HOMER MICROGRID AND HYBRID POWER 9TH ANNUAL INTERNATIONAL

HITACHI ABB

Snohomish County PUD Microgrid

Using microgrids as a platform for V2G

POWERING GOOD FOR SUSTAINABLE ENERGY

2021-08-30

HITACHI ABB POWER GRIDS

About Gastón Ortega

Presenter

Gastón Ortega

Business Development Manager
for Microgrids and Energy Storage

Hitachi ABB Power Grids – Grid Edge Solutions

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786-266-4780

California, USA

Biography:

Since 2020, Gastón Ortega has lead the business development of microgrid and energy storage solutions in the west of the United States of America (USA) for Hitachi ABB Power Grids.

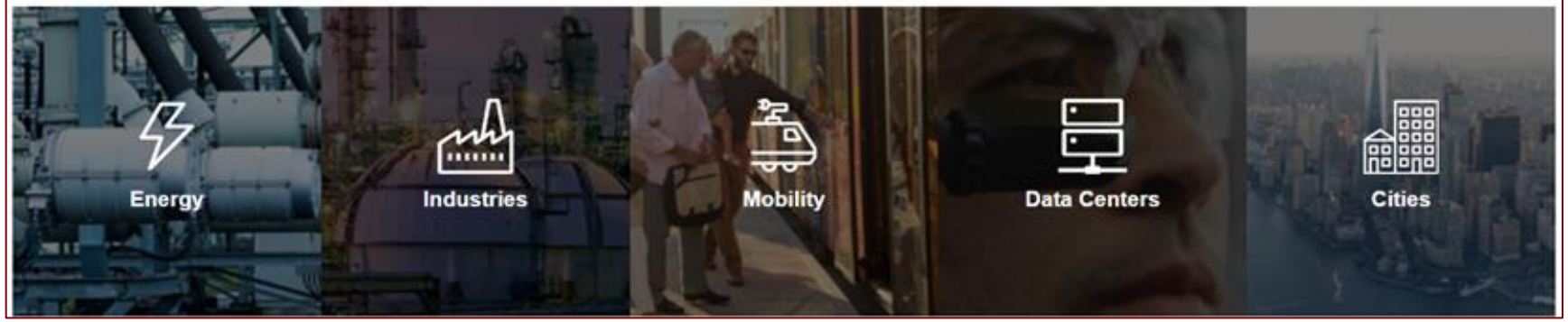
With more than 17 years of market and technical experience in 3 leading global organizations, and a patent addressing system protection communications, Gastón has influenced the modernization of the USA electric grid. He has been recognized as a change agent in roles spanning **engineering, product management, project management, channel and sales leadership.**

Gastón's utility, commercial and industrial microgrid experience has involved system resiliency, energy cost optimization, renewables integration, and non-wire alternatives.

Gastón holds a Bachelor of Science in Electrical Engineering with Honors from Washington State University (WSU), Pullman, WA.

About Grid Edge Solutions

Energy Storage and Microgrids Sectors we Serve



30+

Years of experience

700MW+

MW of Global installed base of Grid Edge solutions including microgrids and BESS

225+

Projects delivered worldwide

100+

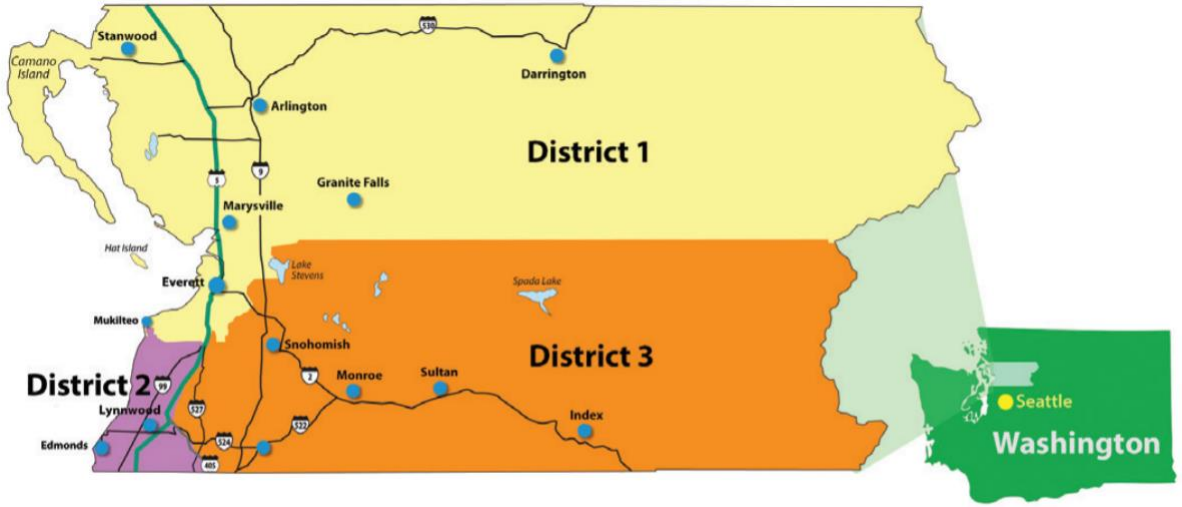
Countries supported with Service and Sales organizations

Innovation and technology leadership

Reliable and field proven product portfolio across various energy assets

We are proven Pioneers in grid technology, solutions and project execution.

Snohomish County Public Utility District (SnoPUD)



Quick facts

- 12th largest public utility in the USA
- Employees: 1,085
- Annual energy sales: ~8.5 TWh/yr
- Operating revenue: $678.5 MUSD/yr
- Territory: 2,200 square miles
- Population served: 907,000 people
- Average residential rate: 10.18¢/kWh
- Average commercial rate: 8.51¢/kWh

SNOHOMISH COUNTY PUD PUBLIC UTILITY DISTRICT NO. 1

Adapted from https://www.snopud.com/Site/Content/Documents/custpubs/QuickFacts_521.pdf

About the Arlington Microgrid

Project Goals

- **Grid support** (voltage and frequency)
- **Resiliency** with **seamless transition** to Island critical utility infrastructure (disaster recovery center, utility data center) with solar smoothing, capacity firming.
- Renewable integration, running **100% renewable**
- Deploy one of the **first V2G** installations in the USA
- **Public education** around the future of utility technology
- Explore grid edge technologies to **help SnoPUD in the energy transition**

Hitachi Project Scope

- e-mesh PowerStore BESS (1 MW/1.4 MWh)
- e-mesh Control System & SCADA
- Back-up Genset (350 kW)
- Integrate V2G, Solar, Genset, Grid, BESS

Timeline

2018-2019: Design and preparation

2019: Community Solar Array (500kW)

