

ENVIRONMENT AND ENERGY

- All energy sources have some impact on our environment



- Fossil fuels do substantially more harm than renewable energy sources

ENERGY: ENVIRONMENT ISSUES

- Burning fossil fuels is changing the Earth's climate...
 - increasing global average temperatures
 - causing melting of polar sea ice and raising sea levels
 - acid rain and CO2 emissions
 - stronger hurricanes
 - recurrent high tide flooding

Over the past 20 years, nearly three-fourths of human-caused emissions came from the burning of fossil fuels!!!

ENERGY

Thermoelectric
Hydroelectric
Nuclear
Solar
Wind

- What is it?
- Global perspective
- Advantages
- Disadvantages

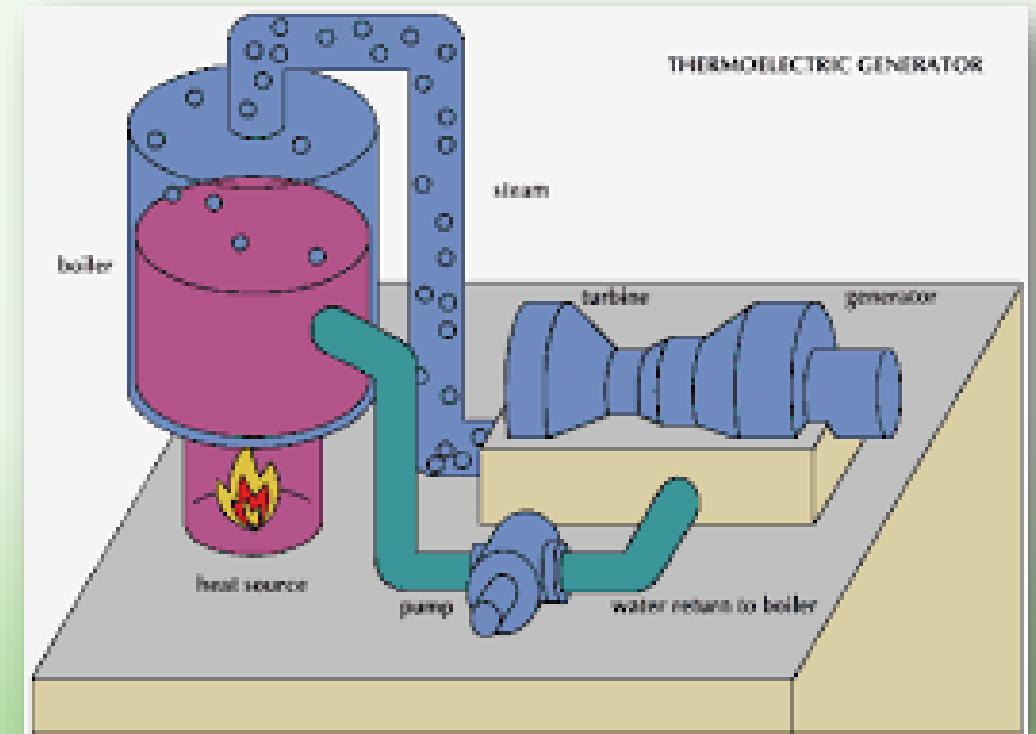
Thermoelectric Energy



Thermoelectric energy

What is it?

- Energy produced by burning fossil fuels, like oil, coal or natural gas.
- The fuels are placed in a boiler that heats the water and its steam drives turbines.



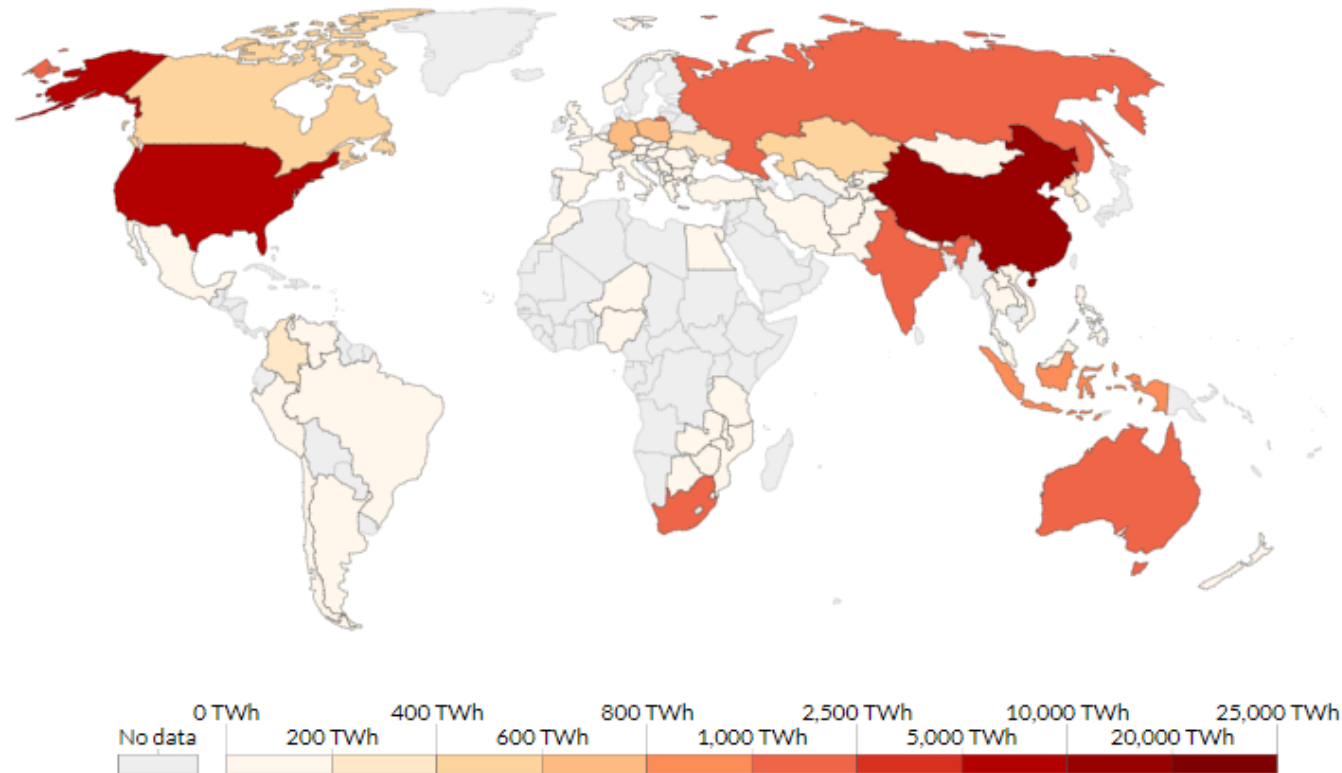
Thermoelectric energy

Global perspective

Coal production, 2004

Annual coal production by country or region, measured in terawatt-hour (TWh) equivalents.

Our World
in Data



Source: The SHIFT Project; UK DECC (2018)

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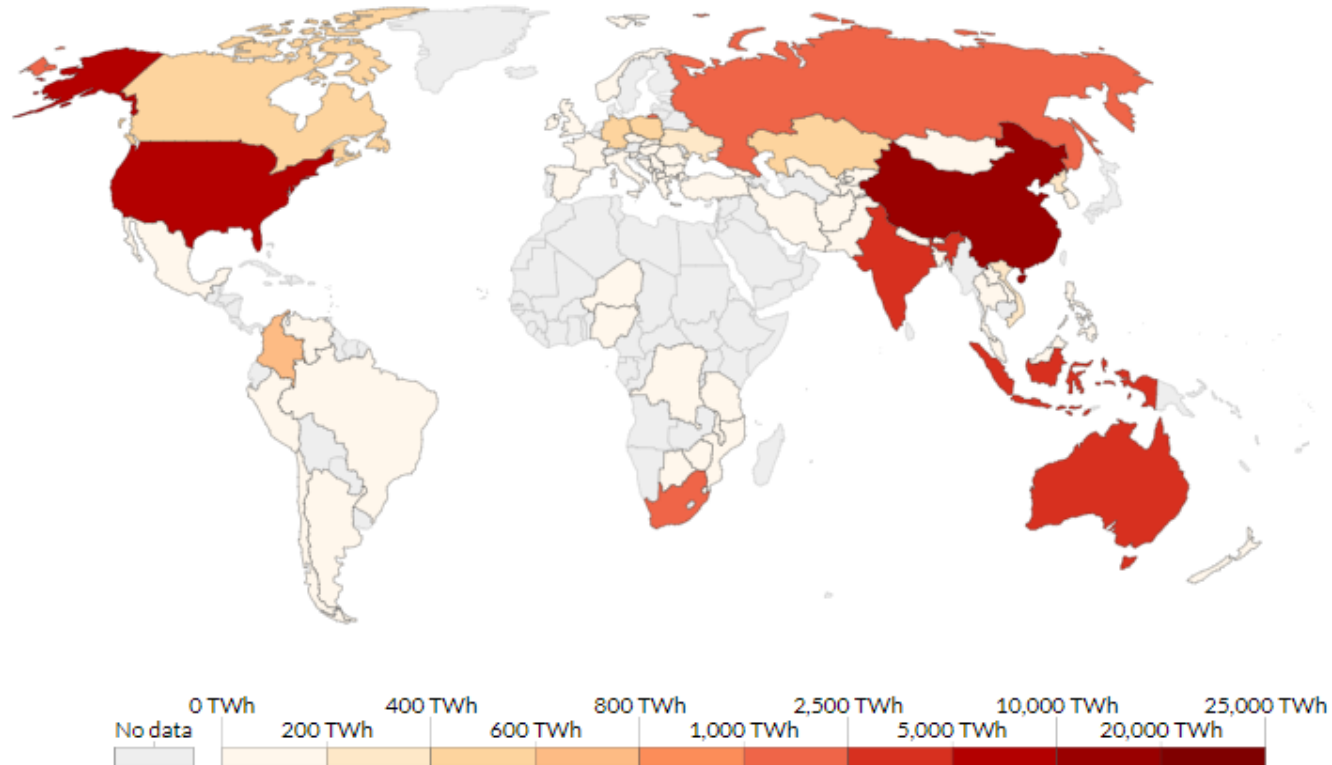
Thermoelectric energy

