

SANDY COMMUNITY 27 EMERGENCY PREPAREDNESS CLASS APRIL 20, 2023 – WHEN THE LIGHTS GO OUT!

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Sandy Community 27 website www.beyhondfoodstorage.net

Slide 1

ALTERNATIVE POWER SOURCES

When the power goes out, you will need an alternative power source. It may be a short-term outage requiring a short-term solution or a longer outage requiring a more powerful power source.

We will talk about a few of these solutions tonight, but we will dive a little deeper. We will break down the pros and cons of each power source, approximate cost, how to use it, and how to maintain it.

Related Links and Printouts at the end of each slide.

Slide 2

WHAT ARE YOUR BIGGEST CONCERNS WHEN THE POWER GOES OUT?

What would your concerns be if you lost power to your home for longer than four hours? Some things to consider are:

- Food spoilage
- Climate control
- Cooking food
- Communication

It would be best if you had a plan BEFORE the power goes out to prevent your food from spoiling.

Ask yourself these questions:

- How will you keep your fridge/freezer cold?
- How will you stay warm if your furnace isn't functioning in a power outage in the middle of winter?
- How will you cook or heat food? Do you have a way to boil water without a microwave or stovetop?
- Do you have a way to charge your phone or laptop to stay informed about the situation or power outage?

Slide 3

WHAT YOU NEED TO CONSIDER WHEN CHOOSING ALTERNATIVE POWER SOURCES

WHAT DEVICES ARE YOU TRYING TO POWER?

- Fridge
- Freezer
- Furnace
- Hot plate
- Medical device

Slide 4

ASK YOURSELF THESE QUESTIONS

- How will your needs change based on a 12-hour power outage to 72 hours or longer?
- How will your needs change based on the season?
- How long or how often will you need to power the device?
- What fuel source does the device require (solar, battery, gasoline, propane, natural gas, etc.)?
- How long will your power source last?

Slide 5

HOW MUCH POWER WILL YOU NEED?

EXAMPLE

Our goal is to keep our food safe in a power outage. Let's look at a quick example of what you need to power your refrigerator.

First, how much power does your fridge need? You will need to find the wattage your fridge uses. The easiest way is to look on label inside the fridge. It may be on the inside of the door or the inside side panel.

You are looking for the amps and volts. You can then calculate the wattage the device uses.

Watts = amps * volts

This will give you the refrigerator running watts.

An average fridge has about 700 running watts.

Slide 6

SURGE WATTS

You will also need to know the surge watts of the appliance. This is the power the device will require when it initially starts up.

The surge watts may be hard to find because this information is usually on the motor or compressor of the appliance.

For a fridge that has 700 running watts, the surge watts can be around 2,000 watts.

[Running and Surge Watts by Edgestar](#)

[Compressor Labels by Refrigeration Club](#)

Slide 7

POWER NEEDED FOR OUR EXAMPLE

Refrigerator = 816.5 running watts

Surge watts = $816.5 * 2 = 1,633$

Will need a generator that produces at least 1,633 watts

Home Depot

2,000-watt gas generator

\$360.00

Slide 8

HOW OFTEN DO YOU NEED TO RUN THE FRIDGE SO IT STAYS COLD?

If the doors stay closed, refrigerated food will stay at a safe temperature for about four hours. You have about three hours if it is hot outside and your fridge is in the garage. If it is winter and cold where your fridge is, it may be longer than four hours.

Food in the freezer will last 48 hours if the freezer is full and 24 hours if the freezer is half full.

You would want to power on your refrigerator every four hours, and run it for one hour, to keep the food safe.

Slide 9

POWERING MULTIPLE DEVICES

You may want to power more devices than just your refrigerator, like your furnace or medical devices.

As a guide, look at the wattage worksheet we handed out.

[List of Electric Appliances and Wattage Usage from Generatorist.com](#)

Sandy Community 27 Alternative Power Sources Presentation

Generator Calculator to Determine Household Needs

A good rule of thumb for calculating all appliances:

1. Make a list of the appliances you will want to use.
2. Determine the watts each appliance will need.
3. Add together all the wattages and then multiply that number by 2.0. This is so the generator can provide the extra power appliances needed to start up. This amount is the minimum wattage for your generator.