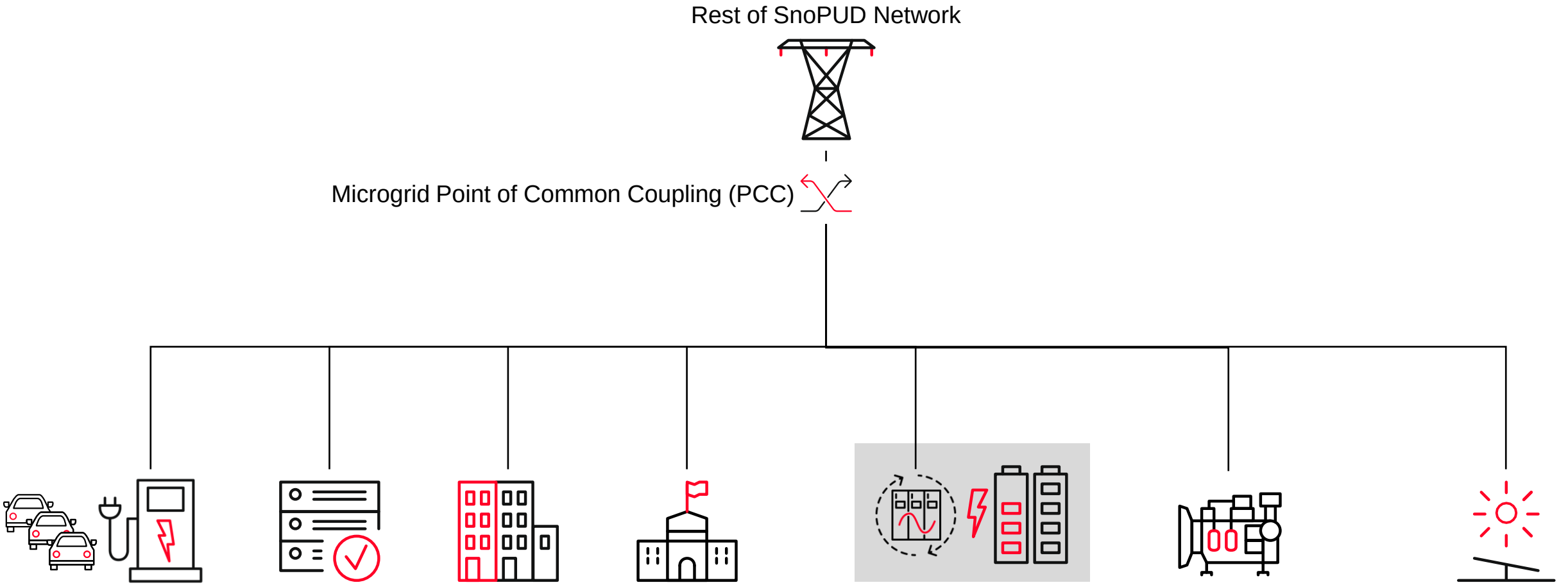
2019-2020: Clean Energy Center

2020: Procure PowerStore, microgrid controls and genset

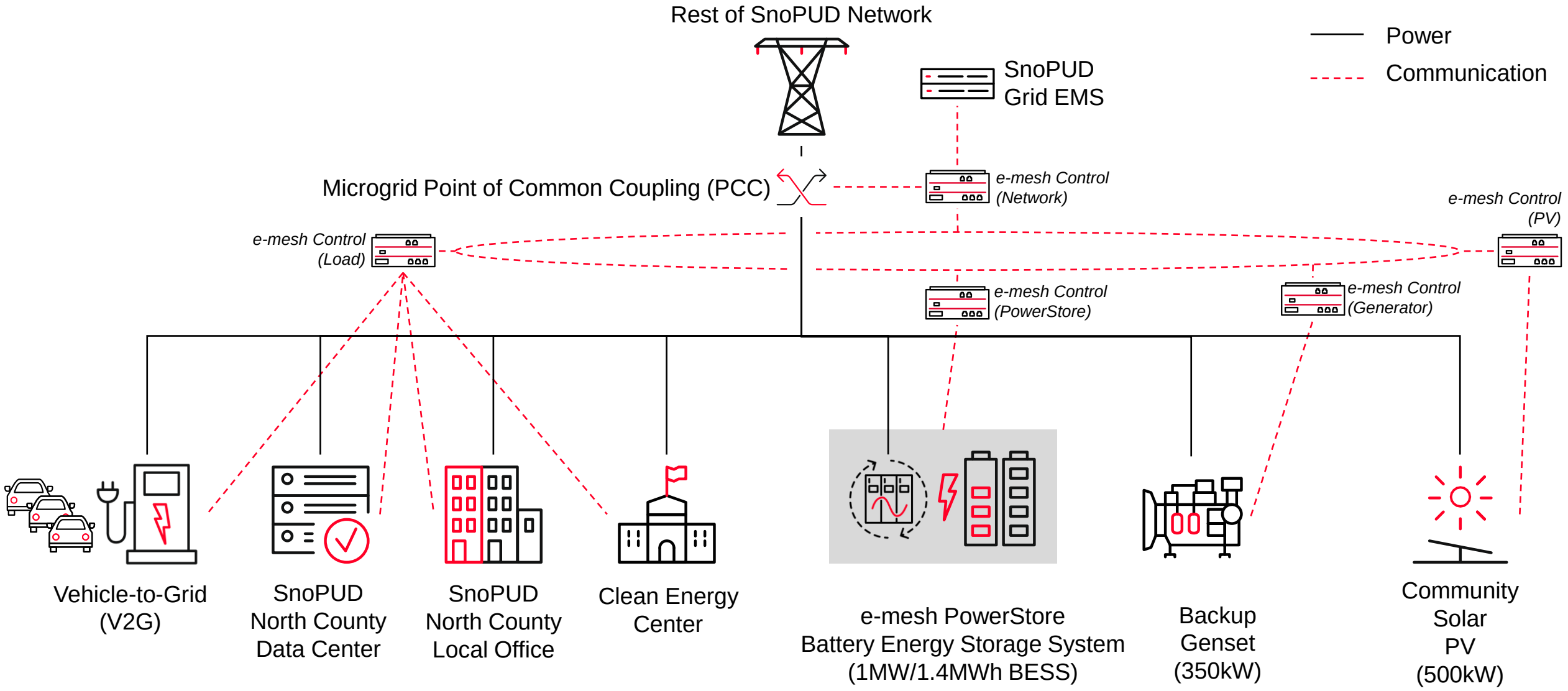
2021: Start-up, commissioning & report

2021-2033: Operation & study

Arlington Microgrid Architecture



Arlington Microgrid Architecture



HOMER Grid Simulation

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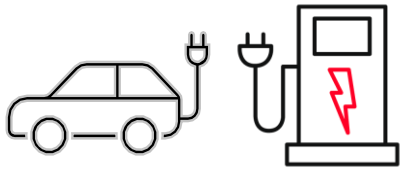
Simplified Theoretical Assumptions:

- Solar capacity at Arlington, WA
- Major equipment simplified per table
- Commercial load <400 kW, peaking in January
- Treated multiple loads as one (single meter)
- Grid to Vehicle charging (V1G)

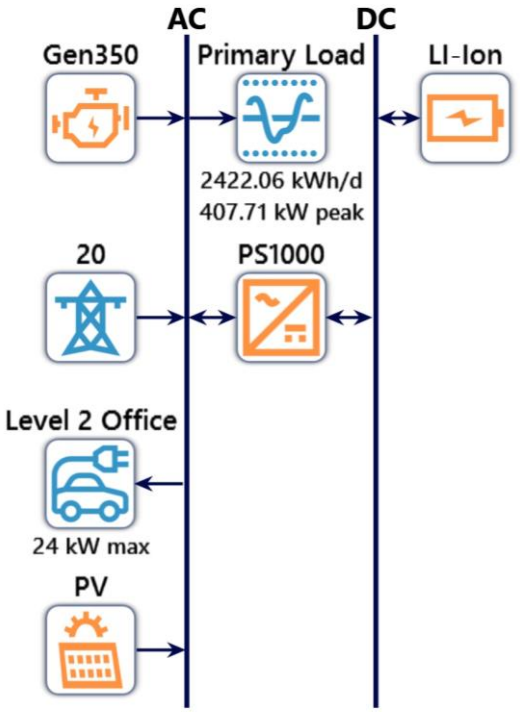
with EV load profile for two scenarios

1. average 100kWh/day, 24 kW capacity
2. average 1000kWh/day, 160 kW capacity



System Architecture

Component	Name	Size
Generator	Backup Genset	350
PV	Community PV	500
Storage	Li-Ion	1,400
System converter	PowerStore	1,000
Dispatch strategy	e-mesh Control	



