

# Microgrids & Energy Storage





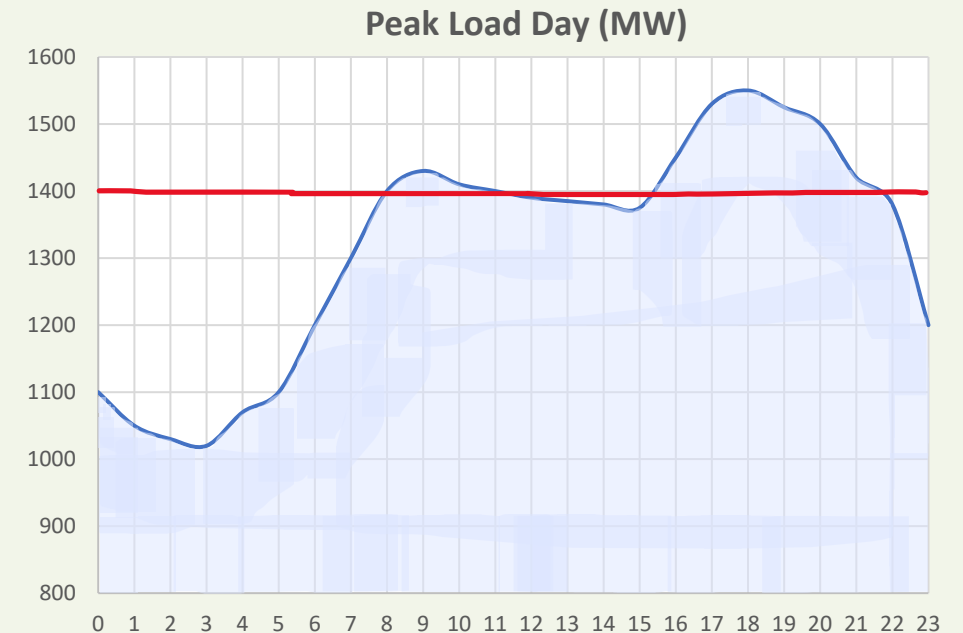
# Agenda

- Changes to the Energy Landscape
- How Snohomish PUD is Adapting
  - Grid-Scale Battery Energy Storage
  - Arlington Microgrid
  - Tulalip Tribe Microgrid



# Today's energy

- Most of Snohomish PUD's power is purchased from BPA
  - Over 90% renewable energy sources
- Bulk agreements cover most of Snohomish PUD's power needs
- During peak usage we need to go to the open market
  - Increasingly volatile prices
  - Often not clean energy sources
  - Uncertain market trajectory



# The Changing Energy Landscape

- Policy: Clean Energy Transformation Act - 100% carbon free by 2045
- Traditional power distribution structure is changing
  - No new generation (at least in our area)
- Increased demand
  - Population Growth
  - Electrification of Vehicles & Buildings
- Right now, energy storage seems to be the best solution
  - Grid-Scale Batteries
  - Residential/Commercial Systems
  - Electric Vehicles

# Grid-Scale Energy Storage

- 25MW Lithium-Ion Battery in Arlington
- Charge when power is cheap, discharge during peak loads
  - Insulates us a little bit from the increasingly volatile energy market
- The first step to SnoPUD gaining a little more control of our energy sources
  - IRP calls for 70-100MW storage by 2029
- Comes with siting concerns and fire safety questions





