

Living with Solar

Class 4 for Solar Team 6

In Class1 Generating Electricity
we looked at the big picture.

In Class 2 Electricity Basic
we saw how electricity works.

In Class 3 Components
we learned how
Gallup Solar's Hogan System is put together.

In this Class 4 Living with Solar
we get to decide
how we will use our Solar Power in daily life.



Living with Solar

What you need to know.

Q. How much electric power does it take to run appliances?

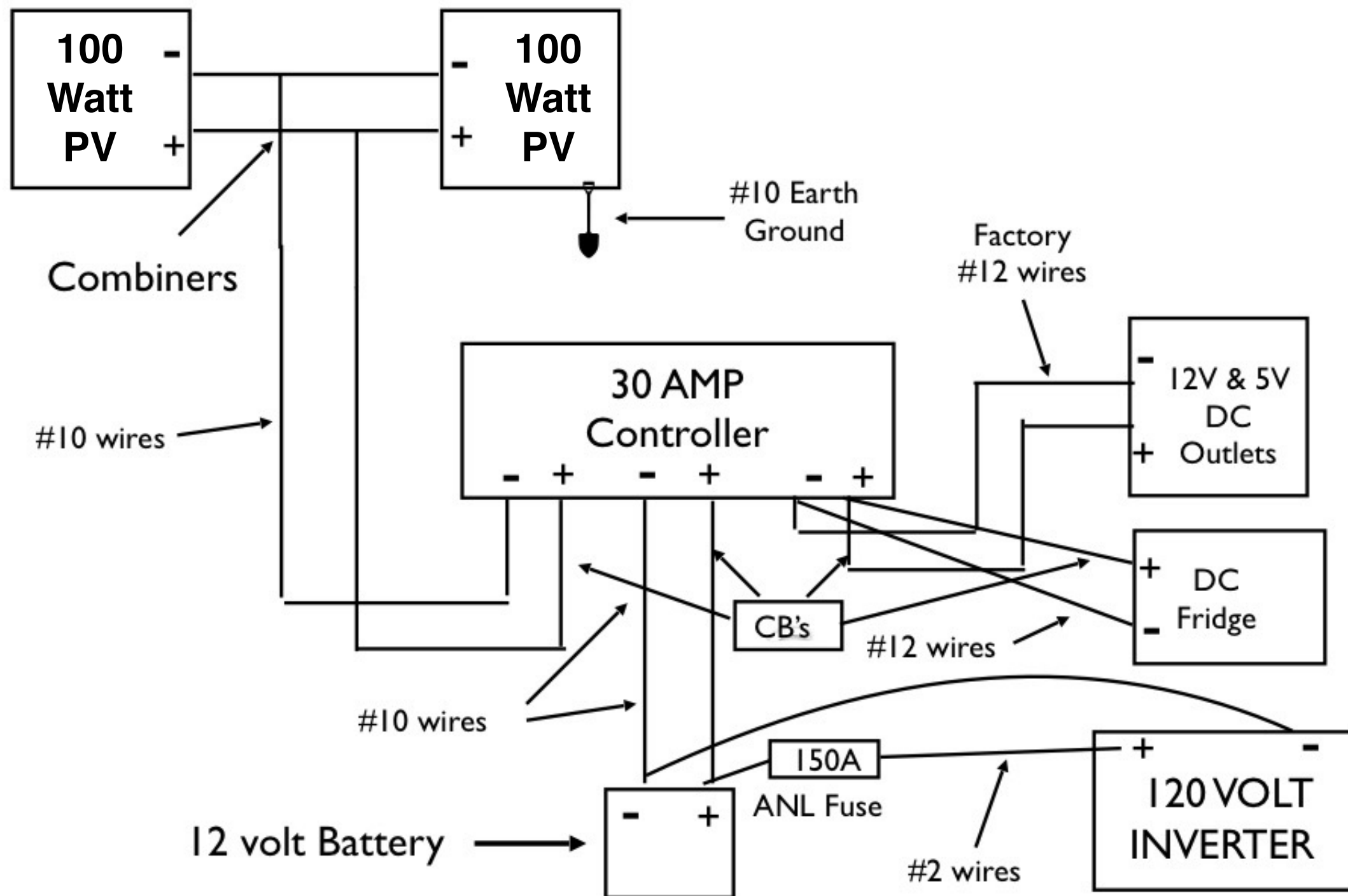
A. Every electric appliance has a rating in Watts.

And when you run it for a certain length of time...

