Basic Generator Types & Safety

Tips to guide your choice of generators and how to use them safely.

Tuesday, October 6th

Basic types of generators

Typical for consumers:

- Small portable generators
- Permanent home standby generator

Not as typical for consumers

- Trailer mounted diesel generator

Generator wattage ratings

Not all watts are created equal when comparing generators

- Portable and home standby generators of the same wattage rating will not perform equally
- A 10,000 watt home standby generator will provide up to 2x more peak power than a portable generator of the same rating for starting large motors for A/C & refrigeration
- A home standby generator with the same wattage rating of a portable will have a more powerful engine and larger alternator for more power stability & peak power capability

Home standby generator

Whole house or partial house

- Generally automatic
- Can power entire household or select circuits
- Typically run on natural gas or propane
- Clean, stable power similar to utility
- Professionally installed by licensed electrician
- Require a lot less user intervention to operate
- Expensive relative to portable generators

Home standby generator

Whole house or partial house

- Typically more quiet than standard portable generators
- Connected to home with automatic transfer switch. Turns on and powers home automatically. Turns off when the power comes back on
- Most now offer remote control & status monitoring with a phone app or computer
- Typically very safe to operate

Portable small generators

Different types to consider

- Standard “work site” generators
- Inverter generators (open frame/closed frame)
- Single fuel - typically gasoline
- Dual fuel - can run on gasoline or propane
- Come in a wide variety of wattages

Portable standard generators

Also known as “work site” generators

- Generally the least expensive
- Usually very noisy
- Can be single or dual fuel
- Can power a well if you have a 240v model
- Worst quality of power
- Not always safe for sensitive electronics
- Intended to power tools at a construction site

Portable inverter generators

Often the best choice all around

- Stable, clean power. Safe for sensitive electronics
- More quiet than standard portable generators
- Can be single or dual fuel
- The most fuel efficient of portable generators
- More expensive than comparable wattage standard generators
- Closed frame versions are very quiet
- Open frame models available with 240v for powering wells

Dual fuel portable generator advantages

The argument for propane over gasoline

- Gasoline is more hazardous to handle relative to propane
- Propane cylinders are much easier & safer to change compared to refilling the gas tank
- Propane can be stored indefinitely whereas gas will go bad
- Propane will not sit in the generator & clog the carburetor like gas does when it sits too long
- Propane doesn’t foul the engine oil & spark plug nearly as much as gas
- Propane exhaust is much less toxic than gasoline exhaust

Disadvantage of propane for generator fuel

Really, there is only one…

- Propane in the same generator will reduce maximum power output by 10% relative to gasoline
- If you have a 2000W rated dual fuel generator, it will produce 1800W maximum when running on propane
- All things considered, 10% is a relatively negligible tradeoff for increased safety, less pollution, decreased maintenance, & increased convenience for the operator of the generator.

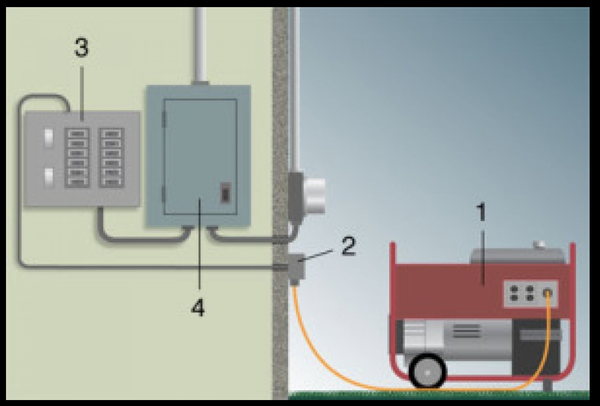
Getting power into the house from your generator

Proper cords & connections are essential for safety

- Whole/partial home standby generators take care of this for you
- For portables, the best option is a transfer switch installed by an electrician
- If using extension cords, they must be grounded (3 prong), the correct wire gauge, & have heavy duty jacketing
- If there is potential for lightning, the generator needs to be properly earth grounded or it can conduct lightning into your home if there is a lightning strike nearby