Global perspective

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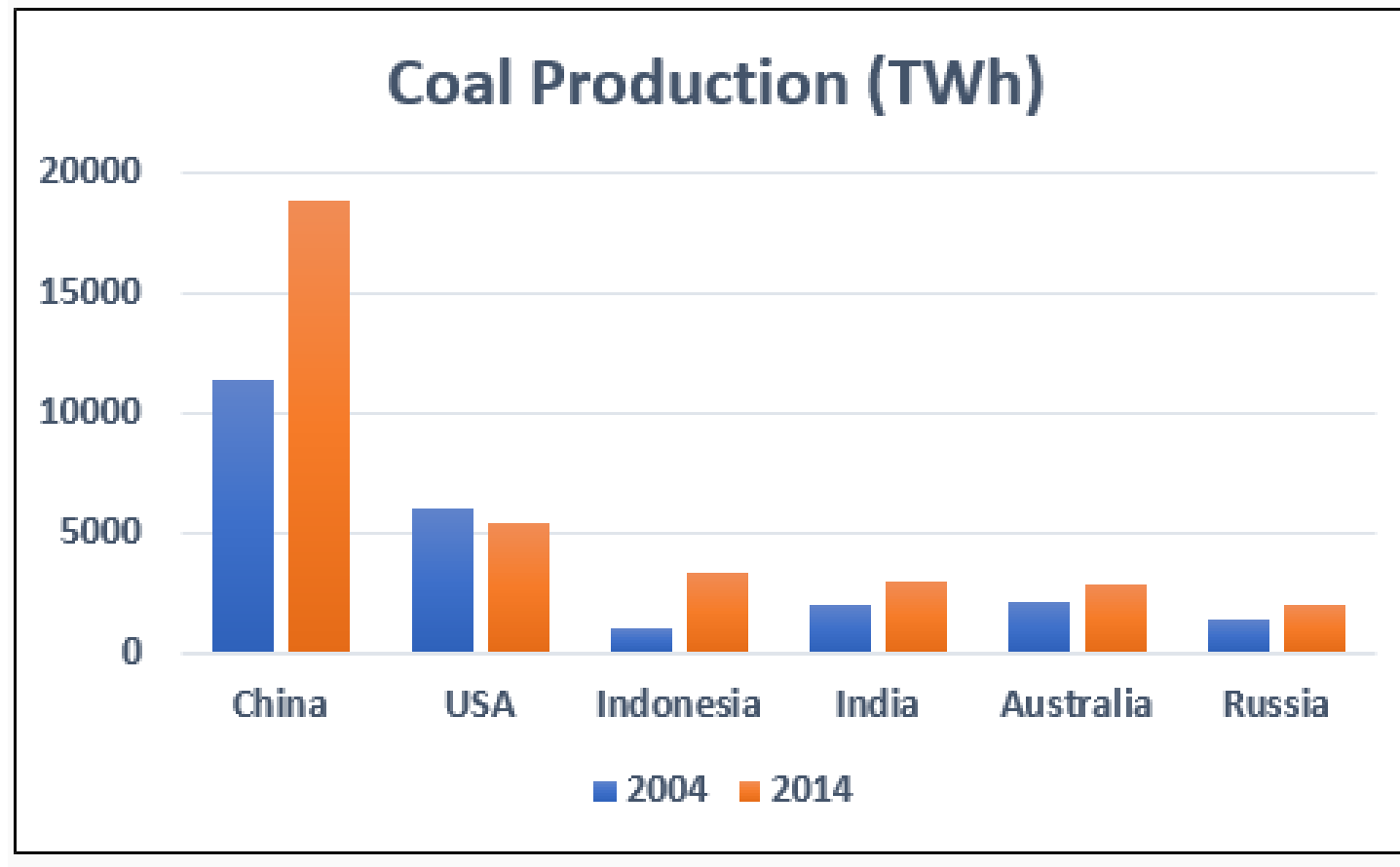


Source: The SHIFT Project; UK DECC (2018)

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Thermoelectric energy

Global perspective



Thermoelectric energy

Advantages

Easy to find

Extremely efficient

Available in plenty

Easier to transport

Generate thousand of jobs

Thermoelectric energy

Disadvantages



Environmental impact



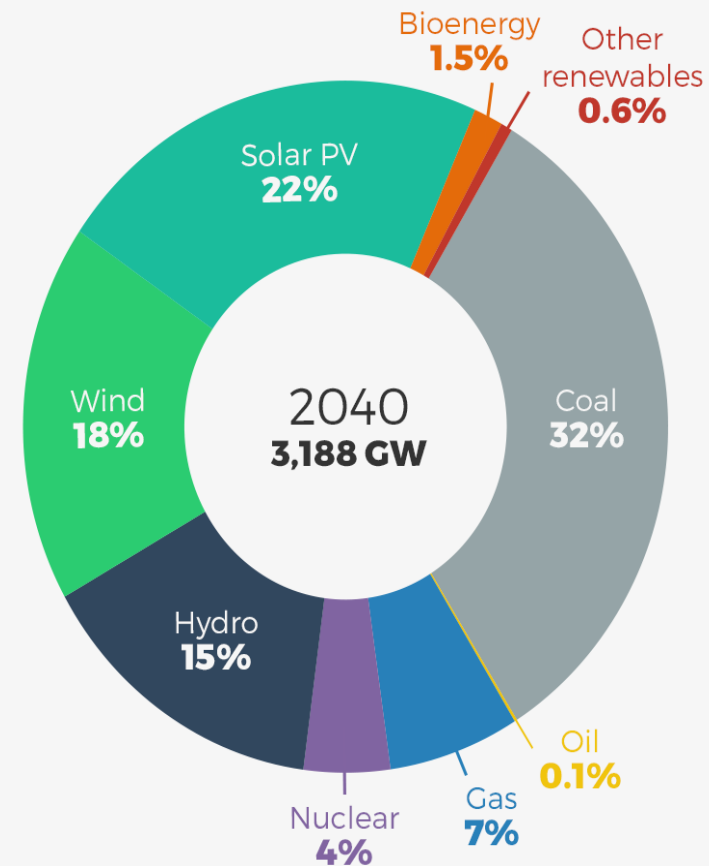
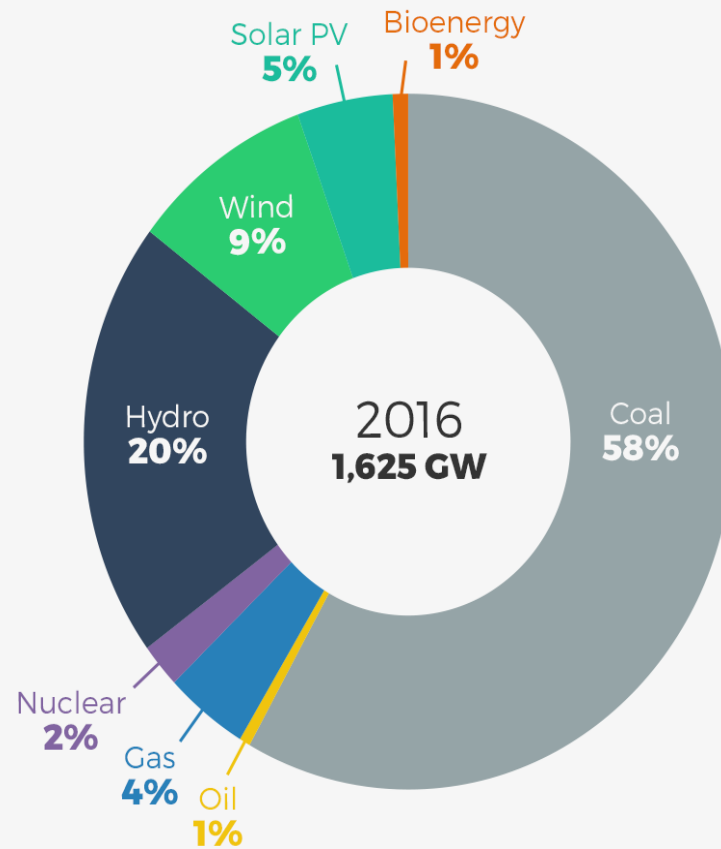
Non-renewable