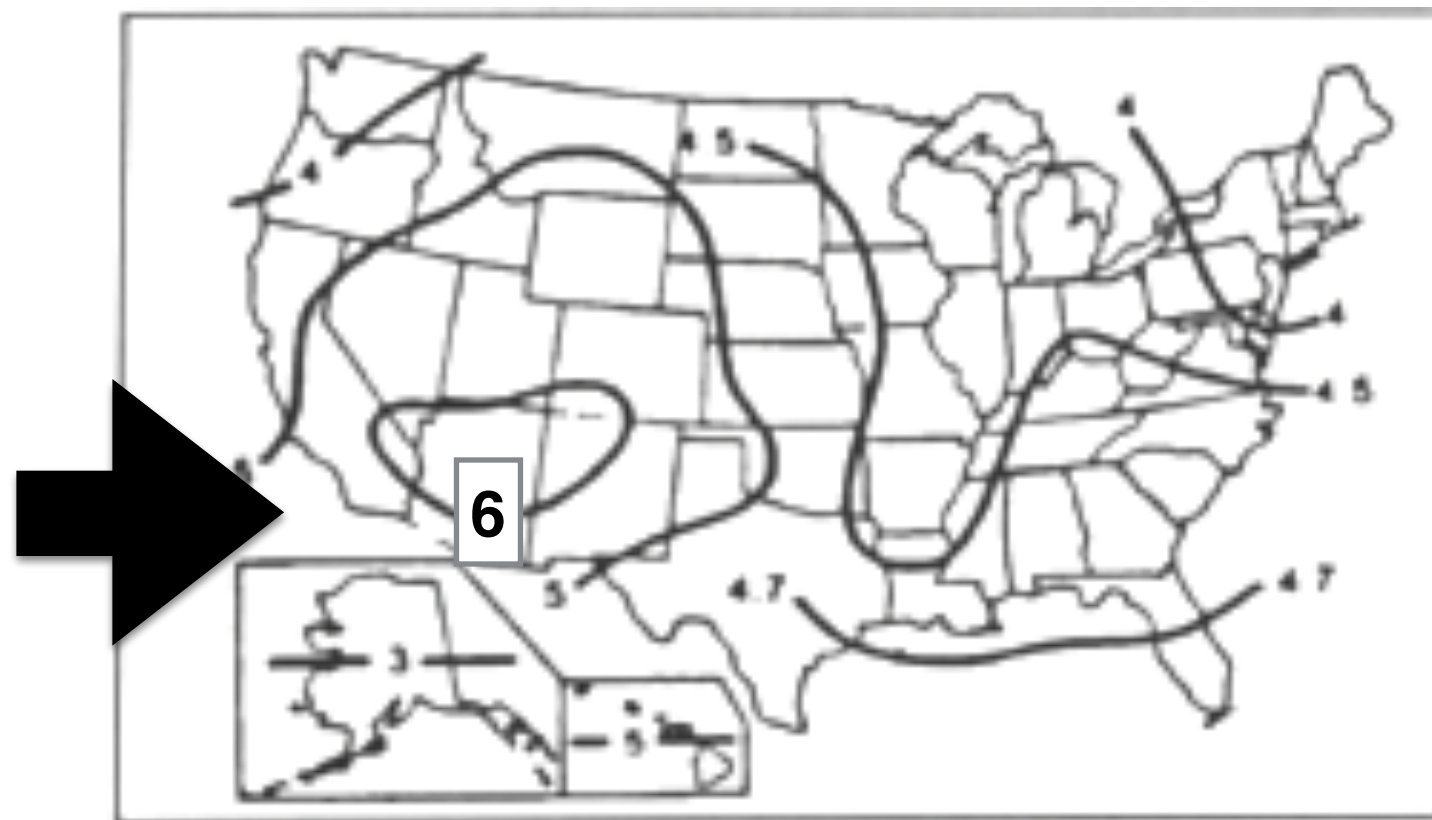
Watts x Hours = WH

WH are a measure of electric power.

And you need to know how many Watt Hours your PV (photovoltaic) panels produce:



It all depends on Sun Hours
Multiply PV Watts x SunHours.

