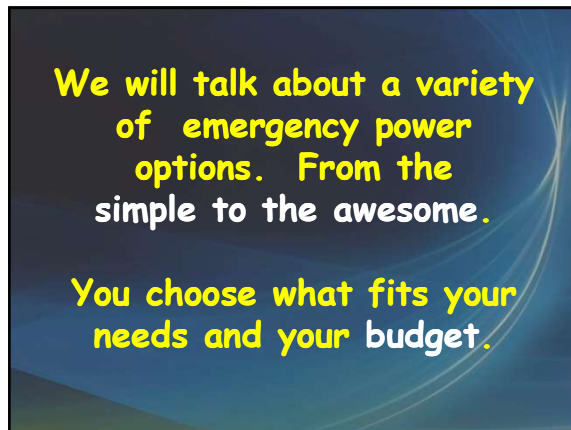
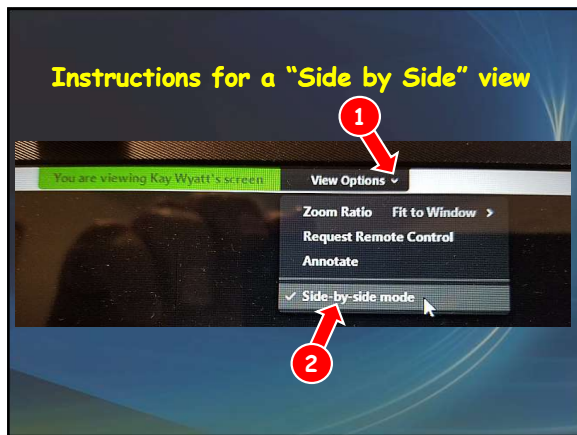


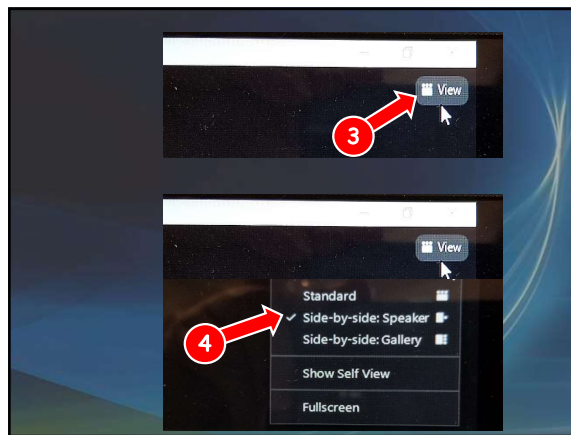
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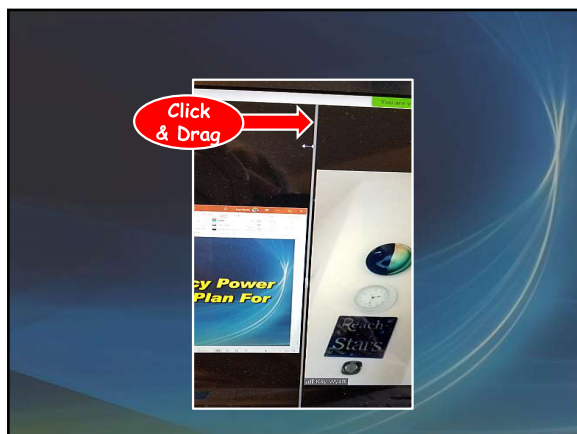
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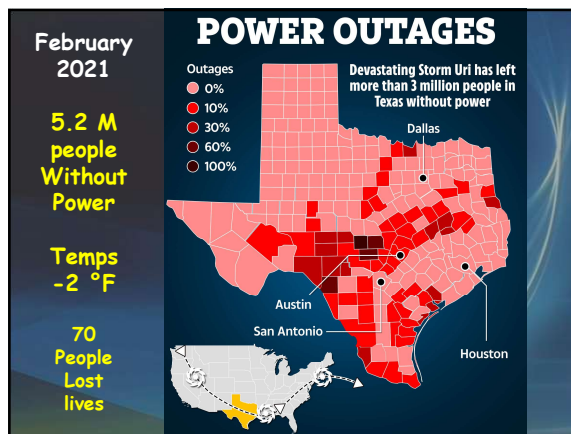
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4



5



6

Remember the Echo Mountain Fire?