Public health issues

Needs truckloads of reserves

Installed power generation capacity in China in the New Policies Scenario

World Energy Outlook 2017



Annual renewables

SOLAR

World Energy Use

Hydro

Biomass

OTEC

Wind

waves

Total Non-renewables

Natural Gas

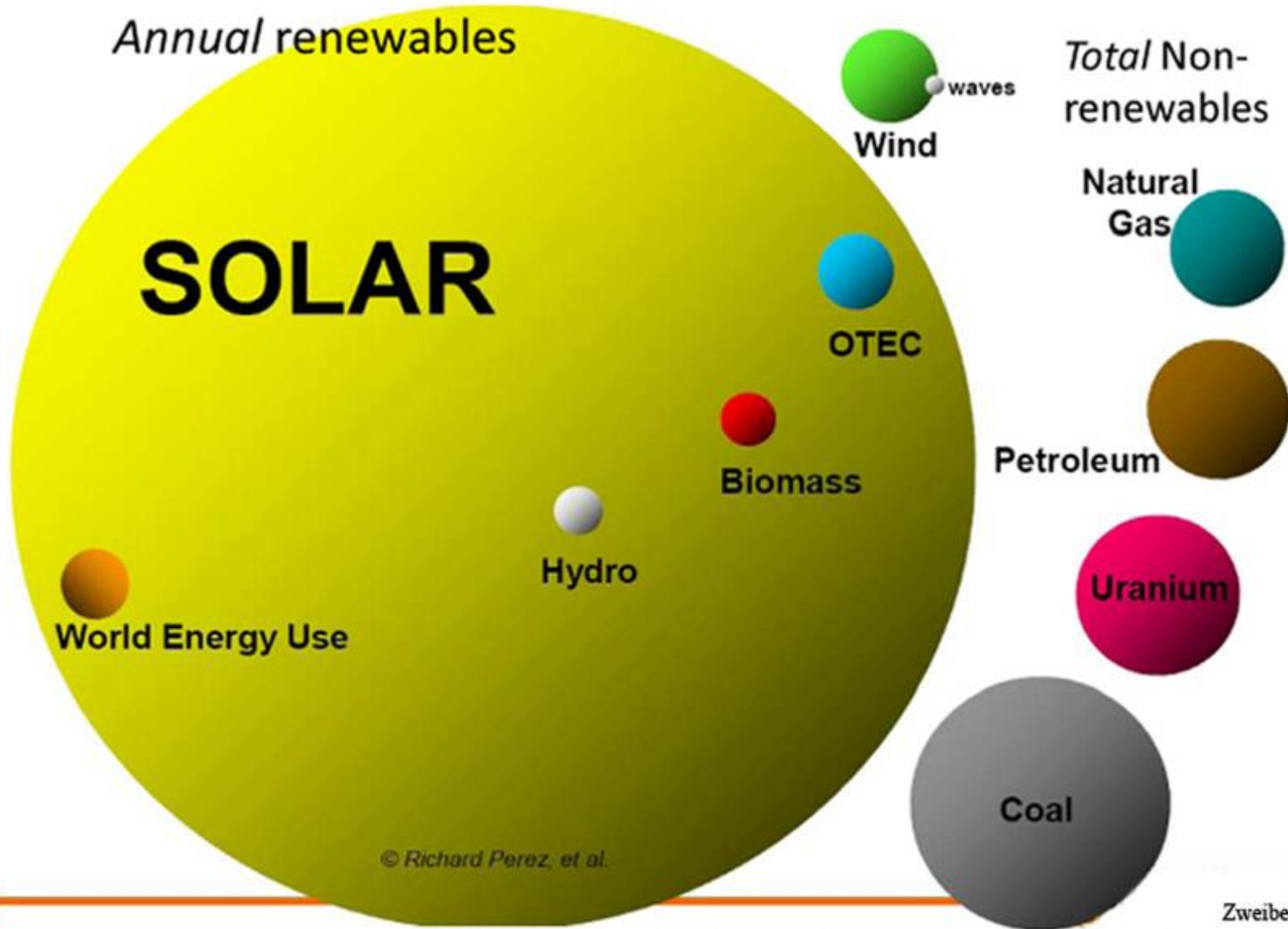
Petroleum

Uranium

Coal

© Richard Perez, et al.

Zweibel/GWU



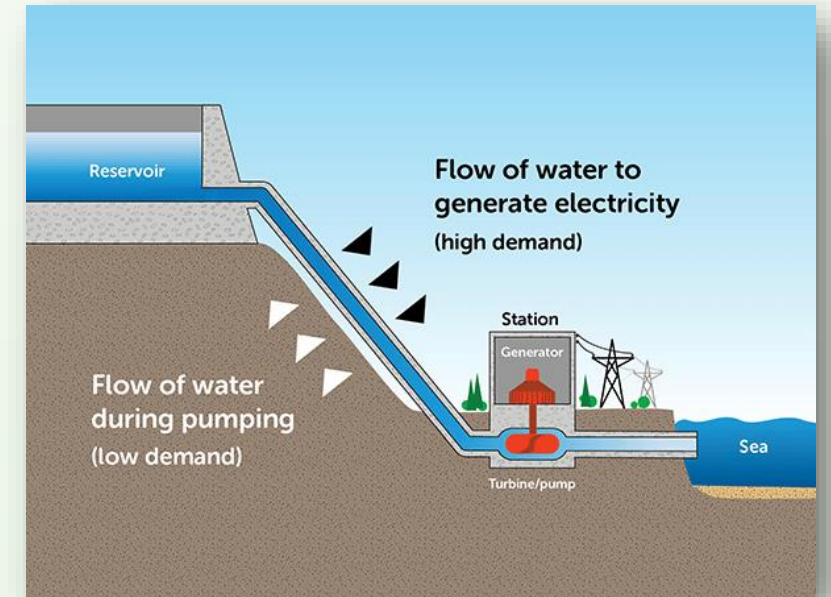
Hydroelectric Energy



Hydroelectric energy

What is it?

- Renewable energy
- Uses the power of moving water
- **Of the remaining renewable technologies, hydropower remains dominant, accounting for approximately one-quarter of renewable consumption.**
- People have used this force for millennia!



The Three Gorges Dam in China is the largest hydroelectric power plant in the world!

