The Webinar will begin shortly

For Tech Support call (707) 572-7779

Type your questions into the Q&A (not the chat) and we’ll do our best to answer them at the end of the presentation.

Mike Avcollie
Mavcollie@RedwoodEnergy.org

Kyle Haas
khaas@swellenergy.com
Battery Energy Storage Systems: Uses and Benefits
Emergency Backup Power

Power Critical Site Loads

- Refrigeration
- Medical Devices
- Lights
- Pumps

Power Critical Facilities

- Water/Wastewater
- Police/Fire
- Municipal Facilities
- Communications
- Hospitals
- Food/Fuel
Customer Benefit - Energy Management

Rate Arbitrage/Load Shifting/Peak Shaving

Daily Energy Use vs Cost

- Utility Cost ($/kWh)
- Demand (kW)

TIME OF DAY

- ELECTRIC DEMAND (KW)
- UTILITY COST ($/KWH)
Grid Benefit-Energy Management

- Duck Curve
- Midday Solar Glut
- Evening Ramp Up
- GHG Benefits
Battery Energy Storage Systems: System Types
System Types:

**Stand Alone System**

http://www.solarenergyofillinois.com/battery-backup
System Types:

**Grid Tied w/ Emergency Backup-DC Coupled**

http://www.solarenergyofillinois.com/battery-backup
System Types:

**Grid Tied w/ Emergency Backup-AC Coupled**

https://floridasolardesigngroup.com/photovoltaic-solar-electric-systems-with-battery-backup/
System Types:

**Grid Tied Emergency Backup with Energy Management**

![Diagram of Smart Energy Management with Backup Power](image)

*Figure 1: Smart Energy Management with Backup Power*
Battery Energy Storage Systems: Common Battery Metrics
Common Battery Metrics

- Allowable Depth of Discharge (%)
- Warranted Number of Cycles
- Roundtrip Efficiency
- Capacity Watt-hours (kWh or Wh)
- Discharge Rate (kW)
- Cost
Battery Types: Lithium-Ion Batteries

- 90%-95% Allowable Depth of Discharge
- 2,000 – 3,000 Warranted Cycles
- 90%-95% Roundtrip Efficiency
- 9.8 kWh Capacity
- 9.3 kWh Available
- 350-450 Volt Nominal Voltage
- Cost: ~Varries
## Battery Energy Storage Systems: Example:

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Energy Use (From Utility Data)</td>
<td>4,674 kWh</td>
</tr>
<tr>
<td>Daily Energy Use (4,674 kWh/365 days)</td>
<td>12.8 kWh</td>
</tr>
<tr>
<td>Estimate of Critical Loads (50% of Daily Use)</td>
<td>6.4 kWh</td>
</tr>
<tr>
<td>Max Site Demand (From Utility Data)</td>
<td>4 kW</td>
</tr>
<tr>
<td>Average Site Demand (From Utility Data)</td>
<td>2 kW</td>
</tr>
<tr>
<td>Battery Capacity (From Spec Sheet)</td>
<td>9.8 kWh</td>
</tr>
<tr>
<td>Available Capacity (From Spec Sheet)</td>
<td>9.3 kWh</td>
</tr>
<tr>
<td>Max Power (From Spec Sheet)</td>
<td>5 kW</td>
</tr>
<tr>
<td>Whole House Backup (9.3kWh/12.8kWh*24)</td>
<td>17.4 Hours</td>
</tr>
<tr>
<td>Critical Loads Backup (9.3kWh/6.4kWh*24)</td>
<td>34.9 Hours</td>
</tr>
</tbody>
</table>
Battery Energy Storage Systems: Codes and Safety
General Safety Considerations

- Facility Signage
- Safety Data Sheets
- Emergency Response Plan
- Disconnect and Shutdown Capability
- Ventilation
- Fire Suppression
NFPA 70 National Electric Code (NEC)

- **Section 706**: Energy Storage Systems
- **Section 705**: Interconnected Electric Power Production Sources
- **Section 712**: Direct Current Microgrids
- **Section 750**: Energy Management Systems
- **Section 690**: Solar Photovoltaic (PV) Systems
Other Codes Referenced In NFPA 70

▪ **NFPA 111-2013**, *Standard on Stored Electrical Energy Emergency and Standby Systems*

▪ **IEEE 484-2008** *Recommended Practice for Installation and Design of Vented Lead-Acid Batteries for Stationary Applications*

▪ **UL 1989**, *Standard for Standby Batteries*

▪ **UL Subject 9540**, *Safety of Energy Storage Systems and Equipment*
Battery Energy Storage Systems: Incentives and Eligibility
The Self Generation Incentive Program (SGIP)