HOMER Grid Simulation – Winter Load & Solar Production

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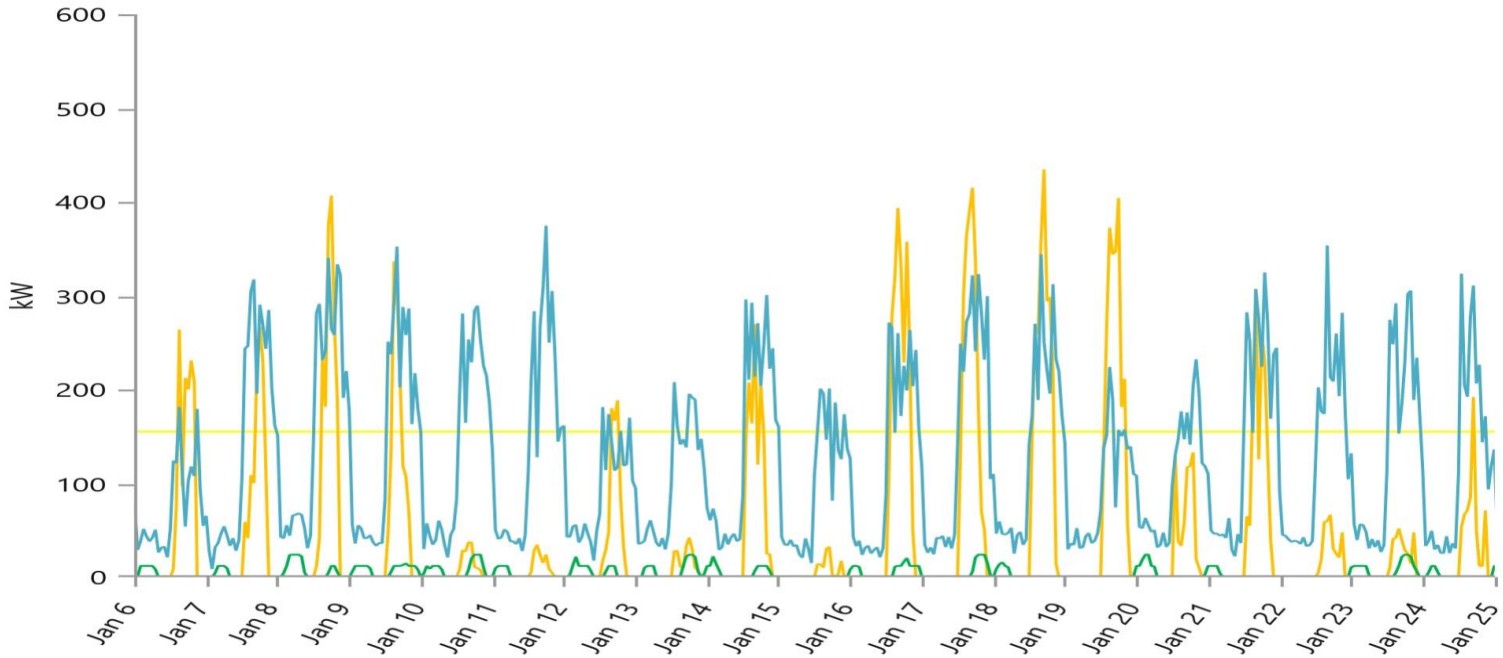
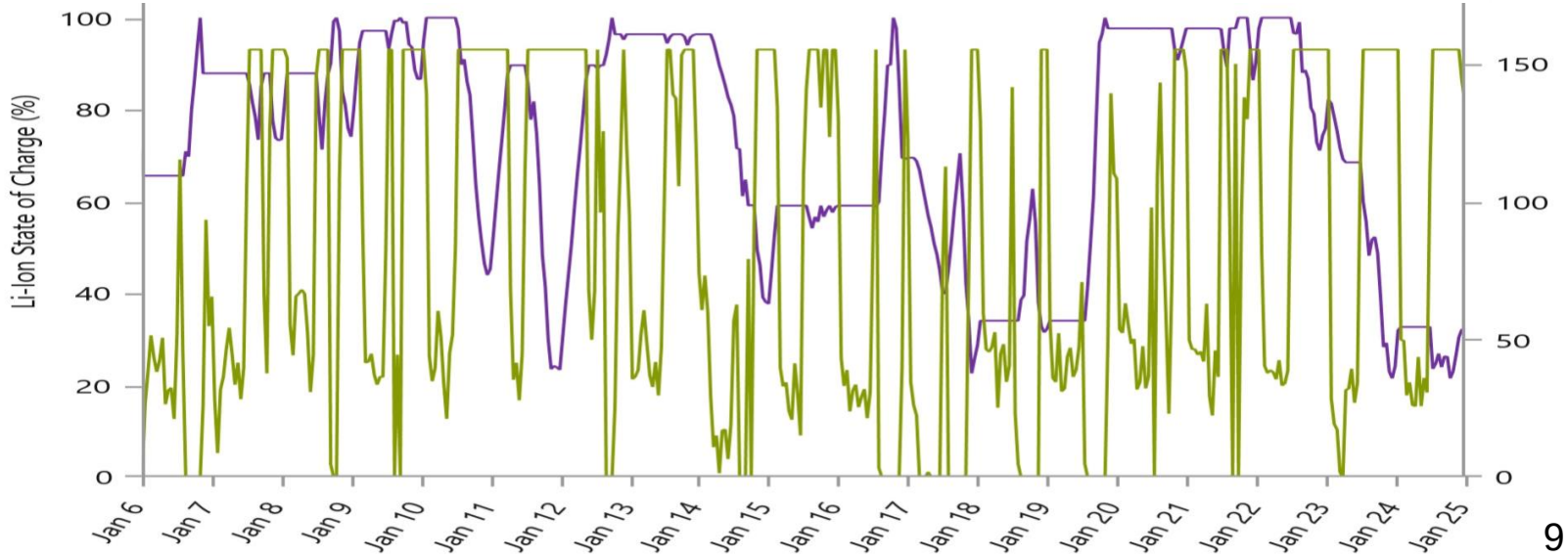
- Grid Demand Limit
- Community PV Power Output
- Total Electrical Load Served
- Total EV Charger Served
- Backup Genset Power Output