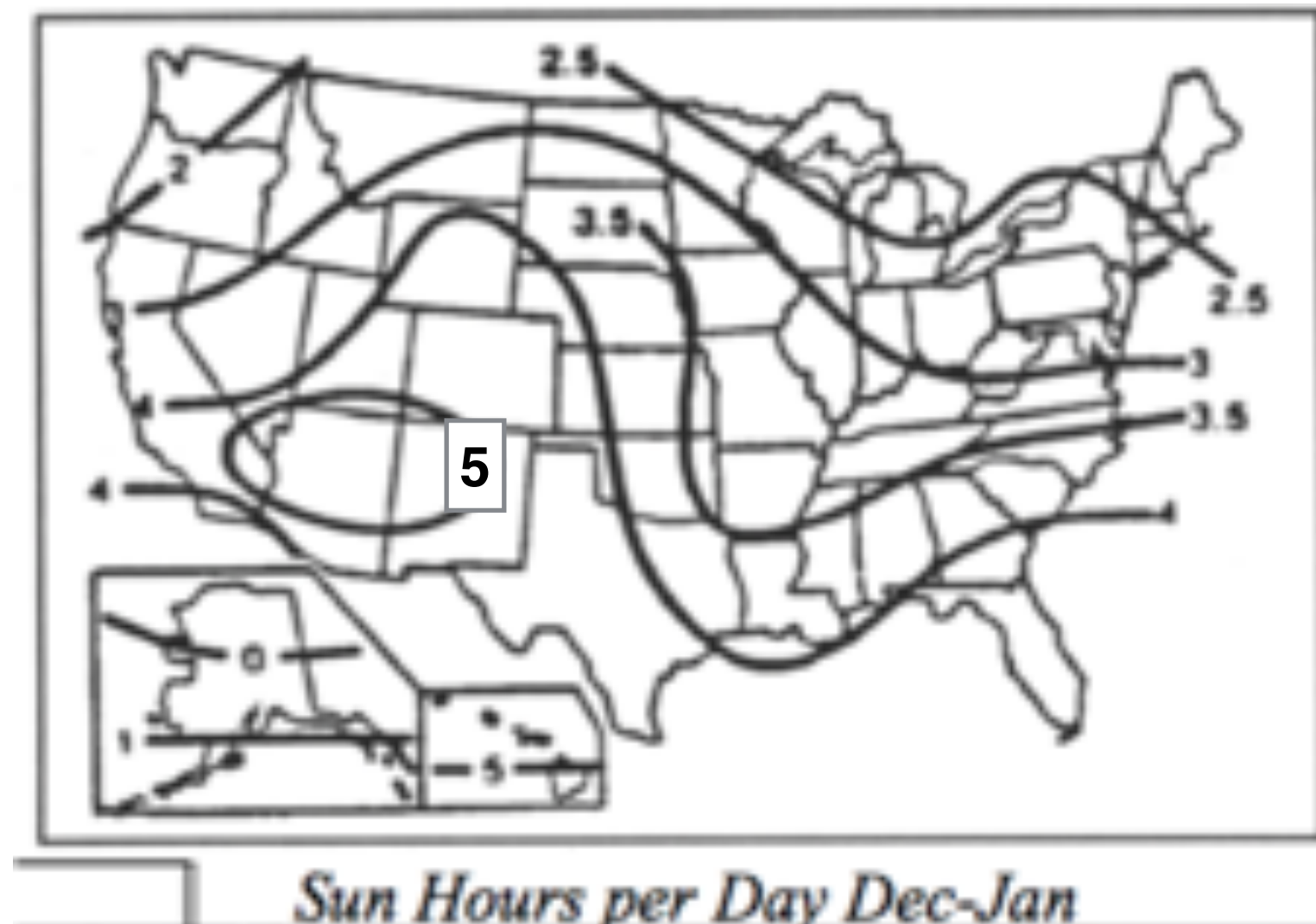


Average Sun Hours Year-Round

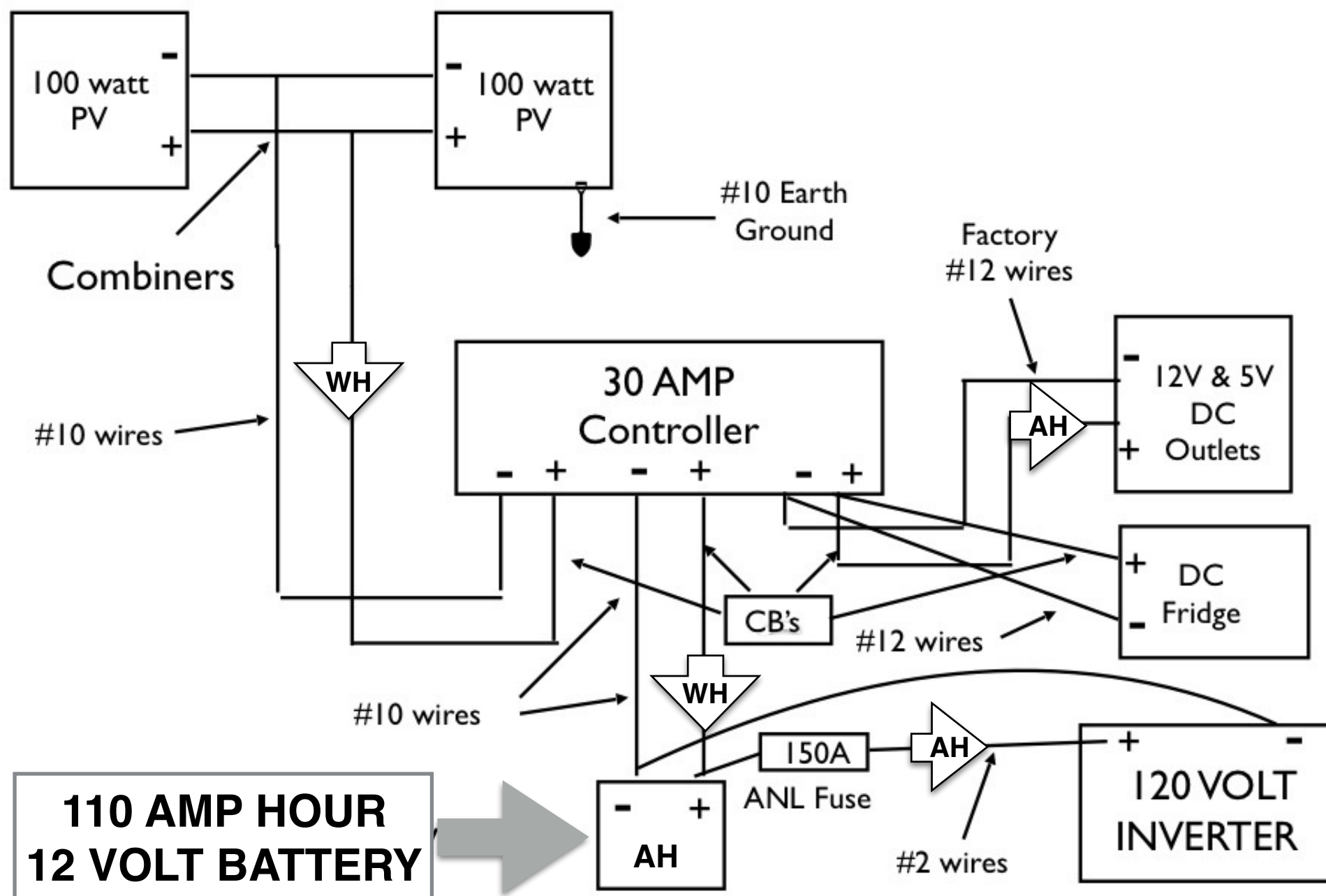
We get six hours of sun.

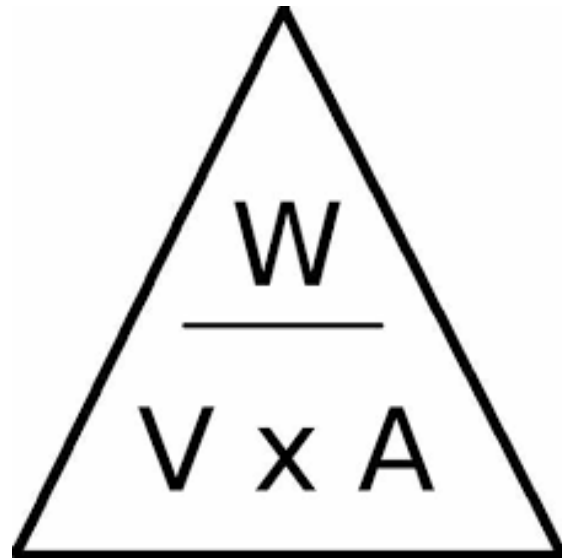
200 Watts x 6 Hours = 1200 WH!

But...Sun hours are fewer in winter.
And there are always system losses,
cloudy days and inefficiencies, so to be safe,
reduce 1200WH by 1/3 to **800WH** per day



The **800WH** from your solar panels
are stored as Amp/Hours
in your 12 Volt 110 AH battery





Using Watts law

Watt/Hours ÷ Battery Voltage = Amp/Hours

800WH ÷ 12VBattery = 66 Amp/Hours

800WH will put 66 AH

in your battery every day.

66 AH is about half the total capacity
of your 110 AH battery.
That means it takes two sunny days to
charge it completely.



For a longer battery life,
try not to go below **55AH**, halfway.



So how do you begin to live on
800WH per day?

