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Green Energy Part 2

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Green energy Agenda - Power

- ✓ Ozone and Pro & Con climate change
- ✓ Solar panels
- ✓ Wind mills
- ✓ Tide
- ✓ Nuclear plants
- ✓ Fossil Plants
- ✓ Problem with Green energy
- ✓ Texas power outage problem and why

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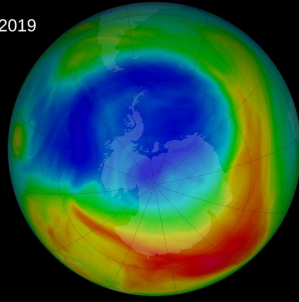
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Green energy Ozone Hole

2019 Ozone Hole is the Smallest on Record Since Its Discovery

Sep 08, 2019



Discovered by Henri Buisson and Charles Fabry, the French physicists in 1913.



Pro & Con Climate Change:
<https://climatechange.procon.org/>

Abnormal weather patterns in the upper atmosphere over Antarctica dramatically limited ozone depletion in September and October, resulting in the smallest ozone hole observed. NASA and NOAA scientists reported today.

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Green Energy Solar panels

- ❖ According to a report by SEIA, a record amount of residential solar capacity was installed in Q3 2019.
- ❖ Overall growth for 2019 is estimated at 23%.
- ❖ Growth expected to continue in the coming years.
- ❖ This rapid development has stemmed mostly from improvements in the efficiency and lower cost of the latest solar power systems.

Solar panels use rare metals.

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- ❖ **Roof-mounted solar panel** systems absorb and convert the **energy-packed photons** of natural sunlight into a usable **energy** form.
- ❖ The solar panel systems are often referred to **photovoltaic (PV)** solar power systems.
- ❖ The result of a residential solar power system installation is a clean, renewable energy source that requires minimal maintenance with savings that may pay back the initial investment in just a few years.

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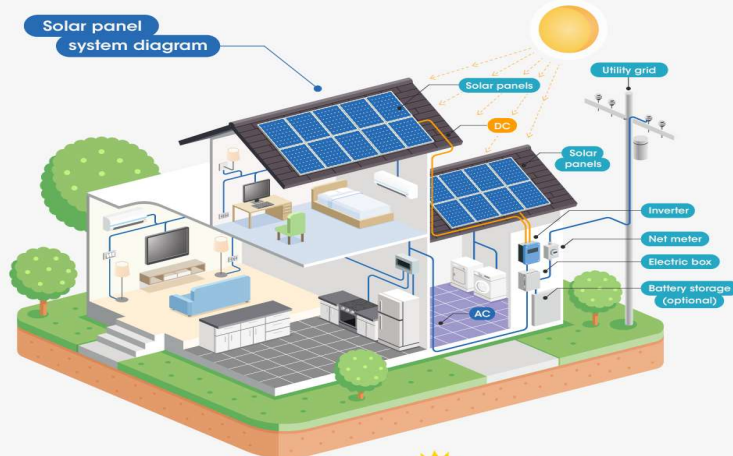
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The solar panels themselves are the key elements of a solar power system. The essential attributes to consider are the efficiency, cost, warranty, and technology type.



 SolarReviews

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- ❖ The number and placement of solar panels are dependent on:
- ❖ Your energy requirements
- ❖ Usable roof surface area
- ❖ Climate
- ❖ Peak sunlight in your location
- ❖ Efficiency rating of the solar panels
- ❖ Whether net metering is available

Net metering, also called **Net Energy Metering (NEM)**, is a utility rate structure that requires your utility to purchase the excess solar energy your solar panels produce at the full retail rate of electricity.

This means when your solar energy system produces more electricity than your home needs, the excess power is sent to the power grid.

