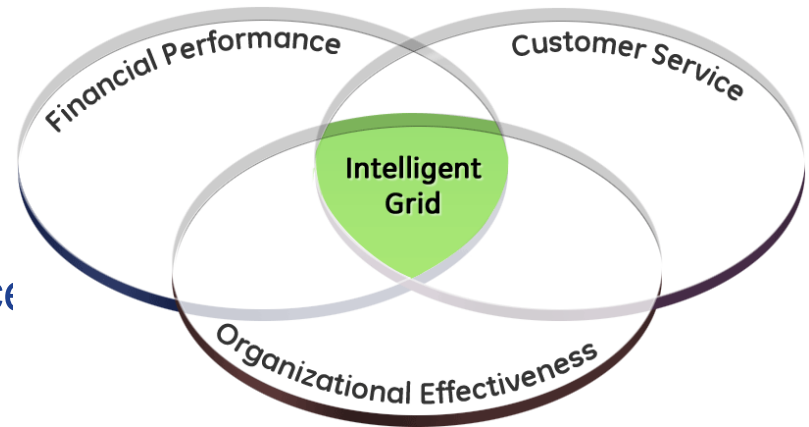
- Reduced T&D capital expenditure
- Reduced T&D operational & maintenance costs

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



Cost reduction in total life cycle investments

Aging infrastructure & increased load demand



Accelerated equipment, expansion & retrofit schedules

Reduced outage durations



Simpler solutions with smaller deployment time

Shrinking workforce



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

Source: IntelliGrid Architecture Report: Volume 1, IntelliGrid User Guidelines and Recommendations, EPRI

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

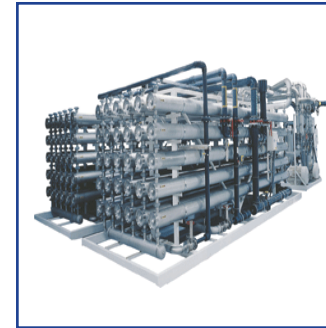
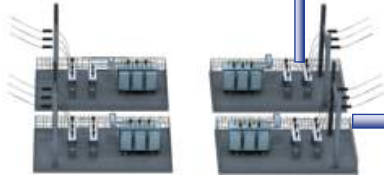
Conventional Loads

Controllable Loads

Main Grid



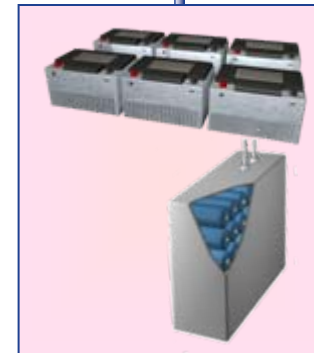
Substation



Solar / Wind Farm

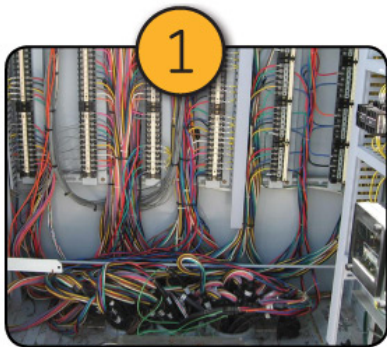
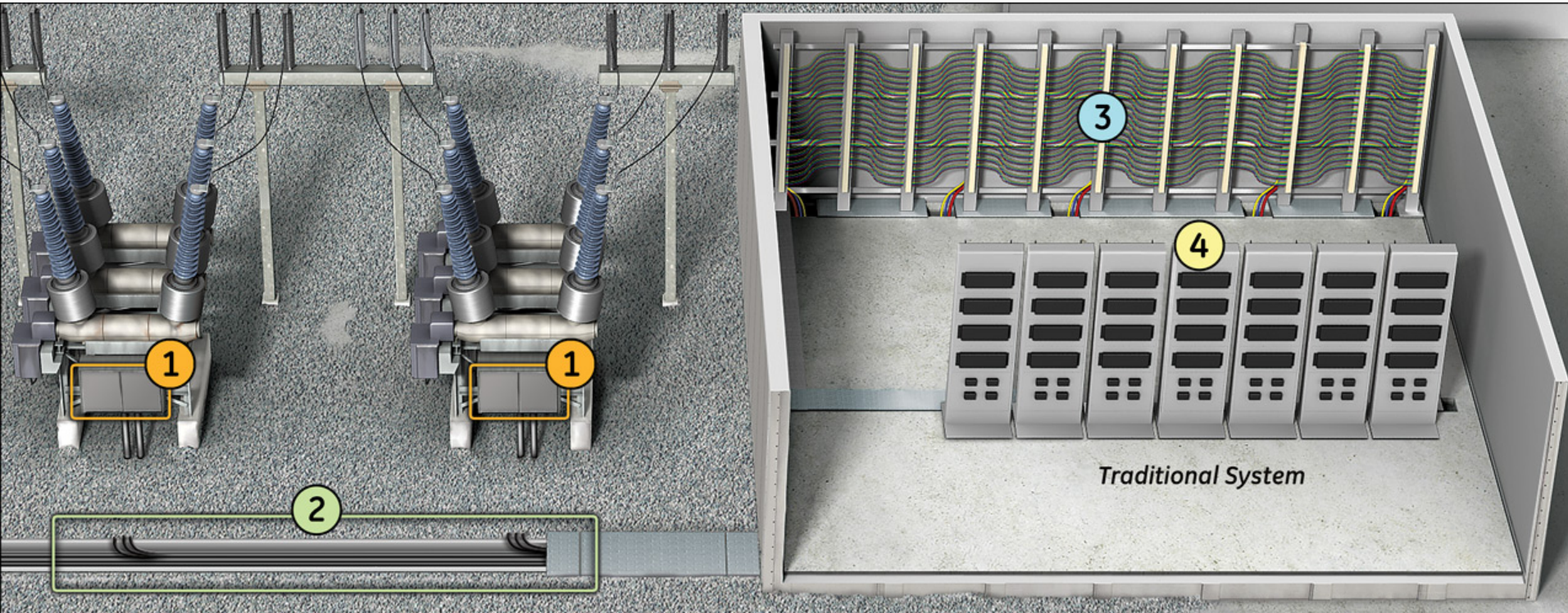


