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Your Partner in the Clean Energy Economy

Boston | Schneider Electric Smart Cities

NECEC Smart Cities Integrated Infrastructure Workshop BSCCII 3.2.16

Jim Anderson & Mark Johnson | Schneider Electric Smart Cites

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Life is On with Schneider Electric Smart City Solutions:

From **downtown** to **suburb** , we deliver **urban efficiency today**

Smart Water

- Plant & Network Energy Performance
- Water Distribution Optimization & Loss Mgt
- Stormwater management and Urban Flooding
- Irrigation Management

Smart Energy

- Smart Grid Asset Management, Smart Generation, Demand Side Management, Utility Services
- Renewables Integration & Micro Grid
- District Heating/Cooling Management
- Gas Distribution Management
- Shore Connection

Smart Buildings & Homes

- Multiple Disparate Buildings Management
- High Performance Buildings
- Flexible Buildings
- Efficient Homes

Smart Public Services

- Public Safety: Video Surveillance
- Smart Street Lighting Management

Smart Mobility

- EV Charging Infrastructure & Supervision Services
- Traffic Management
- Tunnel Management
- Tolling Management
- Railway Management
- Airport Solutions

Smart Data Center

- Efficient Data Centers
- Prefabricated Data Centers
- Infrastructure Enabled Management Services