Hydroelectric energy

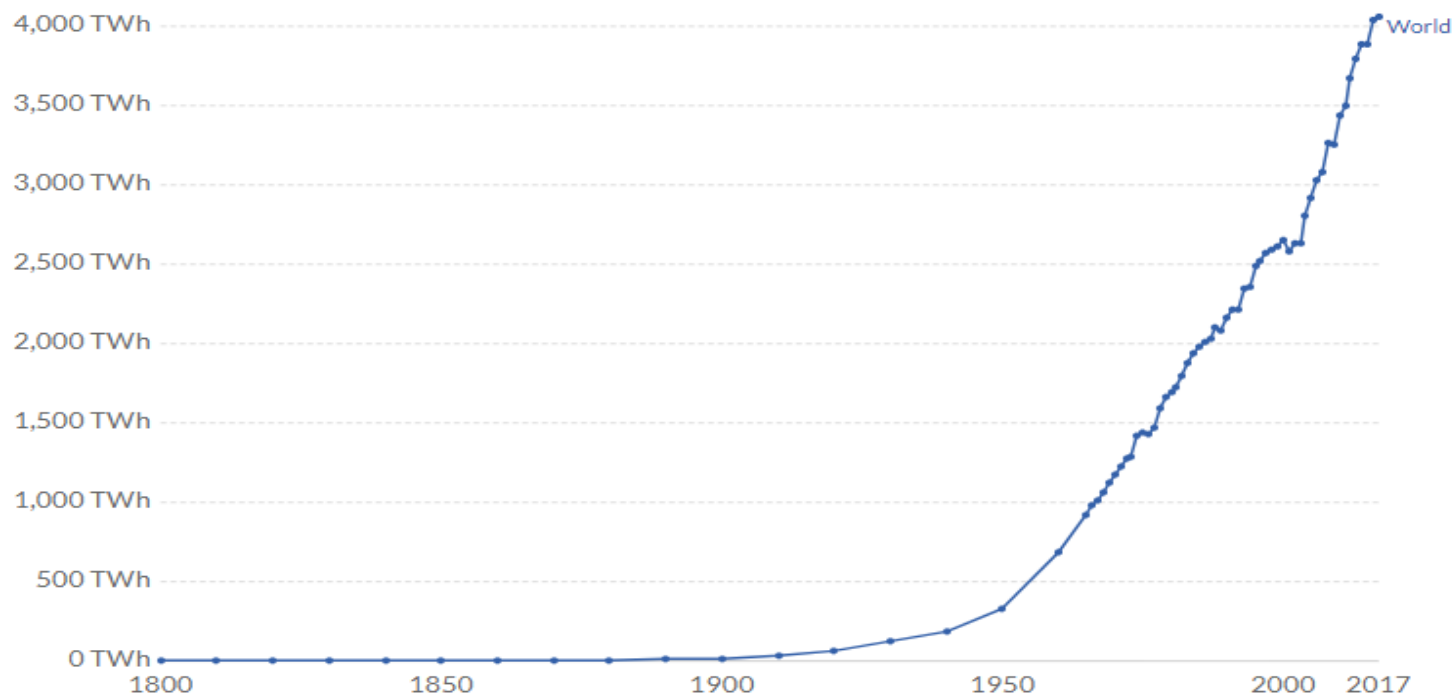
Global perspective

Global hydroelectric consumption over the long-term

Global hydroelectric power consumption, terawatt-hours

Global hydroelectric power consumption over the long-term, measured in terawatt-hours (TWh) per year.

Our World
in Data



Source: Smil (2017) & BP Statistical Review

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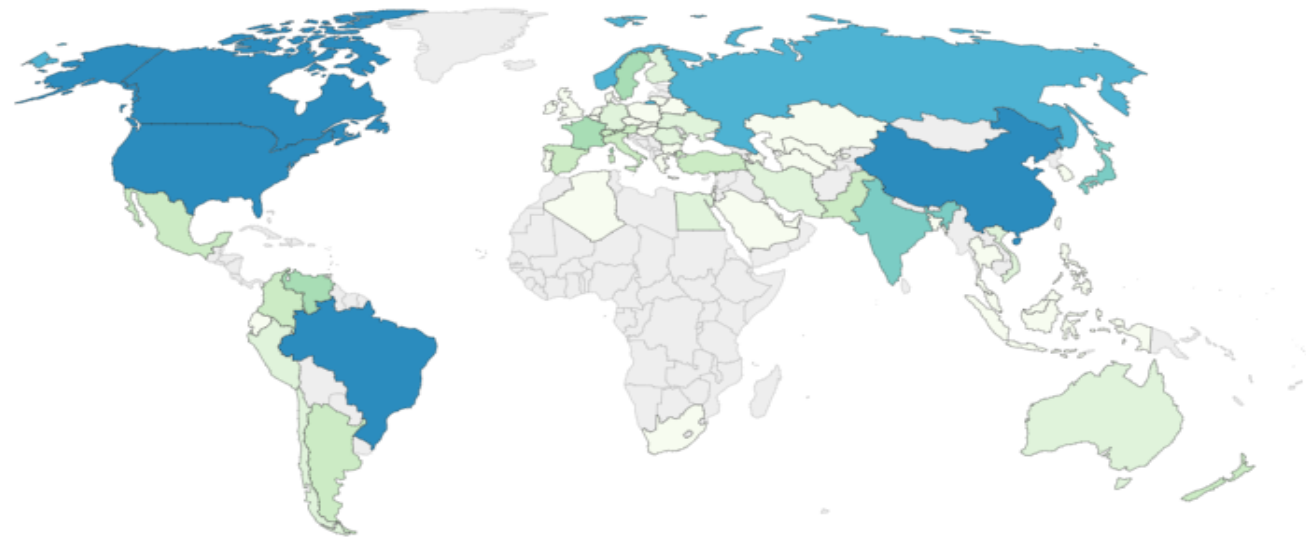
Hydroelectric energy

Global perspective

Hydropower consumption, terawatt-hours, 2004

Annual hydropower consumption, measured in terawatt-hours (TWh) per year.

Our World
in Data



Source: BP Statistical Review of Global Energy

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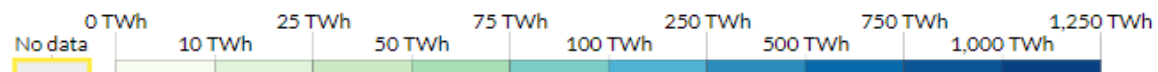
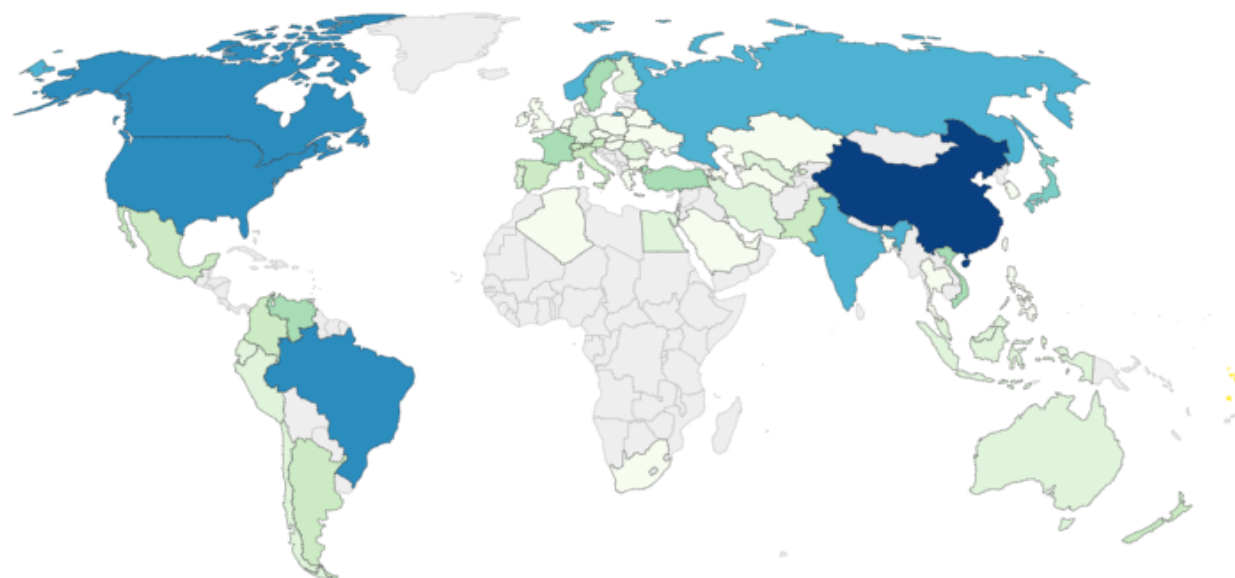
Hydroelectric energy

Global perspective

Hydropower consumption, terawatt-hours, 2016

Annual hydropower consumption, measured in terawatt-hours (TWh) per year.

