Microgrid Workshop
Managing a Complex Energy Landscape with New Technologies

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Objectives of Presentation

Explain the relationship between our existing grid and the new energy solutions arriving at the grid edge.

Clarify how prosumers are actively managing their energy outcomes and what systems they are deploying to solve their challenges.

Examine approaches to simplifying energy at the edge that can be deployed by many more users.
MacroGrid or “The Grid”

- large interconnected regional energy system supporting our Modern Energy Economy

Mini Grid

- small “off-grid” system usually found on islands or remote locations without Macrogrid interconnection.

MicroGrid

- interactive with the Macrogrid, a localized energy system supporting campuses, buildings or subdivisions

Macrogrid vs Microgrid, can be thought of similar to Macroeconomics vs Microeconomics
The *Smarter* Grid is much more aware of network function

Distribution utilities understand their network conditions and respond to secure its behavior

- Network visualization
- Realtime and offline
- Power forecasting
- Simulation scenarios
- Historical analysis
- Dashboard reporting
Macrogrid and microgrids interact to benefit both the end user and grid operator.

- Grid: DER aggregation and management
- Microgrid EMS
- Smart Grid ADMS
- DERMS
- Energy Storage: Supporting renewables integration
- Solar PV: Local urban generation

Life Is On | Schneider Electric
We have an opportunity to co-create the future as *The New Energy Landscape* becomes…

Historical Energy Value Chain transitions …

Centralized Generation → Transmission → Distribution → Retail → Consumer

… to “The New Energy Landscape”

…built for the **Prosumer**!
Prosumers come in many shapes and sizes
Microgrids are suitable for most every application, from industrial/commercial buildings to campuses

- Commercial Buildings
- Healthcare Facilities
- Data Centers
- Municipal Services
- Military Installations
- Transportation

Note: Distributed energy resources are often already existing on site.

Montgomery County, Maryland

2 Microgrids:
- Solar PV
- Combined Heat and Power
- Energy as a Service

Project includes:
- Power control
- Energy Optimization
- Cybersecurity

Public Safety Headquarters and Correctional Facility

Prosumer microgrids “treble triplet”

It’s about making wise choices at the intersection between energy smartly acquired, locally produced, and efficiently consumed!
Advances in Microgrid Control and DER integration are enabled by IT/OT Convergence

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

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

Energy Management Software

Microgrid Controller

Energy market pricing

Weather forecast (DTN)

Demand response requests

Client Constraints
Automated peak demand and tariff management

Avoid or minimize costs by shaving peak demand and leveraging off-peak pricing.

- Demand Charge Limit set to 780KW

[Diagram showing peak management and tariff management with solar PV and battery storage]

Source: Oncor Electric Delivery Company

250KW/500KWH BESS coupled with Energy Management Software
Integration of protection and controls to simplify grid edge systems deployment

Grid & onsite production integrated management for energy savings & uptime

Cloud Services

Energy Management Software

Microgrid Controller

SCADA

Power Monitoring

Edge Control

MV Smart Panel

Main LV Smart Panel

Automated Switchboard

LV Final Distribution Smart Panel

Connected Product

Confidential Property of Schneider Electric

Protection Relay

Programmable Logic Controller Source Transfer & Remote I/O

Source Transfer & Remote I/O

Branch Circuit Power Meter

Lighting Control MCCB control & status

Branch Metering

PLC

Automatic Transfer Switch

Fuel Cells

Combine Heat & Power (CHP)

PV inverter

Battery Inverter w/ Management

Distributed Energy Resources

Genset

UPS

Power Monitoring

Energy Management Software

Cloud Services
UPS with Peak Shaving Capability

High-performance uninterruptible power supply including li-ion storage and dispatch flexibility

With the right UPS…
- Energy Management Software adjusts UPS input power limit to maximize ROI
- Load power beyond input power limit is drawn from batteries
- Only a portion of battery capacity is used for peak shaving to ensure reserve for full backup time

Higher resiliency ➔ Battery issues can be detected BEFORE backup needed
Microgrid w/ Dispatchable Uninterruptible Power Supply (UPS)

Automated Microgrid Switchboard

Note: circuit breakers are typically smart and electrically operated

Li-Ion UPS

Critical loads

Essential loads

Standard loads
Critical Power supported by DC Integrated Microgrid

Hybrid AC/DC infrastructure enhances DER resiliency

- Utility Main(s)
- Genset
- Solar PV
- Wind
- Fuel Cell
- Non Critical Loads
- Controls & HMI
- DC Integration Bus
- AC Distribution Bus
- DC Loads
- Critical Loads (i.e., Data Center Whitespace + Cooling)
Save your CAPEX… utilize Energy as a Service!

Financing Partners can simplify these energy investments allowing off-takers to achieve:

- Resilience – secure business and services continuity and offer community hub during natural disasters
- Cost efficiency - more predictable costs, flexibility, and services allowing companies the freedom to reinvest in their own business
- Sustainability - reduced carbon footprint and enhanced brand image
- Ability to scale - projects can start smaller and then be expanded as your company grows and needs evolve.

Many investors are ready to support credit worthy microgrid projects with funds that target renewable generation. The end-user commits to an OPEX based Power Purchase Agreement (PPA) that meets the return goals of the investor while allowing off-takers to retain and focus their capital on their primary business objectives.
Case Studies
Customer Challenge
Schneider Electric’s new headquarters experienced utility-related outages.

The Solution
Pre-configured microgrid solutions with site optimization platform owned and operated by third-party capital partners.

Customer Benefits
Greater electrical reliability, resiliency, demand-side efficiency, and sustainability at no upfront cost.

The Results: Life is On with...
When we collaborate with partners to develop real-world solutions that enhance the electric reliability, boost use of clean energy, and manage energy economically—all while sparing customers from paying any upfront capital costs.

“The sustainability aspects of the microgrid create savings, and equipment upgrades can be funded by those savings.”

Mark Feasel,
Vice President Smart Grid, Schneider Electric

In partnership with Duke Energy Renewables and REC Solar, the Schneider Electric built microgrid powers critical operations.
Customer Challenge
Integrate and easily manage multiple onsite distributed energy resources (DER) at the Bubolz Nature Preserve.

The Solution
The configurable equipment combined with the 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
With microgrid solutions from Schneider Electric and installation support from Faith Technologies, the Bubolz Nature Center will easily optimize resources and maximize facility performance.

The Results: Life is On with...
The potential to have zero carbon emissions and to achieve 50 percent lifetime power savings. The microgrid will provide power to Bubolz’s main facility, as well as the smaller buildings on the property, while achieving net-zero energy consumption.

“This microgrid was designed and engineered by Faith’s team of energy experts and utilizes specialized equipment and technology made possible through our collaboration with a very forward-thinking partner: Schneider Electric.”

Mike Jansen, CEO of Faith Technologies

One of the largest, most advanced microgrid in the Midwest

Project won DER Project of the Year from POWER Magazine

Revenue
Capex $714k
Opex $3,600/yr
GM 28%

EcoStruxure® Microgrid Advisor

Apps, analytics, and services

Edge control

Connected products

Energy Control Center

Nature Offers Real-Life Drama During Microgrid Tour in Wisconsin

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