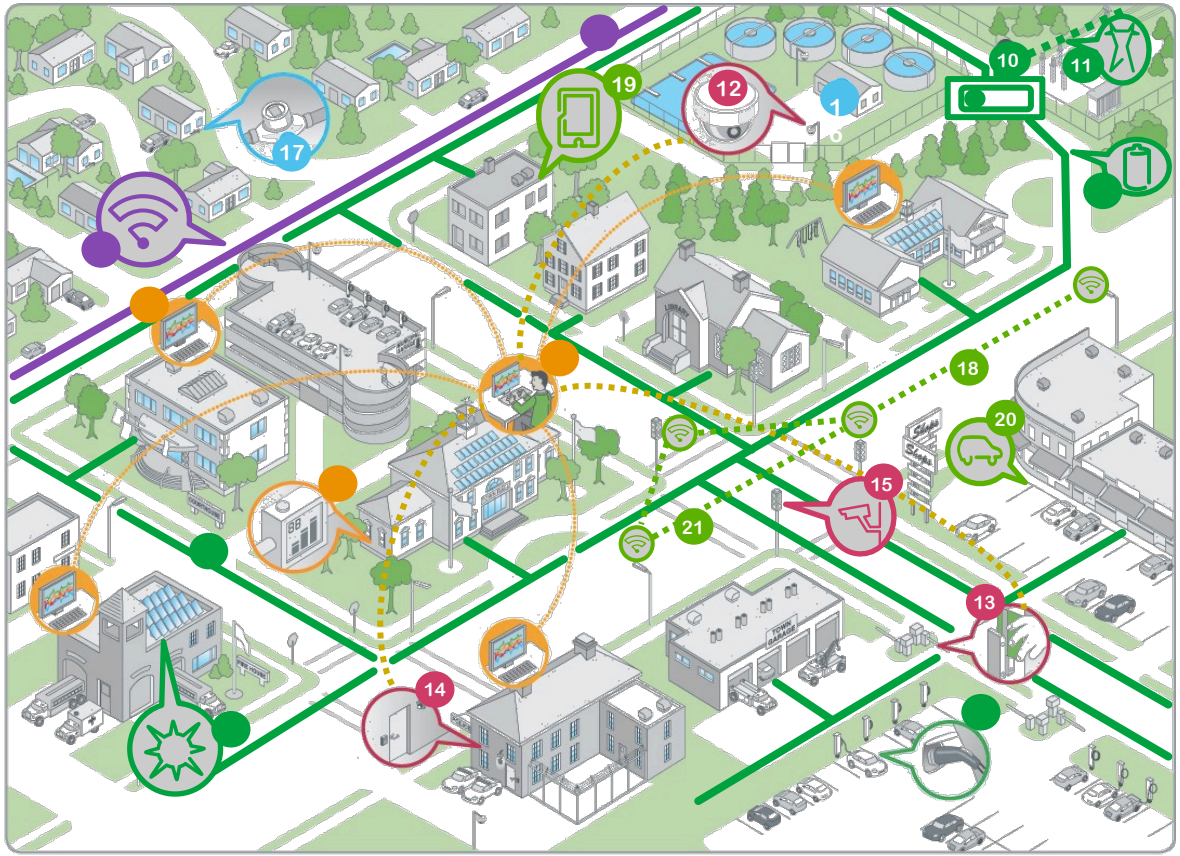
Smart Integration

- City-wide Platforms
- Energy & Sustainability Resource Management
- Urban Efficiency Platform
- District Energy Management Information System

- Cross-domain Application
  - Weather
  - GIS
  - Asset Management

- City Strategy Services
  - Sustainability Services
  - Smart Cities Advisory Services
  - Energy Performance Contracting

Urban Development: Connecting the Eco-System



Integrated Management

1 Network Operations Center (NOC)
2 Enterprise System Control & Visibility
3 Centralized Management & Metering

Integrated Communications

4 Fiber
5 Broadband Access (FTTx, LTE), Small Cells/WLAN & IP Backhaul

Energy Infrastructure

6 Community Microgrid
7 On-site Renewables (Solar)
8 Energy Storage
9 Electric Vehicle Infrastructure
10 Utility Switch, Primary Meter
11 Smart Grid Utility Tie-in

Primary Solution Focus for Urban Development

Public Safety

12 Surveillance
13 Access Control
14 Fire & Life Safety
15 License Plate Cameras

Water Infrastructure

16 Water Treatment, Storage, Recycling
17 Water Infrastructure & Metering

Entertainment/ Services

18 Micro-Cell Broadband Internet
19 Citizen Apps & Entertainment
20 Smart Parking
21 Smart Streets

BRA PLANDorchester Avenue Corridor integrated infrastructure planning

Digital City Services Hub

- Entertainment
- Phone
- Smart Parking
- Network Services
- Advertising Options
- eHealth
- Connected Car
- Educational
- Free Micro-Cell Broadband Internet

Smart Energy

- Smart Grid & Microgrid
- Smart Metering & Demand Response
- Renewables Integration & energy Storage
- Real-Time Smart Grid Software Suite

Smart Mobility

- EV Charging Infrastructure & Services
- Traffic Management
- Congestion & Parking management
- Integrated Mobility
  - Public Transit
  - Traveler Information

Smart Water

- Stormwater management and Urban Flooding
- Power, Control, Distribution, Leak detection
- SCADA and Telemetry Software
- Smart Water Metering

Smart Safety

- Public Safety
  - Video Surveillance
  - Emergency management
- Access Control & Intrusion detection
- Network Operations Center (NOC)
- Street Lighting management

Smart Buildings

- High-performance Buildings*
  - Energy Efficiency
  - Security solutions
  - Energy Services
- Smart Homes
  - Home Energy management
  - Power Systems
- Connection to the Smart Grid

Operational Systems

- Power, Security, Building, IT, & Process Management Systems
- Integrated District Management Platform
- Security Systems & Management
- Energy & Environment Management Information System
- Weather Intelligence

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Integrated Urban Infrastructure