Our World
in Data

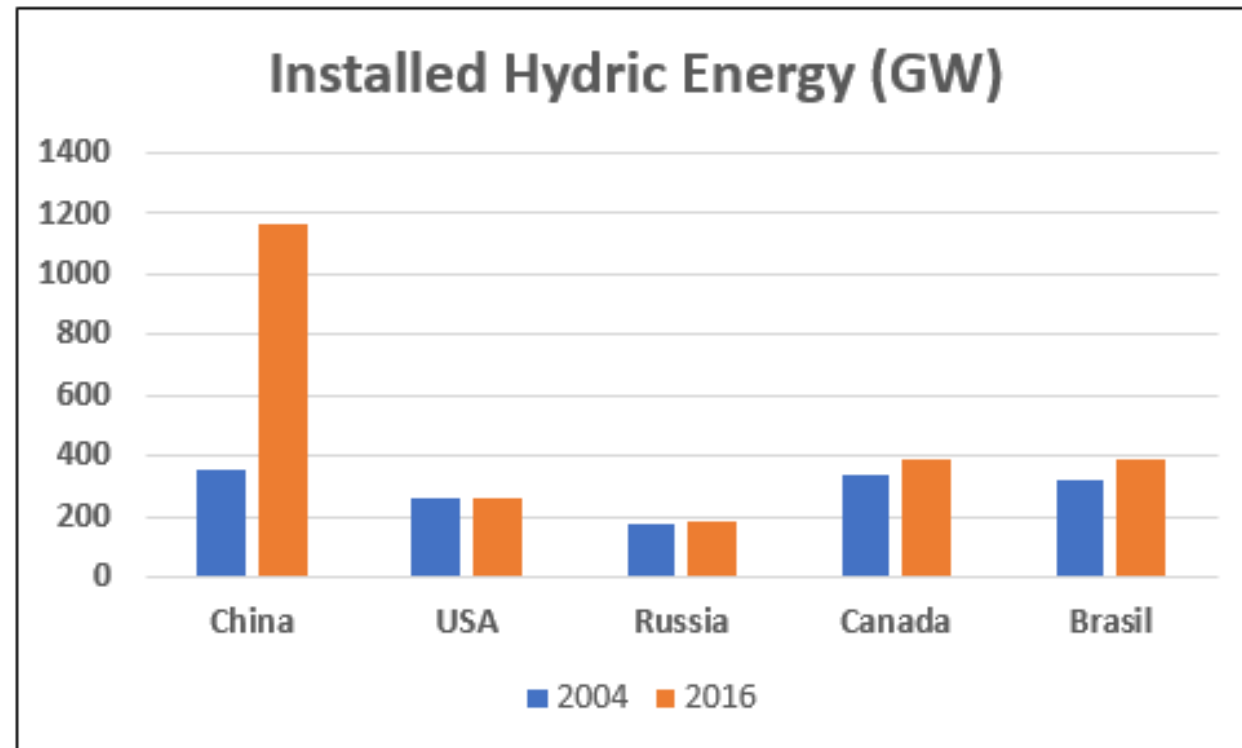


Source: BP Statistical Review of Global Energy

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Hydroelectric energy

Global perspective



Hydroelectric energy

Advantages

Renewable

Green

Reliable

Flexible

Safe

Hydroelectric energy

Disadvantages



Environmental consequences



Expensive

Droughts

Limited water supply

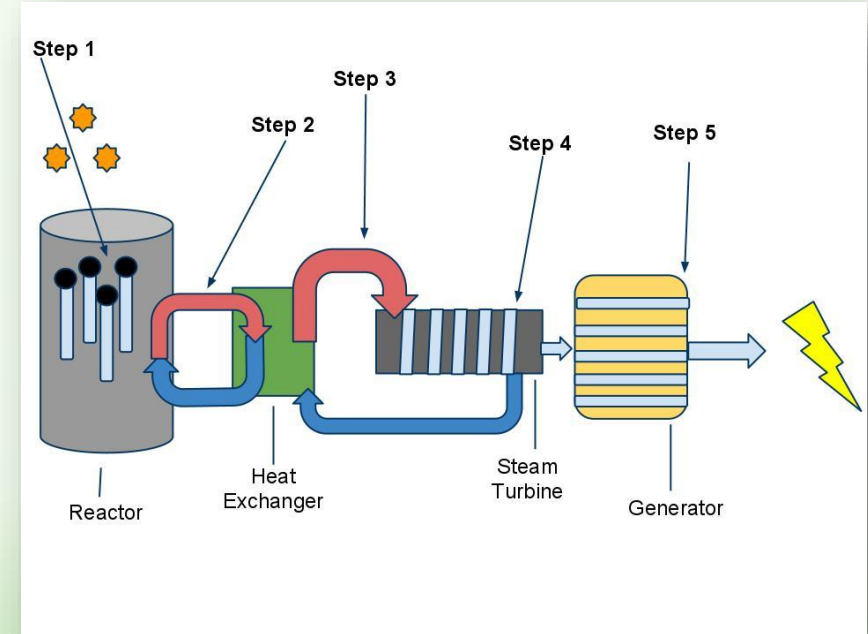
Nuclear Energy



Nuclear energy

What is it?

- Renewable energy
- Uses the energy released by fissioning and splitting the atoms of uranium
- Provides about 10% of the world's electricity from about 450 power reactors.