Click on the short video below shows how it works

<https://youtu.be/A5Wb61nEoZc>

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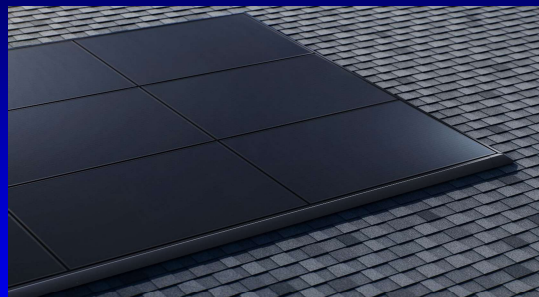
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Tesla Solar Panels typical 12KW Installation. 36 Panels



Tesla Cost:

- ❖ Rent it for \$195/months
- ❖ Buy it with a 4.99% for 10 years for \$201.09

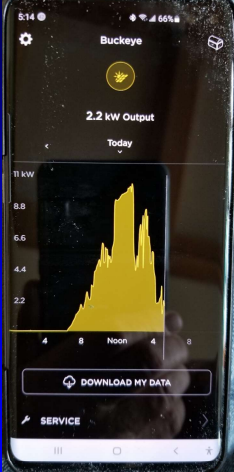
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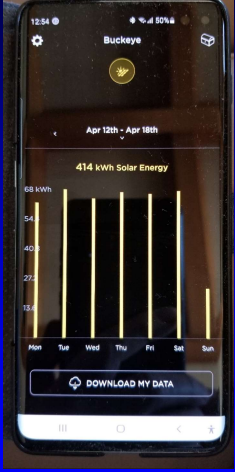
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Green Energy Solar panels Tesla App

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A Cloudy day 2.2 kWh



Week 414 kWh

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Our Solar panels power:

- On a sunny day we get about 7.5KW
- When a short cloud passes it goes down to 1.1Kw
- It goes down ~85%

LA consumes about 10GW (10,000,000 KW)

- If all is solar power and a cloud passes over, instantly power produces will be reduced by 85%, total blackout!

US consumes 4,127 Billion GW

- If all is solar power and a cloud passes over, instantly power produces will be reduced by 85%, total USA blackout!

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Net metering, also called **Net Energy Metering (NEM)**
Cost. If you have PG&E NEM setup. Available in
California.

Time	KWH hrs summer Cents	KWH hrs Winter Cents	Comments
3pm – 4pm	37	33	Year end settlement
4pm – 9pm	48	35	You get 3 cents KWH
9pm – 12pm	48	35	
12pm – 3pm	16.8	16.8	Night cheapest

Sell to PG&E in the day and buy back off peak!

Green energy Electricity formulas

$$V = R \times A$$

$$W = V \times A$$

V = Volts

R = Resistance

A = Amps

1000W = 1 KW

Hair drier 1800 Watts:

$1800/110 = 16.36$ Amps

Charging Tesla:

220v at 30 Amps

$220 \times 30 = 6600$ Wats

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- **Net metering** ensures you get the **most out of your solar panels**.
- With net metering, it allows you to use the grid as a **'virtual' battery** to store the economic value of your excess solar power.
- **Without net metering**, you would have to install a solar battery to store and use your excess generation, which will cost you several thousand dollars.
- Without net metering or energy storage, all of the extra power would get sent to the grid and you wouldn't get any value from it.

No SUN, NO OR LITTLE POWER!

- **PG&E outage may be a consideration**

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Green Energy Solar Roof

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Full information here:

<https://www.solarreviews.com/blog/what-is-net-metering-and-how-does-it-work>

Tesla Solar Roof replaces your existing roof and brings it to life with beautiful solar tiles that can power your home for decades with the energy you produce.



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Green Energy Wind mills



Considerations are:

1. Space
2. Wind speed
3. Amount of energy (kwh per month)
4. At least half an acre for the turbine. Requires some serious space!
5. Average wind speed in your area is at least 10 mph. Anything less and you won't be producing much (if any) power.

Green energy Wind mills

1. LA basin requires 10 GW electricity supply. If this were to come from Wind energy, a total of 300 sq miles of land would be required. California Area: 163,696 mi²
2. Useable wind generation occurs, on average, for 30% of the time. That would be about 8 hours per day. You will need a means of energy storage, and at present LA uses an enormous pumped storage facility (Castaic Pumped Storage Plant, built in 1968 rated at an impressive 1.2 GW)
3. But there are no more places in California where you can build Pumped storage plants.
4. Castaic produces about 900 GWh annually, or 2.5 GWh daily.