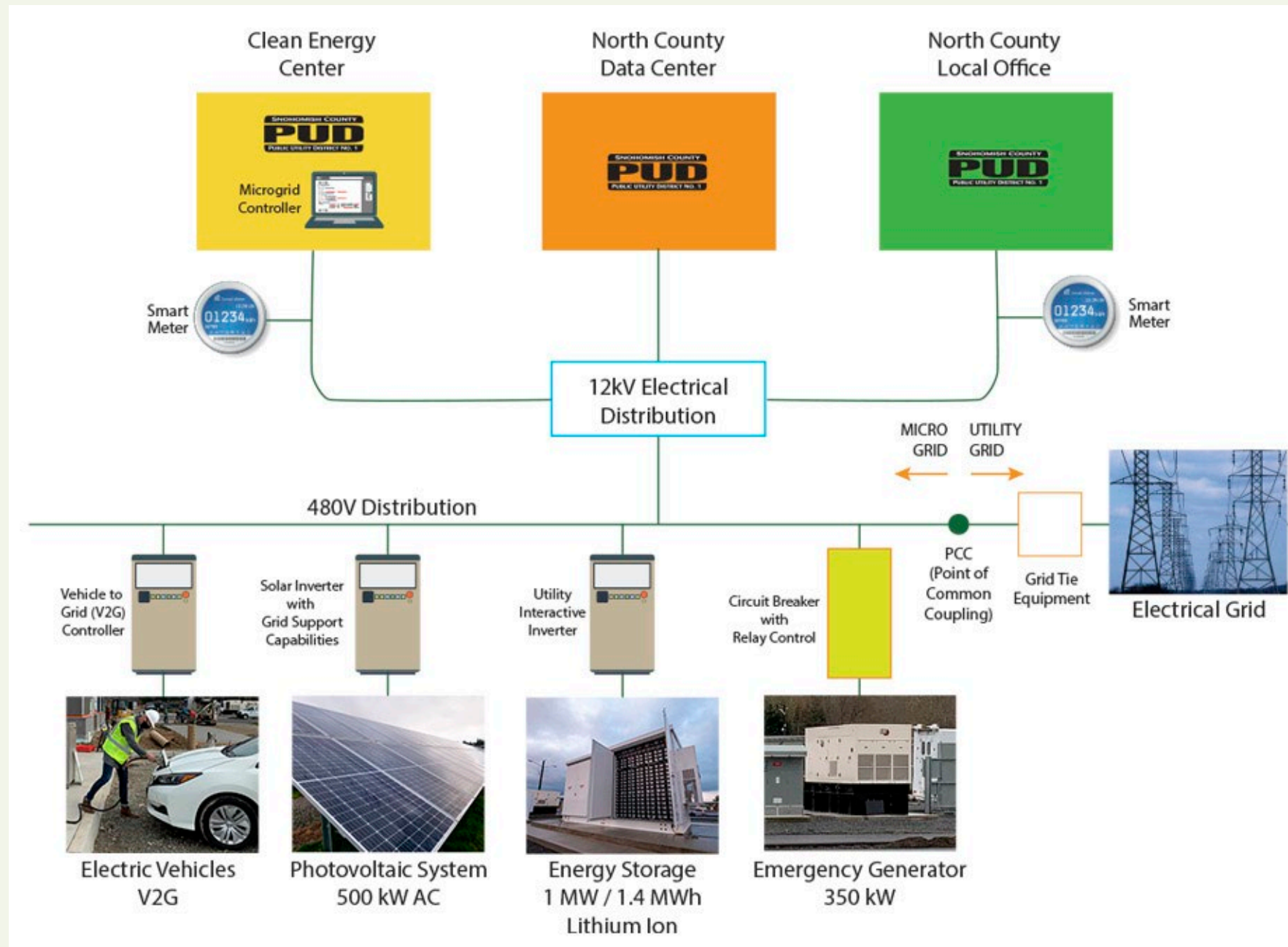
# Arlington Microgrid

- 1MW Battery Energy Storage System
- 500kW Solar Array (1.7 acres)
- 350kW Diesel Generator
- Vehicle-to-Grid (V2G) bi-directional EV charger
- Provides:
  - Backup Power to North County Operations Center
  - Grid Support & Ancillary Services
  - Seamless Transfer from grid-connected to islanded mode
  - Demonstration of Renewable Energy Integration



# Arlington Microgrid Architecture

- Battery can power buildings for ~12 hours under normal operation
  - Solar Array can recharge battery & power building (spring, summer, fall)