How long were YOU out of power?

7

We will focus on:

1. What do you want/need to power
2. What power sources are available
3. How long will the power source last

8

What do you want/need to power?

1. **Communication**
 - Smart Phone
 - Community (GMRS) Radio
 - HAM radios
2. **Lighting**
 - Flashlights
 - Household

9

When the power goes out, think about

3. **Keep in touch devices**
 - Cordless phone for landline
 - Radio
 - TV
 - Tablet / Computer

10

When the power goes out, think about

4. **At home medical needs**
 - CPAP
 - Oxygen concentrator
 - Refrigeration for medicine
 - Ventilators & nebulizers
 - Power wheelchairs and scooters
 - Powered recliners
 - Emergency alert necklace tied to land line

11

When the power goes out, think about

5. **Appliances**
 - Coffee maker
 - Refrigerator/freezer
 - Microwave oven
 - Well pump
 - Septic pump
 - Garage door opener

12

When the power goes out, think about

6. Heating

- Pellet Stove - including feeder, fan, igniter
- Fan on fireplace
- Heat pump
- Resistance heat

13



Let's start simple

What do you want to power

Your Community Radio (BTECH GMRS V-1)

14






Long Battery

Standard Battery

\$17.49

\$20.49

15

HOW LONG DOES IT LAST?





~1 day

~2 days

16

Your radio battery may be different:

- **Health of your battery**
- **Charge level at start**
- **How you use it**

17

"Long" battery is depleted after

2-1/2 hours of talking, or
48 hours of standby

18

VERY Conservative Usage

At the top of the hour
(8 times):

Listen for 5 minutes
Talk for 1 minutes
Turn off otherwise

Standard battery - 4 days
"Long" battery - 8 days

19



Remember the LED light?

When you talk -> RED

When you hear someone talking -> GREEN

When in Standby - Off

20

RECOMMENDATIONS

- Use "talk" very conservatively. Concise, short transmissions.
- Turn radio on at the top of the hour.
- If you do NOT have alternate power, turn radio off when not using it
- Consider alternative power methods

21

Let's explore alternative power sources

What if it is an emergency and all you have handy are good old fashioned AAA batteries



22

★ Solution - BL-8 AAA Battery Pack



This allows you to insert five AAA batteries in the battery plus the "dummy" battery.

Then insert the pack into the radio just as you would your standard battery.

\$20.49

23

How long will the BL-8 AAA Battery Pack last?



The average user will get about 1 day of use before replacing the AAA batteries.

\$20.49

24

How long will the BL-8 AAA Battery Pack last?

BUT...it depends on your use.


Batteries depleted after 1 hr of talking, or 40 hrs of standby

25

RECOMMENDATIONS

- Use "talk" very conservatively. Concise, short transmissions.
- Turn radio on at the top of the hour.
- If you do NOT have alternate power, turn radio off when not using it
- **Have plenty of AAA batteries handy**

26



The advantage of this device is that you can use standard AAA batteries.

The disadvantage is that you can't recharge alkaline batteries. So you would have to have a large supply of AAA's in an extended outage.

\$20.49

27

If you use AAA alkaline batteries, you will need five AAA batteries and one "dummy" battery



28

If you use rechargeable NiCad or NiMH AAA batteries, do not use the dummy battery!

You will need 6, not 5, rechargeable batteries



29

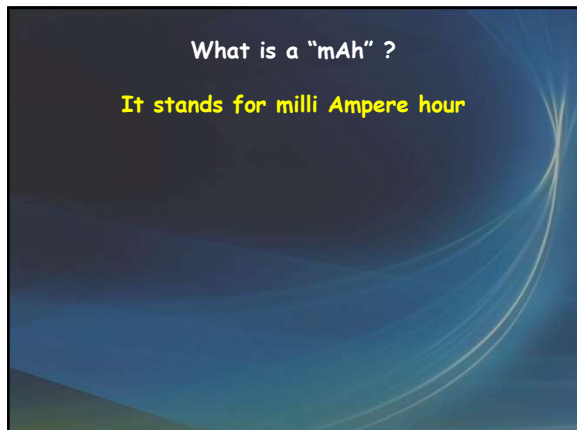
★ Now let's look at the nifty new **lithium power banks** that are available to charge small devices.