Green energy Wind mills - Castaic

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How LADWP Uses Two Lakes To Store Energy Like A Giant Battery



https://laist.com/2019/05/13/how_ladwp_got_two_lakes_to_store_energy_like_a_giant_battery.php

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- ❖ If you were to do that with batteries @ \$ 350 per kWh it would cost $2.5 \times 350 \times 10^6 = \$ 875$ million (Tesla 12kWh Powerwall costs \$ 7,000 or \$ 700/kWh).
- ❖ Daily LA basin requirement based on 10GW power requirement and store energy for 70% of the time , i.e. 16.8 hours, you would need 168 GWh of battery storage.
- ❖ That would cost $168 \times 350 \times 10^6 = \$ 58.8$ BILLION !!!

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Tesla lists the **Powerwall** at a cost of **\$7,000** alone, and puts supporting **hardware costs** at **\$1,000**, bringing the price of just the Powerwall and its associated components to **\$8,000**.

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Green energy Cost of Windmills

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That does not include:

1. The cost of the land occupied by the windmills.
2. The cost of the turbines.
3. The enormous amount of interconnecting copper wire.

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Is Nuclear Energy Clean, Zero
Emissions And Ecological?

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Is Nuclear Energy Clean, Zero
Emissions And Ecological?

- ❖ 10% of the world's energy comes from a **nuclear** source.
- ❖ The **largest slice** coming from the **burning and fossil fuels**.
- ❖ Renewable energies are on the rise, especially solar and Eolic energy.
- ❖ However, they demand **earth minerals such as lithium or ion** which come with **high environmental costs** and whose end of lifecycle in a sustainable way is yet to be discovered.

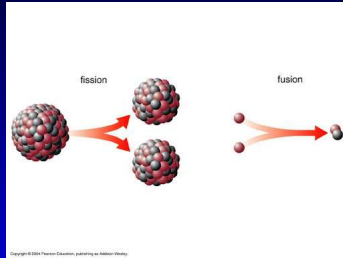
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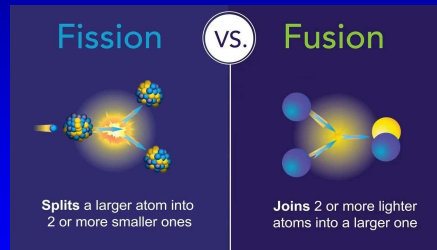
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A pioneering **reactor** in Britain is gearing up to start pivotal tests of a fuel mix that will eventually **power** ITER — the **world's biggest nuclear-fusion** experiment. **Nuclear fusion** is the phenomenon that powers the Sun and, if physicists can harness it on Earth, **it would be a source of almost limitless energy**.
Feb 22, 2021

The fundamental differences in the physics and technology used in **fusion reactors** make a fission-type nuclear **meltdown or a runaway reaction impossible**



Fusion reactors don't emit toxins such as carbon dioxide or other greenhouse gases.

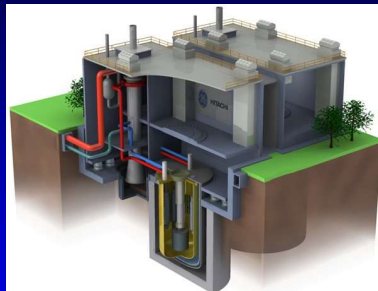
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US Nuclear Regulatory Commission has recently approved tiny nuclear reactor designs.

Small Nuclear Reactors Could Be the Future to Greener Energy

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Green Energy Advanced Small Nuclear

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Advanced Small Modular Reactors (SMRs) are a key part of the Department's goal to develop safe, clean, and affordable nuclear power.