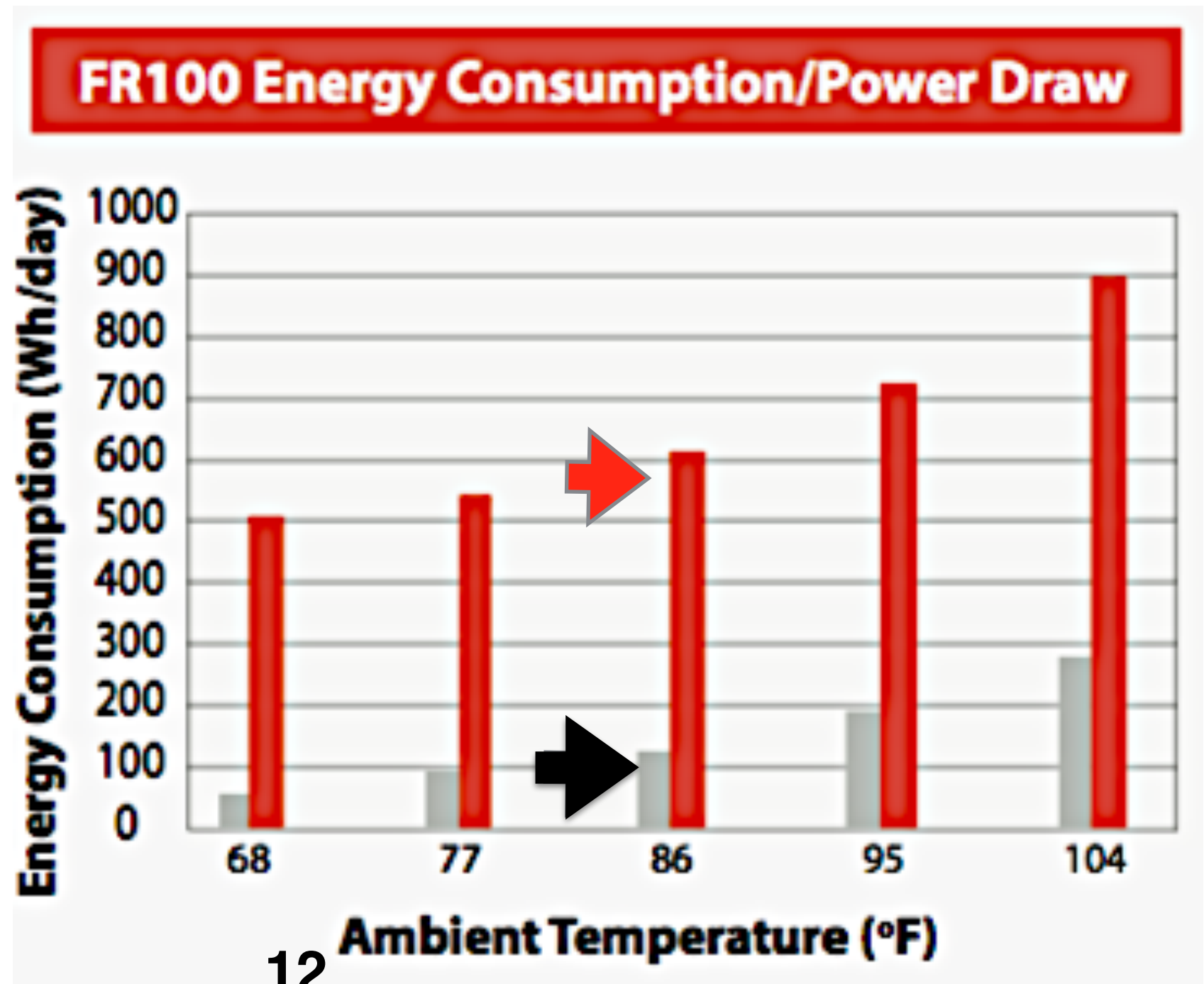


Your fridge 100WH per day
the *phocos* refrigerator cycles on and off over 24 hours
and uses about 100WH per day in fridge mode.

It uses 600WH in freezer mode



-  Freezer Mode (-0.4 °F)
-  Fridge Mode (+46.4 °F)

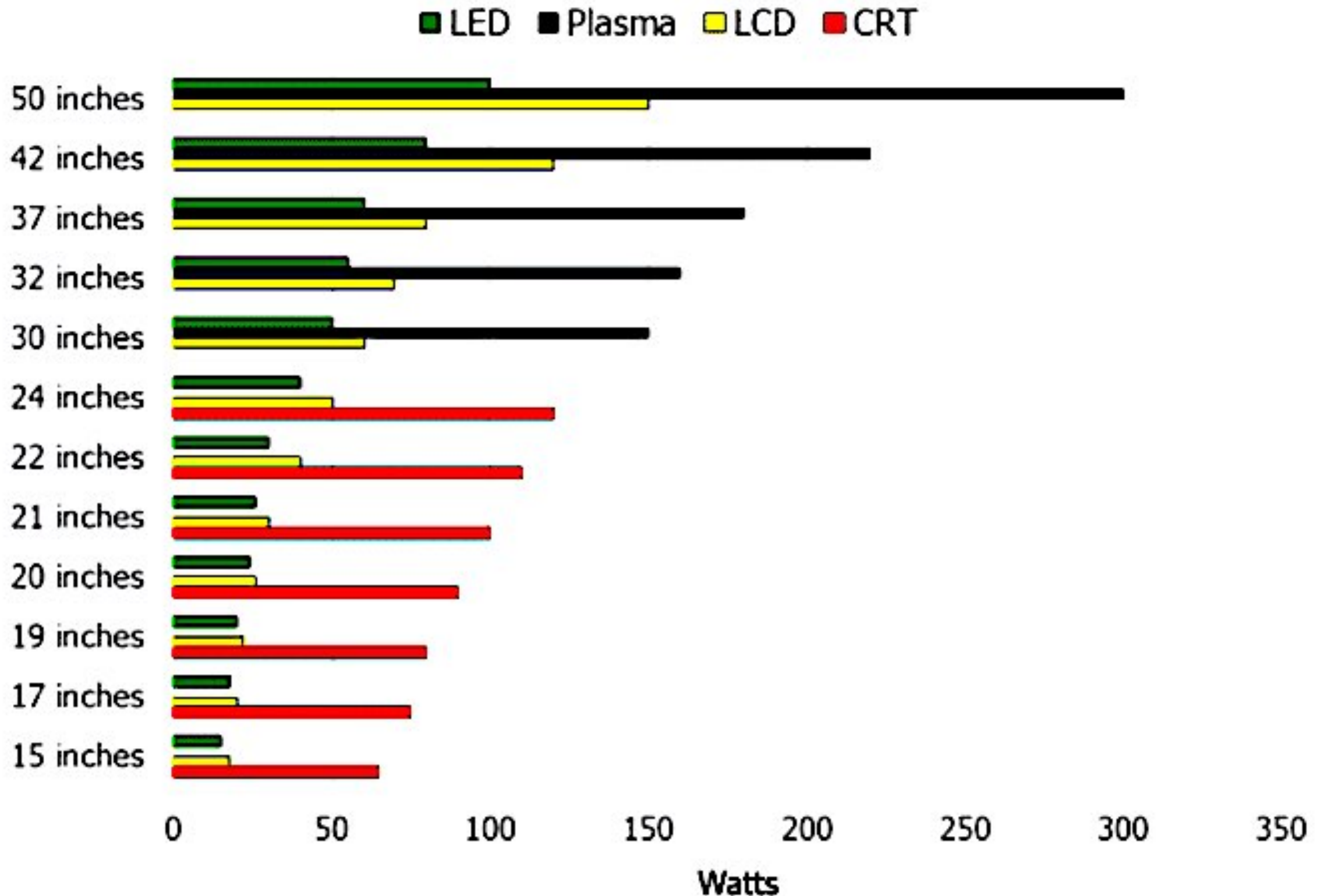


Your coffee maker 150 WH



A coffee maker uses about 600WH but you might only have it plugged in for 15 minutes, a quarter hour so you would only use 150WH.

TV Wattages are all over the place



There is even 15" DC LED TV that only uses 6W per hour!

Learn to look at labels



Power Consumption 65W



Power Consumption
350W 120W
Watts per Hour



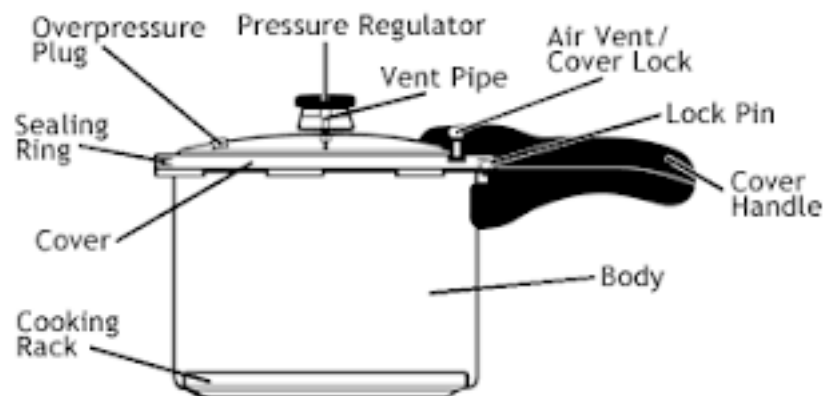
NOW! The 3 Quart Instant Pot 700WH



ADD INGREDIENTS & LIQUID



SECURE & LOCK THE LID



SELECT 'PRESSURE COOK'