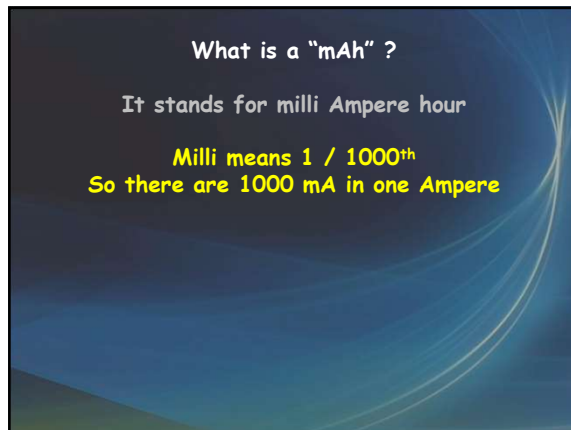
These come in various sizes from 10,000mAh to 32,000mAh.

Higher capacity → higher cost

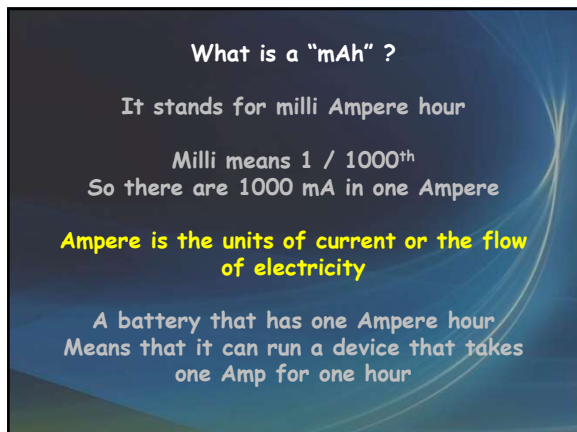
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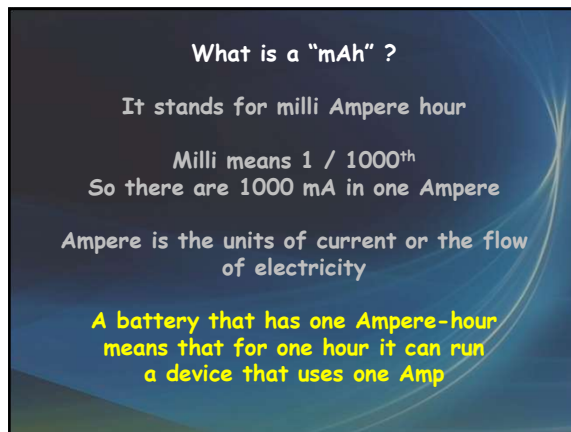
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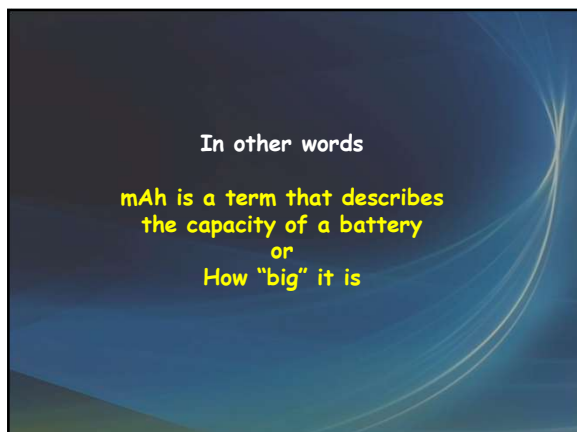
32



33



34



35



36

Larger capacity → Higher price

| Power Bank size in mAh | Price |
|------------------------|---------|
| 10,000 | \$28.99 |
| 15,000 | \$28.04 |
| 22,000 | \$29.99 |
| 26,800 | \$60.99 |
| 32,000 | \$89.99 |

37

HOW MANY TIMES YOU CAN CHARGE YOUR SMART PHONE

| Power Bank size in mAh | Smart Phone |
|------------------------|-------------|
| 10,000 | 2.1 |
| 15,000 | 3.2 |
| 22,000 | 4.7 |
| 26,800 | 5.7 |
| 32,000 | 6.8 |

