Eliminate risk while maximizing your resiliency, efficiency, and sustainability
Learn more at http://microgrids.schneider-electric.us
Schneider Electric, the Global Specialist in Energy Management and Automation

$30 billion
FY 2016 revenues

~5%
of FY revenues devoted to R&D

160,000+
people in 100+ countries

Four integrated and synergetic businesses – FY 2016 revenues

<table>
<thead>
<tr>
<th>Building</th>
<th>IT</th>
<th>Industry Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>43%</td>
<td>15%</td>
<td>22%</td>
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Balanced geographies – FY 2016 revenues

- 28% North America
- 27% Western Europe
- 27% Asia Pacific
- 18% Rest of World

- 100-year legacy in the power distribution and energy management business
- Innovative, modular microgrid solutions allow electrical distribution systems to evolve with technology and regulatory structures—all while supporting locally with responsive operations, maintenance and optimization services.
We have an opportunity to co-create the future

More ELECTRIC
2X faster growth of electricity demand compared to energy demand by 2040

Source: IEA WEO 2014

More DIGITIZED
10X more incremental connected devices than connected people by 2020

Source: Cisco, Internet World Statistics

More DECARBONIZED
82% of the economic potential of energy efficiency in buildings and more than half in industry, remains untapped

Source: World Energy Outlook 2012, Internal Analysis

More DECENTRALIZED
70% of new capacity additions will be in Renewables by 2040

Source: BNEF
On the brink of disruption

“The electricity system that has served us well for 100 years is facing a fundamental threat to its existence.”

Navigant Research, Liberating Microgrids (and all DER)
We have an opportunity to co-create the future as *The New Energy Landscape* becomes…

### Historical Energy Value Chain vs. “The New Energy Landscape”

- **Centralized Generation** → **Transmission** → **Distribution** → **Retail** → **Consumer**
- **Centralized Generation** → **Transmission** → **Distribution** → **Retail** → **Prosumer**
Integrated Energy Outcomes
Historically Passive Consumers are Thinking About Energy in a New Way

**Cost/Savings**
- Lower / More Predictable Energy Costs
- Energy / Fuel Source Arbitrage
- Flexibility drives savings / incremental revenue

**Resilience**
- Serve loads during times of grid instability
- Oasis for employees / customers – shelter in place
- Protect power sensitive / critical assets from poor power quality

**Sustainability**
- Reduce carbon footprint
- Improve brand image
- Attract / Service carbon sensitive customers
One EcoStruxure architecture, serving 4 End Markets with 6 Domains of Expertise

**Connected Products**
- i.e. Smart Breakers, PV Inverters, Storage, Gensets, etc.

**Edge Control**
- i.e. EcoStruxure Microgrid Operation

**Apps, Analytics & Services**
- i.e. EcoStruxure Microgrid Advisor

**End to End Cybersecurity**
- Cloud and/or On Premise

**EcoStruxure Architecture**
- Building
- Data Center
- Industry
- Infrastructure

Confidential Property of Schneider Electric | Page 8
Apps, Analytics & Services: EcoStruxure Microgrid Advisor

Forecast and optimize when to consume, produce, store, or sell energy

DER Monitoring & Autonomous Optimization
• Web accessible multi-stakeholder dashboards

Tariff Management
• Consume or produce energy at the most advantageous time based on variable utility rates

Demand Response & Control
• Reduce peak demand charges
• Partner with curtailment service providers for grid ancillary services

Self Consumption & Island Mode
• Toggle from economic optimization to resilience storm mode
Microgrid Controller: EcoStruxure Microgrid Operation

Real time control of DER and islanding management

Features:

- PLC or Industrial PC based solution, usually with a Load Generation Control Unit (LGCU) for each grid forming DER
- System stability
- Load sharing
- Load preservation system
- Performs Automatic Transfer Operation (on grid to off grid, off grid to on grid)
- Ensure the safety and security of the microgrid (grounding, changing settings of protection devices, etc.)
- Can be connected to an EMS (Schneider, 3rd party)
- DER agnostic
- Connectivity: Modbus IP, IEC 61850
Connected Products