Communications Network

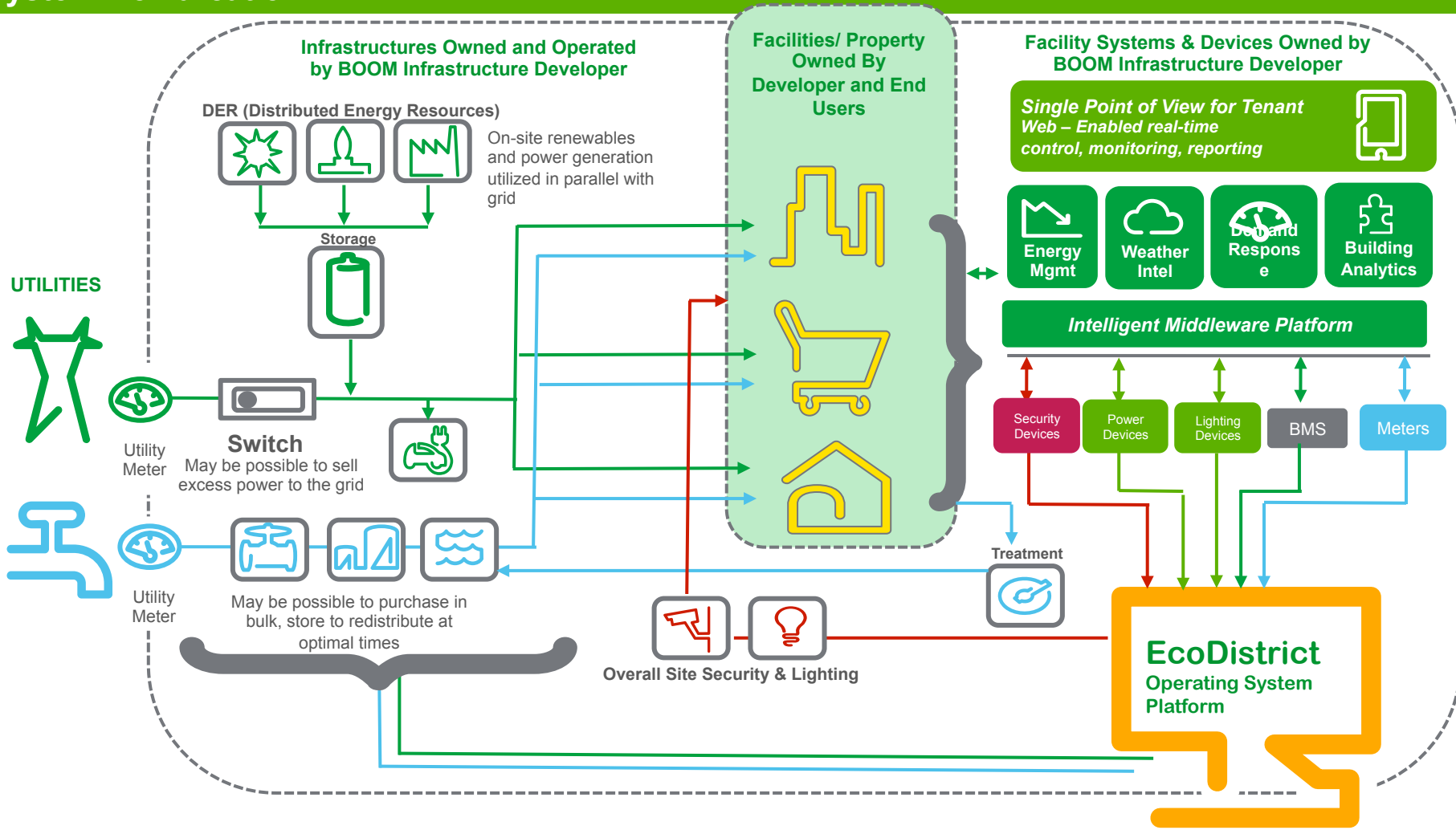
- Broadband Access, (4G LTE, FTTx, xDSL)
- IP Backhaul
- Small Cell/ WLAN
- IP Aggregation- Edge & Access Network
- WLAN/2G/3G/4G Roaming