Clean Energy  
Center

V2G Electric Vehicles

PowerStore  
BESS

Generator

480V  
Switchgear

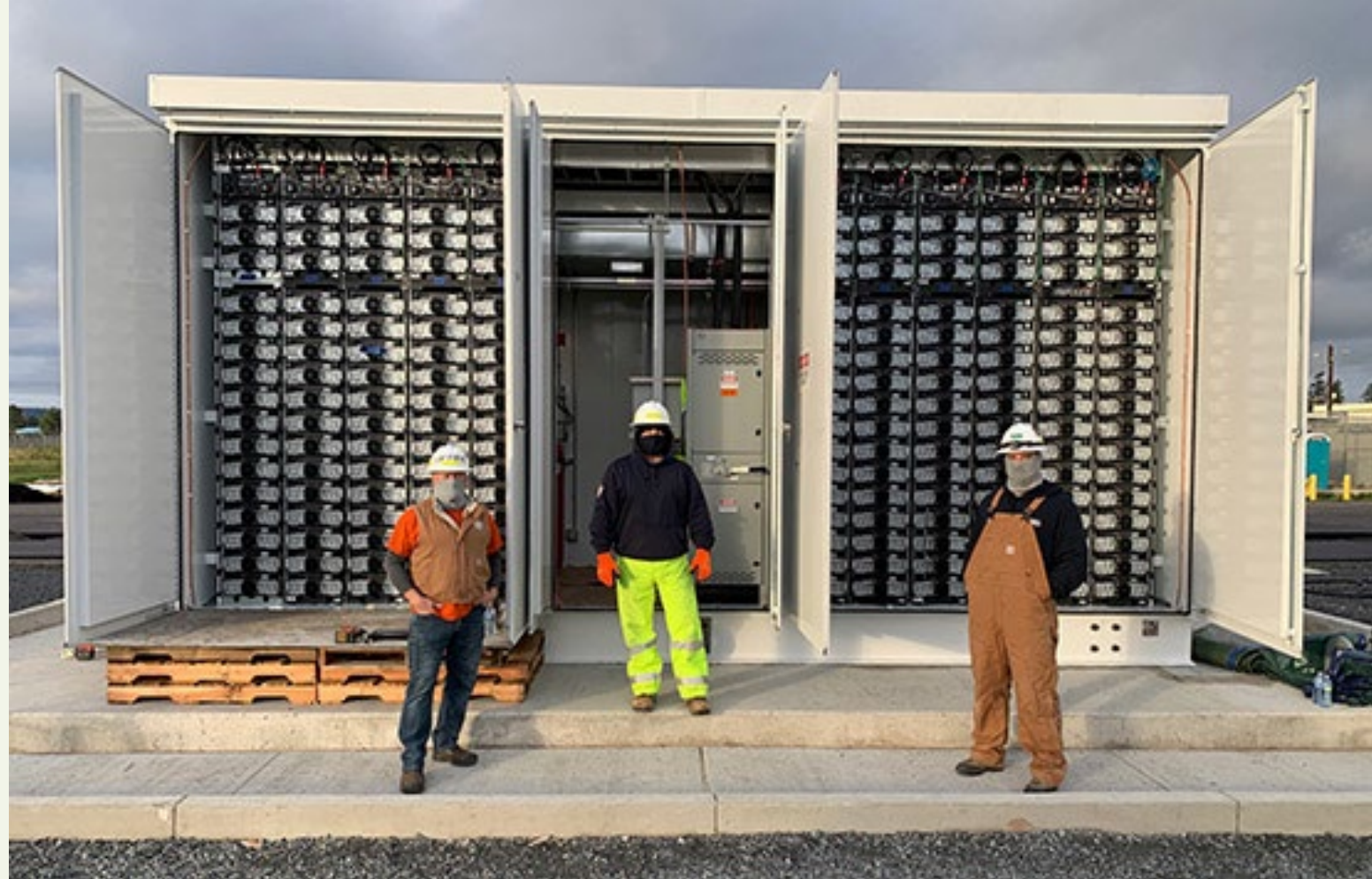
12kV:480V  
Transformer

500kW<sub>AC</sub> Solar PV  
1620 x 380W Panels



# PowerStore 1MW/1.4MWh BESS

- Hitachi Energy solution includes:
  - Site Controller
  - Integrated Power Conversion System
  - Batteries (Samsung SDI M3)
  - Battery Management System (BMS)
  - AC/DC protection
  - Outdoor rated container
  - Climate control (HVAC)
  - Fire protection
- PowerStore Grid Forming (GFM) Power Conversion System
  - Enables seamless grid connected to islanded transition
  - Can operate in virtual generator mode (VGM)



# Vehicle-to-Grid (V2G)

- 2 x Level 2 chargers (Mitsubishi Electric)
  - 6kW bi-directional charger
- 2 x Electric Vehicle
  - Nissan Leaf
  - 40kWh and 62kWh
- Microgrid Control
  - When islanded
- DERMS Control
  - When grid connected





# Microgrid & Battery Safety Lessons

- Fire response – water is out!
  - “Let it safely consume itself”
  - Explosion prevention is key
  - New codes are still being developed
- Unit Spacing – code says 3 feet...probably not for long!
- Emergency responders are still learning how to deal with battery fires
- Proactively work with local jurisdictions on projects



# Tulalip Microgrids for Resiliency

- Feasibility studies currently underway
  - Funded by Washington Commerce Dept
- Exploring community benefits from solar+energy storage microgrids
  - Emergency Power
  - Energy Bill Reduction
  - Grid Support / Peak Shaving
- Tulalip infrastructure layout is ideal for expanded microgrid



