Avoid Infrastructure Upgrade

• Application: Use of storage and PV adjacent to new loads to reduce demand allowing owner to avoid service/infrastructure upgrades.
2. Case Study – Hawaii Dept. of Education

- Multiple microgrids installed for HVAC Equipment for over 30 classrooms on 5 campuses
- 140 kW of PV, 230 kW/607 kWh of battery
- Avoided service and wiring upgrades on all 5 campuses.
• PV/Battery microgrid provides power for new AC.
• Microgrid prevents increased demand on the distribution system from the new AC equipment... avoiding an expensive upgrade.
• Nighttime charging circuit charges microgrid in case the battery gets low: <10% of time.
Fire Season Microgrid

• Increasing number of Public Safety Power Shutdown “PSPS” blackouts during fire season.

• Power lines are becoming a greater fire hazard with dryer weather.

• 2018 - PG&E Plead guilty to causing the Camp Fire, which destroyed 19,000 structures.

• In 2019 businesses losses estimated at $2.5 billion over one month.

• Awareness raised that utility caused fires are becoming a large issue
## PG&E Public Safety Power Shutoffs (PSPS)

<table>
<thead>
<tr>
<th>Utility</th>
<th># Customers Served (Thousands)</th>
<th>% Cust. Served (% of all CA Customers)</th>
<th># Cust. w/ PSPS Outages (Thousands)</th>
<th>% Cust. w/ PSPS Outages 2013-2020</th>
<th>Average PSPS Duration (Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG&amp;E</td>
<td>5,590</td>
<td>0.38</td>
<td>2,701</td>
<td>0.48</td>
<td>46.8</td>
</tr>
</tbody>
</table>

Source: Physicians, Scientists, and Engineers (PSE) for Healthy Energy

**Notes:** The average PSPS event duration **46.8 hours** for PG&E

This is a “moving target” since PSPS Events are a new phenomenon and statics and studies are still being conducted.
PG&E Public Safety Power Shutoffs (PSPS)

Notes:
Most of the PSPS events in PG&E Territory and the other utilities in California occurred in September and October.

Source: Physicians, Scientists, and Engineers (PSE) for Healthy Energy
PV System – Seasonal Power Generation
Microgrid – Seasonal Performance

- Jan – Up to 24 hours
- Feb – Up to 24 hours
- Mar – 3.5 days to Entire Month
- Apr – Entire Month
- May – Entire Month
- Jun – Entire Month
- July – Entire Month
- Aug – Entire Month
- Sep – 10 days to Entire Month
- Oct – 3 days to Entire Month
- Nov – Up to 24 hours
- Dec – Up to 24 hours

- Number of days of backup depends on the weather.
- Connections for a portable generator connection can be added to the system in case the battery runs low
- Data above assumes the PV system has been sized to offset 100% of annual energy usage of the loads it is supporting, and battery system inverter has been sized to handle the max peak demand on the system and has capacity to have a runtime in winter of up to 24 hours
Microgrid – Seasonal Performance

- Jan – Up to 24 hours
- Feb – Up to 24 hours
- Mar – 3.5 days to Entire Month
- Apr – Entire Month
- May – Entire Month
- Jun – Entire Month
- July – Entire Month
- Aug – Entire Month
- Sep – 10 days to Entire Month
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- Nov – Up to 24 hours
- Dec – Up to 24 hours

Number of days of backup depends on the weather.
Connections for a portable generator connection can be added to the system in case the battery runs low.
Case Study: Confidential Tech Client

• 1.3 MW of PV

• 2.5 MW / 5 MWh of Energy Storage

• Campus style project with (2) new large office buildings and (1) existing office building.

Functionality:

• Automatic or manual selection which building is to remain operational.

• Ability to energize portions of the building.
Questions

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