CISCO

verizon

* Hospitals, industrial facilities, datacenters and commercial buildings

System Demarcation



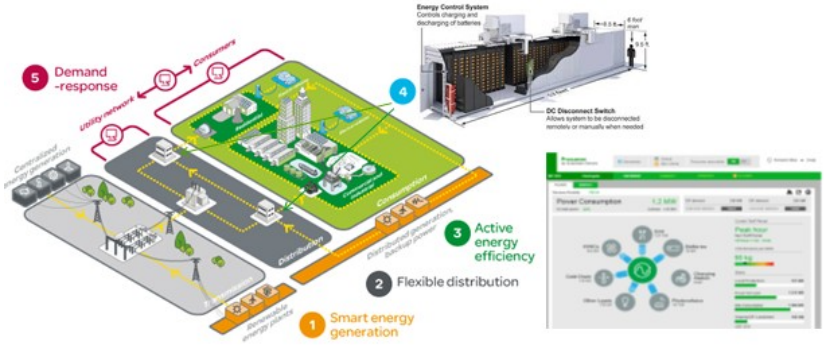
Solar+Storage Microgrid for Resiliency

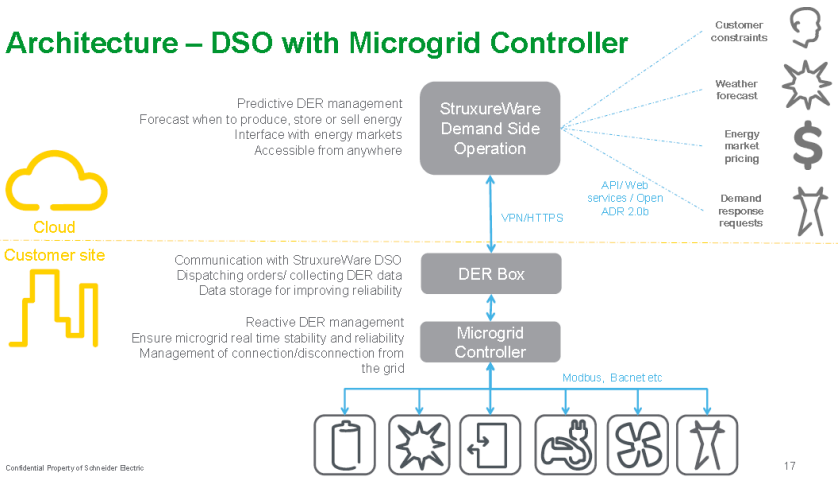
Shedd Aquarium Chicago, IL

Challenges: store solar & backup power

Solution: MW battery energy storage connected to solar, building & grid paid by utility & ISO programs

Result: Resiliency power for disaster & outage recovery





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Resiliency Microgrid

Fairfield CONNECTICUT

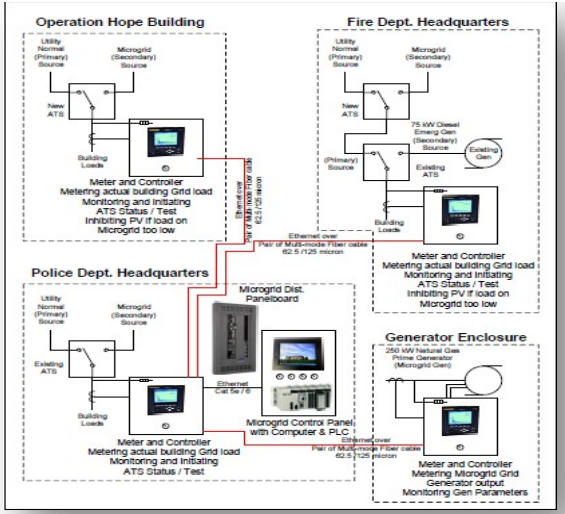
City of Fairfield CT Fairfield CT

Challenges: critical infrastructure operability during disasters & outages

Solution: distributed generation for 120% of critical power needs with solar

Result: Resiliency power for disaster & outage recovery

FAIRFIELD, Conn. — The town on Wednesday unveiled its new microgrid, a high-tech system that will reduce energy consumption and protect critical facilities, such as the police and fire departments, during emergencies and power outages.



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Fairfield: A Connecticut Town on the Vanguard of Microgrid Development

Client Microgrid Vision

Comply with new state legislation requiring towns to improve emergency preparedness and response efforts by ensuring critical facilities remain operational during emergencies.

CUSTOMER BENEFITS

- Reliable local energy generation
- Energy resiliency during emergency
- Energy efficiency and cost savings

PROJECT AT A GLANCE

Location:
Fairfield, CT, USA

Project type:
310 - 350 kW microgrid with distributed energy resources

Properties:
- Police and fire stations
- Emergency communications center
- Cell phone tower
- Public shelter

Project details:
- 300 kW natural gas generator
- 60 kW combined heat and power
- 47 kW solar photovoltaic system
- Control and distribution system
- Energy efficiency measures
- On-grid and island modes

Funding:
- $1.1 million grant from CT's microgrid pilot program
- $130,000 from the Town of Fairfield

The Challenge

The coastal town of Fairfield, Connecticut has won accolades as one of the best places to live in America. The town's five miles of beach that stretch along the Long Island Sound add to its charm.