WATTAGE WORKSHEET

When selecting a Home Generator System, you need to calculate both your rated and surge wattage requirements. Rated, or running wattage, is the amount of electricity necessary to run your appliances continually. Surge, or starting wattage, is the additional amount of electricity needed for 2-3 seconds to start electric motors commonly found in household appliances (such as a furnace fan or refrigerator). Since appliances rarely start-up at the same time, you will only need to factor in the appliance with the highest additional surge watts.

Follow these simple steps to estimate your particular wattage requirement.

1 Select the items you wish to power at the same time. Using the chart on the opposite side, fill in the rated watts and additional surge watt requirements on the "Your Power Needs" worksheet.

2 Add the RATED WATTS (the items you wish to power). Enter the total in the TOTAL RATED WATTS boxes.

3 Select the ONE INDIVIDUAL ITEM with the highest number of additional surge watts. Take this ONE NUMBER, add it to your TOTAL RATED WATTS, and enter the total in the TOTAL SURGE WATTS box.

EXAMPLE		
TOOL OR APPLIANCE	RATED (RUNNING) WATTS	ADDITIONAL SURGE (STARTING) WATTS
1. Refrigerator/Freezer	800	1600
2. 1/2 HP Furnace Fan	800	1300
3. Deep Freezer	500	500
4. Television	500	-
5. Lights (6 x 75 watts)	450	-
6.		
7.		
8.		
9.		
10.		

HIGHEST ADDITIONAL SURGE WATTS

TOTAL RATED WATTS = 3050 + 1600

With this example you need a generator that produces at least 3050 total rated watts and 4650 total surge watts.

HIGHEST ADDITIONAL SURGE WATTS

+

3050

TOTAL RATED WATTS

=

4650

TOTAL SURGE WATTS

YOUR POWER NEEDS		
TOOL OR APPLIANCE	RATED (RUNNING) WATTS	ADDITIONAL SURGE (STARTING) WATTS
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

TOTAL RATED WATTS = +

I need a generator that produces at least _____ total rated watts and _____ total surge watts.

HIGHEST ADDITIONAL SURGE WATTS

+

TOTAL RATED WATTS

=

TOTAL SURGE WATTS

Home Generator Systems



Slide 10

ADDITIONAL APPLIANCES EXAMPLES (CONSUMER REPORTS)

A 2,000-WATT POWER SOURCE WILL GET YOU:

1. Refrigerator (700 watts)
2. Laptop (200 watts)
3. Five to 10 lights (250 watts)
4. Smartphone charger (20 watts)
5. Home security system (100 watts)
6. TV (100 to 150 watts)

A 3,500-WATT POWER SOURCE WILL GET YOU:

1. Refrigerator (700 watts)
2. Laptop (200 watts)
3. Five to 10 lights (250 watts)
4. Smartphone charger (20 watts)
5. Home security system (100 watts)
6. TV (100 to 150 watts)

PLUS:

7. 10,000-btu air conditioner (1,000 watts) ****This is not a large whole-home AC Unit****

OR

ONE OF THESE:

- Toaster oven (1,200 watts)
- Hair dryer (1,200 watts)
- Washing machine (1,200 watts)
- Space heater (1,500 watts) ****never plug into surge protector****
- Coffee maker (1,000 watts)

Slide 11

A 7,500-WATT POWER SOURCE WILL GET YOU:

1. Refrigerator (700 watts)
2. Laptop (200 watts)
3. Five to 10 lights (250 watts)
4. Smartphone charger (20 watts)
5. Home security system (100 watts)
6. TV (100 to 150 watts)
7. 10,000-btu air conditioner (1,000 watts)

PLUS:

8. Well pump (1,250 watts)

- 9. Sump pump (900 watts)
- 10. Gas or propane furnace (800 watts)

OR

ONE OF THESE:

- 8-inch burner on an electric range (2,000 watts)
- Dishwasher (1,500 watts)

[How to Choose the Right Size Generator by Consumer Reports](#)

Slide 12

NOTES ON AIR CONDITIONERS

Central air conditioners can use between 15 to 60 amps and 240 volts.

Remember: Watts = amps * volts.

If you have a 2-ton AC, it could require 7000 watts.

You may be able to use this but nothing else. Consider this when you choose your alternative power devices.