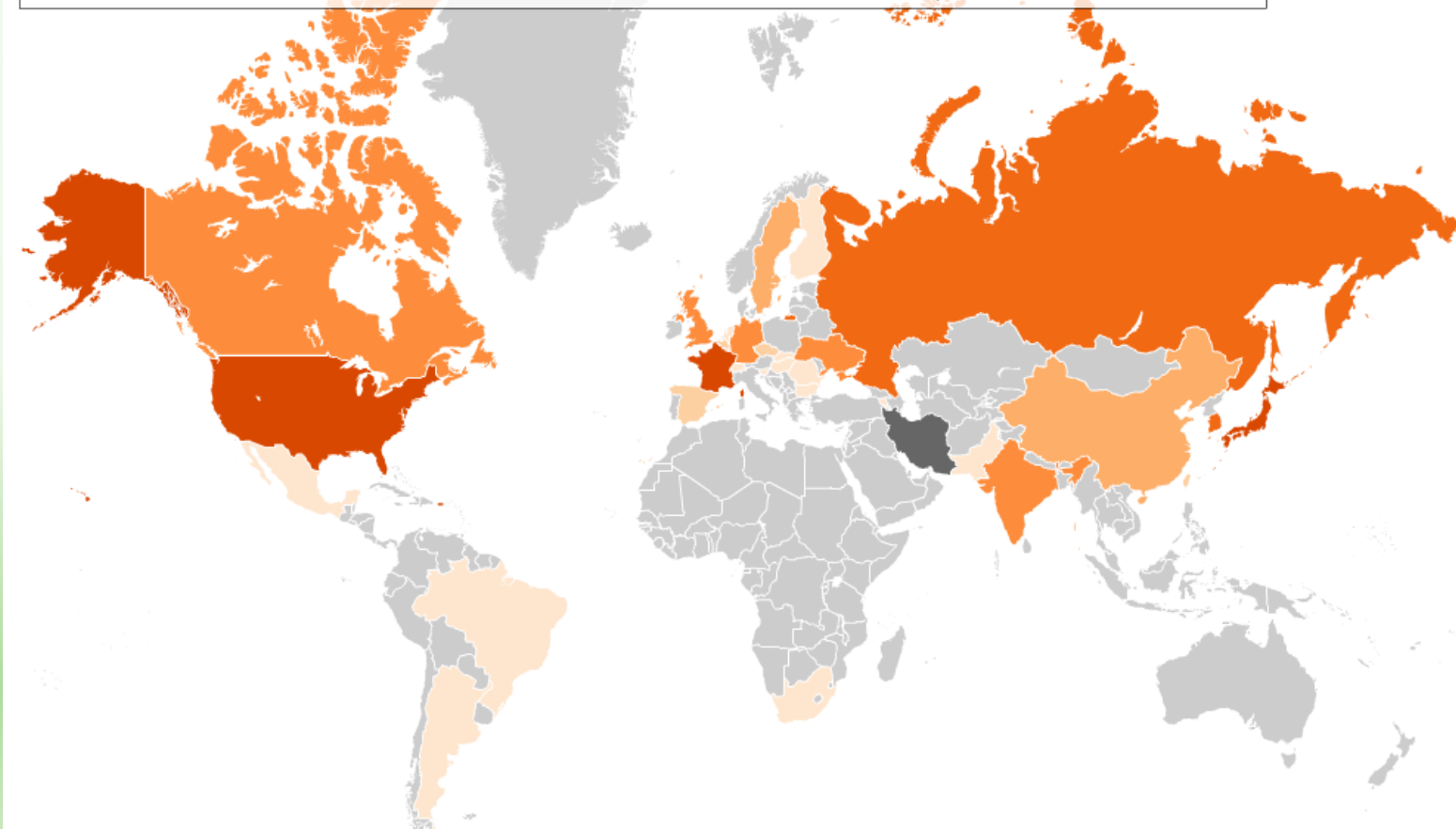


Nuclear energy

Global perspective

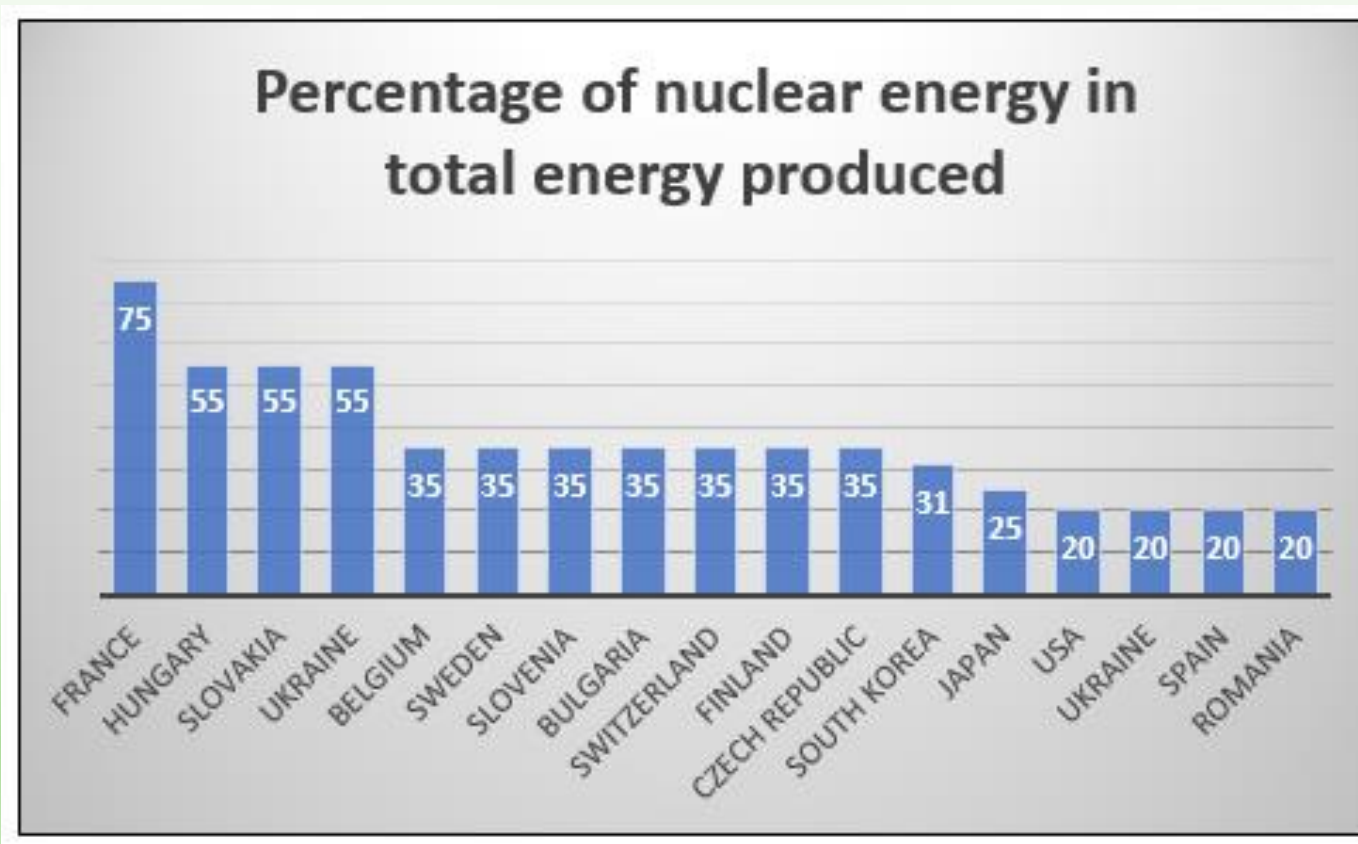
Reactors worldwide in 2011: **443**

Nuclear reactors 1-5 6-10 11-15 16-20 21-50 51+ No nuclear power Under construction*



Nuclear energy

Global perspective



Nuclear energy

Advantages

Low pollution

Low operating costs

Reliability

Renewable?