- Li-Ion State of Charge
- Grid Purchases



Higher grid purchases during winter

HOMER Grid Simulation – Summer Load & Solar Production

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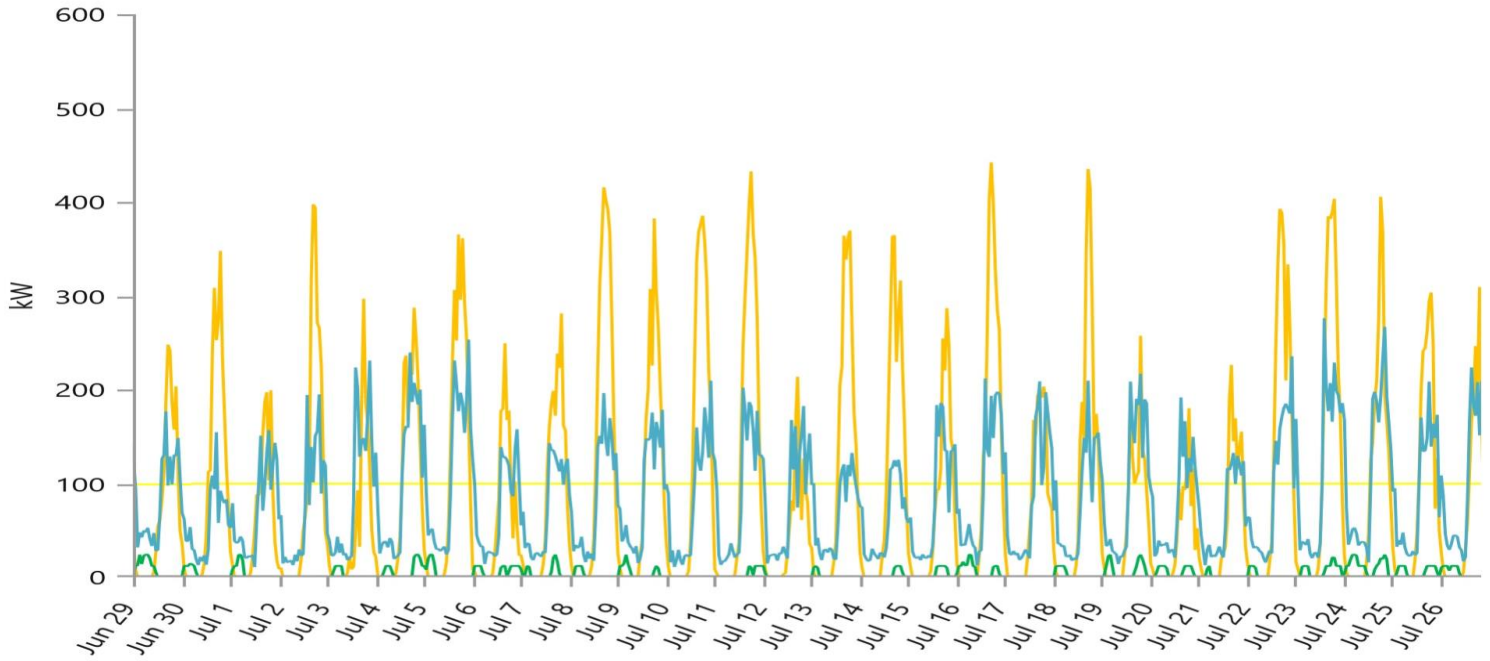
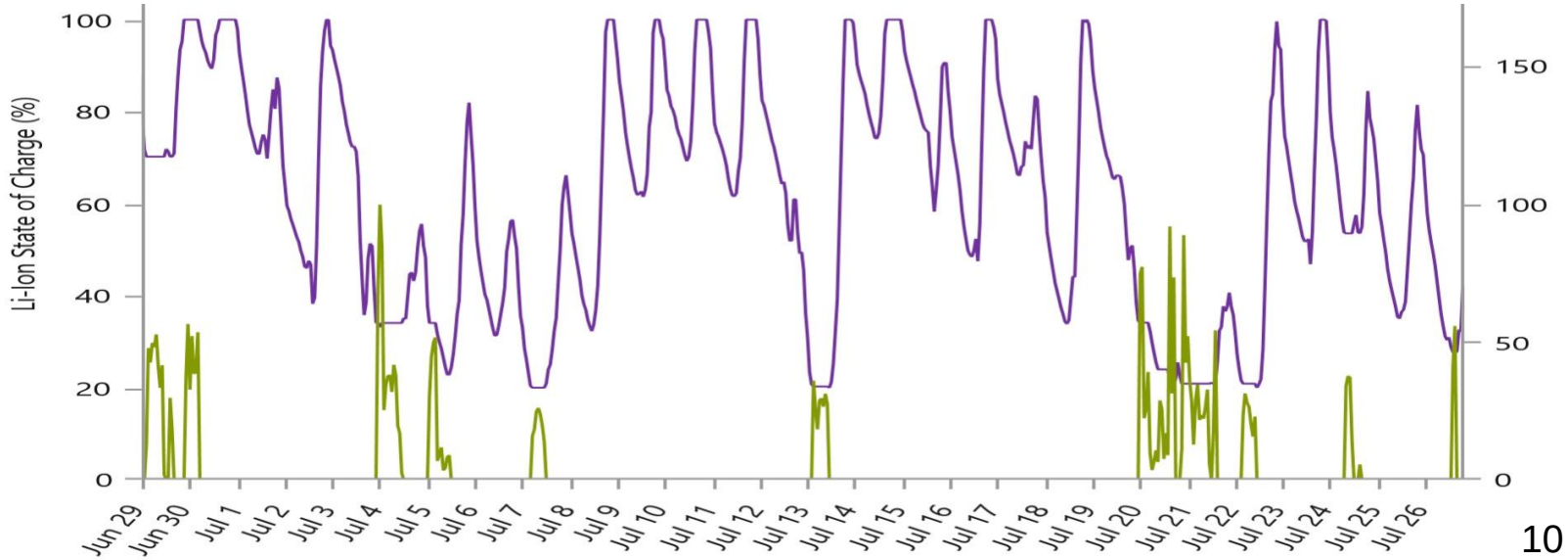
- Grid Demand Limit
- Community PV Power Output
- Total Electrical Load Served
- Total EV Charger Served
- Backup Genset Power Output