Approx. surge watts = 11,400

HOUSEHOLD APPLIANCES								
Kitchen Appliances			Other Appliances			Essential Appliances		
Running Watts	Surge Watts		Running Watts	Surge Watts		Running Watts	Surge Watts	
Coffee Maker	1,000 W	0 W	Cell Phone Battery Charger	25 W	0 W	Ceiling Fan	60 W	70 W
Deep Freezer	500 W	1,500 W	Clock Radio	50 - 200 W	0 W	Central AC (10,000 BTU)	1,500 W	4,500 W
Dishwasher	1,500 W	1,500 W	Copy Machine	1,600 W	0 W	Central AC (24,000 BTU)	3,800 W	11,400 W
Electric Can Opener	170 W	0 W	Electric Mower	1,500 W	0 W	Common Light Bulb	75 W	0 W
Electric Kettle	1,200 W	3,000 W	Electric Strimmer	300 W	500 W	Electric Water Heater	4,000 W	0 W
Electric Stove (8" Element)	2,100 W	0 W	Fax	60 - 80 W	0 W	Furnace Fan Blower (1/2 HP)	800 W	2,350 W
Food Dehydrator	800 W	0 W	Garage Door Opener (1/2 HP)	875 W	2,350 W	Furnace Fan Blower (1/3 HP)	700 W	1,400 W
Food Processor	400 W	0 W	Outdoor Light String	250 W	0 W	Garage Door Opener (1/2 HP)	875 W	2,350 W
Fryer	1,000 W	0 W	Paper Shredder	200 W	220 W	Heat Pump	4,700 W	4,500 W
Microwave	1,000 W	0 W	Printer	400 - 600 W	0 W	Humidifier (13 Gal)	175 W	0 W
Pressure Cooker	700 W	0 W	Projector	220 W	270 W	Space Heater	1,800 W	0 W
Refrigerator / Freezer	700 W	2,200 W	Scanner	10 W	18 W	Sump Pump (1/2 HP)	1,050 W	2,150 W
Rice Cooker	200 W	500 W	Security System	500 W	0 W	Sump Pump (1/3 HP)	800 W	1,300 W
Toaster	850 W	0 W	Treadmill	280 W	900 W	Well Water Pump (1/2 HP)	1,000 W	2,100 W
Entertainment Appliances			Entertainment Appliances			Window AC (10,000 BTU)	1,200 W	3,600 W
Home Internet Router	5 W	15 W	Clothes Dryer (Electric)	5,400 W	6,750 W	Window AC (12,000 BTU)	3,250 W	9,750 W
Home Phone	3 W	5 W	Clothes Dryer (Gas)	700 W	1,800 W	https://generatorist.com		
Laptop	300 W	0 W	Curling Iron	1,500 W	0 W			
Monitor	200 - 250 W	0 W	Electric Shaver	15 W	20 W			
Stereo	450 W	0 W	Hair Dryer	1,250 W	0 W			
Television	500 W	0 W	Iron	1,200 W	0 W			
VCR / DVD Player	100 W	0 W	Vacuum Cleaner	200 W	700 W			
Video Game System	40 W	0 W	Washing Machine	1,150 W	2,250 W			

Slide 13

ALTERNATIVE POWER SOURCES

Some alternative power sources that you may want to consider:

WHOLE HOUSE GENERATORS (GENERAC, HONEYWELL, ETC)

These generators are usually powered by natural gas or propane, and they will automatically turn on in a power outage. This can be very helpful if you are not at home or on vacation. You can rest assured that the fridge and freezer will keep your food cold.

Home generators are expensive. A 7,000-watt unit can cost \$5,000 with installation being an additional cost. Total cost could average \$15,000 - \$20,000.

SOLAR PANELS

We will only spend a little time here, but here are a few things to consider when researching solar panels.

What are the differences between getting solar panels from a private company vs. the power company? Who controls the flow of the electricity your panels produce? Would your house have the capability to be completely "off-grid?" How long do the batteries last? How many batteries would you need to power your home? What happens if solar panels get damaged? How long will the batteries last? How much will a new battery cost?

SOLAR GENERATOR

A battery-operated generator can be recharged via an electrical outlet or solar panels.