Micro Turbine



Energy Storage

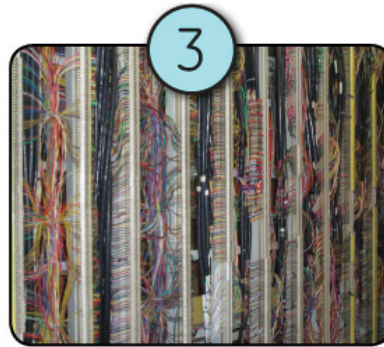
Traditional Switchyard Construction



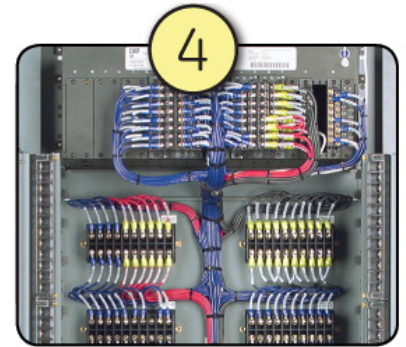
Traditional Breaker Wiring



Traditional Cable Trench



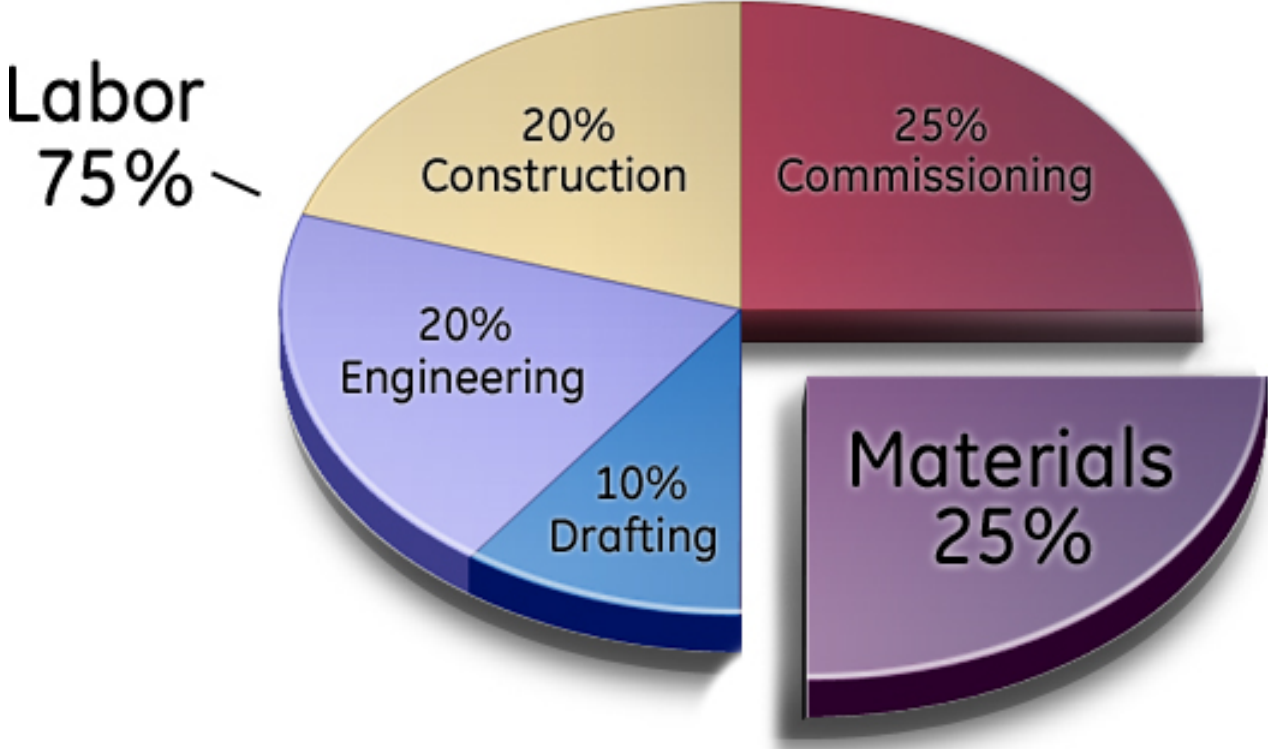
Thousands of Copper Wires from Switchyard



Labor Intensive Copper Wiring on Relay Panels

Traditional Switchyard Solution

Project Cost Breakdown



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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