- Li-Ion State of Charge
- Grid Purchases



Lower grid purchases during summer

HOMER Grid Simulation – Outage in September

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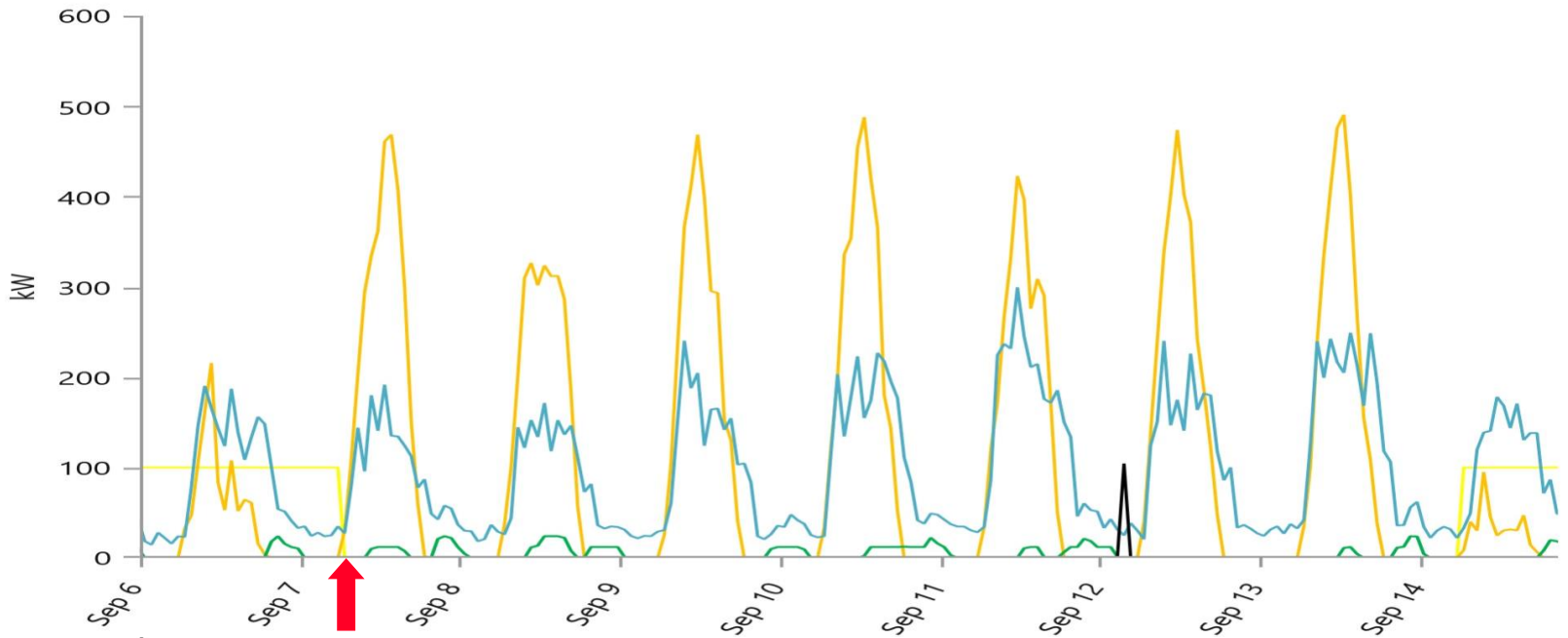
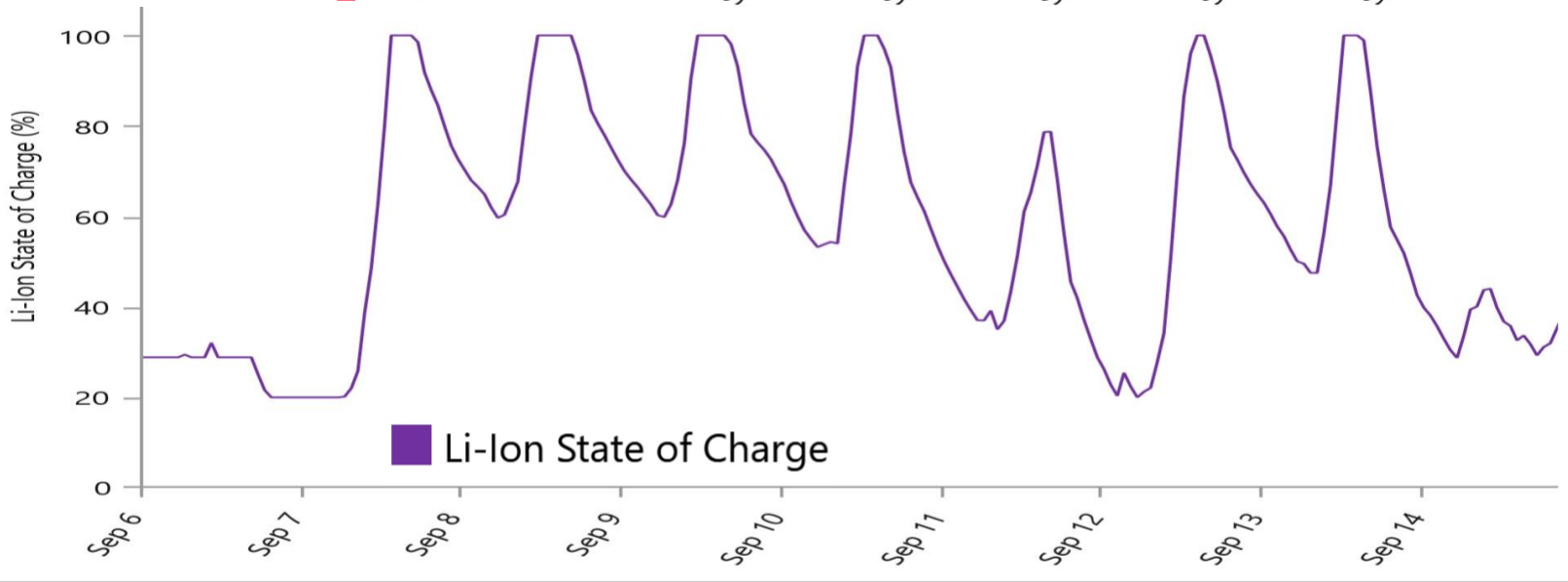
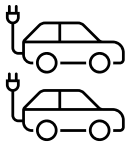
- Grid Demand Limit
- Community PV Power Output
- Total Electrical Load Served
- Total EV Charger Served
- Backup Genset Power Output





Scenario:

- Sunny: September 7-15
- 7-Day outage
- EV load averages 100kWh/day, 24 kW capacity



HOMER Grid Simulation – Outage in September + Extended Fleet

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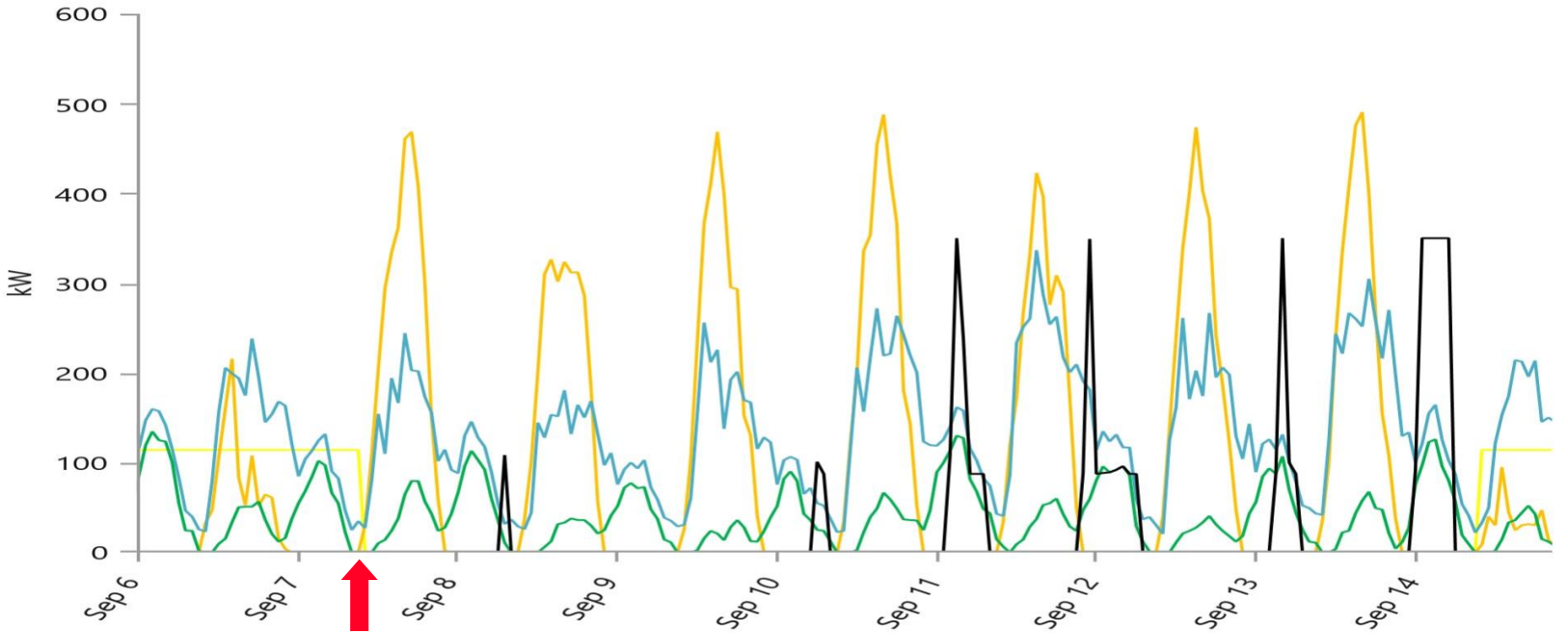
- Grid Demand Limit
- Community PV Power Output
- Total Electrical Load Served
- Total EV Charger Served
- Backup Genset Power Output