ADJUST PRESSURE LEVEL IF NEEDED

Instant Pot

CONVERTING RECIPES

FROM SLOW COOKER

Slow Cooker Time	Instant Pot Time
10 hours on low/ 5 hours on high	30 minutes on high pressure
8 hours on low/ 4 hours on high	24 minutes on high pressure
6 hours on low/ 3 hours on high	18 minutes on high pressure
4 hours on low/ 2 hours on high	12 minutes on high pressure

FROM OVEN/STOVE TOP

Stove/Oven Cook Time	Instant Pot Time
2 hours	40 minutes on high pressure
1 ½ hours	30 minutes on high pressure
1 hour	20 minutes on high pressure
30 minutes	10 minutes on high pressure

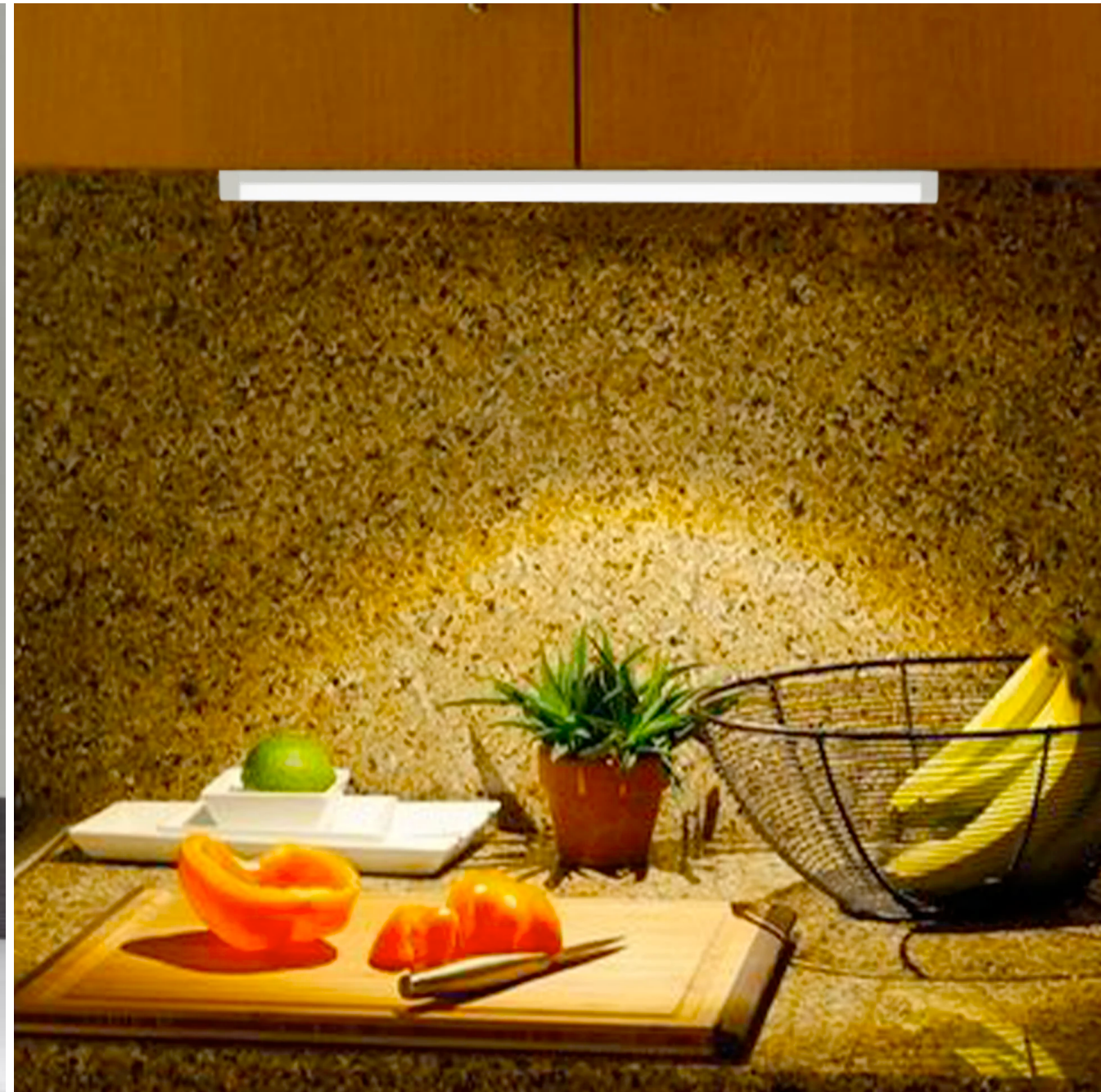
RECIPES WITH PASTA

Lowest Pasta Cook Time	Instant Pot Time
12 minutes	4 minutes on high pressure let NPR for 5 minutes then QR
9 minutes	3 minutes on high pressure let NPR for 4 minutes then QR
6 minutes	2 minutes on high pressure let NPR for 3 minutes then QR
3 minutes	1 minute on high pressure let NPR for 2 minutes then QR



7W LED Lights

5 Hours per day = 35 WH each





Space Heaters No Way!

The average electric heater uses
1500Watts

$$1500WH \div 12V = 125 AH$$

**Couldn't even run for an hour on
your 110 AH 12V Battery**

It's for you to decide but here is an example of what you can run every day.

12 VOLT DC APPLIANCES	WATTS power	HOUR time used	WATT HOURS power x time used	AMP HOURS divide WH by 12
PHOCOS DC REFRIGERATOR	4 W	CYCLES ON AND OFF OVER 24 HRS	100WH	8 AH
THREE 7 WATT DC LED LIGHTS	21 W	5 HOURS	105 WH	8.75 AH
CHARGING DEVICES Phone, LED light, etc.	5 W	2 HOURS	10 WH	.8 AH
			215 WH USED	DC LOAD 17.55 AH
120 VOLT AC APPLIANCES requires inverter	WATTS power	HOUR time used	WATT HOURS power x time used	AMP HOURS divide WH by 10 for inverter loss
TV/DVD	90 W	2 HOURS	180WH	18 AH
OR	OR	OR	OR	OR
3 QUART INSTANT POT	700 W	20 MINUTES (1/3HR) CYCLES ON AND OFF	180WH	18 AH
COFFEE POT	600 W	15 MINUTES (1/4 HR)	150 WH	15 AH
SMALL TOOL	500 W	4 MINUTES (1/15 HR)	33 WH	3AH
			363 WH USED	AC LOAD 36AH
TOTAL DC AND AC	WATT HOURS 578 WH		AMP HOURS	53.55AH

There are 2 kinds of electricity
Direct Current DC and Alternating Current AC
Some of your appliances are going to be
12 Volt Direct Current, **12VDC**,
and some are 120 Volt Alternating Current, **120VAC**.



12VDC



120VAC

12VDC is what your panels produce and needs no conversion to run DC appliances.