But when severe storms pummel the Northeastern seaboard, coastal living in this town can be dangerous and inconvenient. Crushing waves have flooded streets and even destroyed coastal homes in recent years. Along with the wind, rain, and water comes downed power lines and prolonged outages. Townspeople worry about reports that the worst is yet to come – that "storms of the century" are the new norm for residents of Connecticut and across the U.S.

In an effort to proactively mitigate the damage and discomfort caused by future storms, Connecticut is an early leader in microgrid development. Now, if the power goes out, the town's critical facilities can rely on a microgrid for electricity.

The Solution . . . A New Energy Era

In July 2012, Connecticut's Governor Dannel Malloy passed legislation demanding an improvement to the state's emergency preparedness and response efforts. In turn, Connecticut became the nation's first state to develop a program that funds the development of microgrids at critical facilities. The Town of Fairfield was among the first recipients of a grant award as a result of the new law.

The Connecticut Department of Energy and Environmental Protection (DEEP) allotted $18 million in microgrid funding to nine municipalities, including Fairfield, in July 2013. A year later, DEEP would award an additional $5.1 million[1] for two additional pilot projects. The state expects to release a third solicitation for microgrid projects in 2015.

Fairfield's $1.1 million grant went towards the implementation of a microgrid that will sustain operation of a police station, a fire station, and a public shelter, all critical facilities that will benefit the town's 59,000 residents in the event of a natural disaster.

These progressive strides in microgrid development are in line with Fairfield's reputation for being ahead of the energy curve. The town's public works department is known for its support of clean energy, with already installed rooftop solar panels and a fuel cell.

The microgrid keeps power flowing to the town's critical facilities 24 hours a day, 7 days a week, 365 days a year, thanks to its ability to 'island' or disconnect from the central grid if utility power is lost in an emergency. A power outage cascades through the grid, alerting the microgrid to electrically separate and protect itself from the disturbance. Rather than drawing power from the central grid, the microgrid uses its own distributed generation resources to distribute power to the town's identified critical facilities.

When utility power is present, the microgrid operates in grid-connected mode. It can switch between drawing power from its distributed energy resources, or the local utility power, depending on which power source is most optimal at the time.

The town's microgrid harnesses 310 to 350 kW from onsite power and shares it across the prioritized buildings, including an emergency communications center and cell phone tower service located in the police station. In all, the microgrid is designed to supply 120 percent of the town's peak demand power for the buildings it serves.

Schneider Electric's Role

Fairfield's public works department teamed with Schneider Electric in submitting a winning proposal to the state's microgrid program. The town recognized Schneider Electric's expertise and professionalism after the company assisted with a water/wastewater proposal. Schneider Electric was a clear choice as a microgrid developer, with over two decades of experience in completing more than 300 control and microgrid projects.

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Resiliency lessons-learned:

1. Start with engineering study to identify all existing & new energy sources
2. Team with utilities & ISOs for all program grants
3. Integrate controls & sensors from all microgrid sources

After seeing Schneider Electric's water/wastewater proposal, "I immediately requested that they concurrently provide a municipal (microgrid) proposal," said Ed Boman, Assistant Director of Public Works.

For Fairfield, Schneider Electric installed a microgrid that offers efficient, clean, and reliable energy. The project included:

- An increase in capacity of a natural gas-fired generator from 50 to 60 kW
- The replacement of a diesel-fired emergency generator at the police headquarters with a cleaner burning natural gas generator
- An electrical connection between the shelter and police and fire stations
- The installation of a 20 kW solar photovoltaic rooftop system at the shelter and a 27 kW solar photovoltaic rooftop system at the fire station
- A state-of-the-art microgrid controls system

Schneider Electric is known for its microgrid controls, which maintain and coordinate critical energy loads, taking into account changes in the availability and cost of grid power versus the microgrid's local distributed generation. The controls system optimizes the microgrid to ensure the maximum economic benefit, while ensuring stable and safe operation.