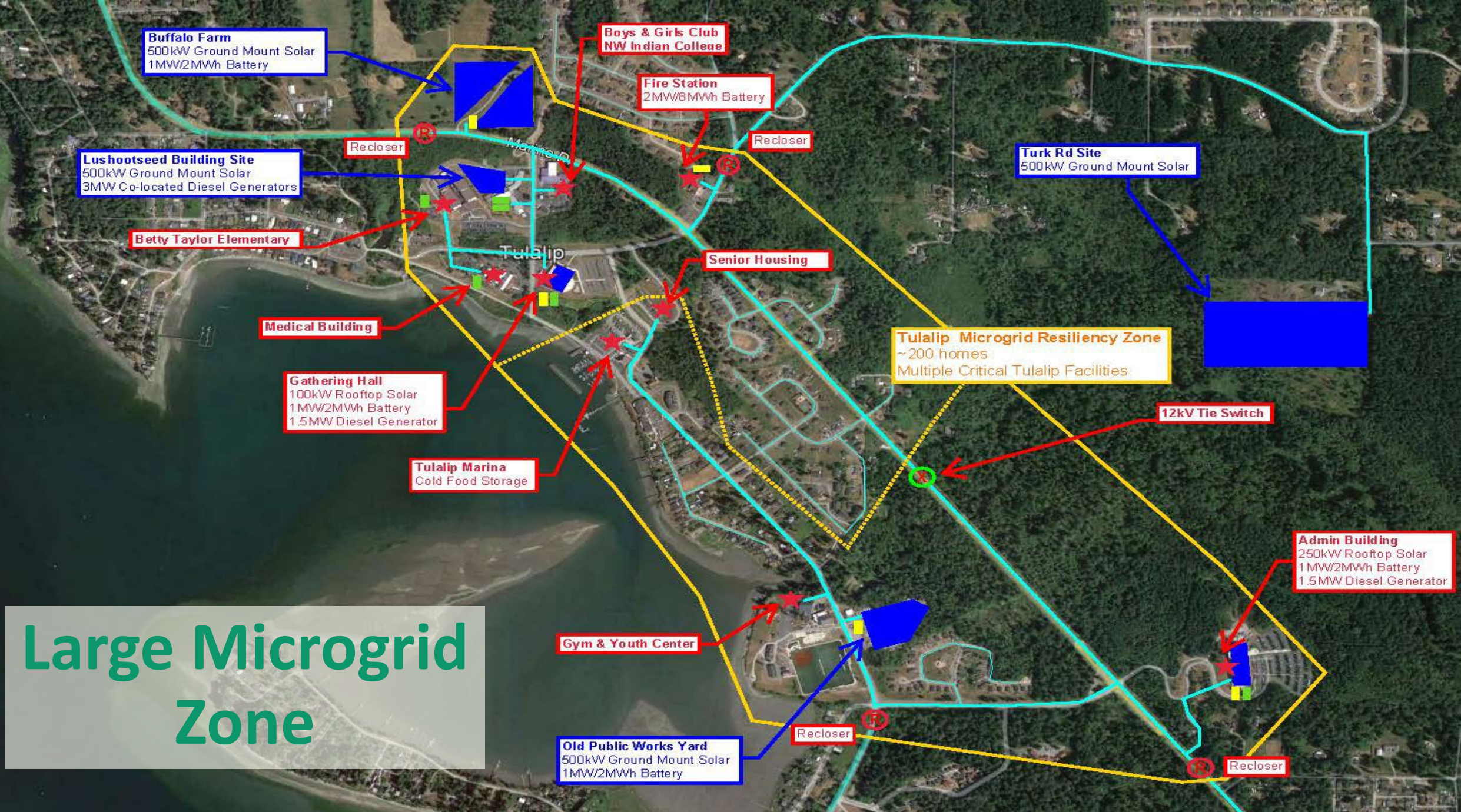




# Potential Microgrid Layout

- 12kV Protective Device allows buildings to disconnect from grid
- **Microgrid Created**
  - Community Center, Medical Building & School powered by:
    - (2) 1MW Batteries
    - ~750kW Solar
    - (3) 1.5MW Diesel Generators
- Technically not too difficult, many operational challenges







# So...what does the future look like?

- Large scale Solar+Wind farms replacing old fossil fueled power plants
- Distributed microgrids
- Aggregated home solar+battery systems
  - Tesla Powerwalls & Enphase IQs
  - Virtual Power Plants
- Vehicle-to-Grid (V2G)
  - Fleet upgrades
- Batteries everywhere!
  - All appliances
- Second-life options for old batteries
- Utilities are (hopefully) better prepared to integrate these distributed energy resources

# Thank You!

Alex Chorey  
[amchorey@snopud.com](mailto:amchorey@snopud.com)

