

# INNOVATIVE

## Advanced microgrid serves as a learning lab

Fox Cities Environmental Learning Center at  
Bubolz Nature Preserve — Appleton, Wisconsin, USA

Advanced microgrid with five distributed energy resources.

In partnership with



[schneider-electric.com/ecostruxure](https://schneider-electric.com/ecostruxure)

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## Overview

Dedicated to environmental ethics, the Fox Cities Environmental Learning Center at Bubolz Nature Preserve advanced its mission significantly in 2018 when it became home to one of the world's most sophisticated microgrids. The microgrid operates as a learning lab for the 100,000+ visitors expected at the Appleton, Wisconsin, preserve each year.

But that's just the start.

The sophisticated energy array, provided and supported by Faith Technologies and Schneider Electric, also offers an opportunity for important research and development. It demonstrates and tests the latest in microgrid operations and will pass the knowledge on to the growing clean energy industry and its customers.

The 45-year-old nature preserve is no stranger to clean energy. In 1981 — well before today's sustainability revolution — Bubolz was experimenting with solar, wind, and geothermal to energize what was then an earth center at the site. More recently, the nonprofit preserve built a new 18,000 square foot, highly efficient lodge which the microgrid will energize by way of solar photovoltaics, energy storage, a fuel cell, microturbine, and a natural gas generator.

The energy project is designed to:

- reduce and even eliminate high energy costs to the nonprofit organization
- modernize the facility
- better educate current and future generations about sustainability
- gain resilience via optional island mode

The microgrid provides yet another good reason to visit the center, which offers a wide range of activities from school field trips to birding to dogsledding on its 700 acres. Students visiting the Nature Center already learn about abiotics, phenology, and echolocation. Now they have the opportunity to understand how a microgrid can help them take control of their energy future and achieve high levels of sustainability, reliability, and efficiency.

## Goal

- Lower energy costs at nature preserve with a sustainable solution
- Create a clean energy research and development facility

## Solution

An advanced microgrid with five forms of distributed energy resources.

## Story

Fox Cities Environmental Learning Center at Bubolz Nature Preserve built a new state-of-the-art, energy-efficient Nature Center. Adding a microgrid offered Bubolz the opportunity to make the Nature Center a living lab for leading-edge energy technology.

## Results

Partners Schneider Electric and Faith Technologies developed a microgrid solution that:

- Lowers energy costs
- Offers a new educational experience at Bubolz
- Acts as a test lab and provides a learning opportunity for other microgrid customers

“It’s a wonderful opportunity and fits well with our mission. Environmental sustainability is what we do. It’s who we are. We specialize in environmental education and the microgrid brings a whole new dimension to what we can offer,” said Randy Tuma, Executive Director of Fox Cities Environmental Learning Center at Bubolz Nature Preserve.

### Economic benefits

Bubolz has a goal to achieve net zero energy — the ability to produce more energy than is consumed. The facility is designed to exceed that goal, producing all of the energy it needs and more. Any excess energy can be fed to the central electric grid, creating an opportunity for the microgrid to earn revenue and provide grid stabilization for the larger community. This eliminates electric utility bills, an especially important benefit given the nature preserve’s nonprofit status.

Bubolz can operate with full energy independence or remain connected to the grid, depending on which mode of operation offers the most benefit at any given time.

“What’s most important to us is the sustainability aspect of the project — not only the environmental sustainability, but the economic sustainability the microgrid brings to our energy budgeting,” said Randy Tuma, Executive Director of Fox Cities Environmental Learning Center at Bubolz Nature Preserve.

The microgrid also provides Bubolz with superior electric reliability. Should a power outage occur on the utility grid, the new \$5 million Nature Center will be able to rely on the microgrid for power.

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

### One of the world’s most advanced microgrids

The Bubolz microgrid benefits the preserve and the wider microgrid industry. One of the most advanced microgrids in existence, it acts as a testing site for increasingly sophisticated microgrid operations. Bubolz is particularly well-suited to play this role because of the large number of energy resources installed on site.

“Very few microgrids today operate with five distributed energy resources. By having access to all five DER, we can explore the technical space in ways not otherwise possible. The number of possible combinations of resources goes up not linearly, but exponentially,” said Don Wingate, Vice President, Microgrid Solutions, Schneider Electric.

## Client vision

Develop an energy system that offers both economic and environmental sustainability.