Getting power into the house from your generator

Transfer switch installed by an electrician



- A transfer switch disconnects the utility & “transfers” your generator power to either some or all circuits in the house
- A transfer switch provides a quick connection for your portable generator to the house
- A transfer switch negates the need for extension cords running into your house through open doors or windows
- They can be expensive to install (must be installed by licensed electrician)

Getting power into the house from your generator

Extension cords

- Cords must be adequate wire gauge for the load you're connecting
- Best practice is that all cords are 12AWG (AWG = American Wire Gauge)
- 12AWG cord can handle up to 20 amp loads which is the maximum the generator's outlet breakers will allow before they trip
- Using under sized cord can cause fires!
- Cord jacket must be heavy duty. Get cords that are rated for outdoor use. Light duty jacketing can melt if it gets hot & can easily be damaged.

Getting power into the house from your generator

Extension cords

- Cords must be the 3 wire, 3 prong grounded type.
- Never EVER use a 2 wire cord for an appliance that has 3 prongs. The 3rd prong is called a “safety ground” for a reason.
- Defeating the ground prong by using an adapter can lead to fires & shock or electrocution if there is a short inside of the device you’re plugging in
- Never run extension cords under carpets or mats. Don’t pinch them in doors or windows. Fires can result if the cord gets hot or they short out

Getting power into the house from your generator

Extension cords

- If the cords are going to be anywhere near water or moisture, they must be plugged into a GFCI outlet to avoid shock or electrocution
- Most newer generators have GFCI outlets on them already
- If your generator doesn’t have GFCI outlets, you can purchase an inline GFCI adapter from you local hardware store
- Don’t use frayed or damaged cords. Remove them from your inventory & dispose of them

Carbon Monoxide Safety

Get a battery powered CO detector

- Engines emit carbon monoxide in the exhaust which can leak into your home
- Keep the generator a minimum of 10 feet from your home & away from open doors or windows
- Carbon monoxide is odorless & colorless
- Carbon monoxide poisoning results in severe illness & possible death
- Carbon monoxide builds up in your bloodstream over time. Limited exposure over several days can result in poisoning
- Generators are notorious for causing CO poisoning. An inexpensive CO detector can save your life

Fuel Safety & Your Generator

Improper fuel handling & storage can cause fires & injury

- Gasoline must be stored away from the generator while it's running. If the generator catches fire, gas containers in close proximity can catch fire and explode
- NEVER fill a running or hot generator with gasoline. Gas can spill or drip easily onto the hot engine or exhaust and ignite. Always shut the generator down & let it cool before adding gasoline.
- If your generator is dual fuel, propane is a much safer fuel to use. You swap cylinders the same as you would would with a propane barbecue. It's fast and relatively safe compared to pouring flammable liquid into a hot machine.

NEVER back-feed your generator into your home

It’s illegal & extremely dangerous

- Back-feeding is the illegal practice of energizing your home’s electrical system by connecting the generator to an outlet inside the home, usually the electric dryer outlet.
- Generators connected in this manner can “back-feed” into the utility power lines & energize them. This can create an electrocution hazard for utility workers that are servicing the power lines.
- Back-fed power can also unexpectedly send power into other homes in your neighborhood creating more hazards.
- The other hazards is that this requires a double male plug cord between the generator & the outlet. Should the cord come unplugged at the outlet while the generator is running, it could shock or electrocute anyone that touches it, or cause a fire.