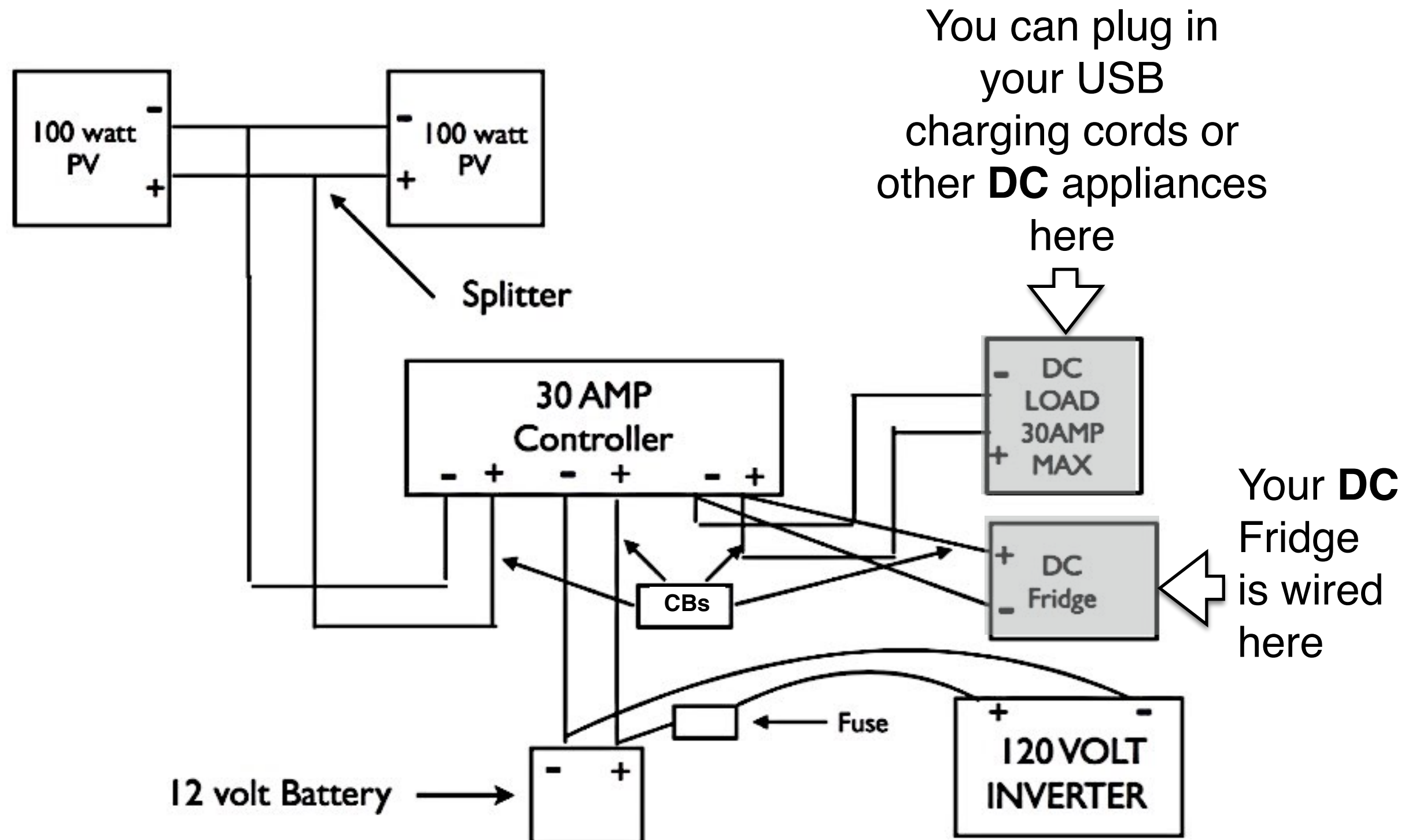
But most appliances are made to run on **AC** because that is what power companies deliver.

AC appliances run on **115V -120V**.

Your inverter raises the voltage coming out of your **12V** battery.

Your inverter makes **AC** current.

Where is your DC?

