

Life Is On

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Scott has 20 years experience at Schneider in Utility Distribution Solutions, including delivery of information and operational technologies and services to the Utility industry. Today, Scott directs microgrid solutions serving Utilities and Prosumers in North America in collaboration with Schneider's many partners in this space.

Energy Megatrends – 3D+E is setting the stage

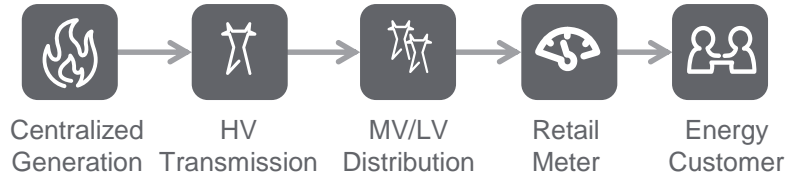
Decarbonization

Digitization

Decentralization

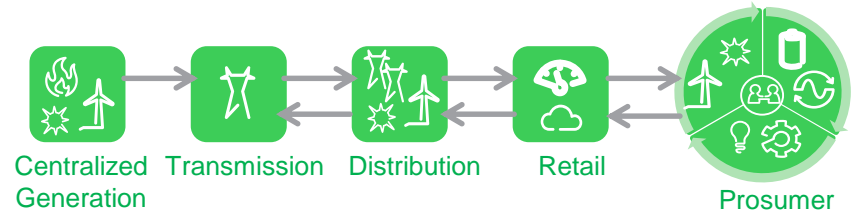
+ More Energy

Historical Energy Value Chain



- Consumers responsible for their own MV/LV Traditional Power Distribution Assets and Operations “behind the meter”, Many implement EE Measures
- Consumers have some partial base-load and traditional backup power generation of many varied capabilities, but few significant islanding systems (CHP and Solar do not Island from Grid)
- Beyond EE, Increasing Local, Efficient Self-Generation + Microgrid Islanding is the road ahead.

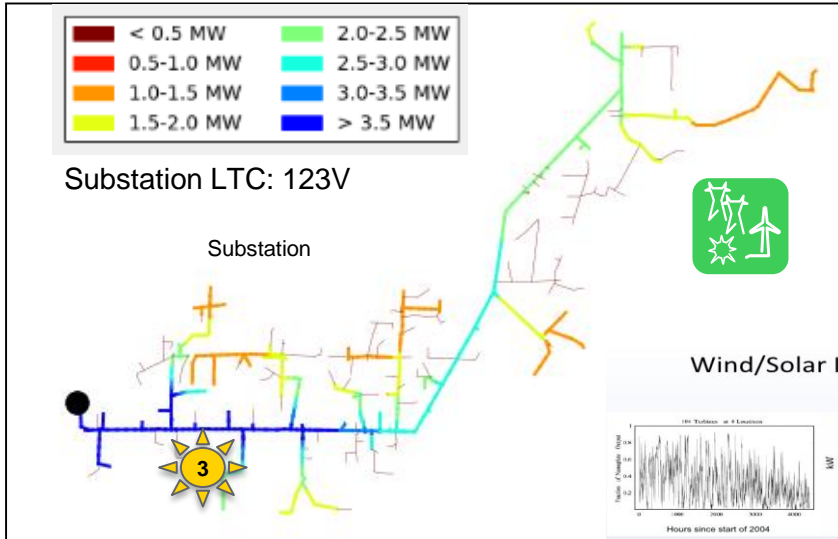
The New Energy Landscape



- Utilities house significant Grid-Connected 3rd party owned Solar PV plants with complementing BESSs. In some cases the developer is the utility, but in others it is a 3rd party or a new Energy “Prosumer”.
- Larger Prosumers and Municipalities PPA/Lease models to leverage existing and build new DERs
- Reduction in costs for DER technologies, increase in reliable delivery + new business models for Energy Services result in the new Energy Landscape, both on Grid and at Prosumer sites

Distribution System “Hosting Capacity”

