

The other WWW: Water, Waste and Watts. A discussion of water supply and sewage and how to keep it all flowing

Emergency situations that I'll consider will involve either an earthquake, wildfire or extended power outage.

Water:

If we don't have a forest fire or earthquake (just an extended power outage) then we're covered for water. There will probably be restrictions (like no re-filling of swimming pools, washing cars, irrigation) but with the water district's generator and 500 gallons of propane, we can keep pumping water from our wells for at least 2 months.

If we have a disaster that impacts the water supply infrastructure (like an earthquake or wildfire) then the water supply will be turned off for as long as it takes to ensure that we don't have any major leaks in the system. This will take at least a day or two, but if there is major damage it may be weeks before water can be restored to all the Cape. We will do our best to provide drinking water (by tank on pickup truck, if necessary) but nothing is guaranteed.

What will you do for water if this happens?

- Your water heater. Depending on size, this may provide you with upward of 40 gallons of drinking-quality water. There is usually a drain tap at the bottom of the. **You need to get a short potable hose** (available at RV stores) to fill a container from the drain as it is usually a couple of inches above the floor. In order to get the water to flow, you'll need to open a tap to let the air in. One on your upper floor is best.
- If, like us, you don't like the taste of the Cape's water and use water in re-fillable 5 (or 3) gallon containers, get several of them that you rotate through. We have 6 5-gallon containers, of which 5 are always full.
- **Have at least 2 collapsible containers for carrying water.** Sherri Phelps has these for sale. You will need them for transporting your drinking water from your water heater, getting water from wherever we're distributing it when you've exhausted your other supplies and for fetching pool water to use for flushing your toilet.

Which gets us onto the subject of

Waste

I'm only going to consider power outages here. If an earthquake leveled your house, or a wildfire burnt it down, then you've got bigger worries.

At the Cape, we're all on septic systems of one sort or another. We have 127 septic that fall into 4 broad categories. How they should be maintained in an extended power outage differs:

Cape San Juan (For reference only, not a legal document)



14 December 2019

Legend: Owner (Renter)

1. "Traditional" gravity-fed septic systems: There are 42 of these systems at the cape. These have a septic tank located below the grade of the lowest drainage fixture in the house, and the drain-field is in turn below the grade of the septic tank. These installations have no pumps and are unimpacted by a power outage and can be used without restriction during any power outage.
2. Pumped septic systems: There are 68 of these systems at the cape. These usually have a septic tank located below the grade of the lowest drainage fixture in your house, but the drain-field (or sand filter) is located above the grade of the septic tank. These systems use a pump to periodically pump grey water out of the septic tank and out to the drain-field (or sand filter). In a power outage, the pump will not operate, and the septic tank will fill up until it overflows or backs up into the house. Limiting use of water fixtures in your house will slow this down but if the power outage is long enough, the septic tank will eventually fill. This leaves 2 options:
 - a. Don't use the system at all. Go to a neighbor who has a gravity system when you need to use a toilet, and capture all other waste water in containers and carry it outside to dump.
 - b. Periodically run your septic system pumps off a generator to clear the excess grey water out of your septic tank. The reserve capacity of a septic tank is generally 1/3 of the expected daily use, but with sensible economies you should only need to pump your septic system for a few minutes every day (or two):
 - i. Only flush toilet when you've pooped in it. "If it's yellow, let it mellow; if it's brown, flush it down".
 - ii. Take very short "military" showers: Wet down, turn off water, lather up, then rinse off.
 - iii. Do not let taps run while brushing teeth or washing hands. Alternatively, capture waste water in plastic tub and dump it outside.
 - iv. Use plastic tubs when washing dishes to capture waste water and dump it outside.

These economies are appropriate in any power outage if you're not sure that power will be restored promptly.