Times are theoretical.
Assumes 70% efficiency

38

HOW MANY TIMES YOU CAN CHARGE YOUR RADIO BATTERY

| Power Bank size in mAh | Standard battery | "Long" battery |
|------------------------|------------------|----------------|
| 10,000 | 3.9 | 1.9 |
| 15,000 | 5.8 | 2.9 |
| 22,000 | 8.6 | 4.3 |
| 26,800 | 10.4 | 5.2 |
| 32,000 | 12.4 | 6.2 |

Times are theoretical.
Assumes 70% efficiency

39

To charge your GMRS radio you will need the BTECH USB Smart Charger Transformer Cable



\$ 10.25

40

★ This power bank can charge your BTECH GMRS-V1 over 4 times*



Plug the BTECH USB power cable into your desk charger.
Plug the other end into the power bank.

*Theoretical times

41

★ You also have a great power bank in your driveway ... your automobile!



So how do we get the power from your car battery to the radio?




There are several ways. But let's choose the easiest.

You could buy the BTECH BL-8 Battery Eliminator.


\$19.98

42

You have a great power bank in your driveway ... your automobile!



The nice thing about this solution is that during an emergency you always have your car.



This device works when you are actually using the radio. It doesn't charge your radio battery ...

it just replaces your radio battery with the car battery.

43

★ What if we want to use the car battery to CHARGE the radio battery!



\$11.99

Easy!

Plug this USB car charger into the cigarette lighter.



\$ 10.25

Then plug the USB charging cable into your charger base and then into the USB car charger

44

★ What if we want to use the car battery to charge your smart phone!

Easy!

Plug this USB car charger into the cigarette lighter.

Then plug the USB charging cable into your USB car charger, and then to the phone



\$11.99



45

CAUTIONS

Your car battery is designed to deliver lots of power for a short amount of time to start the car.

It is NOT designed to provide a steady amount of current over a long period of time.

46

CAUTIONS

Don't run your car battery down. Run the car occasionally to keep its battery charged.

Your car battery has an unlimited capacity to charge ... as long as you have gasoline*.


KEEP YOUR GAS TANK FULL!

*and your battery is healthy

47

TYPES OF Lead-Acid BATTERIES

Starting - Traditional engine start battery. Delivers a large burst of power for a short time. Not designed to withstand multiple discharge. Lots of thin plates



Deep Cycle - designed to provide a steady amount of current over a long period of time. Common in RVs, wheel chairs, golf carts. A few thick plates

48

TYPES OF Lead-Acid BATTERIES

Flooded Cell - Liquid Electrolyte. Typical engine start battery

Gel Cell- A gell type electrolyte. Has advantage of not spilling.

AGM - Absorbed Glass Mat. Also called dry cell. Top of the line. Usually deep-cycle.

49

Lead-Acid BATTERIES

PROS

- Popular
- Cheap

CONS

- Heavy
- Large
- Corrosive acid, explosive gases and hundreds of amps of electrical current.
- Can easily go bad if not used or maintained properly

50

Discharged Battery

| State of Charge | Voltage |
|-----------------|---------|
| | 12V |
| 100% | 12.7 |
| 75% | 12.4 |
| 50% | 12.2 |
| 25% | 12.0 |
| Discharged | 11.9 |

51

WHAT IF YOU RUN OUT OF GAS?

How do you determine what your car battery's capacity is? In other words, how many times can it charge your radio or phone before it dies.

Car batteries are purpose built to provide short bursts of amps to start your car's engine. They are rated in "Cranking Amps" or "Cold Cranking Amps".

52

You have a great power bank in your driveway ... your automobile!

In general, we can ballpark your car battery capacity at

| | Amp-hrs |
|----------------------|---------|
| Small Car | 36-46 |
| Large car, small SUV | 46-60 |
| Large SUV, Truck | 46-60 |

Remember, one amp-hr means that you can run a one amp device for one hour


53

EXTREMELY IMPORTANT

Car batteries are NOT designed to be drained like deep cycle batteries.