STANDALONE GENERATORS (Gas, inverter, propane)

Gas generators are powerful and what most households should have as a minimum. There are three different types of gas generators:

1. Gas-only standalone gas generators
2. Inverter generators that use gasoline as a power source
3. Dual or tri-fuel generators that use gas and propane and or natural gas

Slide 14

GAS GENERATORS

Pros

- Powerful
- Long run time
- Less expensive

Cons

- Loud
- Power supply is limited based on gas stored
- Heavy
- Required to be outside- not fun in winter

Maintenance

- Use a stabilizer to store gas for one year.
- Empty out gas after one year. Reuse gas in the lawnmower, snow blower, car, etc.
- Keep oil on hand. Most new generators need their first oil change after the first 25 hours of use. After that, it should be changed every 50 to 60 hours.
- Most generators usually have automatic shutoff if the oil low.
- Start up periodically to keep the carburetor healthy – every few months. Check on what the manufacturer recommends

[Five Generator Mistakes That Can Leave You In The Dark by Consumer Reports](#)

Slide 15

NEED TO KNOW ABOUT GAS GENERATORS

IF IT IS COLD, GAS GENERATORS BECOME LESS EFFICIENT.

Once the temperature drops below 40 degrees Fahrenheit, the generator will be less efficient. (Fun fact, when it gets too hot outside, over 104 degrees, your generator may also not run at optimal efficiency.)

Here are a few common reasons why a generator won't start in cold weather:

1. Engine oil can gum up when it gets too cold, which prevents it from lubricating the engine parts it needs to. This can result in serious damage.
2. Cold temperatures can drain batteries more quickly.
3. Falling snow can accumulate around a generator and block its ventilation.
4. Skipping essential maintenance and storage steps could lead to damage when you need your generator for winter use.

DIFFERENT TYPES OF OIL FOR COLD WEATHER.

Example:

DuroMax Generators can use 30W, 10W-30, or 5W-30 conventional or synthetic oils. But if you're using 10W-30 engine oil in your generator, you could experience problems when temperatures dip below 0°F.

In below-freezing temperatures, 5W-30 oil is recommended for DuroMax generators.

[How to Run Generator in Cold Temperatures by DuroMax](#)

[Cold and Maintenance by Housedigest](#)

BATTERY

Cold weather can cause car batteries to drain faster; the same goes for generator batteries if they're exposed to cold temperatures for extended periods.

Using a battery tender (or trickle charger) while your generator is in storage can help preserve its battery life so it's charged and ready to go when needed.

Remember that most 12V batteries only have a few years of shelf life, so you'll need to replace yours at some point.

A battery warmer can also help extend its capacity in extremely cold temperatures.

VENTILATION

Just like you would in any weather, ensure the area where you're operating your generator is well-ventilated. The surrounding area must remain clear of snow, leftover fallen leaves, and any other obstacles so that nothing is blocking your generator vents.

If snow falls on your generator, monitor the area to ensure it stays well-ventilated. Be careful of the risk of water getting into the engine or fuel tank. Solutions are to create a tent shelter or covering.

[Can You Run Your Generator in the Rain? By Bob Vila](#)

THEFT

How can you secure your generator to deter theft?

Slide 16

GOOD TO KNOW ABOUT GAS GENERATORS

- Can overload – drawing more electricity can cause components to overheat and rotor blades to warp.
- Can overheat – engine can get too hot by too much demand for power.
- If generator capacity is exceeded, the engine will run at a higher RPM causing excess vibration and increased noise. This is not good for the longevity of the generator.
- You can only refuel when the generator has cooled down. If you refill when the generator is hot, you risk splashing/spilling on hot engine parts, which can cause a fire.
- Your generator will use more gas if you use more electricity.
- Let the generator cool down completely before restarting.
- Portable generators should only run 6-18 hours continuously – depending on the model.
- Security – you may want to secure your generator to prevent theft.
- Generators should be run on a level surface.

[Using Portable Generators Safely by OSHA](#)

[What Happens if You Overload a Generator? By Generator Sage](#)

[How to Reduce Generator Fuel Consumption by Generator Sage](#)

[Generator Fuel Efficiency YouTube Video by Solar Solution](#)

Slide 17

INVERTER

An inverter generator is a device that inverts electricity to provide a cleaner and safer product for sensitive electronics. It converts AC current into DC current and then inverts it back to AC current. This creates a cleaner wave of electricity with consistent flows.

Gas engine generators can have bigger power fluctuations. These surges could hurt sensitive electronics like CB, ham radios, or laptops.

Bigger generators can supply more energy for more devices, but some larger generators can use 20 gallons of gas per day.

A solution to this problem could be an inverter generator, which will throttle the engine up or down electronically to supply power more efficiently. Inverters are more expensive but have more fuel efficiency and are quieter than gas generators.