NEVER back-feed your generator into your home

It’s illegal & extremely dangerous

- Persons caught doing this by the utility company will be fined and their electric service disconnected
- Persons causing injury or death from an illegal back-feed will be held liable
- All generators connected directly to home electric circuits & are attached to utility power must go through a proper transfer switch or safety interlock device
- If not using a transfer switch/safety interlock, generator power can only be brought into the home with *proper* extension cords

Other considerations

Operating a portable generator during rain or snow

- If operating the generator during rain or snow, the generator should be covered with a suitable canopy or roof structure to keep it dry
- Never operate a generator in a puddle of water
- Don’t handle running generators with wet hands. This is a shock or electrocution hazard
- Extension cords running through the wet outdoors need to be one contiguous run with no breaks where water can infiltrate and create a shock hazard.
- If you must connect two cords together in wet conditions, rain boots are available to water seal the junction. But a single run is ideal

Other considerations

Operating a portable generator during potential lightning events

- Portable generators properly connected to a transfer switch will already be earth grounded and can remain in operation
- Generator using extension cords should be shut down & disconnected from the home. Any extension cords connected to the generator should be removed from the home
- If the generator must remain in operation, the chassis & bonded neutral conductor need to be *earth grounded* to conduct lightning into the earth and not into the home during a strike. This involves connecting the generator chassis to the main service panel ground, or connection to a 6ft. grounding rod driven into the earth. You will likely need an electrician to provide this connection. If you cannot property ground the generator during potential lighting events, ***do not*** use the generator.

Generator Maintenance

Generators need exercise too

- Home standby generators are supposed be “exercised” at least once a month or more depending on the manufacturer’s recommendation. This is to ensure it will operate when you need it & keeps engine parts lubricated.
- Many standby generators have an automatic exercise cycle so you don’t have to think about it
- Portable generators should also be manually exercised when not being stored
- Generators should be exercised under load at least every 4 months. This ensures full functionality & prevents moisture build up in critical parts

Generator Maintenance

If you let your generator down, it will let you down

- Generators, like any air-cooled small engine machine, require frequent maintenance
- Portable generators require more basic maintenance than larger standby generators
- Oil level must be checked often
- Oil must be changed often - usually every 100 hours of use, or yearly
- Standby generators usually need oil filters replaced every 200 hours of use
- Air cleaners must be inspected, cleaned, or replaced periodically

Generator Maintenance

If you let your generator down, it will let you down

- Choose a generator brand that has local service if possible
- There are service technicians that can come to your home to service your standby generator just like any appliance
- Portable generators can be brought to small engine repair shops for maintenance. Pearson’s in Grass Valley is one example

Generator Maintenance

Oil, oil, oil. Did I say oil?

- Aside from all else, checking the oil level before each use is *critical.* Lack of oil is certain to cause engine failure.
- Generators that run a long time under load can burn more oil than you might expect, especially generators with a lot of hours on them.
- True synthetic oil such as Mobil 1 can last longer & extend the life of your generator compared to conventional oil.
- Generators should be broken-in before using full synthetic motor oil.
- *If you don’t do any other maintenance, make sure you have oil!*

Generator Storage

Like a horse, don’t put your generator away “wet.”

- Home standby generators, in a sense, are always “in storage.” Regular exercise is all that’s required aside from maintenance mentioned previously
- Portable gasoline generators put into storage need to have all fuel removed from the gas tank & the carburetor
- Failure to burn off or drain fuel from the carburetor will likely result in a plugged up carburetor & failure to start when needed.
- Storage procedure generally involves adding gas stabilizer to prevent gumming/breakdown & running the generator until all fuel in the tank & carburetor run dry

Generator Storage

Like a horse, don’t put your generator away “wet.”

- Duel fuel generators run only on propane do not need to have the fuel drained to prevent gumming. They are ready for storage without special procedures
- Portable generators should be stored in a dry place, preferably a garage or shed.
- If the generator has an electric starter, put a trickle charger on the battery to prevent the battery from going bad
- If the generator must be left outside, it needs to be covered with a fitted generator cover or a well deployed tarp. Some manufactures have fitted covers available for their generators. There are also generic aftermarket covers available.
- Be sure to follow the storage guidelines outline in your generator’s Owner’s Manual

Questions?

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