## Benefits

- Net zero energy consumption
- An end to paying utility electricity bills
- Electric reliability
- A new education platform in keeping with the mission of the nature preserve

## Project

### Project at a glance

- Location: Fox Cities Environmental Learning Center at Bubolz Nature Preserve, Appleton, Wisconsin
- Project type: advanced microgrid with five distributed energy resources

### Project details

- 200 kW solar photovoltaics
- 100 kW lithium-ion battery energy storage system
- 30 kW fuel cell
- 65 kW microturbine
- 60 kW natural gas generator
- Schneider Electric EcoStruxure Microgrid Advisor
- Schneider Electric Energy Control Center

Installed by Faith Technologies, the five distributed energy resources (DER) are managed by Schneider Electric's Energy Control Center, an intelligent, pre-engineered power control center, and optimized by Schneider Electric's EcoStruxure™ Microgrid Advisor, a cloud-connected software platform. The sophisticated tool can autonomously configure the DER into a range of different permutations to produce the most efficient, clean, and cost-effective combination of energy resources available at any given time. This is an extremely important exercise because energy pricing and resource availability can change minute by minute.



Customers bring different priorities to their microgrids. Some want their microgrids programmed for lowest-carbon emissions, others for price or reliability. By exploring the different permutations of DER, Schneider Electric and Faith Technologies can better understand how to achieve these goals for a range of customers from educational institutions to commercial and industrial operations to communities.

Further, in managing the resources, Schneider Electric can see which DER act most effectively as anchor resources when the microgrid islands from the

central grid — and pass this information along to others who use microgrids. Schneider Electric and Faith Technologies will also explore integration of more than one Energy Control Center. More specifically, the site will have a parent Energy Control Center in one building and a child, or subordinate, control center in another.

While microgrid experts often theorize about this kind of sophistication, the Bubolz microgrid actually exhibits it.

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— Randy Tuma,  
Executive Director of  
Fox Cities Environmental  
Learning Center at  
Bubolz Nature Preserve



“There are theoretical combinations of DER, but you have to read the fine print. One resource may be able to anchor the microgrid and others follow — in theory. But the combination may not be as effective as envisioned. The real-world learning offered through the Bubolz microgrid gives Schneider Electric and Faith Technologies an opportunity to really push the envelope and resolve issues still under debate. As a result, we can provide the world with microgrids that operate in a superior fashion,” said Don Wingate, Vice President, Microgrid Solutions, Schneider Electric.



Over the years, the system will continue to grow in sophistication without the need for any on-site visits or physical changes made by Schneider Electric or Faith Technologies. This is because the software is cloud-based. This feature allows Schneider Electric to monitor the Bubolz microgrid’s assets and update the programming from its own headquarters in Boston.

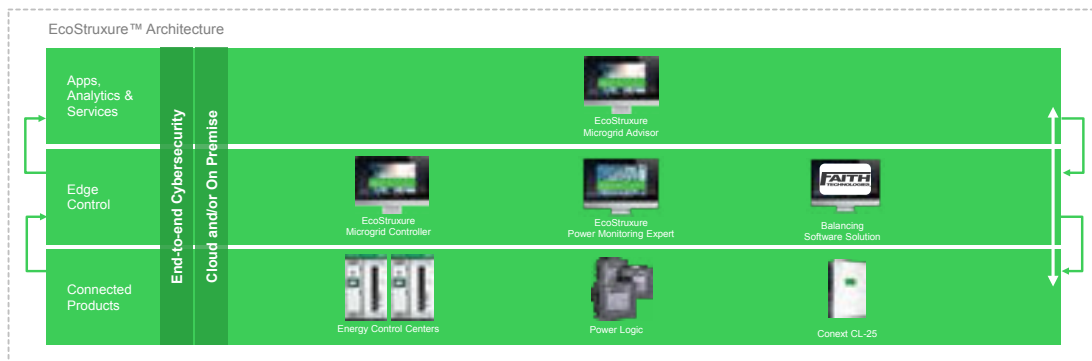
In addition, the microgrid feeds live data about its performance to a display at Faith Technologies’ Innovation Center in downtown Menasha, about five miles from Bubolz. From there, Faith Technologies can monitor and test the microgrid generators. The display gives Bubolz a clear view into its system’s performance.

“Not every customer has the ability to come out and see what we’ve accomplished as partners in energy; when they can’t, we have it on live feed to our central Innovation Center lab. Here customers can learn ‘remotely’ how this microgrid R&D facility is truly leading energy management learning and results,” said Mike Jansen, CEO of Faith Technologies.