Office of
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*These advanced reactors, envisioned to vary in size from **tens of megawatts** up to **hundreds of megawatts**, can be used for power generation, process heat, desalination, or other industrial uses.*

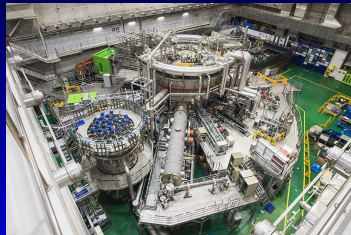
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Green energy Fusion Nuclear

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Scientists have just set a new world record for high-temperature sustained plasma with the Korea Superconducting Tokamak Advanced Research (KSTAR) device, reaching an ion temperature of above 100 million degrees Celsius (180 million degrees Fahrenheit) for a period of 20 seconds.

Nuclear fusion power remains a possibility, not a certainty.

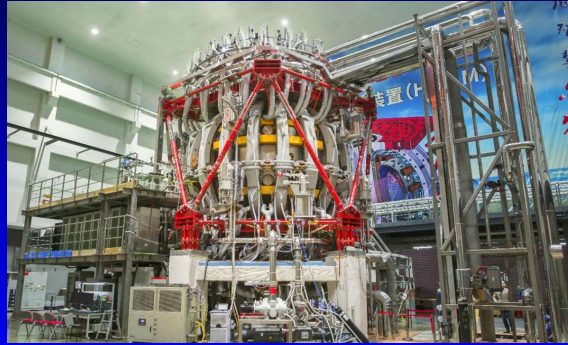
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It uses a powerful magnetic field to fuse hot plasma and can reach temperatures of over 150 million degrees Celsius, according to the People's Daily - approximately 10 times hotter than the core of the Sun.

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Green energy Fusion Nuclear

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The world's largest nuclear fusion research project based in France, which is expected to be completed in 2025.

"Fusion is safe, with minute amounts of fuel and no physical possibility of a run-away accident with meltdown" as with traditional nuclear power stations, the partners said in a statement.

If the technology proves feasible, future fusion reactors would be capable of powering two million homes each at an operational cost comparable to those of conventional nuclear reactors

Fusion is considered the 'Holy Grail' of energy and is what powers our Sun.

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Green energy Texas power outage

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About 56 percent of **Texas' energy** comes from natural gas, just under 24 percent comes from wind, 19 percent from coal, and almost 9 percent from nuclear **energy**

What caused Texas power outage?

1. The most significant source of **power loss** during the crisis came from natural gas **power** plants that couldn't generate **power** .
2. Whether from fuel supply shortages or freezing components at the plants.
3. The grid that covers most of **Texas** lost **an** extraordinary amount of **power**, about 52,000 megawatts

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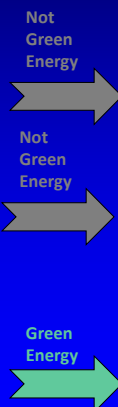
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USA Energy Production

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Total US production 4,127 Billion Kilowatt hours