3. Proprietary Treatment Units: Examples of this are Whitewater, Advantex, Jet and Cyclone. There are 14 of these systems at the cape. These systems use electricity to pump air and/or run UV lights to clean your waste and require 24/7 electricity to keep working properly. Unless you have a dedicated generator and lots of fuel to run your system, you should avoid using it until power is restored.
4. Unrecorded systems. There are 3 of these systems at the cape.

In the event of a prolonged power failure, we can keep our pumped systems running by sensibly economizing on how much water goes down the drain and attaching a generator to the system periodically. As best as I can make out, the preferred pumping schedule would be:

1. Apply power to circuit that feeds the septic system for 2 minutes while noting if the pump is running the entire time
2. If pump stopped running by itself, then we are done for today (and tomorrow)
3. If pump runs for all of the 2 minutes, turn off the generator, wait a minimum of 4 hours and repeat from step 1. This is to prevent possible flooding of drainfield when there is a lot of liquid to pump.

As the generator doesn't need to run for long, the Cape is procuring a couple of portable generators and will train several volunteers to "do the rounds" of those that need their systems pumped.

Preparations:

1. **Know your system.** If Gravity, then no worries; if Pumped, see next steps; if Proprietary, make sure you are on friendly terms with a neighbor who doesn't have a Proprietary system.
2. Further steps for Pumped systems (assuming you're not already wired for a whole-house generator):
 - a. **Determine if your septic system uses one or more electrical circuits to operate.** Look in your breaker panel, if multiple circuits marked as "Septic" then this is beyond my scope and I suggest you make sure you are on friendly terms... (see above)
 - b. **Get a one-circuit EZ Generator Switch installed in the circuit that feeds your septic system.** These switches are available on Amazon for about \$100. Good luck on finding an electrician, though. Once this is done, it will be straightforward to plug in one of the community generators to keep your system running. If you don't have this switch (or equivalent) installed, the volunteers won't be able to run the pump on your system and I suggest you make sure you are on friendly terms... (see above)



Watts (Electricity)

I've dealt with lack of electricity regarding your septic system, but your problems don't end there. I'll cover a couple of additional issues that become real problems if you don't have mains power.

Heat

If you only use electricity to heat your house, recognize that you probably won't have any heat. No portable generator can keep up with a furnace. Those of you who have whole-house generators and big propane tanks can probably run your heat, but you'll be staggered at how fast you get through your propane. I did an analysis for friends and concluded that they'd get through about 1000 gallons of propane in a month if they didn't conserve. For the rest of us, even if you have a propane- or oil-powered furnace or a pellet-stove for heat, you will still need electricity to run it. Your only sensible source of heat is burning wood. If you don't have a wood-burning fireplace and it's cold outside, you will need to be on friendly terms with a neighbor who does have heat.