Therefore, NEVER drain a car battery more than 50%

| Charge Level (%) | Battery Voltage (V) |
|------------------|---------------------|
| 100% | > 12.6 volts |
| 75% | 12.5 volts |
| 50% | 12.3 volts |
| 25% | 12.1 volts |
| 0% | < 12.0 volts |



54

I have a small SUV

So I could charge the standard radio battery about 13 times

And my smartphone about 8 times

These are BALLPARK numbers!!!

55

What do YOU have?

- What kind of vehicle do you have?
- What kind of device do you want to charge
 - Smart phone
 - AM/FM radio?
 - GMRS emergency radio
- How many times can you charge it before the car battery dies?

SEE THE HANDOUT TO FIND THE ANSWERS

56

Before we jump to the "big" stuff, I want to cover three fairly common power devices

- Hand Crank power
- Fire powered electricity
- SMALL portable solar devices

57

Crank powered devices



58

RunningSnail Emergency Crank Radio

\$42.90



Portable flashlight with AM-FM-NOAA radio, cell phone charger, SOS alarm, motion sensor reading lamp, with hand crank, solar cell, 4200mAh internal battery

59

RunningSnail Emergency Crank Radio




4-Ways To Power

Four ways to power the radio: USB input, solar cell, hand crank, battery

60

★



This works well to charge a cell phone or GMRS radio IF the internal battery is already charged.

61


★



Hand Crank

Crank the handle for 1 minute at 130rpm. It can be used for the flashlight for 30 minutes or radio for 6 minutes.

62




Hand Crank

You would be cranking for a VERY VERY long time to charge the internal battery.

63

★



Hand Crank


Solar Panel

In reality, the hand crank and solar cell are just designed to maintain the internal battery.


64

What is a Watt?!

A Watt is a measure of power.



A light bulb can use 100 Watts



A space heater can use 1500 Watts

65



What is a Watt-hour?

A measure of electrical energy. Can be used to measure the capacity of a device such as a battery.

66

What is a Watt-hour?

A 100 W-hr device can provide 100 Watts for one hour.



Such as keep a 100-Watt light bulb burning for one hour.

67

Powerhouse 60 Hand-Crank Generator

\$ 329.00



"Most users can generate 12-18W via hand cranking. Three minutes of cranking usually charges a dead smartphone enough for a short call."

68

K-TOR Power Box 20 Watt Pedal Generator

\$ 329.00



"Fast pedaling for 45 min to 1 hr will charge a smart phone"

69

BioLite Campstove 2 Wood Burning Electricity Generating & USB Charging Camp Stove

\$ 235.00



Heat is converted into electricity via a thermoelectric generator. This sends electricity to a USB charging port or internal battery

70

BioLite Campstove 2 Wood Burning Electricity Generating & USB Charging Camp Stove

\$ 235.00



"A strong fire would charge a cell phone in 4-5 hours."

71

Small Solar Panels About 30 watts with USB Ports

\$ 74.99



11.02 in
8.10 in
1.38 in

72

★ What can it be used for?

USB-A: 5V/3A +
 USB-C: 5V/3A +
 (NOTE: SUPPORT PD CHARGING)
 DC-14.4V
 Polarity reversal indicator

PowerBank

Smart Phone

GMRS
Emergency Radio

73

★ Best way to use it

STEP 1: Charge PowerBank

STEP 2: Charge Smart Phone

74

How long to charge a smart phone?

Under bright sunlight it should take about 6 hours

Even on a cloudy day it will still charge the phone, but slower

What about the Oregon Coast on a cloudy day?

75

There are dozens of these small notebook size solar panels

Choose wisely

- Choose a solar panel with a conversion efficiency of at least 21 to 23% (23% is good)
- If it doesn't specify the efficiency, run away very fast
- Don't expect more than they are designed to give

76

Wouldn't it be nicer to lay out panels in the yard than to crank like crazy!

12-18 Watts

30 Watts

77

★ One more suggestion for your emergency power needs - lighting!

\$ 9.99

Five watt LED light. Power by a USB (Power Bank). Hang them anywhere you need light

78

NOW FOR THE "BIG STUF"!

Power Stations

Can solar work in Oregon?