An inverter generator is fueled by gasoline but has a higher fuel efficiency than a traditional gas generator by adjusting the engine's speed to the power it provides. A traditional gas generator will only run at one speed regardless of the power demand.

Slide 18

DUAL-FUEL (OR TRI-FUEL)

With dual-fuel generators, the wattage output will change based on your fuel. Each dual-fuel model will have two different wattage ratings, one for gasoline and one for propane.

The higher wattage will be for the gasoline.

Slide 19

HOW TO USE YOUR GAS GENERATOR

In this scenario, we are experiencing a long-term power outage, and now we need to get things running.

We will assume that you will want a bigger generator for use with your entire house. Our example will be based on a 7,500-watt generator.

We grab our generator, and then what?

How are you going to connect the power to your house?

You have two options:

1. Connect the generator directly to your circuit panel
2. Run extension cords to your generator

Slide 20

CONNECT THE GENERATOR DIRECTLY TO THE CIRCUIT PANEL

This option supplies power to your entire house. You will need to have an electrician install a transfer switch.

Slide 21

CONSIDER WHEN RUNNING EXTENSION CORDS DIRECTLY TO THE GENERATOR

If you plan on running extension cords to your generator, consider the following:

- Generators need to be at least 20 feet away from home b/c portable generators emit carbon monoxide when the engine is on.
- The generator needs to have five feet of clearance from anything flammable.
- You will want additional carbon monoxide detectors.
- If you plan on running cords, how will you do this? Through a window or keeping a door open?
- If you plan on running cords to your generator for each appliance, you may not be able to plug in several appliances simultaneously.
- What appliances do you want to power? How close are they to each other? Will you have to move the generator around?

Slide 22

EXTENSION CORDS

You must have the right extension cord for what you are trying to power for efficiency and safety. Use cords rated for outdoor use.

All cords have an AWG (American wire gauge) rating. The lower the AWG, the thicker the cord and the more amps it can handle.

Considerations:

Your extension cords need to be able to handle the load to prevent overheating and starting a fire.

Lengths come in 25 feet to 250 feet. The longer the cord, the more electrical resistance. So, the shorter the cord, the more efficiently it transfers power.

A cord with higher resistance can also result in a voltage drop, making the generator less efficient and can increase the heat.

It is recommended to stay with a length of 50 feet which is enough to run the cord into the house. A 12-gauge extension cord is the minimum size and is only recommended for small loads or 15 amps.

Following is a list of extension cord gauges and their rated wattage and amperage:

- 6-gauge extension cord: up to 50 amps, max of 12,500 watts
- 8-gauge extension cord: up to 40 amps, max of 10,000 watts
- 10-gauge extension cord: up to 20 amps and up to 5,000 watts
- 12-gauge extension cord: up to 15 amps and up to 3,750 watts
- 14-gauge extension cord: 10-15 amps (the shorter, the better) and up to 2,500 watts
- 16-gauge extension cord: 10 amps and up to 1,600 watts

Slide 23

POWERING YOUR FURNACE

You can run your furnace with a generator BUT furnaces are hardwired into the home. If you connect your generator directly to the main circuit breaker, it will run.

The furnace provides heat from the natural gas, but it needs electricity to run the furnace blower.

A furnace blower can run anywhere from 60 to 900 watts – average about 600 watts.

Because furnaces are usually hardwired into the home, you can't plug the furnace in directly.

You will need an electrician to modify your wiring so you can plug directly into a generator. A "Portable Furnace Connection" will allow the furnace to be plugged into a generator directly.

Slide 24

ELECTRIC OVEN AND STOVE

Are your stove and oven built in? If so, your generator must be connected directly to your circuit panel.

Electric stoves generate more power and typically operate at 250 volts, as opposed to standard 120 volts. Therefore, a 250-volt, 40–50-amp receptacle is generally required to plug in an electric stove with either a 3-prong or 4-prong outlet.

If you have a standalone unit, you could plug it in directly to the generator, but you will need to have the proper extension cord.

Consider:

- An oven will average 2,000 to 5,000 watts.
- An electric stovetop will average 3,000 watts, but powering one burner at a time will use less.
- The smallest burner will average about 1,200 watts, and 3,000 watts for the largest burner.

An 8-inch (small) burner vs. a hot plate or electric kettle:

- Hot plates range from 750 watts for a single 6" burner to 1,700 watts for double 7.5" burners (660 watts for the small burner and 926 watts for the big).
- An electric kettle will use around 1,500 watts.

