



# EMERGENCY GENERATORS

TRAVIS COUNTY AREAS

SEPTEMBER 23, 2018

# GENERATORS

- **What causes power outages?**
- **Types of generators**
- **Type of fuel to use**
- **Generator size**
- **Costs**
- **Safety & Operation**



**How to make your house the one with emergency power**

# WHAT CAUSES POWER OUTAGES?

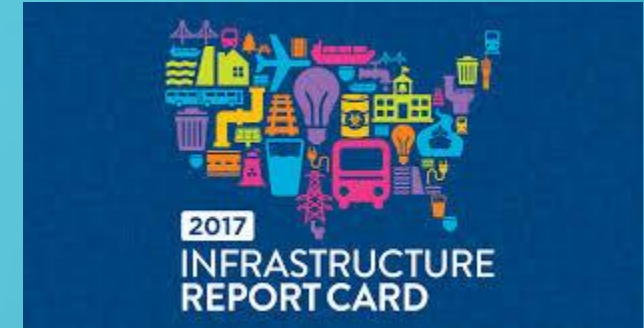
**High Power Demand**  
**Construction Digging**  
**Weather**  
**Animals**  
**Coronal Mass Ejection**  
**EMP**  
**Cyber Attack**  
**Aging Equipment**



**3,526 Power Outages in 2017 affecting 36.7 million people**

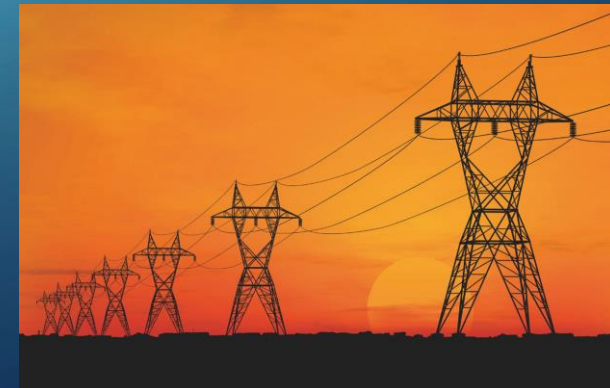


# AGING TRANSMISSION & DISTRIBUTION LINES



In 2017 the American Society of Civil Engineers reported that most of the 640,000 miles of electric transmission and distributions lines were constructed in the 1950s and 1960s with a 50-year life expectancy

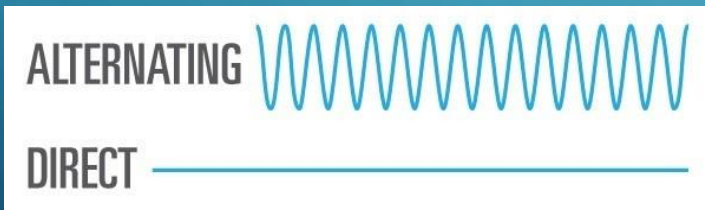
Dr. Joshua Rhodes of the University of Texas Energy Research Department estimates replacement cost to be 1.5 – 2 Trillion dollars



# AC VS DC

## CONVENTIONAL

- Convert mechanical energy into electrical energy
- Produce AC power



## INVERTOR

- Invertor generators supply both AC & DC power
- The engine is connected to an alternator, which produces AC electricity
- Then a rectifier is used to convert the AC power to DC and capacitors are used to smooth it out

# COMPARISON

## CONVENTIONAL

- AC power
- Available 700 – 150,000 watts
- Runs full throttle
- Significantly less initial cost for equal power output
- Less complex

## INVERTOR

- DC power
- Available 1000 – 5000 watts
- Variable Speed based on load
- Quieter
- Smaller & lighter
- Clean, consistent power
- Can be run in parallel

The background is a blue gradient with decorative white circuit-like lines in the corners. The lines consist of straight segments and small circles, resembling a stylized electronic circuit.

