Integrated Distributed Energy Resources Overview

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Comprehensive solutions to address challenges

**Grid Efficiency**
- Integration of Distributed Energy Resources (IDER)
- VAR Management/Support
- Technical Loss Management
- Grid Optimization

**Resource Optimization**
- Demand management for residential, C & I markets
- Renewable integration
- Direct load control
- Demand response

**Reliability**
- Asset monitoring and utilization
- Rapid fault location
- Substation automation
- Transformer monitoring

**Grid Communications**
- Network monitoring
- Network management
- Integration of multiple types of communication
- Distributed intelligence
BPL Global’s Control Strategy

- BPLG creates monitoring & control interfaces to the edge of the electrical distribution grid.
- BPLG coordinates the capture, transport, archiving and interrelationship of data through pervasive networking.
- Solutions are enabled with the intelligence to analyze and model the data it has captured.
- The linkage harmonizes all aspects of energy delivery and consumption into a unified management system.

BPL Global Smart Grid Solutions

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<th>Substation Solutions</th>
<th>Distributed Energy Resource Integration and Management</th>
<th>Load Management</th>
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<td>Extend asset life and improve reliability</td>
<td>Integrate and optimize renewable sources of supply and storage</td>
<td>Meet peak demand for ~1/3 the cost of new generation</td>
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| Fault Location and Asset Protection |
| Identify and isolate faults to improve reliability |

Power SG® - Integration and collaboration
Integrated Distributed Energy Resource (IDER)

Product Description
- IDER coordinates capacity and load in order to meet reliability and efficiency requirements of the distribution system within defined areas. Areas can be as large as operating regions or as small as substations, circuits or individual customer premises. The IDER offering has been jointly developed with First Energy as well as other customer input.

Value Proposition
- Manage the energy delivery system based on the changing conditions of the grid, whether normal, emergency or critical
- Initiate granular, targeted load control to desired area / circuit to enhance operational reliability
- Integrate and fully manage distributed renewables and energy storage devices to shift peak demand, improve energy efficiency and reliability of distribution system
- BPLG’s IDER application is the first of its kind that fully integrates distributed supply, storage, and load as collaborative resources within a definable area
**Power SG Integrated DER – Status Indications**

- Actual load in use for defined local area fed from meters, sensors, SCADA, etc.
- Actual load available for shed in defined local area fed from Demand Disp module
- Available resources (supply, storage, load) identified in each defined local area
- Projected operating condition based upon historical data from data warehouse and forecasts
- Projected state condition of local area fed by rules engine and alarm manager

**Power SG Integrated DER – Program Actions**

- Load shed action has lowered peaks to nearly required levels
- Remaining sheddable load indicated to determine available operating margin
- Create resource specific programs to enact load shed, discharge battery, and/or turn on distributed supply
- Battery discharged to compensate for remainder of peak period
- State condition returned to Normal mode due to actions taken
Integrated DER Direct Load Control Dashboard

Advanced Storage Integration - Operational Examples
200-500 kW batteries are located near critical customer loads

Multiple megawatt battery is located in or near utility substation

200-500 kW batteries are located near critical customer loads

Multiple megawatt battery is located in or near utility substation

Hybrid DER Configuration – Normal Condition
Hybrid DER Configuration – Stressed

Hybrid DER Configuration – Emergency

Open Switch

Customer Loads
Hybrid DER Configuration – Emergency

- Transmission
- Xfmr
- Distribution Load
- Control (Residential)
- Distributed Generation
- Renewable Energy
- Load Control (Commercial)
- Storage
- Open Switches
- Customer Loads

BPL Global
Residential Measurement and Communications Technology
BPL Global Rapid Fault Locator (RFL)

Power SG® Rapid Fault Locator Process

Rapid Fault Locator is the high-definition view and response system required for the next generation, high-reliability distribution network.
Typical RFL Deployment Example

Power SG Rapid Fault Locator (RFL)

- Detects and reports line faults on overhead distribution feeders
- High sampling rates detects previously undetectable transients
- Geographical live view of the distribution grid status
- Flexible rules engine executes user-defined business rules
- Events can be captured and logged by rules observing patterns, exceptions or changes in the data.