- An electric frying pan can use between 1,000 watts to 1,800 watts.
- The higher wattage will heat up and cook faster.

Slide 25

GAS VS. PROPANE

GASOLINE

- Keep out of direct sunlight in a well-ventilated area and away from areas that could produce static electricity (like carpets)
- A 10 oz bottle of stabilizer will keep 25 gallons of gas fresh for one year.
- If you double the dosage of fuel stabilizer, it can last up to two years.
- You need to rotate before the gas deteriorates. Consider storing pumps and funnels to transfer gas to lawnmowers, snowblowers, or cars.
- Never run your generator in your garage, partially enclosed spaces, or indoors.
- Cold weather can reduce your battery's cranking power significantly. Battery warmers heat batteries to an optimal temperature, allowing them to maintain cranking power for easier starts.

[How to Safely Stockpile Emergency Gasoline by Electric Generators Direct](#)

Slide 26

PROPANE

Propane burns cleaner, so there is less carbon monoxide.

A 20-pound propane tank will last about 10 hours on a large grill with multiple burners.

Shelf life:

- Propane has a long shelf-life as it does not degrade or lose its potency over time.
- Propane does not require stabilizers and can last up to 30 years.
- The cylinders that store propane also have a long storage life.

Propane can have temperature-related issues.

- Propane depletion can occur in cold weather. A solution during the winter is to wrap the tank in a propane tank heating blanket. But they are expensive. A 20-pound tank heater would cost about \$400.

- However, you will use more propane when the temp is cold. For instance, it will take longer to heat a BBQ.
- Propane will have to get really cold to cause major issues. At -44 degrees Fahrenheit, the propane will turn to a liquid.

[Propane Storage by Paraco](#)

[Dual Fuel Technology by DuroMax](#)

[Propane Tank Storage by Power Blanket](#)

Slide 27

HOW MUCH GAS OR PROPANE WILL I NEED TO STORE?

How much gasoline will you need, and how long will it last?

- Consider:
- Smaller generators are more efficient.
- Your generator will burn gas faster running at 100% capacity vs. 50%, but you get better fuel efficiency if you run closer to 100%. (It is not recommended that you run your generator at 100% for an extended time.)

Example: 7500-watt gas generator (9000 peak) 5-gallons of gas

100% full load = 4.84 hours

75% = 6.46 hours

50% load = 9.69 hours

25% load = 19.38 hours

Slide 28 and 29

RUNNING TIME FOR GAS VS. PROPANE TABLE

Table provided by: Learn Metrics

[How Long Will a Generator Run by Learn Metrics](#)

I will have the link on the website for this site. They go into the math on calculating all of this if you are interested.

A gas generator will provide more power per gallon of fuel than a propane generator.

You can see that the higher the generator wattage, the more fuel it requires.

Slide 30

SOLAR GENERATOR

Pros

- Limitless power if sun is available
- Can also charge in electrical outlet ahead of time
- Quiet
- Can use indoors
- Portable

Cons

- Can be very expensive
- Recharging can take a long time with solar panels
- Run time is limited
- Batteries can diminish or stop taking charge

Slide 31

SOLAR GENERATOR CONSIDERATIONS AND POPULAR BRANDS

1. Jackery
2. Bluetti
3. Goal Zero

Need to consider:

- How long can it run
- How long it takes to charge
- The power needed (the average home will need about 6,000 watts to go entirely off-grid)
- What do you want to use it for

Slide 32

UNDERSTANDING THE TERMS

CAPACITY

The power the device can store in watt-hours (Wh) for one hour.

CONTINUOUS OUTPUT

The maximum number of watts that the battery can provide continuously.

SURGE OUTPUT

Startup needed for devices to get the engine moving.

RECHARGE TIME

How long it will take to recharge an exhausted battery to full charge.

SOLAR INPUT CAPABILITY

How quickly you can charge the device with solar panels.

BATTERY CHEMISTRY

Lithium-Ion vs. Lithium Iron Phosphate

Slide 33

CAPACITY

Capacity: The amount of power the device can store in watt-hours (Wh) for one hour.

Ex.