The Fox Cities Environmental Learning Center at Bubolz Nature Preserve may be hidden in the woods, but it stands out on the global microgrid map as an energy innovator and educator. As partners, Schneider Electric and Faith Technologies have produced a demonstration that will enhance the nature preserve and lead the way for less expensive, more reliable, and cleaner microgrid energy production for the world.

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— Mike Jansen,  
CEO of Faith  
Technologies



# EcoStruxure™

## Innovation At Every Level

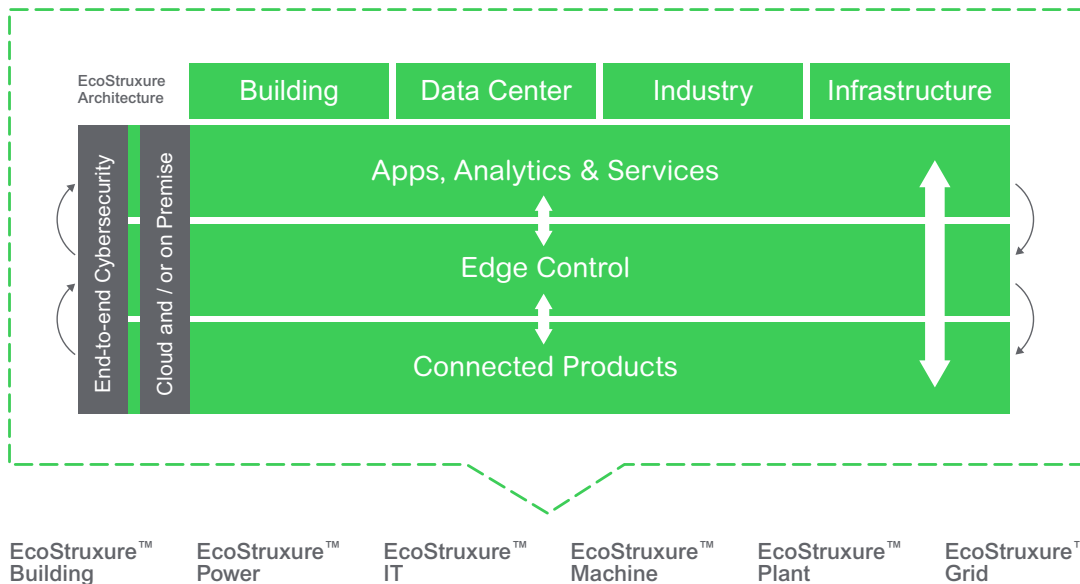
### IoT-enabled solutions that drive operational and energy efficiency

EcoStruxure is Schneider Electric’s open, interoperable, IoT-enabled system architecture and platform.

EcoStruxure delivers enhanced value around safety, reliability, efficiency, sustainability, and connectivity for our customers.

EcoStruxure leverages advancements in IoT, mobility, sensing, cloud, analytics, and cybersecurity to deliver Innovation at Every Level including Connected Products, Edge Control, and Apps, Analytics & Services. EcoStruxure™ has been deployed in 480,000+ sites, with the support of 20,000+ system integrators and developers, connecting over 1.6 million assets under management through 40+ digital services.

### One EcoStruxure architecture, serving 4 End Markets with 6 Domains of Expertise



#### Connected Products

The Internet of Things starts with the best things. Our IoT-enabled best-in-class connected products include breakers, drives, UPSs, relays, sensors, and more. Devices with embedded intelligence drive better decision-making throughout operations.

#### Edge Control

Mission-critical scenarios can be unpredictable, so control of devices at the edge of the IoT network is a must. This essential capability provides real-time solutions that enable local control at the edge, protecting safety and uptime.

#### Apps, Analytics & Services

Interoperability is imperative to supporting the diverse hardware and systems in building, data center, industry, and grid environments. EcoStruxure enables a breadth of agnostic Applications, Analytics, & Services for seamless enterprise integration.

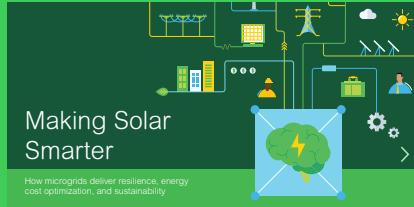
Find out more about EcoStruxure

[schneider-electric.com/ecostruxure](https://schneider-electric.com/ecostruxure)

# Learn More



Discover Microgrid solutions



eBook: Making Solar Smarter



White Paper: Microgrid Knowledge — Energy as a Service



Webinar: Microgrids with No Money Down



White Paper: Avoid common Microgrid implementation pitfalls



White Paper: Understand your Microgrid options

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