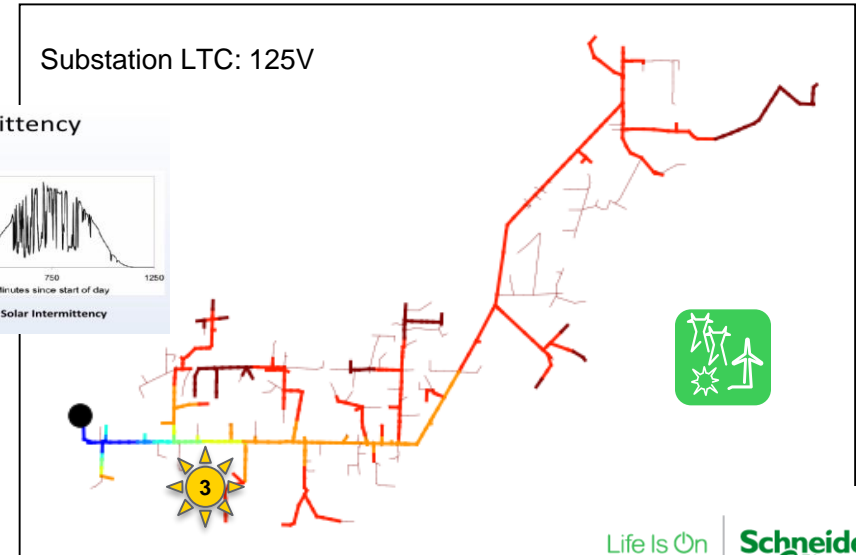
The amount of variable renewables that can be utilized at the grid tied location is dynamic at all points and times, different for every feeder



When inverter-based DERs exceed ~20% of load, voltage and frequency stability may become a challenge.



Challenges may be met with BESS or other, but adding these assets may impose additional topological restrictions on distribution operations



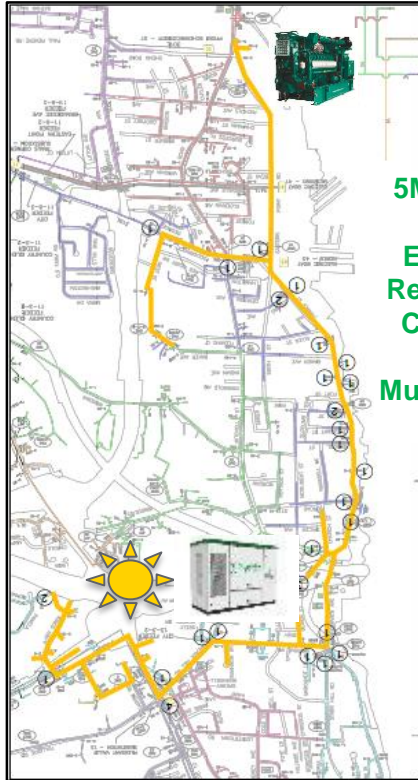
Normal Management of Feeder Voltage and System Protection can require DERs to be curtailed. High Penetration of DER increases automation/operations required, but locks down topological options for the Utility

*Illustration of DER (PV) hosting capacity based on evaluating overvoltage

Utilities must provide stability and reliability for all consumers

Distribution Microgrid Topologies using Gensets and Solar PV/Storage

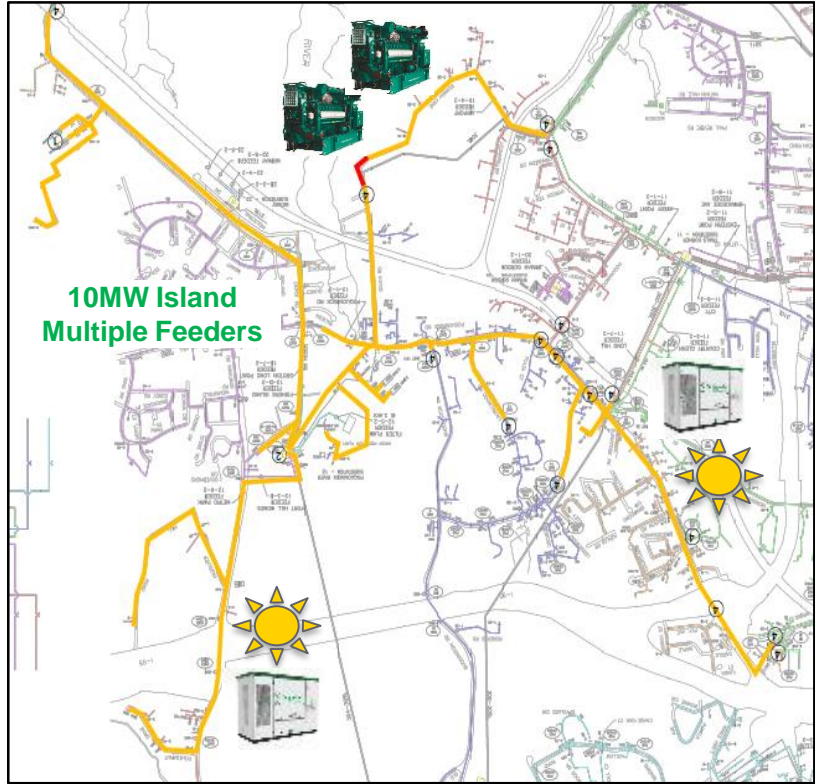
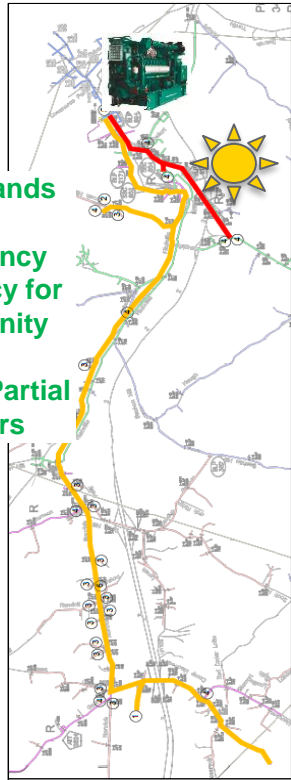
Regulatory environment for “rate base” recovery of these assets is challenge for Utility