# WHICH IS BEST?

Depends on your use  
and budget

# WHICH TYPE FUEL ?

- **Gasoline**
- **Diesel**
- **Natural Gas**
- **LPG/Propane**
- **Dual Fuel (Gasoline or Propane)**
- **Multiple Fuel (Gasoline / Propane / Natural Gas )**



# GASOLINE POWER

## PRO

- **Lowest initial Cost**
- **Wide availability**



## CON

- **Refueling danger due to spillage on a hot engine**
- **Fuel storage fire issues**
- **Fuel degrades over time**
- **E0 gas hard to find, E10 gas gunks up the carburetor**
- **Requires 3600 rpm run speed**

# DIESEL FUEL

## PRO

- Long standing proven technology
- Runs at 1800 rpms instead of 3600 rpms
- Longer run time & durability
- Low storage fire risk

## CON

- Higher initial costs
- Diesel degrades over time
- Emission regulations require ultra-low sulfur diesel which is less stable
- Rising fuel costs



# NATURAL GAS

## PRO

- No refueling issues
- No fuel storage issues
- Low fuel costs
- Some run at 1800 rpms  
other at 3600 rpms

## CON

- Fuel supply delivery  
outside your control
- In an emergency  
delivery is subject to  
prioritization and  
containment



# LPG/PROPANE

## PRO

- Fuel stored on site
- Unlimited shelf-life
- Runs clean without carburetor fouling



## CON

- Requires 3600 rpm run speed
- Power output 10% less than a gas or diesel fueled generator
- Fuel tanks do not fill to capacity

# DUAL & MULTI-FUEL

## PRO

- Take advantage of preferred fuel type, with a back-up capacity if that fuel is unavailable
- Better manage refueling issues



## CON

- Higher initial cost
- Power is 10% less when running on natural gas or propane
- Storing multiple fuels more complex



# SIZING YOUR GENERATOR



- **Make a list of the items that need to be powered by the generator.**
- **Make a note of the running and starting wattage of the respective items.**
- **Total the wattage requirements using the starting wattage for items that require them.**
- **Allow at least 25% above the running wattage total**
- **Note best fuel efficiency is running at 50% load**

# ITEMS TO CONSIDER



## Basic Items

	Running Watts	Starting Watts
Refrigerator w/freezer	700	2200
Deep Freezer	500	1500
Six 75w light bulbs	450	
Radio 30A power supply	300	
Phone charger	20	
<b>TOTAL Needed</b>	<b>4470 Watts</b>	

## Optional Items

Laptop	200 watt
10,000 BTU Room A/C	1200/3600
Box Fan	200
Microwave	1200
Coffee Maker	1000
Space Heater	1800
TV 27"	500
DVD	100

# SMALL INVERTOR 2000W

CHOOSE WHAT YOU CAN RUN



## Basic Items

	Running Watts	Starting Watts
Refrigerator w/freezer	700	2200
Deep Freezer	500	1500
Six 75w light bulbs	450	
Radio 30A power supply	300	
Phone charger	20	
<b>TOTAL Needed</b>	<b>4470 Watts</b>	

## Optional Items

Laptop	200 watt
10,000 BTU Window A/C	1200/3600
Box Fan	200
Microwave	1200
Coffee Maker	1000
Space Heater	1800
TV 27"	500
DVD	100

# MEDIUM GENERATOR 4500W

CHOOSE WHAT YOU CAN RUN



## Basic Items

	Running Watts	Starting Watts
Refrigerator w/freezer	700	2200
Deep Freezer	500	1500
Six 75w light bulbs	450	
Radio 30A power supply	300	
Phone charger	20	
<b>TOTAL Needed</b>	<b>4470 Watts</b>	

## Optional Items

Laptop	200 watt
10,000 BTU Window A/C	1200/3600
Box Fan	200
Microwave	1200
Coffee Maker	1000
Space Heater	1800
TV 27"	500
DVD	100

# LARGE GENERATOR 12000W

CHOOSE WHAT YOU CAN RUN



## Basic Items

	Running Watts	Starting Watts
Refrigerator w/freezer	700	2200
Deep Freezer	500	1500
Six 75w light bulbs	450	
Radio 30A power supply	300	
Phone charger	20	
<b>TOTAL Needed</b>	<b>4470 Watts</b>	