Scenario:

- Sunny: September 7-15
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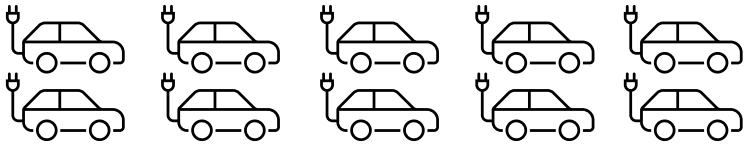
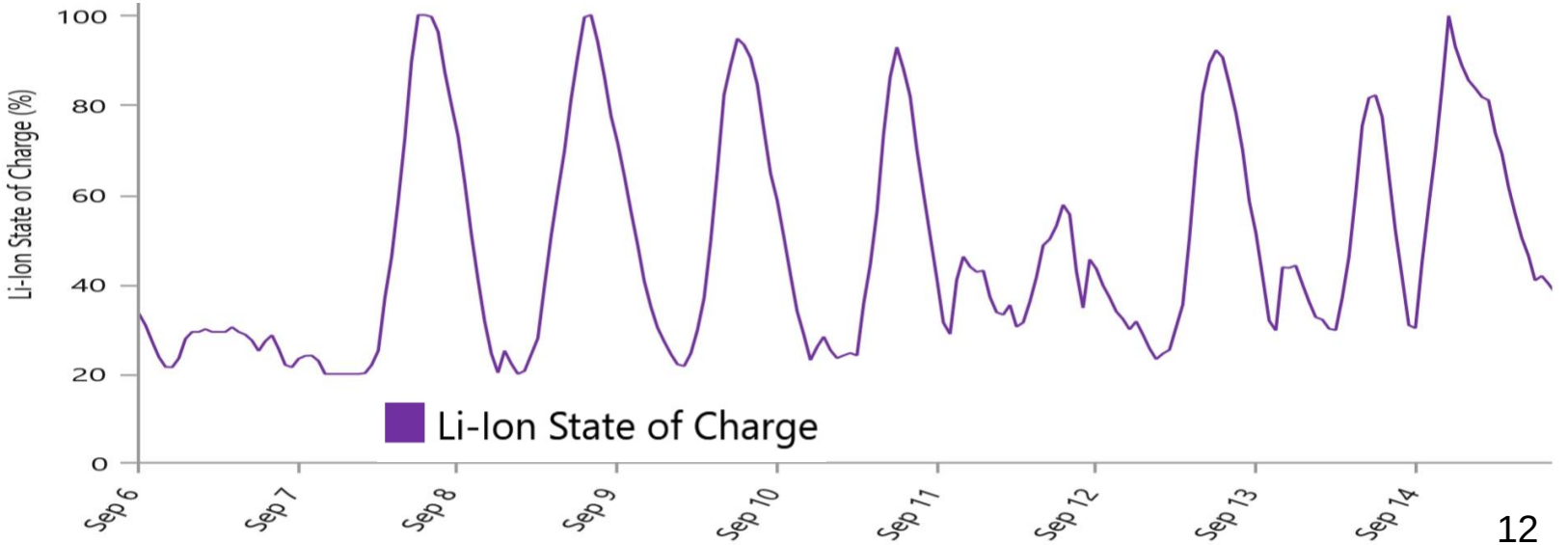
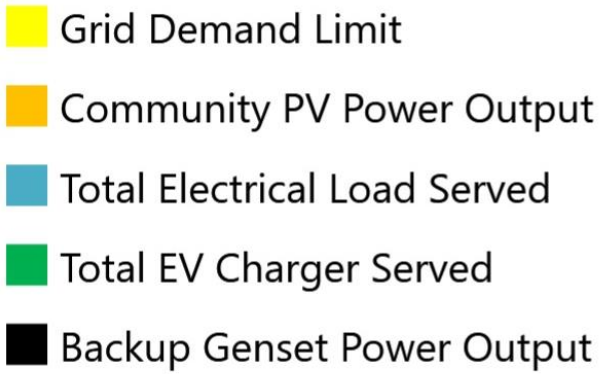
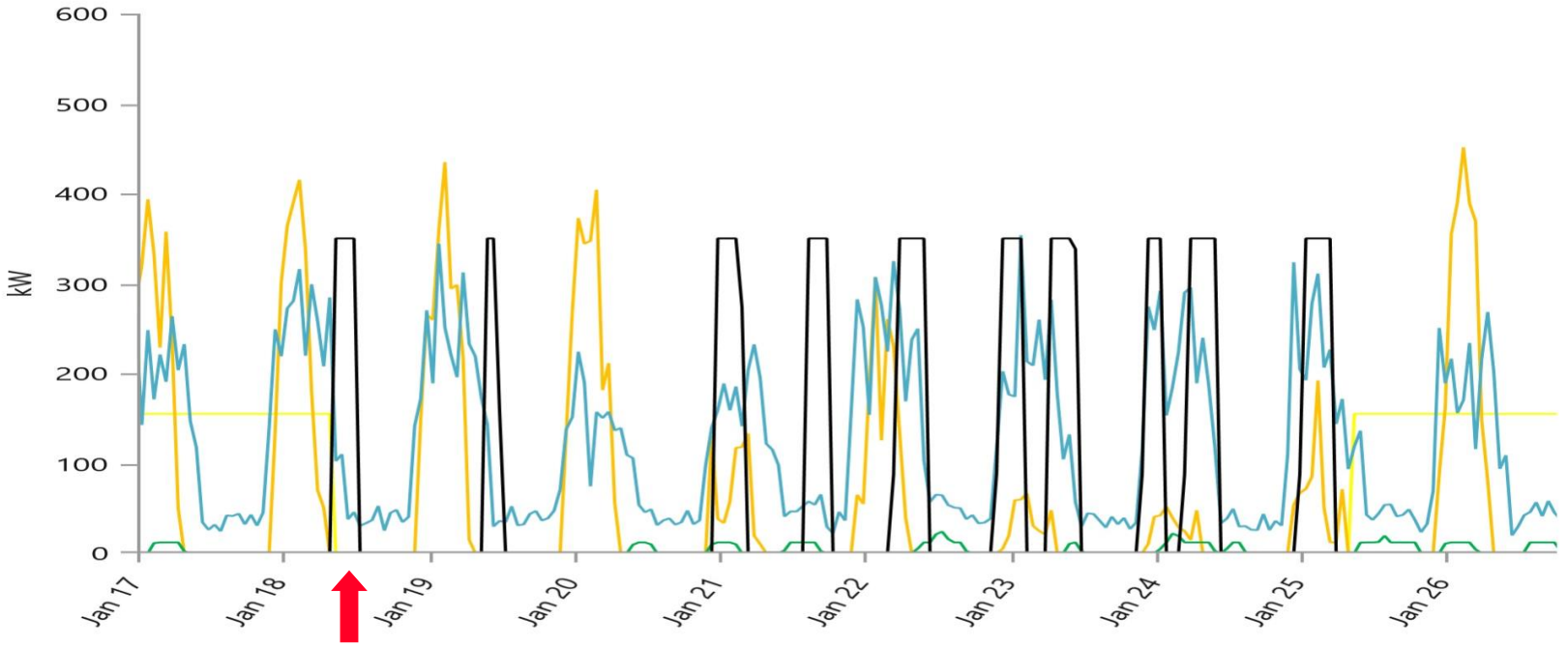




HOMER Grid Simulation – Outage in January





Scenario:

- Cloud: January 18-25
- 7-Day outage
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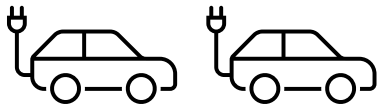