5MW Islands

Emergency
Resiliency for
Community

Multiple Partial
Feeders



10MW Island
Multiple Feeders

Providing key services from existing infrastructure during emergency

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Microgrid Architecture – Building or Facility Prosumer

Control System Solves for Economic Optimization and site Resiliency to exclusively benefit Prosumer



Cloud



Microgrid Analytics and Optimization



VPN/HTTPS

- Customer constraints
- Weather forecast
- Energy market pricing
- Demand response requests



Building

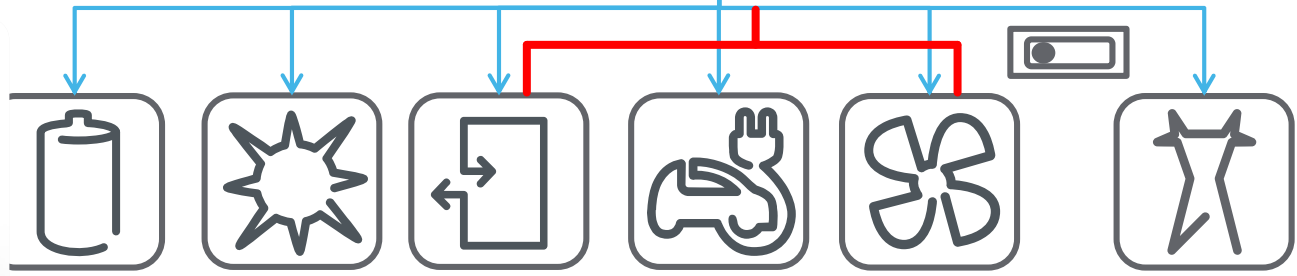


Building BMS

Building Gateway

Microgrid Controller

Modbus, DNP, DDS, IEC61850



Advanced Microgrid with **CHP**, Solar PV, Energy Storage, Electric and **Thermal** Energy Generation and Distribution



Microgrid Architecture – Independent Power Producers

Control System Solves for maximizing sale of Energy and Ancillary Services
From their fleets of Storage, Solar, Wind and District Energy



DER Analytics and Optimization

- Customer constraints
- Weather forecast
- Energy market pricing
- Demand response requests



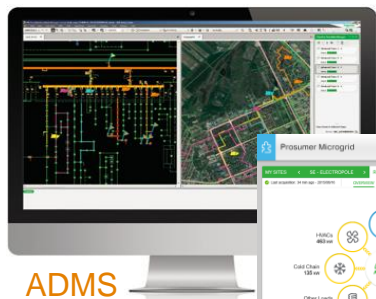
Local DER Plant Controller



Cloud
Fleet of DERs

Microgrid Architecture – Utility T&D Grid and Asset Fleets

Solves for Stability and Reliability for all



Utility Grid
Microgrid Advisor



Utility Distribution Control

- Customer constraints
- Weather forecast
- Energy market pricing
- Demand response requests



Utility Control Center

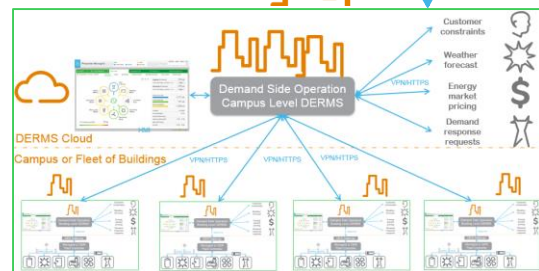
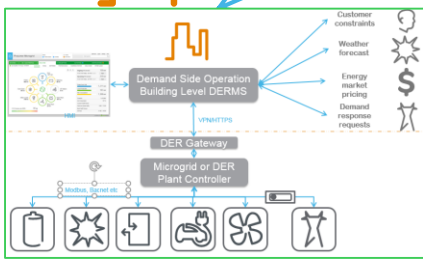
Prosumers, IPP Fleets, DER
Plants and Everyone Else