## Optional Items

Laptop	200 watt
10,000 BTU Window A/C	1200/3600
Box Fan	200
Microwave	1200
Coffee Maker	1000
Space Heater	1800
TV 27"	500
DVD	100



# LARGE GENERATOR NOTES

- **Allow extended run time**
- **Can run your air conditioner**
- **Can run your whole house**
- **Require a starting battery**
- **Require a transfer switch which must be installed by a certified electrician**
- **Require a water cooling system**



# TYPICAL COSTS



GENERATOR	WATTAGE	TYPICAL COST
Recreational Inverter	Up to 2000W	\$400-\$1000
Mid Size Inverter	Up to 3500W	\$1000-\$1700
Large Inverter	Up to 7500W	\$1400-\$4000
Portable Generator	Up to 7500W	\$350-\$2800
Home Standby Generator	Up to 20Kw	\$3000-\$10,000
Diesel	10Kw-24Kw	\$3000-\$12,000

# SHOULD THE GENERATOR BE GROUNDED

OSHA states the frame of a portable generator need not be grounded (connected to earth) and that the frame may serve as the ground (in place of the earth),

## IF

The generator supplies only equipment cord and plug connected equipment through receptacles mounted on the generator 1926.404(f)(3)(i)(A)



The noncurrent carrying metal parts of equipment are bonded to the generator frame AND the equipment grounding conductor terminals that are part of the generator are bonded to the generator frame.

1926.404(f)(3)(i)(B)



# DEVICE REQUIREMENTS & MAX CORD LENGTH BY WIRE GAUGE

Amps	Watts	#10	#12	#14	#16
10A	1200	250'	150'	100'	50'
20A	2400	125'	75'	50'	-
30A	3600	65'	-	-	-



**Make Sure the Power Cord is Rated for Outdoor Use**



# HOW TO RUN YOUR POWER CORDS THROUGH THE WINDOW



**Cut a notch  
in a board**



**Sized to fit the  
power cord**



**Cut the board  
To fit the  
window**



**Temporary  
Power  
outlet**



# GENERATOR SAFETY

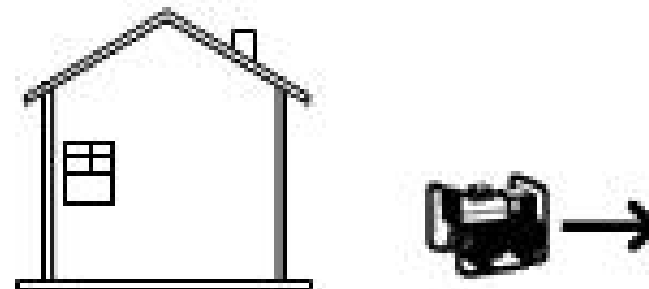
## **DANGER**

**Using a generator indoors CAN KILL YOU IN MINUTES.**

**Generator exhaust contains carbon monoxide. This is a poison you cannot see or smell.**



**NEVER** use inside a home or garage, **EVEN IF** doors and windows are open.



**Only use OUTSIDE** and far away from windows, doors, and vents.

# KEEP THE GENERATOR DRY



- **Keep outlets 100% dry**
- **Maintain air flow**
- **Be sure the enclosure can handle the elements and wind**

# GASOLINE REFUELING SAFETY

- Turn the generator off and let it cool for 2 minutes before taking off the gas cap
- Do not let gas spill on the hot engine
- Do not overfill





# CONNECTING TO THE GENERATOR

1. Start the generator
2. Allow it to run for 2-5 minutes to stabilize
3. Plug in the highest draw item
4. Allow the engine to stabilize
5. Repeat plugging in one item at a time, followed by allowing the engine to stabilize



# STOPPING THE GENERATOR

1. Turn off and unplug each electric load, one at time
2. Run the generator at no load for several minutes
3. Turn off the fuel valve until fuel starvation has stopped the engine
4. Turn off the engine switch

**Continue if a gasoline engine**

5. Remove the spark plug cap
6. Crank the engine to drain any gasoline from the carburetor jets
7. Clean the carburetor
8. Drain the fuel tank







# What if you don't have a generator?





# QUESTIONS/COMMENTS