Portable Generator


Whole house Solar

Whole house Generator

79

★

The Power Station

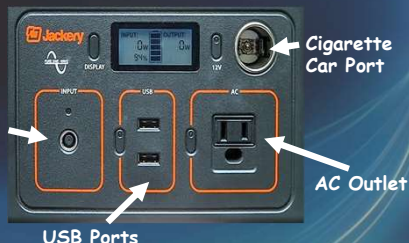


There is one more type of "battery" that I want to cover ... the Power Station which is becoming more popular every day.

80

The Power Station

This device usually houses a lithium battery and offers a variety of power outputs



DC Input

USB Ports

AC Outlet

Cigarette Car Port

Their claim to fame is convenience

81

The Power Station

You can buy them in small to large capacity.



| PRICE | W-hr |
|-----------|------|
| \$ 139.00 | 167 |
| \$ 199.00 | 240 |
| \$ 299.00 | 293 |
| \$ 499.00 | 518 |
| \$ 999.00 | 1002 |

82

How many times will this charge my smart phone

Jackery Explorer 240 is equipped with a 240 watt-hour lithium-ion battery pack

Samsung Galaxy Note 8 battery has 12.21 watt-hours

$(240 \div 12.21) * .85 = 16 \text{ times}^*$

*Assume 85% charging efficiency
Theoretical numbers

83

How many times will this charge my smart phone

According to the company, Jackery Explorer 240 can...

| | |
|----------------|------------|
| Phone | 24 charges |
| Laptop | 2 charges |
| LED light (5W) | 21 hours |
| Mini cooler | 4 hours |
| TV (60W) | 3.5 hours |
| CPAP (40W) | 5 hours |

84

How many times will this charge my GMRS-V1 Radio?

Jackery Explorer 240 is equipped with a 240-watt-hour lithium-ion battery pack

The GMRS-V1 standard battery has 13.32 watt-hours

$(240 \div 13.32) * .85 =$ **15 times ***

*Assume 85% charging efficiency
Theoretical numbers
See handout on how to calculate

85

SOLAR OPTIONS TO CONSIDER

Our batteries will run out eventually. We need a way to charge them in an extended outage.




Jackery SolarSaga 60W Solar Panel
\$179.99

Takes 8-10 hrs full sun to charge the power station

86

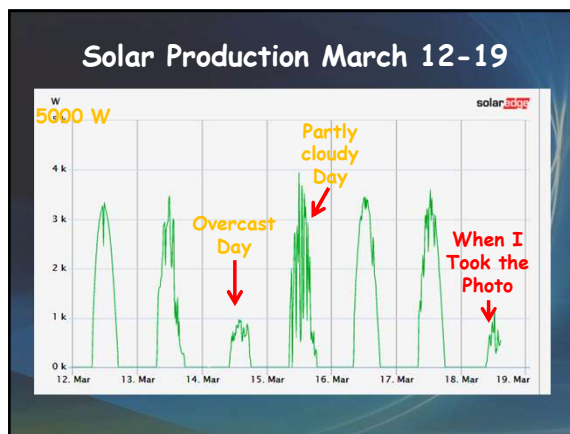
CAN SOLAR WORK ON THE OREGON COAST?

Yes ... but not like West Texas




March 18, 2021

87

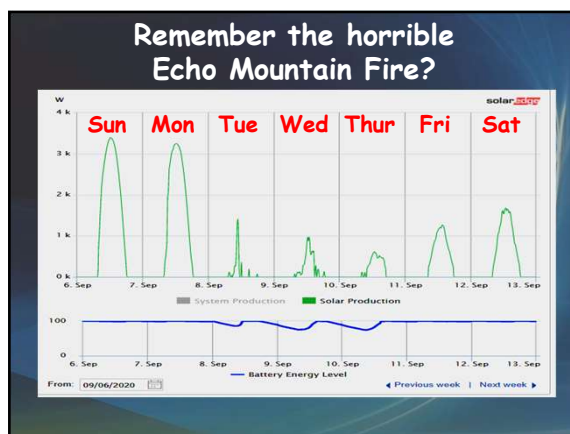


88

Remember the horrible Echo Mountain Fire?



89



90

FINAL OPTIONS TO CONSIDER



Small portable generator



Whole house solar



Whole house generator

91

SMALL PORTABLE GENERATORS



Gasoline 2200 W

What fuel?
How big?