A 600-Wh generator could power a 50-watt light for around 12 hours.

$$50 \text{ watts} * 12 \text{ hours} = 600 \text{ Wh}$$

OR

Two 100-watt devices for around three hours, before the battery is exhausted.

$$\text{First device: } 100 \text{ watts} * 3 \text{ hours} = 300 \text{ Wh}$$

$$\text{Second device: } 100 \text{ watts} * 3 \text{ hours} = 300 \text{ Wh}$$

Slide 34

CONTINUOUS AND SURGE OUTPUT

Continuous Output: maximum number of watts that the battery can provide continuously.

Surge Output: Startup for devices to get the engine moving. Then will settle down to continuous watts.

Example on the Jackery Explorer

Continuous Output on the side of the device = 1,800 watts

This device can output a maximum of 1,800 watts at one time (each hour)

** Not smart to run at 100% very often because it will burn out the battery more quickly.*

You want to run at 50% of what the manufacturer suggests. This device would be 900 watts.

Surge output: This device has a surge capacity of 3,600 watts. If you plug in something higher, the device will trip out and need to restart.

Slide 34

RECHARGE TIME AND SOLAR INPUT

RECHARGE TIME

Recharge Time: How long it will take to recharge an exhausted battery to full charge. You can recharge a solar generator via an electrical outlet or solar panels.

SOLAR INPUT CAPABILITY

Solar Input Capability: How quickly you can charge the device with solar panels (if there is no electricity).

- Smaller numbers mean longer charge time/slow charge.
- Higher wattage rated means more solar panels can be connected and recharge faster.
- The manufacturer's numbers are usually based on the maximum solar power input, i.e., direct sunlight with zero clouds.

You may want a spare battery to alternate while charging.

Slide 36

BATTERY CHEMISTRY

Usually two choices:

1. Lithium Ion
2. Lithium Iron Phosphate

Lithium-Ion

- Lighter
- Get fewer charge cycles.
- The life span of lithium-ion batteries is only about 2-3 years before storage capacity begins to degrade.

Charge cycles are when the battery runs from a full charge down to complete depletion. The battery will lose its ability to hold as much of a charge as when it was new.

Example: Jackery

The battery will only hold 80% of its original capacity after 500 charge cycles.

Lithium Iron Phosphate

- Heavier
- More charge cycles typically rated 3500 charge cycles.
- Rated for roughly 10 years.

Jackery Explorer 2000 (Lithium-ion)

2000-watt capacity

43 pounds

Bluetti AC200 MAX (Lithium iron phosphate)

2000-watt capacity

62 pounds

Is weight or charge cycles going to be more important for you?

Slide 37

RECHARGING TIME COMPARISON

If you want to charge your generator fast, you will need multiple solar panels.

To charge the Jackery Explorer 2000 in 2.5 hours (need full direct sun) you need 6 solar panels. At \$700 each that will cost you an additional \$4,200.

Jackery SolarSaga 200W Solar Panel

\$699

Need 6 solar panels to charge in 2.5 hours @ \$700 each

Total = \$4,200

Slide 38

OTHER CONSIDERATIONS

Other considerations (Lowes – on website):

INVERTER TYPE

Inverters transform DC from solar panels to AC power to charge your devices.

PURE SINE VS MODIFIED SINE

Pure sine inverter is more expensive but will be better for sensitive electronics.

Modified sine inverter is less expensive and works with many types of devices but some devices may not work with this inverter.

SOLAR PANELS

Not all generators include the solar panels, you will pay additional.

Solar panel input types: higher and lower wattage.

Expandable storage capacity: some allow for an additional battery or include a second battery.

MATERIALS

Polycrystalline vs. Monocrystalline

Poly is more economical.

Mono is more expensive but more efficient.

COMPATIBILITY

Not all solar panel are compatible. Need to know connection type, max voltage, and wattage.

CONNECTORS

Can connect panels together to deliver more solar energy (parallel or daisy-chaining).

Make sure the power output from panels isn't too high for the input capacity of the generator.

WEATHER

Not all panels are weatherproof – know the level of moisture the panel will tolerate.

Temperature below 32 degrees Fahrenheit may reduce battery capacity.

POWER TRANSFER KIT

Power transfer kits allow an electrician to connect the generator to the home's electrical system.

Bottom line with solar
 They will not be as powerful or last as long as a gas generator.

[The Survival Prep Store Guide to Solar Generators](#)

[How to Choose a Portable Solar Generator by Lowes](#)

Slide 39

WHICH SOLAR GENERATOR IS RIGHT FOR YOU?