SGIP provides incentives for battery energy storage systems.

https://www.selfgenca.com/home/resources/
Incentive Levels

- Large Scale Storage (> 30 kW): $0.30/Wh ($300/kWh)
- Small Residential Storage (<30 kW): $0.20/Wh ($200/kWh)
- Residential Storage Equity (Waitlisted): $0.85/Wh ($850/kWh)
- Non-Residential Storage Equity (Waitlisted): $0.85/Wh ($850/kWh)
- Equity Resilience (Waitlisted): $1.00/Wh ($1000/kWh)
Residential Equity Eligibility

- Multifamily, deed-restricted
  - At least five rental housing units
  - 80% of households at or below 60% area median income
- Single-family homes subject to resale restrictions
- MASH, SASH and DAC-SASH customers
Residential Resiliency Eligibility

In Tier 2 or Tier 3 HFTD

And one of the following

- Equity Budget eligible
- Medical baseline program eligible
- Notified utility of life-threatening illness/condition
Non-Residential Equity Budget Eligibility

Non-Residential Criteria

• Local and State Agencies
• Small Businesses and Non-profits
• Educational Institutions

And located in low-income area

• AB 1550 Map for Reference
Non-Residential Equity Resilience

- Located in Tier 2 or Tier 3 HFTD
- **And** located in community eligible for equity budget
- **And** is a critical facility provider
- Where critical facilities and services are defined as:
  - Emergency services, medical facilities, gas stations, water/wastewater treatment, public utilities, grocery stores, and food banks, etc.
## Summary of Incentives

<table>
<thead>
<tr>
<th>Incentive Type</th>
<th>New Incentive Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Residential Storage (&lt;30 kW)</td>
<td>$0.20/Wh ($200/kWh)</td>
</tr>
<tr>
<td>Large Scale Storage (&gt;30 kW)</td>
<td>$0.30/Wh ($300/kWh)</td>
</tr>
<tr>
<td>Residential/Non-Residential Storage Equity (Waitlisted)</td>
<td>$0.85/Wh ($850/kWh)</td>
</tr>
<tr>
<td>Equity Resiliency (Waitlisted)</td>
<td>$1.00/Wh ($1000/kWh)</td>
</tr>
</tbody>
</table>

### Equity Budget Discharge Duration Step-Down

<table>
<thead>
<tr>
<th>Discharge Duration (hours)</th>
<th>Percent of Base Incentive</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2</td>
<td>100%</td>
</tr>
<tr>
<td>2-4</td>
<td>100%</td>
</tr>
<tr>
<td>4-6</td>
<td>50%</td>
</tr>
<tr>
<td>6+</td>
<td>0%</td>
</tr>
</tbody>
</table>
More SGIP Considerations

• Customers must work with an “Approved” Developer or apply as a “Developer” to process the rebate themselves.

• SGIP Approved Developer List can be found here: https://www.selfgenca.com/documents/developer/approved

• Rebates can be paid to customer or installer

• For Non-Residential customers ½ of the rebate will be paid upon verification of installation, the remainder will be paid annually over 5 years as a Performance Based Incentive

• Consult with your tax professional about implications of incentives
Other requirements

▪ For PBI purposes, all non-residential projects must install metering and monitoring equipment that measures net electrical output or offset from the system(s).

▪ Residential and non-residential equity resiliency and equity budget storage projects must cycle a minimum of 52 and 104 times per year respectively

▪ Ineligible equipment:
  ▪ Backup systems intended solely for emergency purposes.
  ▪ Equipment that has been interconnected for more than 12 months.
  ▪ Rebuilt, refurbished or relocated equipment (e.g. second life batteries).
SGIP References and Links

CPUC Equity-Resiliency SGIP Decision – September 18th 2019

• http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M313/K975/313975481.PDF

CPUC Proposed SGIP Decision – December 11th 2019

• http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M321/K658/321658813.PDF

CPUC High Fire Threat District (HFTD) Map (SGIP Resiliency Eligibility)

• https://ia.cpuc.ca.gov/firemap/

AB 1550 low-income map (SGIP Equity Budget Eligibility)

• https://ww3.arb.ca.gov/cc/capandtrade/auctionproceeds/lowincomemapfull.htm

SGIP 2019 Handbook

• https://www.selfgenca.com/documents/handbook/2019

SGIP Approved Developer List

• https://www.selfgenca.com/documents/developer/approved

SGIP FAQ and Documentation

• https://www.selfgenca.com/home/resources/
Community Choice Energy
Lower rates. Local control. Same reliable service.

Thank you
Mike Avcollie • (707) 382-0187
mavcollie@redwoodenergy.org
Submit your questions in the Q&A and we will answer them after the presentation.