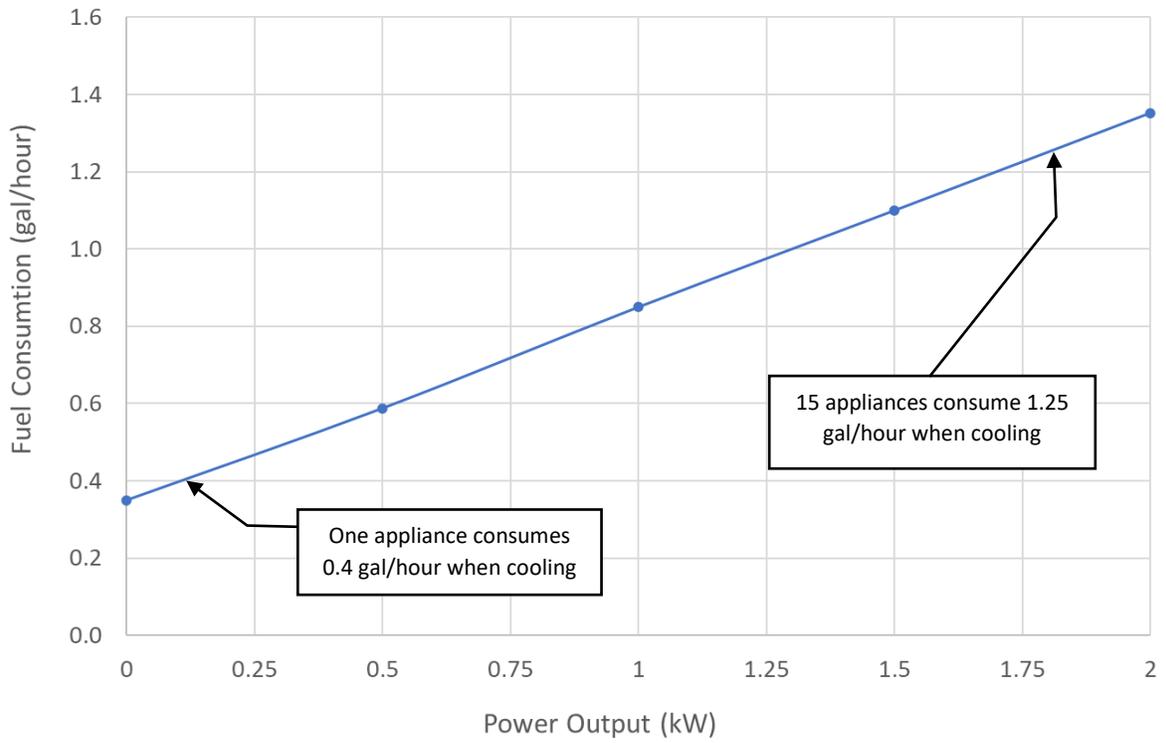
Food (Fridges and Freezers)

This is going to be the biggest problem. Your fridge and freezer will warm up and all your food will spoil. The big issue here is that fridges and freezers are "on" about 40% of the time (based on my fridge) or about 10 hours per day. They draw about 120W when cooling (nothing when not). If you try to power the fridge off a propane-powered generator, then you'd have to run the generator 10 hours per day (maybe in four 2.5 hour sessions) wasting a lot of fuel. A small generator under light load will run about 50 hours on a 20lb tank of propane, or 5 days in our scenario. You quickly see that you're going to get through an awful lot of propane in an extended power outage.

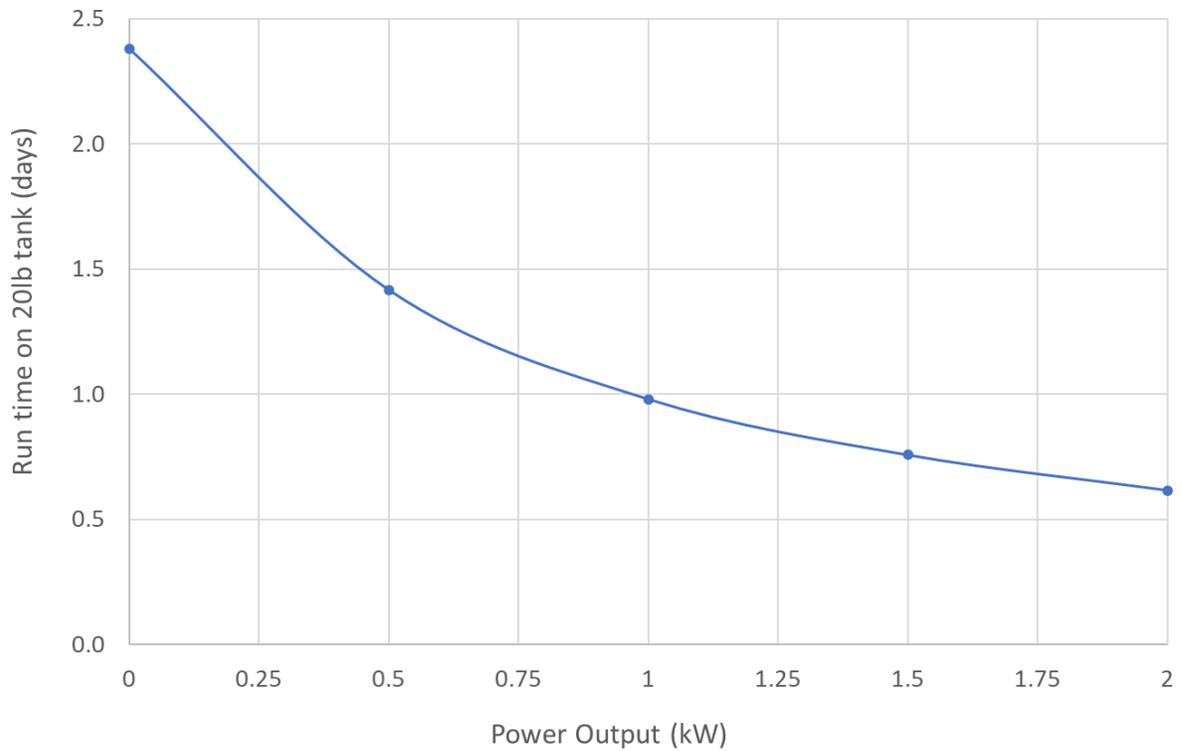
How can we make our limited fuel go further?

