A Public Workshop

Battery Storage Basics

Learn about emergency back-ups and financial incentives

February 4, 5:30-6:30 pm (Tuesday)
Agenda

5:30 - Opening - Nancy Stephenson
  • Introduction to RePower Hour series, review agenda, roles and ground rules

Mahayla Slackerelli
  • 5:35 – RCEA Solar Initiatives Overview

Mike Avcollie
  • 5:45 – Battery and Energy Storage System Basics
  • 6:10 – Self Generation Incentive Program (SGIP)
  • 6:25 – Closing, Q&A, Review
Ground Rules

- One speaker at a time
- Be succinct, stay on topic and help the group stay on track
- Strive to be inclusive and support everyone’s efforts to communicate
- Listen to understand first
- Ask questions to increase understanding:
  - During the presentation for clarifying questions
  - Afterwards for other questions
Net Energy Metering

*Solar on your home or business*

- Build credit on electricity bill with excess generated energy
- Solar customers can generate energy when the sun is shining and use that energy when it is not.
- RCEA buys excess generation at **retail electricity rates plus $0.01/kWh**
Feed-in Tariff

Community scale renewable energy in Humboldt County

RCEA offers contracts for local renewable energy projects:

- up to 1MW
- Above market pricing, currently $88/MWh
- Extra incentives for local developers and previously developed sites
- 20-year contracts
Redwood Coast Airport Microgrid

- First front-of-meter, multi-customer microgrid on PG&E’s system
- 2.2 MW solar array with 2.2 MW/8.8 MWh battery storage
- Microgrid controllers will allow the system to island and provide uninterruptible power for long periods
Public Agency Solar Program (PASP)

- Electric Load Analysis
- Energy Efficiency Upgrades
- Solar Site Analysis
- Project Feasibility Studies
- Identification of Funding Sources
- Contracting/Project Management Assistance

To date PASP has helped secure $1.7 million in loan funding for public agencies with 500 kW of solar installations scheduled for 2020/2021
Energy Storage Basics: Uses and Benefits
Emergency Backup Power

Power Critical Site Loads
- Refrigeration
- Lights
- Pumps

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

Rate Arbitrage/ Load Shifting/ Peak Shaving

Daily Energy Use vs Cost

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

ELECTRIC DEMAND (KW)

TIME OF DAY

UTILITY COST ($/KWH)

$0.05
$0.10
$0.15
$0.20
$0.25
$0.30
$0.35

Energy Management - Grid Benefit

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

Grid Tied Solar PV array (No Batteries/Storage)

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

Grid Tied Emergency Backup w/ Energy Management
Energy Storage Basics: Common Battery Options
Common Battery Types:

Lithium Ion and Lead Acid
Common Battery Metrics

- Allowable Depth of Discharge (%)
- Warranted Number of Cycles
- Roundtrip Efficiency
- Capacity in Amp-hours or Watt-hours
- Nominal Voltage
- Cost
Battery Types: Lead Acid Batteries

- 80% Allowable Depth of Discharge
- 2,350 Warranted Cycles at 40% DOD
- 80% Roundtrip Efficiency
- 48 Volt Nominal Voltage
- 390 Amp-hours or 18.7 kWh Capacity
- 14.9 kWh Available
- Cost: ~ $3,000-$3,500
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: ~$5,000-$6,500
Energy Storage Basics: 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*
Energy Storage Basics: Incentives and Eligibility
The Self Generation Incentive Program (SGIP)

SGIP provides incentives for energy storage systems (batteries) when paired with a renewable generation source like Solar Photovoltaics.
SGIP Timeline

September 18th, 2019 Equity-Resiliency Decision
December 11th, 2019 Proposed Decision

December 17th, 2019 PG&E Tier 2 Advice Letter (Part 1, Residential)
February 18th, 2020 PG&E Tier 2 Advice Letter (Part 2, Non-Residential)

March 1st, 2020 PG&E to accept residential applications
April 1st, 2020 PG&E to accept non-residential equity + resiliency applications
Understanding Updates to the SGIP

- Residential vs Non-Residential
- Eligibility and Incentive levels
- Equity Budget vs Resiliency Adder
Recent CPUC Decisions

• General Residential Incentive Rate (All Customers)
  $0.35/Wh ($350/kWh)

• Increased Equity Budget Incentive Rates:
  $0.85/Wh ($850/kWh)

• Established “Resiliency Adder”:
  $0.15/Wh ($150/kWh)
Residential Equity Budget Eligibility
$0.85/Wh ($850/kWh)

- 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
- SASH and DAC-SASH customers
Residential Resiliency Adder Eligibility
$0.15/Wh ($150/kWh)

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
$0.85/Wh ($850/kWh)

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 Resiliency Adder Eligibility
$0.15/Wh ($150/kWh)

- 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>General Market (Non-Equity) at SGIP Step 3</td>
<td>$0.35/Wh ($350/kWh)</td>
</tr>
<tr>
<td>Non-Residential General Market with Resiliency Adder</td>
<td>$0.50/Wh ($500/kWh)</td>
</tr>
<tr>
<td>Equity Budget Storage Incentive</td>
<td>$0.85/Wh ($850/kWh)</td>
</tr>
<tr>
<td>Equity + Resiliency Budget Storage Incentive</td>
<td>$1.00/Wh ($1,000/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>
## Battery/Storage Basics:

### 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/Storage Basics: Example Continued:

Average Site Demand (From Utility Data)  2 kW
Available Capacity  9.3 kWh
Estimate of System Cost  $9,500 - $13,000

<table>
<thead>
<tr>
<th>Discharge Duration</th>
<th>Discharge (kWh)</th>
<th>Standard Incentive $350/kWh ($)</th>
<th>Equity Incentive $850/kWh ($)</th>
<th>Equity Resiliency Incentive $1000/kWh ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2 Hours @ 100% [2 kW * 2 Hrs.]</td>
<td>4</td>
<td>$1,400.00</td>
<td>$3,400.00</td>
<td>$4,000.00</td>
</tr>
<tr>
<td>2-4 Hours @100% [2 kW * 2 Hrs.]</td>
<td>4</td>
<td>$1,400.00</td>
<td>$3,400.00</td>
<td>$4,000.00</td>
</tr>
<tr>
<td>4-6 Hours @50% [2 kW * .65 Hrs.]</td>
<td>1.3</td>
<td>$227.50</td>
<td>$552.50</td>
<td>$650.00</td>
</tr>
<tr>
<td>Total</td>
<td>9.3</td>
<td>$3,027.50</td>
<td>$7,352.50</td>
<td>$8,650.00</td>
</tr>
</tbody>
</table>
Some SGIP Requirements

• 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
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
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