As general contractor, Schneider Electric managed the entire microgrid project from design and construction to installation, training and technical support. The company even secured the rights-of-way needed for construction to tie the city's critical facilities together.

Efficiency First

The new microgrid ensures that the town's buildings are served by cleaner electricity in several ways. First, the town swapped out diesel fuel for cleaner-burning natural gas at one of the generators.

Second, the microgrid incorporates combined heat and power (CHP), a highly efficient form of energy that recycles the heat by-product from the power generation process to then provide heating and cooling for other buildings and water. By comparison, this heat is traditionally lost as waste by conventional generators.

Third, the project features a dashboard that displays energy consumption in real time, which allows for precise management of microgrid resources.

And last, the microgrid harnesses emissions-free solar energy by way of its solar photovoltaic panels.

Fairfield also ensures that the police headquarters does not waste energy. This is important for several reasons. Less use of energy translates into lower energy costs for the town. Using less fuel also reduces emissions from power production, which translates into healthier air.

The town's energy efficiency efforts complement the operation of its microgrid. During a crisis, when the microgrid islands from the local utility, the distributed generation resources do not have to produce as much power as they might have otherwise. Less strain is placed on the generators during this all-important time when the microgrid becomes the only viable source of energy.

The Bottom Line

From adversity – severe storms and power outages – comes innovation. Fairfield's sophisticated use of energy puts the small town on the cutting edge of energy management and microgrid development, promising lower energy costs and unshakable power reliability that guarantee the town's energy resiliency under any circumstance.

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Our Promise

Dependable

- Proven approach in over 250 Microgrid projects over 20 years
- Full service provider with expertise in multiple segments
- Most admired company (reference rankings)
- Gartner Group top ADMS

Best-in-class Expertise

- Global specialist in energy management
- # 1 leader in LV and MV solutions worldwide
- Leadership in standards and regulatory committees
- Broadest and deepest Microgrid expertise in the industry

Customized Approach

- Customizable and scalable Microgrid solutions that grow with your needs
- Turnkey solution provider that is vendor agnostic
- Flexible contracting approach for Brownfield or Greenfield opportunities

Sustainable

- Built-to-last Microgrid solutions
- Enables you to monetize DER and leverage existing infrastructure
- Resilient, efficient and green

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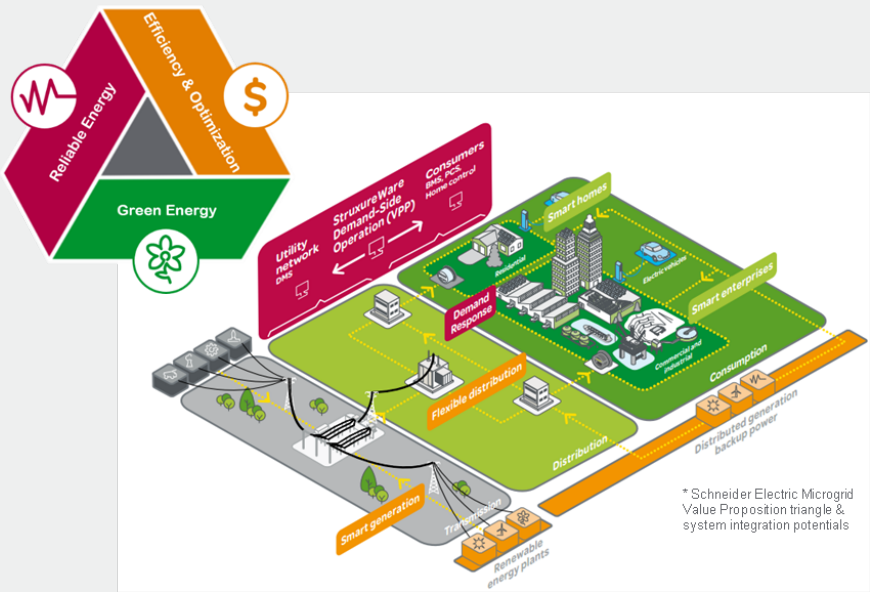

* Schneider Electric Microgrid Value Proposition triangle & system integration potentials

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