BACK-UP POWER FACT SHEET
(SOLAR PLUS BATTERY STORAGE AND GENERATORS)

Due to PG&E's need to mitigate wildfire risk through Public Safety Power Shutoff (PSPS) events, customers may experience outages more frequently. Solar photovoltaic systems coupled with battery storage and generators can provide residents with additional control over powering their home, allowing them to keep at least essential devices (such as medical equipment, refrigeration, air conditioning, electric heating, lighting, electric well pumps) powered during outages. Each option has strengths and challenges homeowners should consider before making any purchase.

Comparison of Backup Options

	Battery	**Portable Generator**	**Permanent Generator**
Cost	$1,500 - $15,000 [1]	$500 - $2,300	$5,500 - $7,000
Potential Loads	Essential loads[2]	Essential loads	Whole house
Lifespan Est.	10 years (MWh or Cycles)	1 – 3 Years	5 years
Noise	None	Yes	Yes
Added Value	Under Time of Use Rate – can sell power back to the grid when not need for back-up – Depends on the equipment selected	None	None
Fuel	None – if charged from a PV system or from the Grid ($)	Gasoline/Diesel/Propane ($$$)	Diesel/Propane/ Natural Gas ($$$)
Maintenance	None	Must be run periodically; Oil change every year ($)	Must be run periodically; Oil change every year ($)
Emissions	None	Yes	Yes
Permitting Requirements	Photovoltaic Permit for Non-Portable Systems	Electrical Permit Required When Connected to House Wiring	Electrical and Plumbing Permits Required (When Connecting to Natural Gas Lines)

Solar Plus Battery Storage

Most residential solar systems are "grid tied," meaning that when power is shut off in the area even homes with solar panels lose power (with the exception of some solar systems that include backup capability for an emergency circuit). Adding battery storage to a home with solar allows that home to retain power during a grid outage.

Added Benefits of Solar Plus Battery Systems

- Energy Arbitrage: under a Time of Use Utility Rate, battery systems can charge at times of the day when electricity is cheap, and power the home when energy is more expensive. This enables a battery system to pay for itself over time.
- No Fuel Required: in the event of a multiple-day power outage, a home with solar and a battery system will charge the battery during the day and use the stored energy at night. With a proper load design, and sufficient sunlight, this cycle will repeat itself each day.
- No operational greenhouse gas (GHG) emissions, noise, or required regular maintenance (as compared to generators).
- If adding a battery storage system at time of PV installation, the permits (PV and Battery) can be combined and no additional fee is required.

Costs, Sizing, and Other Considerations

- Incentives: when combined with solar, battery systems can be eligible for tax breaks (check with your tax advisor) and a rebate from the California Self-Generation Incentive Program: www.selfgenca.com.

[1] Does not include the cost of solar PV equipment.
[2] Critical loads can include lights, refrigerator, some outlets.

- Sizing for Your Home, Cost, Critical Loads: The ultimate cost of a battery system depends on the capacity needed and variables related to your specific installation. The average single-family home has an electrical load of 18.5 kWh per day. Depending on your needs and budget, a battery system can be sized to service the entire home, or only "critical loads" (refrigerator and a small office, as an example).

Permit Requirements (for unincorporated Marin County)

- Marin County Photovoltaic Permit Required
- Scaled Site Plan: illustrating proposed location of equipment in relation to the property lines and existing structure(s).
- Manufacturer's Equipment Information
- Electrical Line Diagram per the latest edition of the California Solar Permitting Guidebook (insert link)

Note: If adding battery that will not be connected to a PV system but will be connected to the house wiring directly via a transfer switch, a permit is still required.

Portable Batteries

Portable backup batteries do not require a building permit (if not hardwired into house) and are more affordable than mounted battery systems. The cost of portable batteries is a function of their capacity; higher capacity batteries can power large home appliances and can range from $1,000 to $3,000. For example, a 1,045 Wh rated portable battery can power the average refrigerator for 17 hours.

Emergency Back-Up Generators

Temporary (Portable) Generators

A building permit is generally not required for use of portable generators when powering household appliances using an outdoor-rated extension cord. An electrical permit **is required** for a portable generator is connected to the house wiring directly via a transfer switch.

Additional Considerations (Portable Generators)

- California Fire Code states that no more than 10 gallons of fuel should be stored onsite in a Department of Transportation-approved container.
- Generators must be used in well ventilated outside areas and away from all doors, windows and vents.
- Never use a generator in a garage or enclosed space, even with the door open.
- Turn off generators and let them cool down before refueling. Never refuel a generator while it is hot.
- FACT: deaths due to CO poisoning associated with generators have spiked in recent years as generator sales have risen.

Residential Permanently Mounted Generators

A building permit is required for the installation of any permanently mounted generator. Submittal requirements:

- Scaled Site Plan: demonstrating proposed location of equipment in relation to the property lines and existing structure(s), and including location of an exterior emergency shut-off that will isolate the generator from the residence
- Manufacturer's Equipment Information
- An electrical schematic and plumbing schematic for the gas line.
- If the property is located in the flood zone, additional requirements may apply.