Nuclear energy

Disadvantages



Environmental impact



Radioactive waste disposal

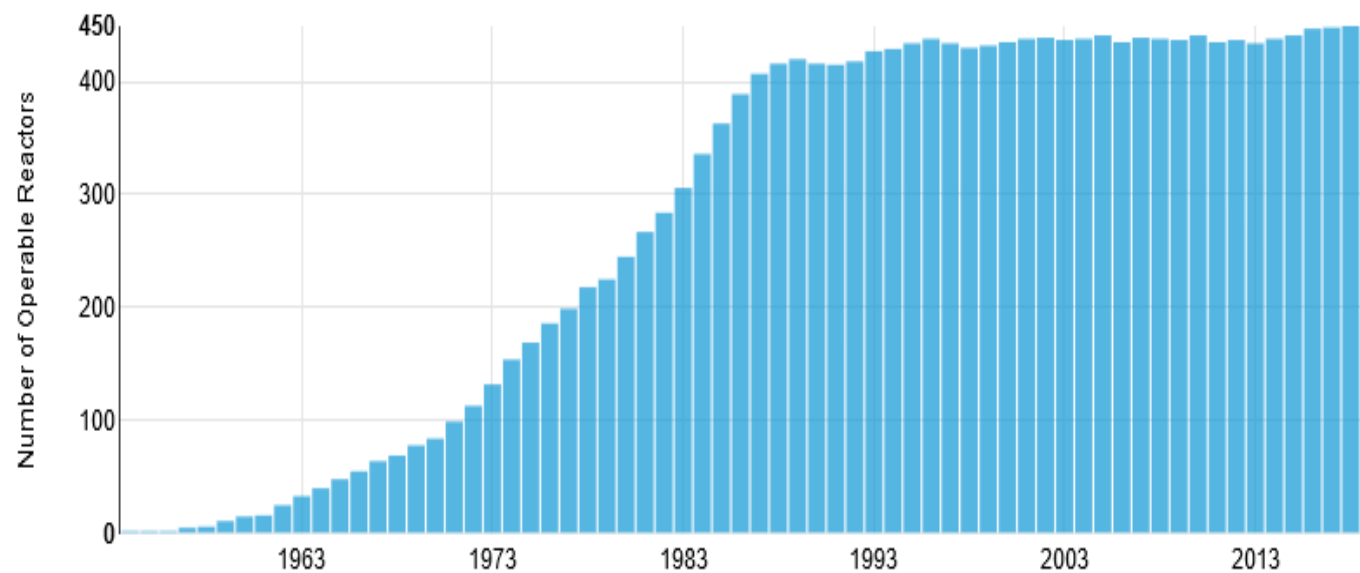
Nuclear accidents

High cost

Nuclear energy

Global perspective

Number of Operable Reactors Worldwide



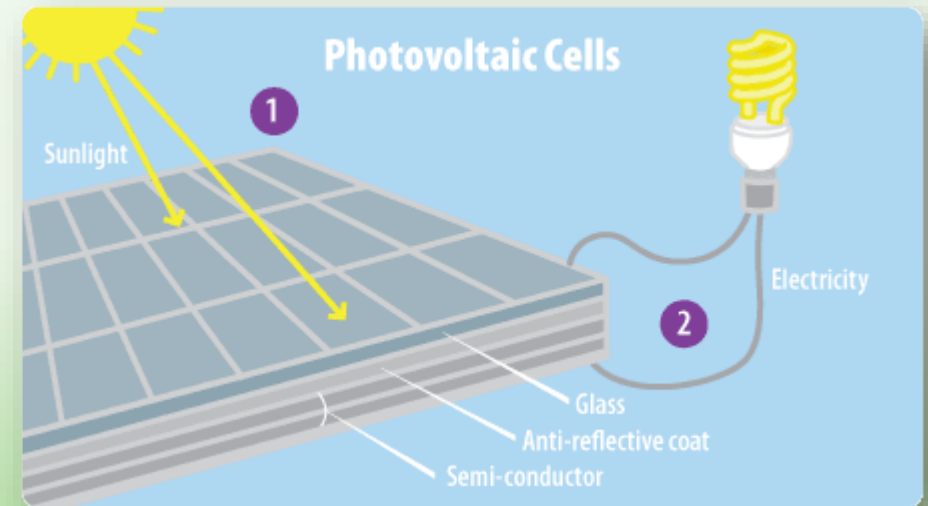
Solar Energy



Solar energy

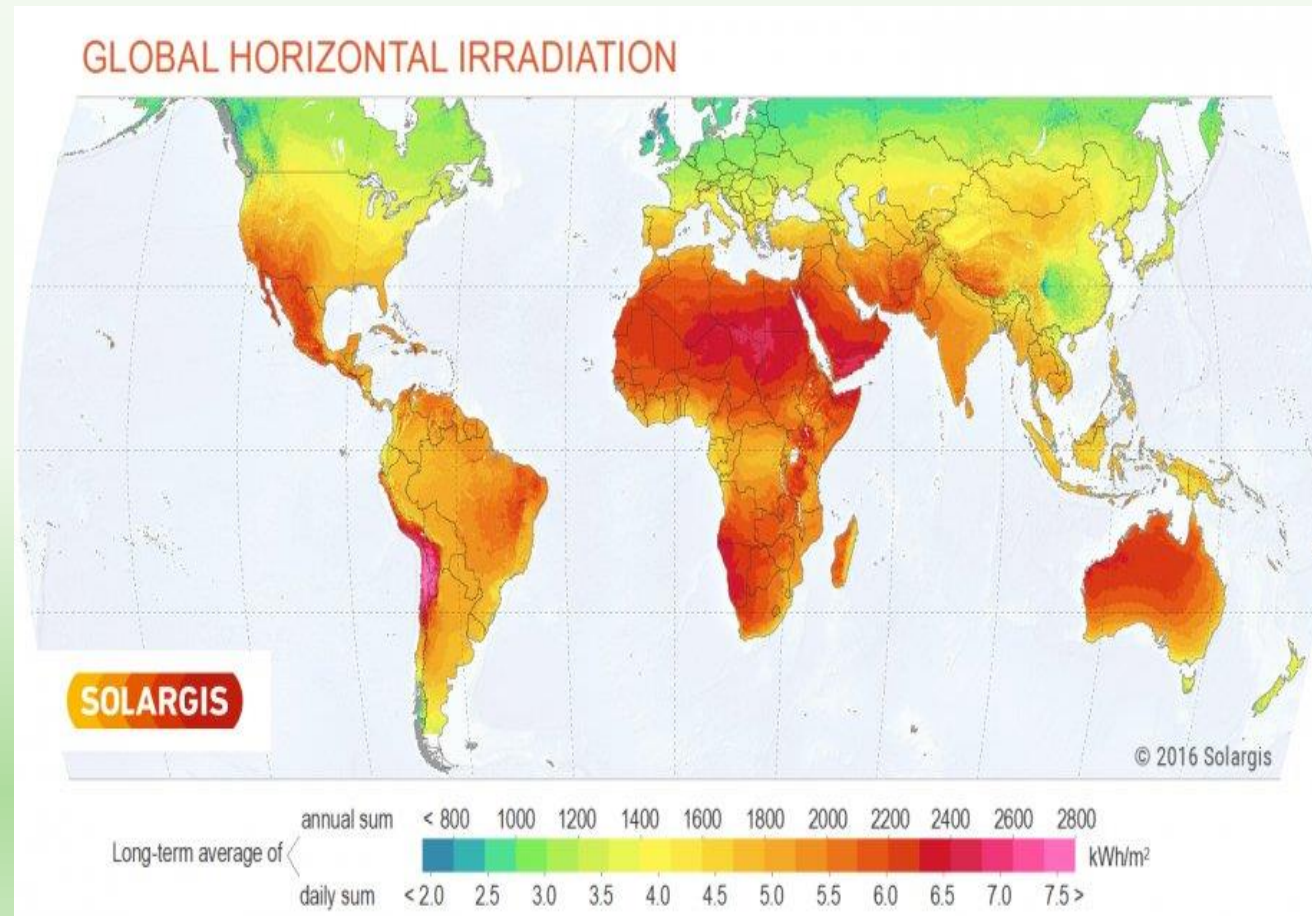
What is it?

- Solar panels convert solar energy into usable electricity through a process known as the photovoltaic effect.



Solar energy

Global perspective



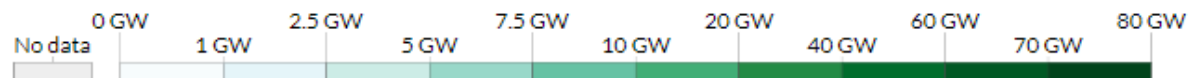
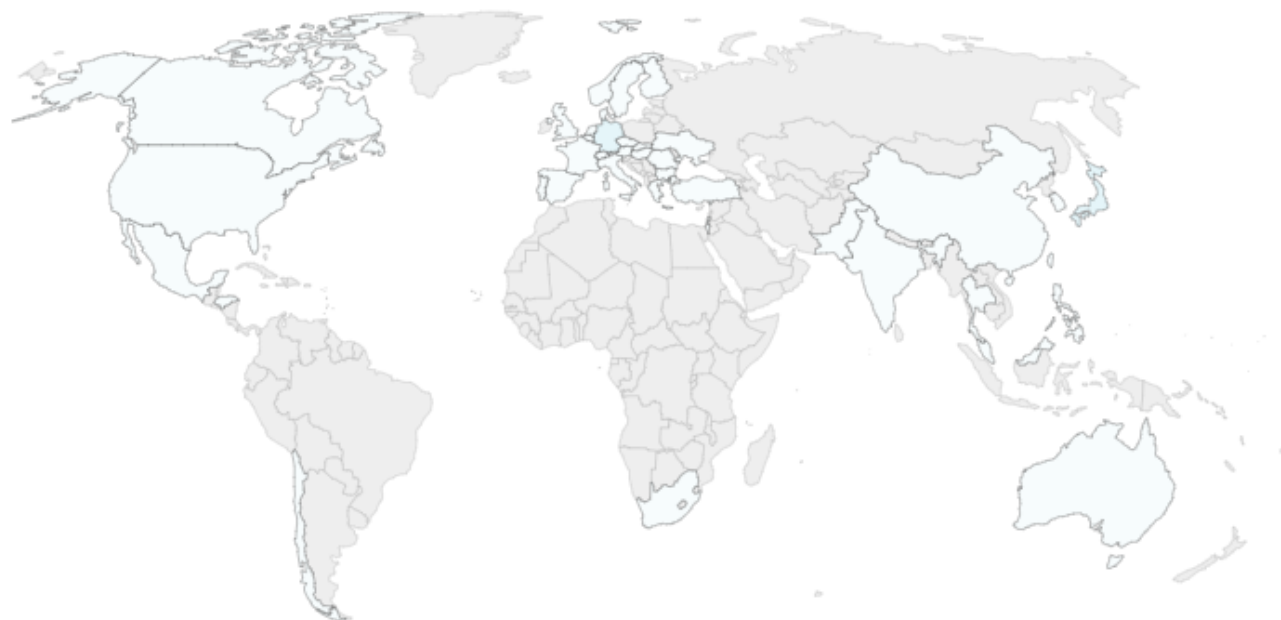
Solar energy

Global perspective

Installed solar photovoltaic (PV) capacity, gigawatts, 2004

Cumulative installed solar photovoltaic (PV) capacity, measured in gigawatts (GW).

Our World
in Data



Source: BP Statistical Review of Global Energy

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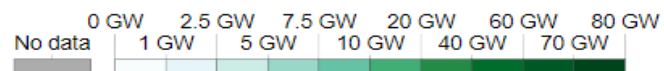
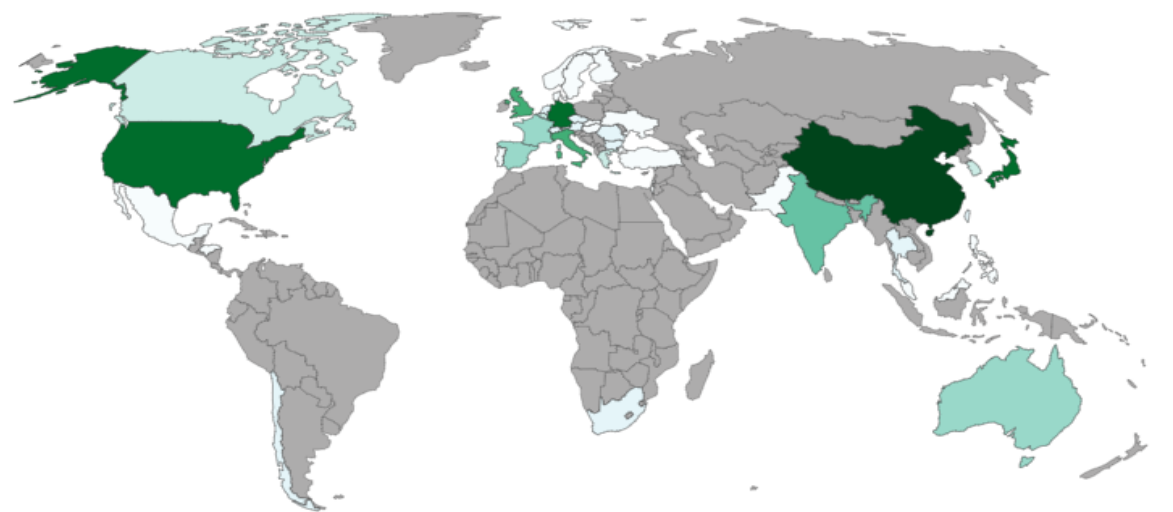
Solar energy

Global perspective

Installed solar photovoltaic (PV) capacity, gigawatts, 2016

Cumulative installed solar photovoltaic (PV) capacity, measured in gigawatts (GW).