Gasoline 1600 W



Propane 5500 W

92

GASOLINE OR PROPANE, DIESEL OR NATURAL GAS?

- **GASOLINE**
 - PROS
 - Common fuel - easy to get
 - Better portability
 - NEGATIVES
 - Highly flammable especially in large quantities
 - Short shelf life (12 mos)
 - Storing is hazardous
 - May not be available during emergency

93


GASOLINE OR PROPANE?

- **PROPANE**
 - PROS
 - Long shelf life
 - Clean burning
 - Easily stored
 - Large tanks available
 - Home delivery available
 - NEGATIVES
 - Pressurized cylinder
 - Fuel system more complicated
 - Higher installation costs

94

Whole house generator

What fuel?
How big?



Generac 16 KW Propane Generator

95

HOW BIG?

What do you want to power?
From the Tillamook PUD list

| EQUIPMENT | STARTING LOAD | AVERAGE WATTS |
|--------------------------|---------------|---------------|
| Clothes dryer (electric) | | 4800 |
| Clothes dryer (gas) | | 500 |
| coffee maker | | 1200 |
| Computer | | 500 |
| Dishwasher | | 1200 |
| Freezer | 2250 | 750 |
| Garage door opener | | 300 |
| Heat (electric) | | 6-20,000 |
| Heat pump | | 10,000+ |
| *** | | |
| Toaster | | 1200 |
| Vacuum cleaner | | 600 |
| Waffle iron | | 1200 |
| Washing machine | 1000 | 500 |
| Water heater (electric) | | 4800 |
| Well pump (1hp) | 4000 | 1000 |

96

HOW DID I CHOOSE MY HOUSE GENERATOR?

Goals:

- Portability
- As small as possible
- Supply only minimum power to get by
- Do not want a transfer switch

97

HOW DID I CHOOSE MY GENERATOR?

Goals:

I'm on a lifeboat ...
Not a cruise ship!

98

HOW DID I CHOOSE MY GENERATOR?

Goals:

I plan on upgrading the house later to solar and don't want to spend a lot of money on a generator

99

HOW BIG DO I NEED?

| EQUIPMENT | MY NEEDS | MY NEEDS |
|---------------------------|-------------|-------------|
| Coffee maker | 1200 | |
| Microwave oven | 1000 | |
| Television | 200 | 200 |
| DirecTV Tuner | 50 | 50 |
| Satellite internet router | 50 | 50 |
| Laptop Computer | 250 | 250 |
| Smart phone charger (2) | 50 | 50 |
| Heating pad-large | 100 | 100 |
| Light - LED 10W (7) | 70 | 70 |
| Space Heater | 1300 | 1300 |
| TOTAL | 4270 | 2070 |

100




Honda EU2200i
Gasoline powered
2200 W Generator

101

HOW TO CONNECT GENERATOR?

The simplest and lowest cost method is to run extension cords from the generator to the loads to be supplied, i.e. refrigerator, freezer, lamps, space heaters, etc.

A properly sized extension cord must be used when connecting loads to the generator.



102

HOW TO CONNECT GENERATOR TO HOUSE?


When a generator is to be connected to household wiring, an approved method of isolating the house electrical system from the utility must be used.

The main breaker of the household panel is not an approved disconnect device

A transfer switch must installed to allow the use of existing household wiring and receptacles.

103

HOW TO CONNECT GENERATOR TO HOUSE?




The transfer switch is to prevent the generator from back feeding and injuring line workers trying to restore power. Without a transfer switch, significant damage and or death can result from the generator being on-line when utility power is restored.

104

Can I open my main disconnect breaker and connect my generator to a receptacle?

- No!
- Not allowed by code
- Main disconnect breaker not designed to isolate power from two sources
- Main disconnect breakers can fail without visible indication
- Death to line workers can result



105

Talk to a qualified electrician

There are many other issues to be considered, such as proper grounding.

So best to consult an expert!