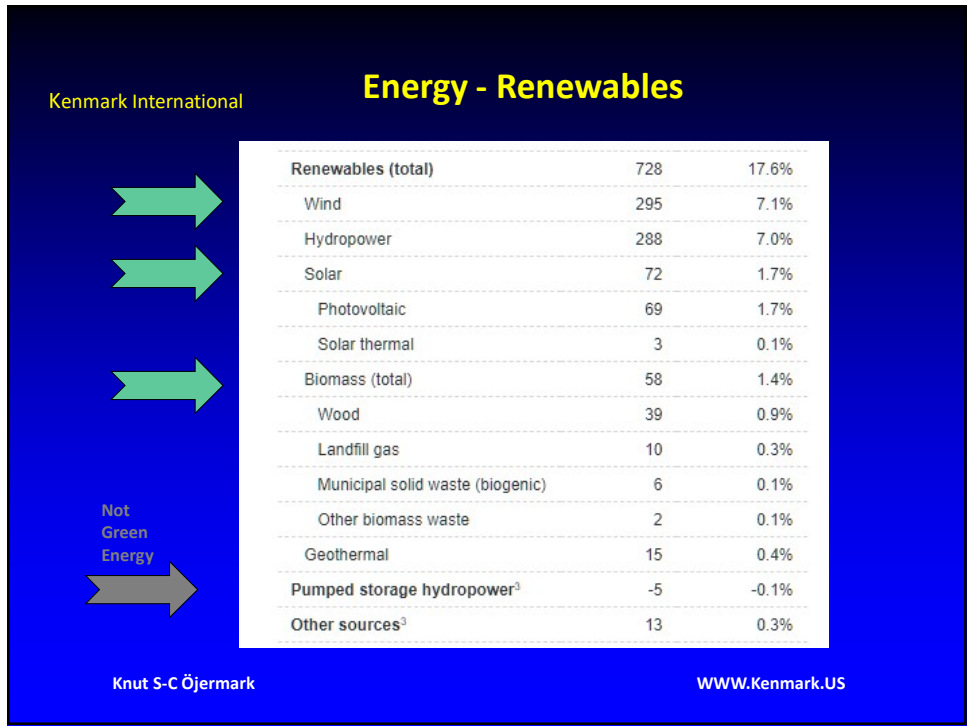
U.S. utility-scale electricity generation by source, amount, and share of total in 2019 ¹		
Energy source	Billion kWh	Share of total
Total - all sources	4,127	
Fossil fuels (total)	2,582	62.6%
Natural Gas	1,586	38.4%
Coal	965	23.4%
Petroleum (total)	18	0.4%
Petroleum liquids	12	0.3%
Petroleum coke	7	0.2%
Other gases	13	0.3%
Nuclear	809	19.6%



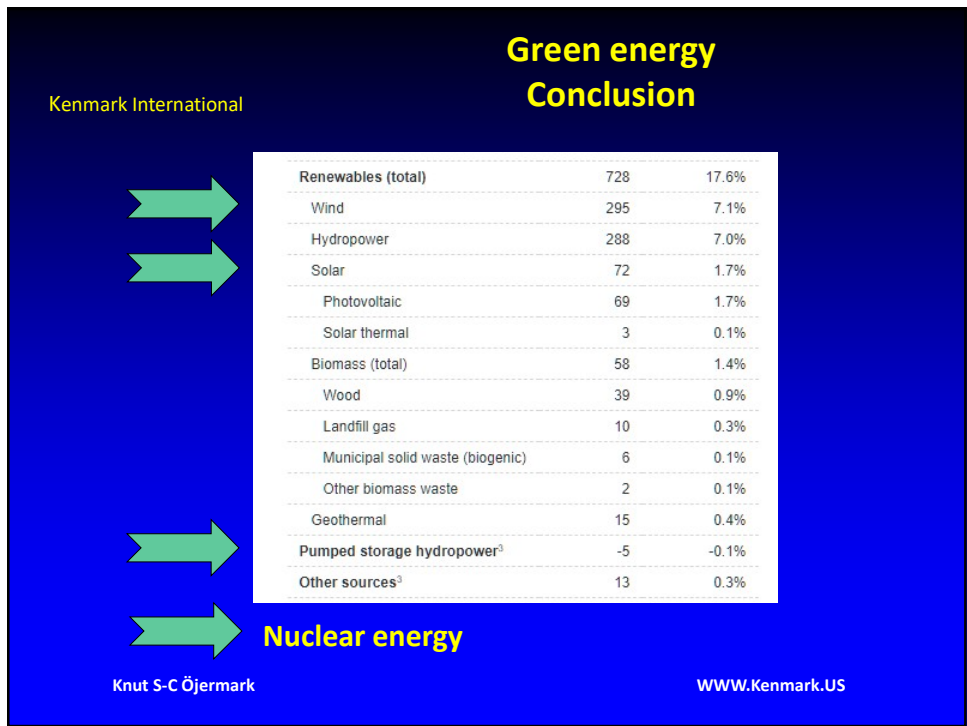
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The more ignorant of GREEN energy you are.
The greener you want the Earth to be!

Most people, including politicians, have little to no
Knowledge the implication!

I hope this gave you a good understanding.

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Questions

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