Devices that are able to be monitored and/or controlled by Edge Controller

- **MV Smart Panel**
  - Main LV Smart Panel
  - Energy Control Center
  - ION9000 PQ Meter
  - PM8000 Advanced Power Meter
  - M580 PLC Source Transfer & Remote I/O
  - SEPAM 80 Protection Relay
  - T300 - Feeder Automation RTU

- **Genset**
  - ASCO 7000 ATS w/ Group 5 Controller

- **Distributed Energy Resources**
  - **PV inverter**
  - **Battery Inverter w/ Management**
  - **Combine Heat & Power (CHP)**

- **UPS**
  - **Galaxy**

- **LV Final Distribution Smart Panel**
  - PowerLink G4 MCCB control & status
  - PM5500
  - Branch Circuit Power Meter
  - ION9000 PQ Meter
  - MTZ Control Unit & Circuit Breaker
  - SEPAM 80 Protection Relay
  - M580 PLC Source Transfer & Remote I/O

- **Energy Control Center**
  - SEPAM 80 Protection Relay
  - Branch Circuit Power Meter
  - PowerLink G4 MCCB control & status

- **Life Is On**
  - Schneider Electric
The Energy Control Center implements all 3 layers of EcoStruxure

- Edge Control i.e. EcoStruxure Microgrid Operation
- Apps, Analytics & Services i.e. EcoStruxure Microgrid Advisor
- Connected Products i.e. Smart Breakers, PV Inverters, etc.
Energy Control Center in Campus Microgrids

Gordon Bubolz Nature Center, Appleton, WI

H2 Storage

H2 Electrolyzer

H2 Storage

H2 Fuel Cell

ECC Main Switchboard Building #1

Solar PV

NG Backup Gen.

Li Ion Battery

ECC Main Switchboard Building #2

Microturbine CHP

Flexible and Priority Loads
Customer Challenge
Integrate and easily manage multiple onsite distributed energy resources (DER) at the Bubolz Nature Preserve.

The Solution
• Configurable microgrid equipment combined with
• autonomous and dynamic platform
• provides real-time tariff management
• demand response requests,
• peak shaving
• CO2 tracking and
• storm hardening across numerous generation assets.

Customer Benefits
Bubolz Nature Center will easily optimize resources and maximize facility performance.

The Results: Life is On with...
• Potential for zero carbon emissions
• Up to 50 percent lifetime power savings
• Microgrid will provide power to Bubolz’s main facility, as well as the smaller buildings on the property
• Net-zero grid energy consumption

“This project represents a forward-looking use case of energy systems that aim to establish a more resilient, efficient, economic and cleaner grid. The advanced control features integrated with Bubolz Nature Preserve’s microgrid will benefit the facility and local community, supporting the development of a more intelligent and sustainable energy system.”
Mike Jansen, CEO of Faith Technologies

www.schneider-electric.us/microgrid

One of the largest, most advanced microgrid in the Midwest

Project won DER Project of the Year from POWER Magazine
The Future of Microgrids.....

....Follows the trend of Distributed Generation

**Engineered Systems**
- Project-specific spec of components to build system
- Highly flexible
- Tend to be most costly

**Packaged Systems**
- Pre-engineering of subsystems
- Some flexibility in subsystem components
- Tend to be highly cost effective

**Productized Systems**
- Factory built and tested
- Minimal system flexibility
  - Based on product "options"
- Tend to be most cost effective

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**CHP Example**
- Engine gen. set in place at jobsite

**Microgrids**
- Custom design
- Custom service support
- High site-specific engineering
  - "If you've seen one microgrid, you've seen one microgrid!"

**Energy Control Center**
- Engineered-to-Order
- Standardized components, controller, etc.
- Standard service packages
- Site-specific control and automation schemes
- Flexibility to use many DERs

**ECC800/1200**
- Configured-to-Order
- Standardized control and automation programs
- Standard service packages
- Limited use cases
- Flexibility to use some DERs
- Lowest cost
Visit the Schneider Electric Booth to Talk More!