Schneider Electric Microgrid Solutions

*Microgrids-at-Scale*… based on Smartly-Connected Distributed Energy Resources

Andy Haun, Chief Technology Officer - Microgrids Business

http://microgrids.schneider-electric.us/
Schneider Electric, the Global Specialist in Energy Management and Automation

€26.6 billion
FY 2015 revenues

~5%
of FY revenues devoted to R&D

160,000+
people in 100+ countries

Four integrated and synergetic businesses
FY 2015 revenues

- Buildings & Partner: 45%
- Industry: 21%
- Infrastructure: 20%
- IT: 14%

Balanced geographies – FY 2015 revenues

- North America: 27%
- Western Europe: 26%
- Asia Pacific: 29%
- Rest of World: 18%
Schneider Electric Global Business in Over 100 Countries

**North America**
- Employees: 33,700
- Factories: 38

**Western Europe**
- Employees: 47,600
- Factories: 92

**Asia Pacific**
- Employees: 61,500
  - Including JV: 77 Factories

**Rest of the World**
- Employees: 34,100
- Factories: 38

1: Published figures in billion € restated to reflect country-market view;
2: Billion € pro-forma basis including LTM Sep 2014 revenue for Invensys
3: Including Invensys, excluding Delixi and Fuji
The Old World of Energy: Singular flow of Electricity from Source to Load
The new World of Energy: Electricity is…

Distributed & Connected
What is a Microgrid?

An integrated energy system consisting of interconnected loads and distributed energy resources which, …

In Normal Operations

- DER (Distributed Energy Resources)
- On-site renewables and power generation facilities utilized in parallel with grid
- May be possible to sell excess power back to the grid through a net metering contract

In Island Mode (or DR)

- DER (Distributed Energy Resources)
- Microgrid will generate energy from local sources in the case of a grid outage

... as a single entity, can be controlled and operated in parallel with the grid or in an intentional *islanded* mode.
Microgrid Value Proposition

We optimize DERs to enhance reliability; improve efficiency and drive environmental benefits.

**Reliable Energy**
- Ability to intentionally “island” from utility
- Preserve critical loads 24/7/365
- Redeploy grid tied inverters for island mode operation

**Efficiency & Optimization**
- Minimize energy costs
- Harness combined heat and power
- Maximize incentives
- Monetize energy flexibility with the grid

**Green Energy**
- Incorporate low cost solar & low emission DER
- Implement net-zero projects
- Reduce green house gases
Highlight - Microgrid Components

SCHNEIDER INNOVATION AT EVERY LEVEL

- Apps, Analytics, Services
- Cloud / On Premise
- Local Control
- Connected Products
Microgrid Control & Event Management

- Reactive DER management
- Ensures microgrid real time stability & reliability
- Manage of connect/disconnect from the grid
- Optimize energy production & use

- Predictive DER management
- Interfaces with energy markets
- Weather forecasts (DTN)
- Forecast when to produce & store
- Cloud based accessible anywhere

StruxureWare™ Demand-Side Operation

Client Constraints
Weather forecast (DTN)
Energy market pricing
Demand response requests

DER Box

Microgrid Controller

Cloud

Client site
Advanced algorithms help make fast decisions about cost-saving opportunities

Battery Energy Storage - The EcoBlade™

Residential
Commerical & Industrial
Utility / Independent Power Producer
A few interesting microgrid examples
Oncor Microgrid

A truly **Autonomous & Dynamic** Microgrid completed in **under 6 months**

**Project at a Glance**

Management of 9 different DER types

- 200 kW BES
- 120 kW Solar PV
- 06 kW Solar PV
- 65 kW Microturbine
- 45 kW Gas recip
- 560 kW Diesels
- Wind - considered

Square D Switchboards
S&C Intellirupter
Schneider Electric Controllers and software

**Efficiency & Optimization**

- Predictive and real-time control of DER
- StruxureWare Demand Side Operation software platform for economic optimization and dispatch
- Load preservation features for ensuring the most critical loads are served Integration of MG Controller with BMS
- 4 separate Microgrids, **autonomous and dynamic**
  - Coordinated Automatic Islanding and Reconnect
  - Dynamic management of critical loads and generation and storage assets

The most advanced microgrid in the US, located near Dallas, Texas

**Green Energy**

- Solar and cleaner gas (vs. just diesel)
- Low emission CHP (not utilizing thermal)
- Serves as a best practice to deploying an environmentally sustainable Microgrid, using solar in island mode
Oncor Microgrids

Site:
- Primary Meter Point
- IntelliTeam on Grid Source
- 2 – Vista Switchgear
- 2 – Remote Switch

Area (3):
- 2 – 175 kW Diesel Backup Generators
- 1 – 25 kW/25kWh Battery

Area (2):
- 1 – 45 kW Propane Backup Generator
- 1 – 200 kW Diesel Backup Generator

Area (1):
- Environmental Lab + Microgrid Demonstration/Education Center
- Solar – 112 kW south-facing & 2kW west-facing
- Battery – 200 kW / 400 kWh
- Microturbine – 65 kW
Powers critical facilities during electrical grid outage

Project at a Glance
- Modern and harden public safety infrastructure to withstand severe weather supporting 59,000 residents
- Using distributed generation sources, a Microgrid control system was installed to control power distribution both in grid parallel and islanded modes
- Harness Solar and gas powered generation

Efficiency & Optimization
- Distributed generation to provide 120% of critical power demand during all peak periods
- Reduce demand and consumption at Police and Fire HQ over 2 years by about 60 kW and 250,000 kWh annually

Reliable Energy
- Ensure 365/24/7 operations of critical infrastructure, including police and fire HQ, emergency comm center, cell phone tower service, and homeless shelter.

Green Energy
- Installed PV system at Fire HQ
- Use natural gas fired CHP generators
Town of Fairfield Advanced Microgrid
Schneider Electric is the proud sponsor of this innovative collegiate competition providing the site microgrid since 2009

2011 Project at a Glance
• Washington, DC (Irvine, Ca in 2013 & 2015)
• Designed, built, and interconnected the sites Net Zero Microgrid
• 19 Connected solar powered homes
• 187 kW peak load
• 87 kW peak export to utility
• 0.5% voltage regulation
• Built to IEC, NEC, and NFPA standards

Reliable Energy
• Ensure 365/24/7 operations of competition microgrid
• Managed the microgrid with 19 unique Solar PV generators

Green Energy
• 100% solar PV generation
Solar Decathlon Microgrid 2011
Take our virtual tour to see how a microgrid works
Visit microgrids.schneider-electric.us