Smart Grid at Seattle City Light

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Seattle City Light is the 10th largest public electric utility in the United States. It has some of the lowest cost customer rates of any urban utility, providing reliable, renewable and environmentally responsible power to nearly 1 million Seattle area residents. City Light has been greenhouse gas neutral since 2005, the first electric utility in USA to achieve that distinction.
• Metered Customers - 400,000+
• Service Area Size - 131.3 sq. mi.
• 7 Hydro Power Plants – 1,810 MW
• Annual power consumption – 9,700,000,000 kWh
Fuel Mix

- **Hydro** 92.4%
- **Wind** 4.1%
- **Other** 3.5%

Nuclear, Coal, Natural Gas, Biomass, Waste and Petroleum
Initiative I-937

- The initiative requires large utilities to obtain 15% of their electricity from new renewable resources such as solar and wind (but excluding hydro) by 2020.
Smart Grid Initiatives

• Advanced Energy Delivery and Distribution Systems
• Advanced Metering Infrastructure (AMI)
• Customer End Technologies
• Utility Information Technology Systems
Advanced Energy Delivery and Distribution Systems

“Smart” Substations

Converting existing substations to "smart" stations capable of remote monitoring, near real-time information collection and distribution, and better performance.
Smart Grid Initiatives

Advanced Energy Delivery and Distribution Systems

Distribution Automation

Upgrading power delivery and distribution systems to achieve better grid reliability by automating operations, enabling remote control and monitoring, mitigating power outages, and avoiding equipment failures.

Energy Optimization

Reducing distribution losses and energy consumption by optimizing voltage and reactive power flow.
Smart Grid Initiatives

Advanced Metering Infrastructure (AMI)

Infrastructure that includes new metering systems that will not only measure electricity use but be capable of real-time, high-speed, two-way communication of that information with the rest of the power grid.
Smart Grid Initiatives

Customer End Technologies

Distributed Generation and Energy Storage
Upgrading the grid connections to support off-site power generators and storage units such as solar panels, wind turbines, battery systems.

Plug-In Electric Vehicles
Integration of the plug-in electric vehicles and creating vehicle charging stations infrastructure, enabling controlled charging of the vehicles.
Utility Information Technology Systems

Computer based information and decision support systems that communicate with the grid and convert large quantities of data into easily understood visual formats and provide utilities with the tools required to operate a smart grid.
Today’s Electric Grid

- **Power Generating Plants:** 7 Hydro Power Plants, Capacity: 1,810 MW
- **Transmission Lines & Substations:** 656 Transmission Circuit Miles
- **Distribution lines:** 2,300 Distribution Circuit Miles
- **Customers:** 420,000 Metered Customers
Seattle City Light Smart Grid Vision

- Smart Meter
- Mobile Workforce Management System
- Geographic Information System
- Distribution Management System
- Customer Information System
- Meter Data Management System
- Transmission/Substation
- Distribution
- Customer End
- Smart Grid
- IT Systems
- Smart Power Systems
- Plant Control System
- Substation Control System
- Data Integration
- Electric Vehicles
- Demand Response
- Distributed Generation
- Energy Storage
- Water Heater
- Solar Panel
- HEMS
- Electric Vehicle
- Distribution Network
- Substation
- Sensors
- Switches
- Capacitors
- Forestry
- Agriculture
- Transportation
- Office
- Home Energy Management Systems
- Advanced Meter Infrastructure
- Plant Control System
- Backbone Communications
- Field Area Communications
- Thermostat
- Building EMS
• 1,000 Nissan LEAF cars
• 2,500 Level 2 (220V) Chargers
  – 1,000 residential (L2)
  ~ 1,500 public/commercial (L2)
• ~ 50 DC fast-chargers (L3)
Smart Green EV Charging
W2V
Smart Green EV Charging with Battery Storage