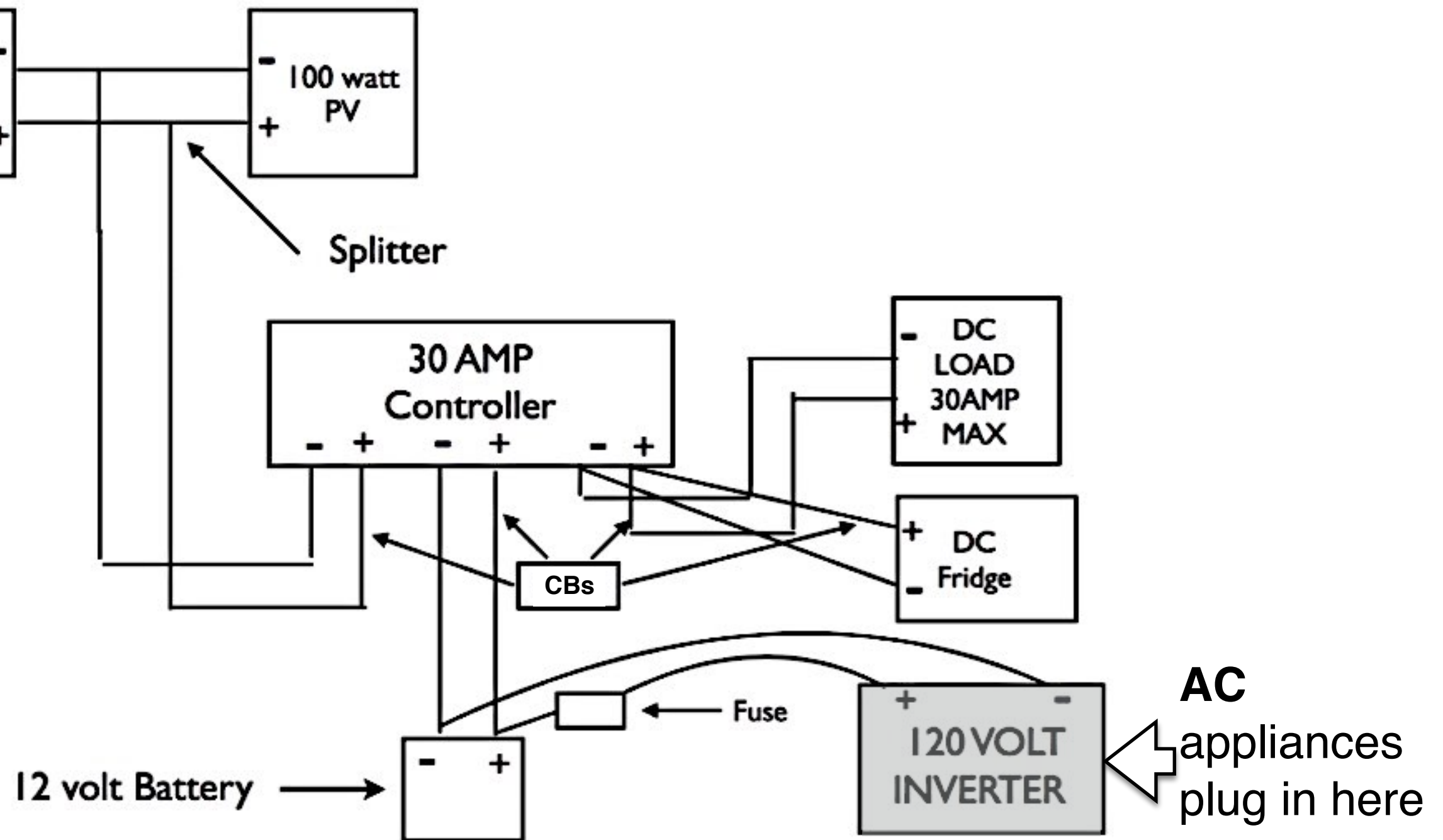


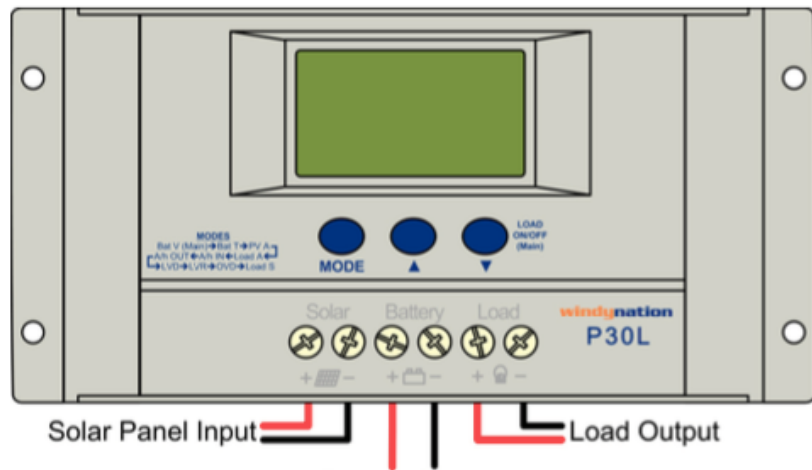
Your Solar Inverter



Your solar panels produce DC.
You need an inverter to make DC into AC.

Where is your AC?





controller



inverter



battery

What if you leave things on or plug in something that will drain your battery?

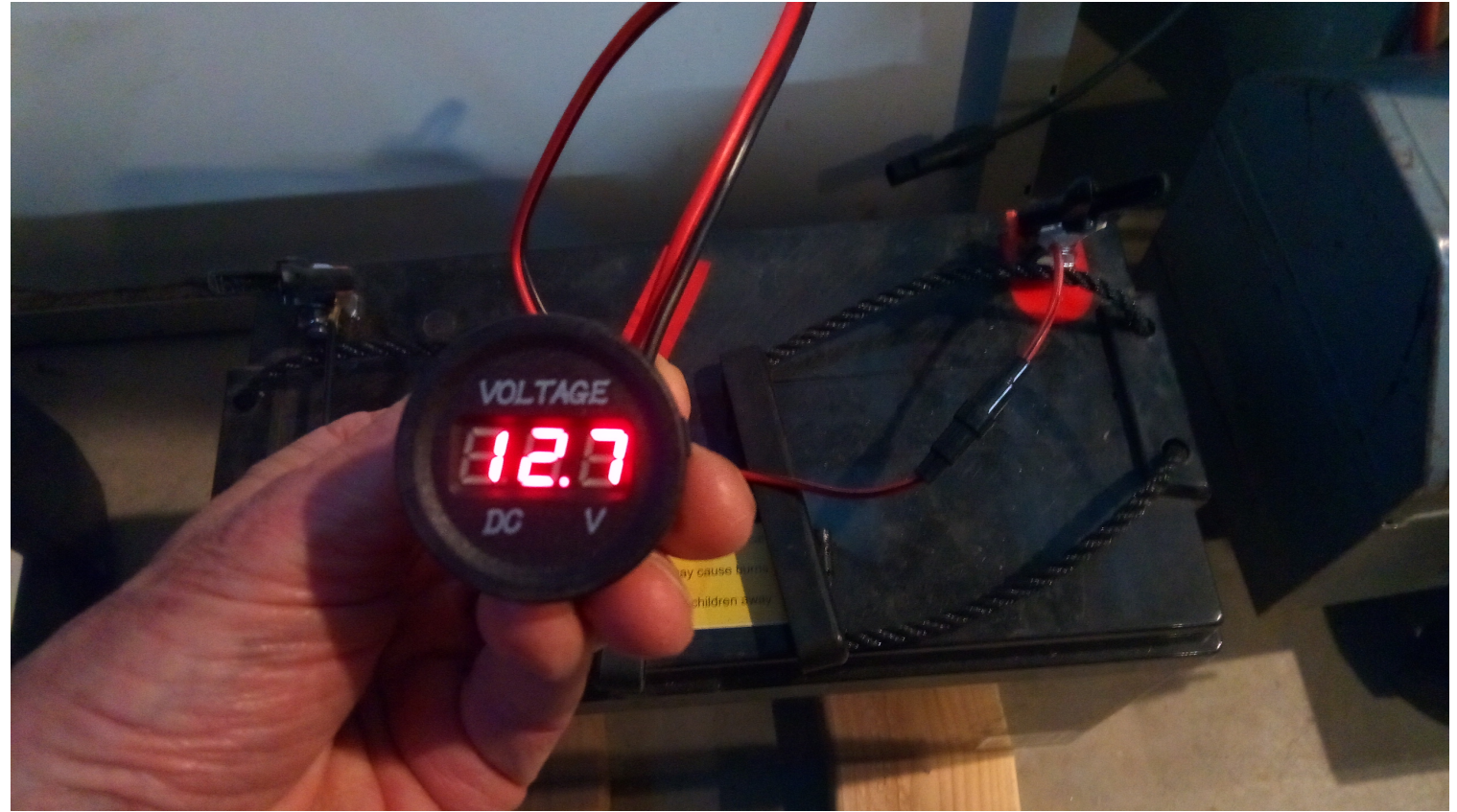
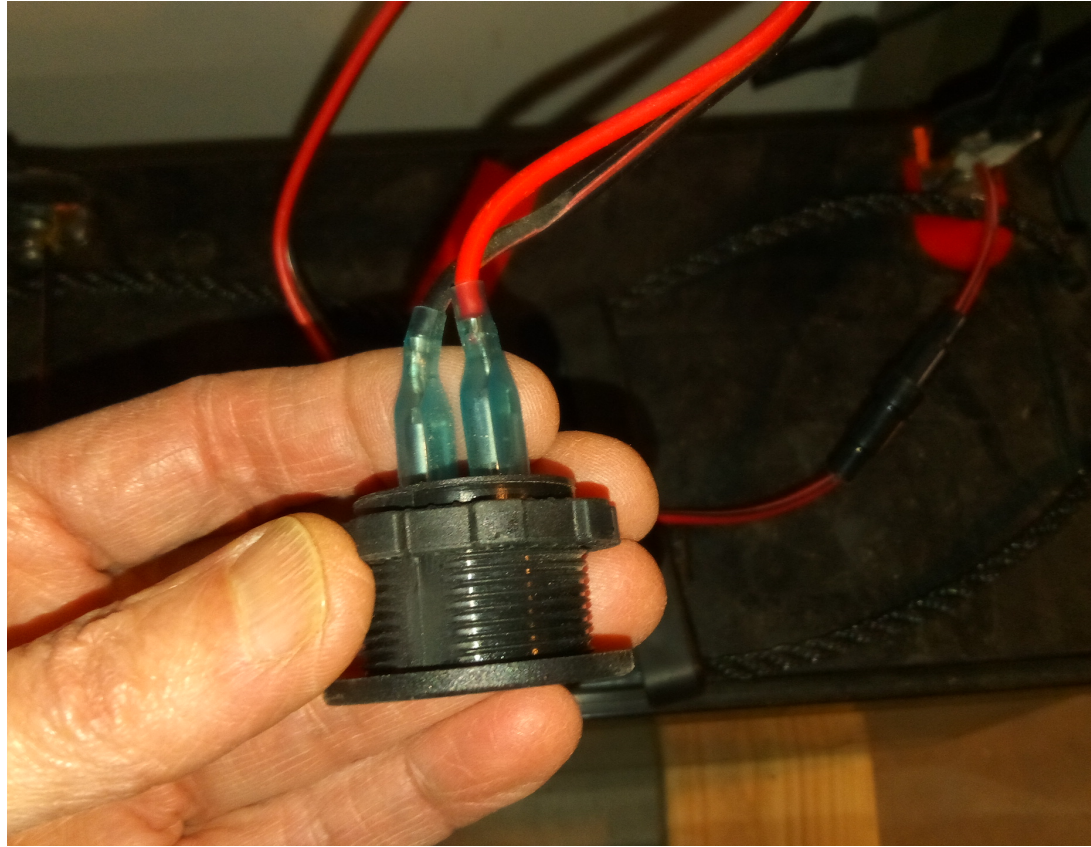
Both your inverter and controller are set to shut down before that happens.