106

Refer to Tillamook PUD's

Generator Safety Tips

For more information

107

Average Cost of a Whole House Generator

Generator -- \$3000 to \$6000

Installation -- \$3000 to \$5000

Typical cost to install a Transfer Switch \$400 to \$2000

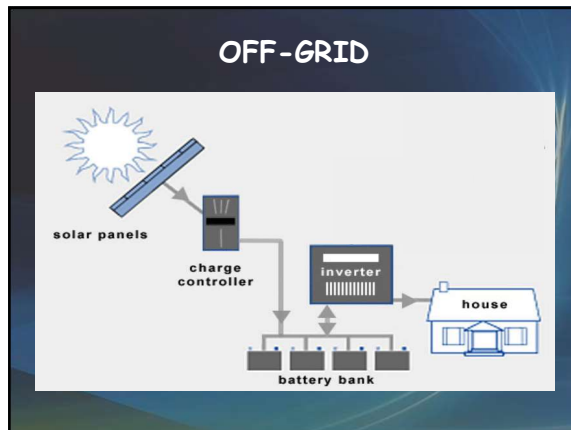
TOTAL COST
\$6,000 TO \$11,000

108

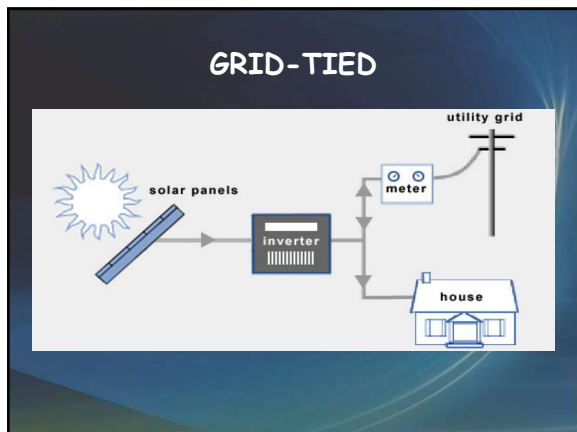
TYPES OF WHOLE HOUSE SOLAR POWER

- OFF-GRID
- GRID-TIED
- HYBRID

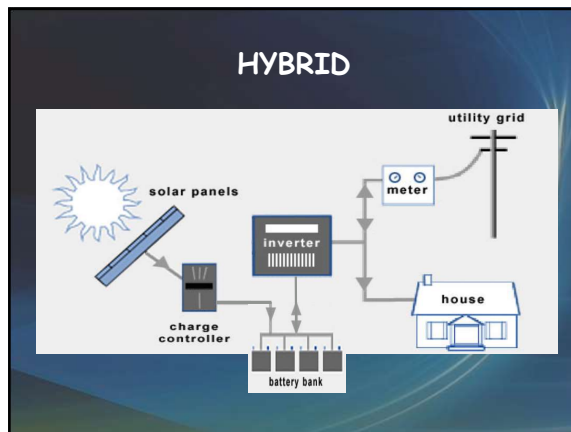
109



110



111



112

OUR SOLAR JOURNEY

We wanted a solar system for our shop



- Well pumps, et al
- All wall outlets
- All lighting
- Everything except heating
- Grid tied with backup battery


113



114

Solar solutions are expensive and complicated, although there are TAX breaks to help.

This especially applies to hybrid solar systems.



115

Except for the monthly connection fee, we haven't paid an electric bill in our shop for three years.

116

COST OF A 6KW SOLAR SYSTEM

\$10,600 - \$13,200

Add 40% for backup power supplies, charge controller, generator, batteries, and installation costs.

\$14,840 - \$18,480

117

Important Lessons

You now know how to:

- Decide what you want to power
- Determine how much power it/they require
- Consider a variety of power sources that can supply the power you need
- Evaluate what your budget can afford

118

QUESTIONS ?

119

Alternative Power Seminar
 Wednesday, March 24th, 6:00 - 7:30 PM

When the power goes out ... what do you do?
 Learn about your power needs and act now **BEFORE** the outage!

The third seminar in the Communication Series
 This seminar is intended to **all audiences**, even if you don't have a GMRS radio!

Learn how to power your devices during an extended power outage!

- Smart phone
- AM/FM Radio and
- GMRS Emergency Radio

SPECIAL BONUS: Even learn about power needs for your lighting, refrigerator, medical devices and more.

We will talk about power sources including

- Batteries, power banks, power stations, and more
- Solar panels ... can they work in Oregon?
- Generators ... portable and whole house

Sign up at
southcountyevc.org



120