YouTube video by City Prepper “Best Solar Generator for 2022”
 30-minute video and very detailed. He provides an Excel spreadsheet with all the results from his experiments.

[YouTube Link to City Prepper](#)

	A	B	C	D	F	G	H	I	J	K	L	M	N	O
1	Devices to power at the same time				Bluetti AC200Max		Ecoflow Delta Mini		Ecoflow Delta		Ecoflow Delta Max		Ecoflow Delta Pro	
2					Running watts max	Surge watts max	Running watts max	Surge watts max	Running watts max	Surge watts max	Running watts max	Surge watts max	Running watts max	Surge watts max
7	Coffee maker	800	0	0	0	0	0	0	0	0	0	0	0	0
8	Cpap machine	50	0	0	0	0	0	0	0	0	0	0	0	0
9	Food Processor/Blender	350	500	0	0	0	0	0	0	0	0	0	0	0
10	Hot plate	1000	0	0	0	0	0	0	0	0	0	0	0	0
11	Internet router	20	0	0	0	0	0	0	0	0	0	0	0	0
12	Laptop computer	75	0	0	0	0	0	0	0	0	0	0	0	0
13	Microwave oven 750W	750	800	0	0	0	0	0	0	0	0	0	0	0
14	Power tools - small	440	600	0	0	0	0	0	0	0	0	0	0	0
15	Refrigerator - dorm *	37.4	75	0	0	0	0	0	0	0	0	0	0	0
16	Refrigerator - freezer *	200	2200	0	0	0	0	0	0	0	0	0	0	0
17	Refrigerator - 18 cu. ft. *	100	1200	1	100	1200	100	1200	100	1200	100	1200	100	1200
18	Security cameras	150	0	0	0	0	0	0	0	0	0	0	0	0
19	Space heater	1100	0	0	0	0	0	0	0	0	0	0	0	0
20	Toaster - 2 slot	850	0	0	0	0	0	0	0	0	0	0	0	0
21	TV - 13 inch	100	0	0	0	0	0	0	0	0	0	0	0	0
22	TV - 27 inch	500	0	0	0	0	0	0	0	0	0	0	0	0
23	Washing machine	750	2300	0	0	0	0	0	0	0	0	0	0	0
24	Wifi	15	0	0	0	0	0	0	0	0	0	0	0	0
25	Device	0	0	0	0	0	0	0	0	0	0	0	0	0
26	Device	0	0	0	0	0	0	0	0	0	0	0	0	0
27					CAPABILITY		Total running	Largest surge	Total running	Largest surge	Total running	Largest surge	Total running	Largest surge
29					Total running watts needed	100	1200	100	1200	100	1200	100	1200	100
30					Recommended running watts - this is 50% of max running watts	1100	4800	700	2100	900	3300	1200	5000	1800
31					DURATION									
32					Stated manufacturer capacity (Wh)	2048		882		1260		2016		3600
33					Quantity (Qty)	20		20		20		20		20

Slide 40

WHAT ELSE?

GENERATOR STORAGE

How are you going to store your generator?

Will you use it often? Camping. RV etc.

Maintenance can be a pain.

You need to drain out gas yearly.

Use the drained gas in the car, lawnmower, or snowblower so the gas is not wasted.

Emergency use only – will you leave it in the box? If yes, you will need to have the supplies on hand.

TEMPORARY SOLUTIONS (LESS THAN 24 HOURS)

Consider small external batteries for phones, laptops, etc.

You may want a solar generator to use indoors for a space heater, hot plate, or electric kettle.

Slide 41

STRATEGIZE

MAXIMIZE YOUR POWER AND FUEL

Charge or use devices during the one-hour charge period for your refrigerators. Charge radios, flashlights, phones, laptops, cooking devices, solar generators, or vacuum (1000 – 3000 watts!).

Only open the fridge doors when the generator is on to prevent food spoilage.

An extended power outage can mean running out of fuel. What are your alternative options?

SAVE YOUR FOOD

Eat food out of the refrigerator first.

If you have more than one refrigerator/freezer, try to consolidate to minimize power usage.

INVEST IN SOLAR GENERATOR

Will you need it for indoor use (medical device, heating device, fan, cooking, etc.)?

If you only have solar/sun charging available, determine the most important need and use for the solar generator.

You probably won't want to run the generator at night – noise – so will a solar generator be necessary?

[How Long to Run a Generator for a Refrigerator During Power Outage by Primal Survivor](#)

END