But you
are really
in control.

If your battery
meter shows
12.6 Volts or
more, your
battery is full.

Voltage	State of Charge
12.6+	100%
12.5	90%
12.42	80%
12.32	70%
12.20	60%
12.06	50%
11.9	40%
11.75	30%
11.58	20%
11.31	10%
10.5	0%

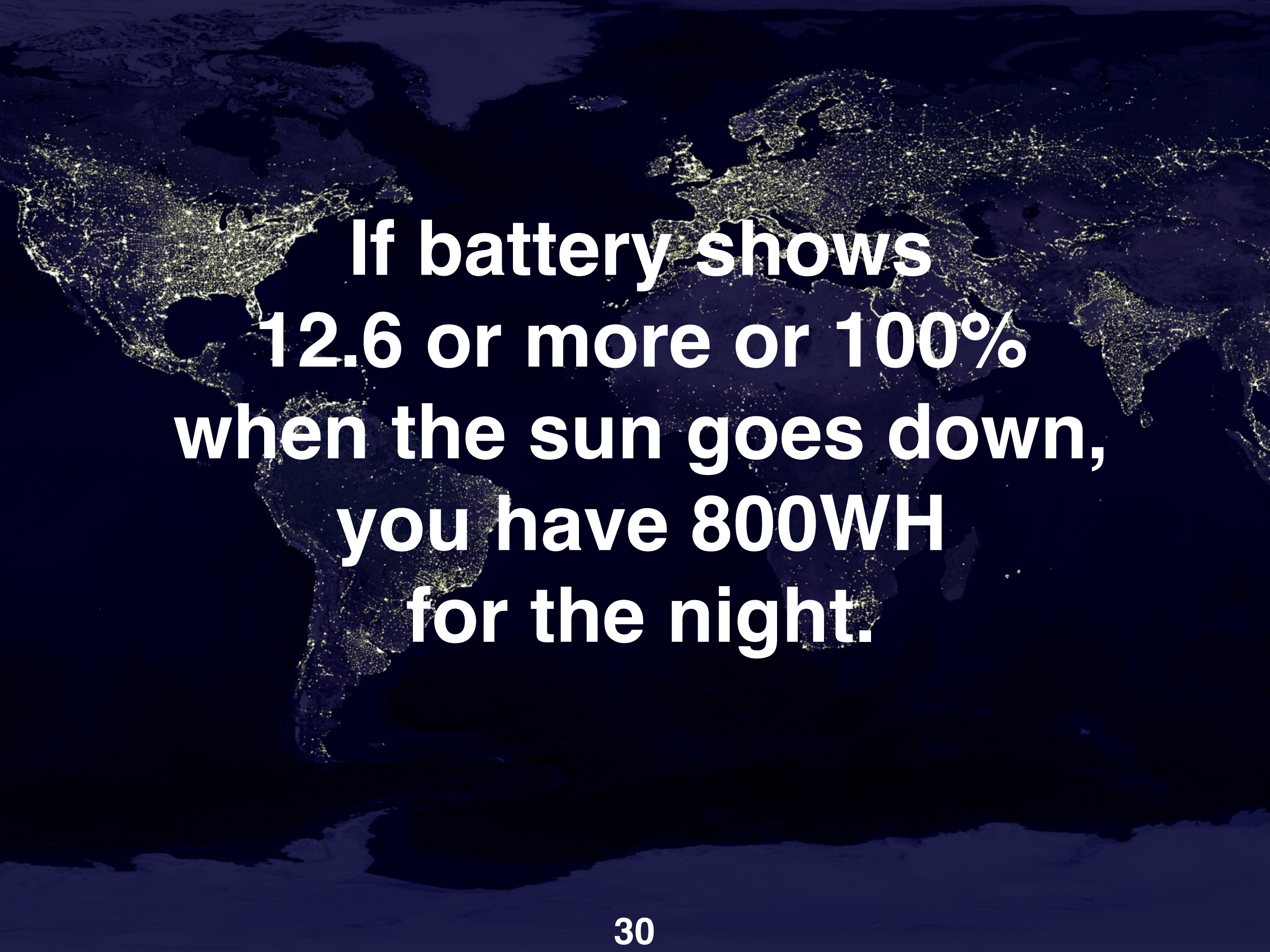
Your Battery Meter



This battery is full

On a sunny day while
your battery voltage reading
is at least 12.6 or the meter shows 100%,
it is a good time to use
incoming solar power, WH,
that the battery is too full to absorb.

Make a pot of chile with beans.

A world map at night, showing the continents and oceans. The landmasses are dark, and the cities are represented by bright yellow and white dots, indicating where the sun has set. The text is overlaid on the map, centered over the Atlantic Ocean.

**If battery shows
12.6 or more or 100%
when the sun goes down,
you have 800WH
for the night.**