VPN/HTTPS



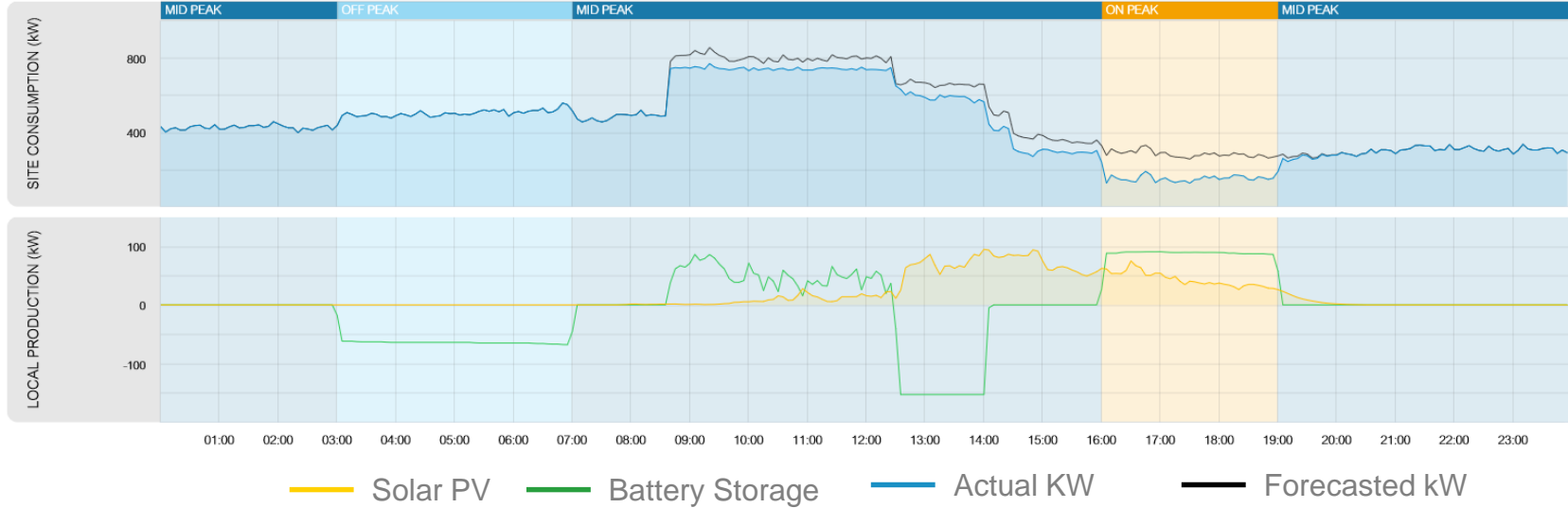
DER

Plants



Prosumer and IPP Assets may be curtailed by Utility

Interests of one may be disrupted by those of another, creating a “conflict” of best outcomes for all
As Prosumers increase local energy independence, Utility loads drop, Traditional Grid Role Changes



Source: Oncor – May 27, 2015

Mixed Use Case example at the Prosumer Microgrid and Utility DR participant

- Prosumer optimization of battery charge, discharge and peak shaving
- However a utility demand response event may “interrupt” prosumer operation and execute based on what utility wants.
- Algorithm Abandons Peak Shaving, and must recharge to prepare for Utility DR event

We shift from Prosumer benefit to Utility benefit case, but only as long as this provides the best economics for Prosumer



Where does all this lead?.. Ask me tomorrow and I may say something different

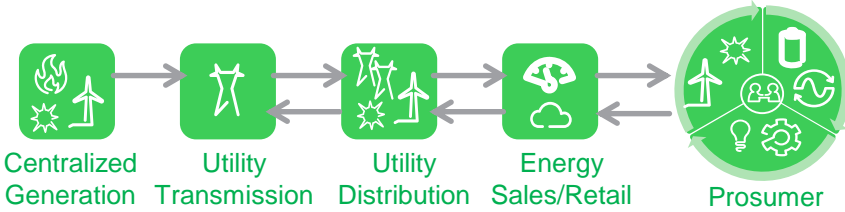
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The New Energy Landscape



- Behind the meter “Prosumer” solutions will evolve and increase in economic and technical viability. First C&I, Campus and Municipal, and over time to residential level
- Utilities will be challenged to integrate larger scale “Distribution” level DERs, owned by themselves or IPPs, given operational limitations like “hosting capacity” and regulatory issues about how rate-based asset investments are recovered. Smart Inverter and Energy Storage will allow for “increasing” hosting capacity, but the potential amount is finite.
- IPPs will move from building “Distribution” level plants, once hosting capacity is reached, to building “Prosumer” level solutions, accelerating the rise of the “Prosumer” and compounding Utility Grid and Business challenges.
- Utilities will consider how to rate-base, own and operate their own Prosumer offers, but this will require significant regulatory change before it can happen for many regulated wires companies.