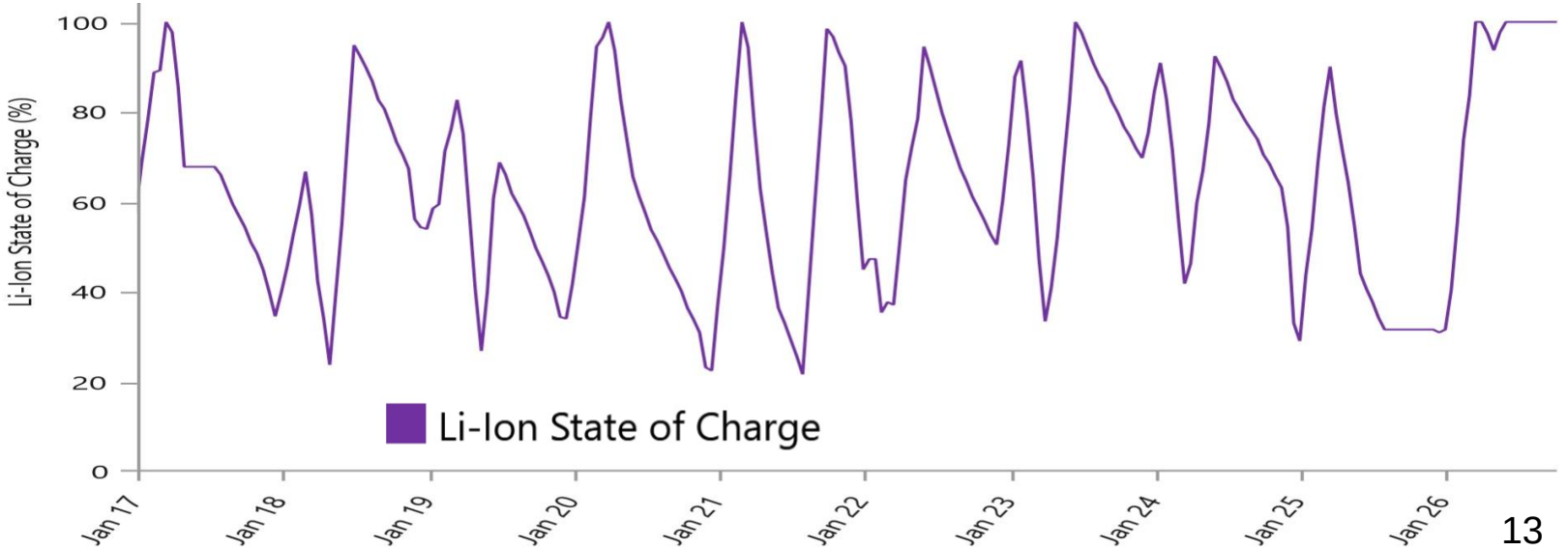

HOMER Grid Simulation – Outage in January + Extended Fleet

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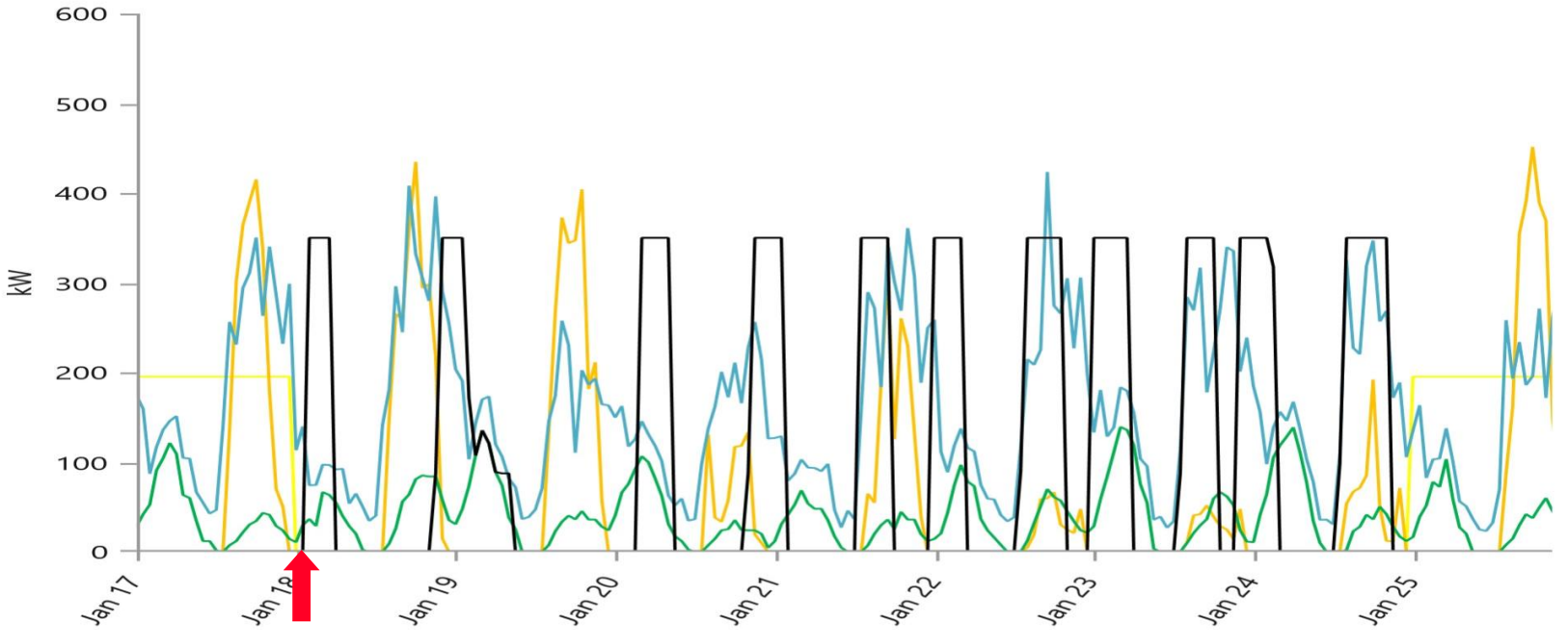
- Grid Demand Limit
- Community PV Power Output
- Total Electrical Load Served
- Total EV Charger Served
- Backup Genset Power Output



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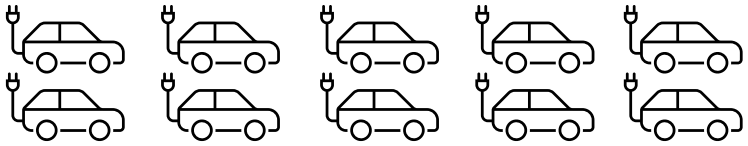