The trick is that you want to run your generator at near to its maximum rating. It will consume propane at maybe three times the low-demand rate, but it will be producing about 15x as much power (for a pretty standard 2kW generator). That's a 5x improvement in generating Watts per pound of propane.

Typical 2kW generator fuel consumption



Typical 2kW generator fuel consumption



So how do we do this?

- Wire up maybe 15 fridges to your generator: They each consume about 120W, so 15 fridges / freezers will consume about 1800W – well within the capability of a small generator. The trick is not to plug them in at the same time (they draw more power when starting up). Now you're running 15 appliances for about 15 hours which equates to 1.5 days (at 10 hours/day) off a propane cylinder. You just need 20 cylinders between you and 14 or your closest friends to keep everything cool for a month. However, you'll need a mile or two of extension cords or you will have to move all your fridges to a central location.
- Use a lithium-powered backup for each fridge: A Goal Zero 1500W portable power station will run a fridge or a freezer (plugged in full time) for about 24 hours, which uses 1200W of power. You can then recharge the Goal Zero in 2 hours using their 600W charger (optional extra). Your small generator can manage 3 of these power stations being recharged at the same time. Now your 20lb propane tank will power 3 appliances for 8 days. So, 4 tanks run 3 appliances for a month, and you need far fewer extension cords. You also need far fewer friends. Downside is that the Goal Zero 1500W portable power station costs about \$2000 with fast charger (from REI) and you need to have 3 power stations to make this work, but they can be spread across 3 houses. If each house has 2 fridges or freezers, this still works with 3 Goal Zero power stations, you just have to recharge every 12 hours, and you'll use twice as much propane.

Medical Devices

If you have a CPAP machine, or other medical device that needs power, then you should be looking at lithium-powered backups like the Goal Zero products to keep your machine running. This is the same problem as with fridges and freezers: These devices draw very little power, so running them off a generator is not going to work for long.

One further preparation step to consider:



If you have a big propane tank (like us), use it as your source of propane for your generator. We modified our connection at the house to include a quick-connect fitting fed through an on/off valve. Now we have 120 gallons of propane (equivalent to 24 20lb cylinders) to run our 2kW generator.

Conclusion

You need to be prepared as an individual with respect to water and waste. The community can/will help you with regards to waste, but only if you're set up to accept our help.

With regards to electricity, and specifically keeping fridges and freezers cold, you need to cooperate with your friends and neighbors. We will be having a future talk regarding food, but here are some things to think about when cooperating with your friends and neighbors:

- Can you optimize how many freezers or fridges need to be run? Consolidation and tossing useless stuff (like bags of ice) will help us all get through a long power outage.
- What will you do if your neighbors are off-island when we're cut off and without power? Know how to get into their house to save their fridge and freezer contents and possibly raid their other supplies.