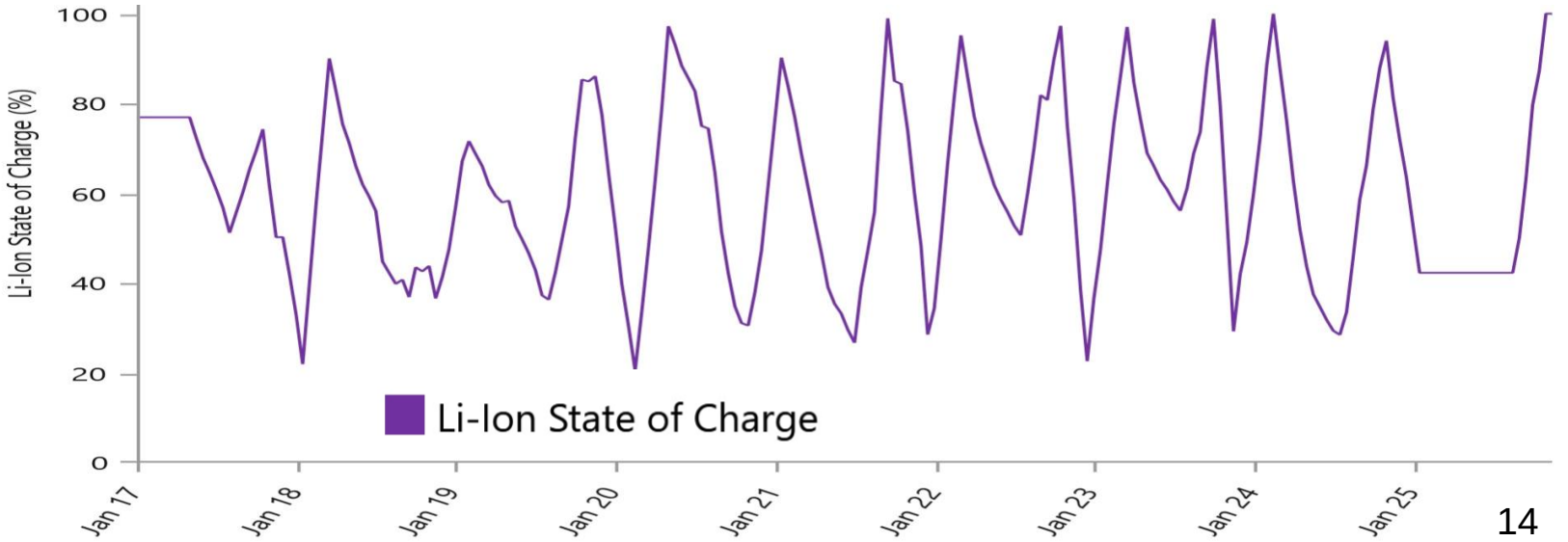

HOMER Grid Simulation

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Simulation Conclusions:

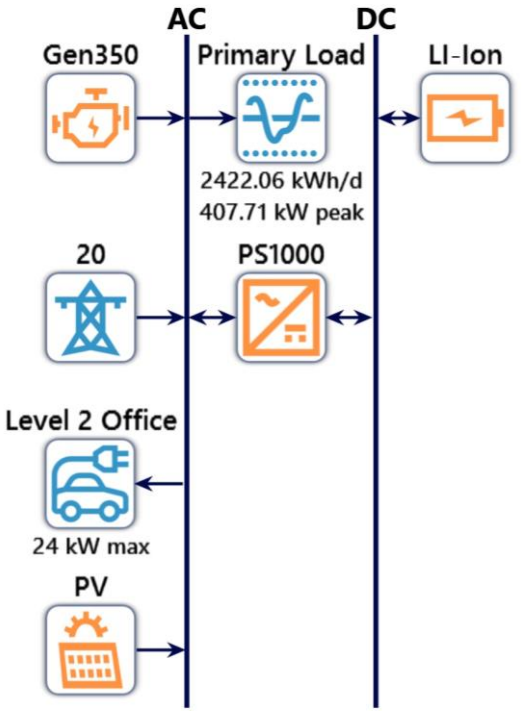
- Expect higher grid purchases during the winter
- PV Solar + PowerStore is well-sized for 100% renewable penetration for the target load
- Microgrid minimizes the genset and diesel consumption usage even during winter outages
- The integration of multiple DERs improves the use cases for a microgrid

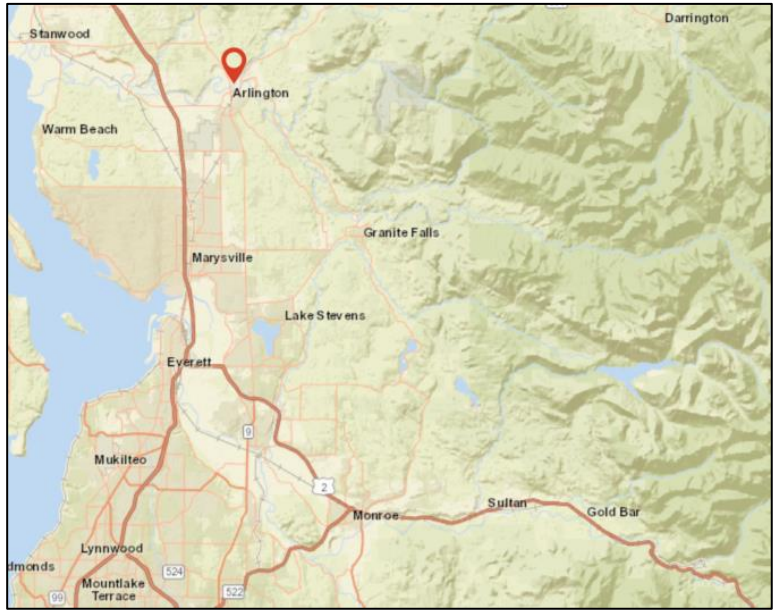
Future Opportunities:

- Compare site measurements with improved models
- Research the EV fleet usage where both the EV load and the V2G DER contribution increases
- Explore potential demand charge reductions

System Architecture

Component	Name	Size
Generator	Backup Genset	350
PV	Community PV	500
Storage	Li-Ion	1,400
System converter	PowerStore	1,000
Dispatch strategy	e-mesh Control	





Project Achievements

1. **SnoPUD's first utility microgrid**
   - Partnered with Hitachi Power Grids based upon our 30-year experience

2. **Integrates community solar into the microgrid**
   - Microgrid can run on 100% Solar
   - Showcase islanding capability of grid forming inverter

3. **Modular Energy Storage Architecture (MESA) compliant microgrid**
   - Microgrid is fully compliant with the MESA standard
   - Facilitates ease of installation and interoperability

4. **Vehicle to Grid (V2G) in a microgrid**
   This among the first utility microgrids in USA showcasing a platform for integrating vehicle fleets to grid (V2G)

5. **Demonstrates the benefits of microgrids**
   - Microgrid provides ancillary services including grid support (voltage and frequency) as well as resiliency.
   - Seamless transition from grid-connected to islanding using e-mesh PowerStore grid forming capability and e-mesh Controls

SNOHOMISH COUNTY PUD PUBLIC UTILITY DISTRICT NO. 1

* https://mesastandards.org

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Arlington Microgrid Project Summary

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Snohomish County PUD (SnoPUD) developed a state-of-the-art microgrid with solar PV, generator and battery storage with electric vehicle-to-grid (V2G) integration.

The Arlington Microgrid demonstrates all the things a microgrid can do to support an electrified future—from grid stabilization to V2G integration to ancillary services to operation on 100% renewable power.

In the media (1) / In the media (2)

About the project

- **Project name:** SnoPUD Arlington Microgrid
- **Location:** Washington, USA
- **Customer:** Snohomish Public Utility District
- **Completion date:** 2021

SNOHOMISH COUNTY PUD PUBLIC UTILITY DISTRICT NO. 1

Solution

- Community Solar PV (500 kW)
- Electric Vehicle (EV) Charging

- e-mesh PowerStore BESS (1 MW/1.4 MWh)
- e-mesh Control System & SCADA
- Back-up Genset (350 kW)
- Integration of V2G, Solar, Genset, Grid, BESS

Customer benefits

- Reliability and resiliency for Clean Energy Center, North County Data Center, Disaster Response Office
- Integration of community solar renewable generation
- Stacking multiple values from energy storage: microgrid, grid stabilization, renewable integration, peak shaving, renewable back-up
- Exploring the future of vehicle electrification
- Utility reliability maximizing the value of batteries