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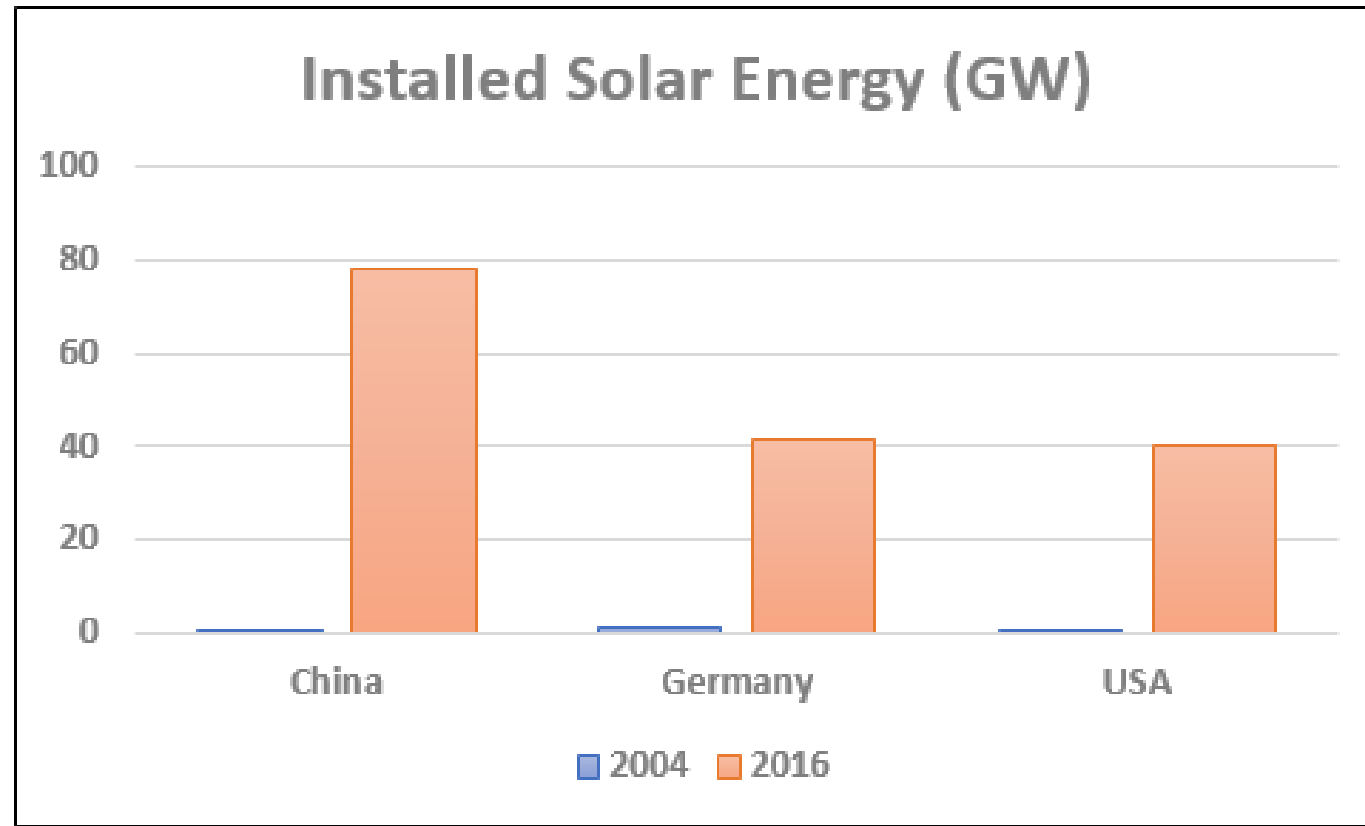


Source: BP Statistical Review of Global Energy

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Solar energy

Global perspective



Solar energy

Advantages

Renewable

Abundant

Sustainable

Good availability

Solar energy

Disadvantages

```
graph TD; A[Disadvantages] --> B[Expensive]; A --> C[Intermittent]; B --> D[Energy storage is expensive]; C --> E[Requires space];
```

Expensive

Intermittent

Energy storage is expensive

Requires space

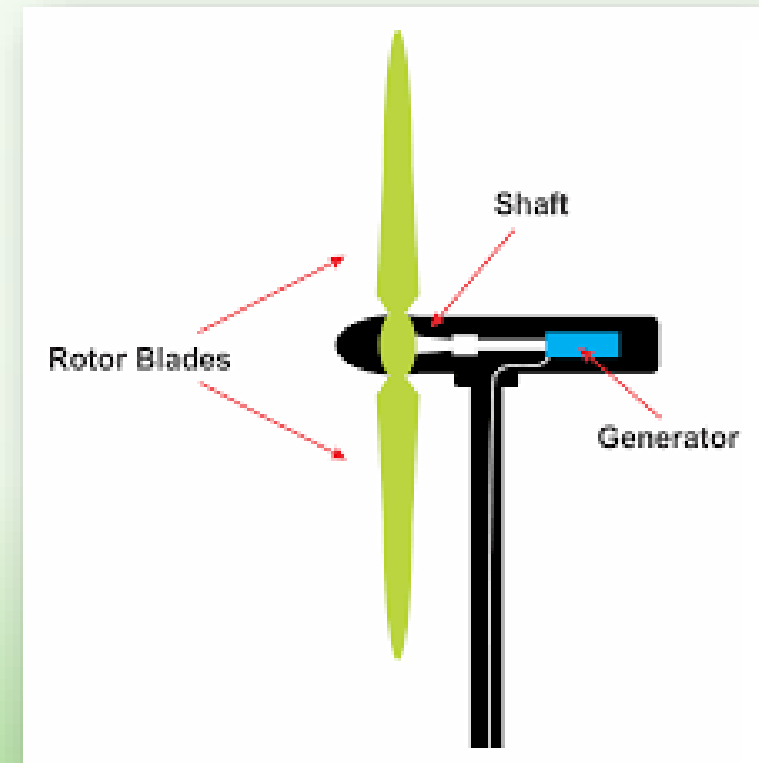
Wind Energy



Wind energy

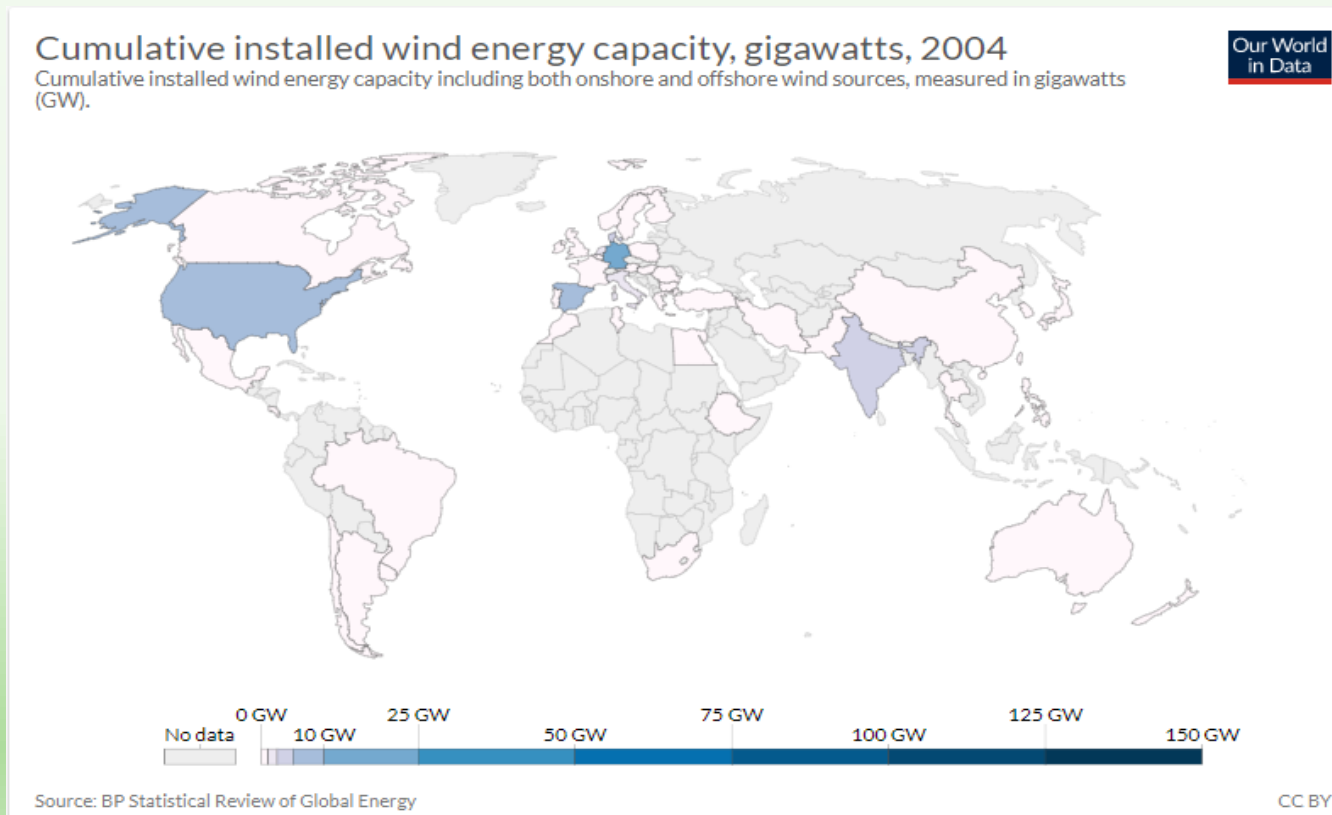
What is it?

- Generates electricity from the wind
- Wind turns the blades of a turbine around a rotor, which spins a generator, which creates electricity



Wind energy

Global perspective



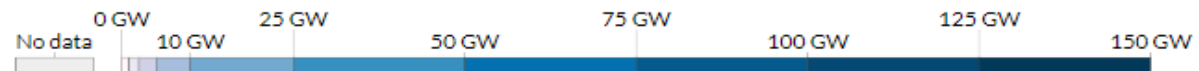
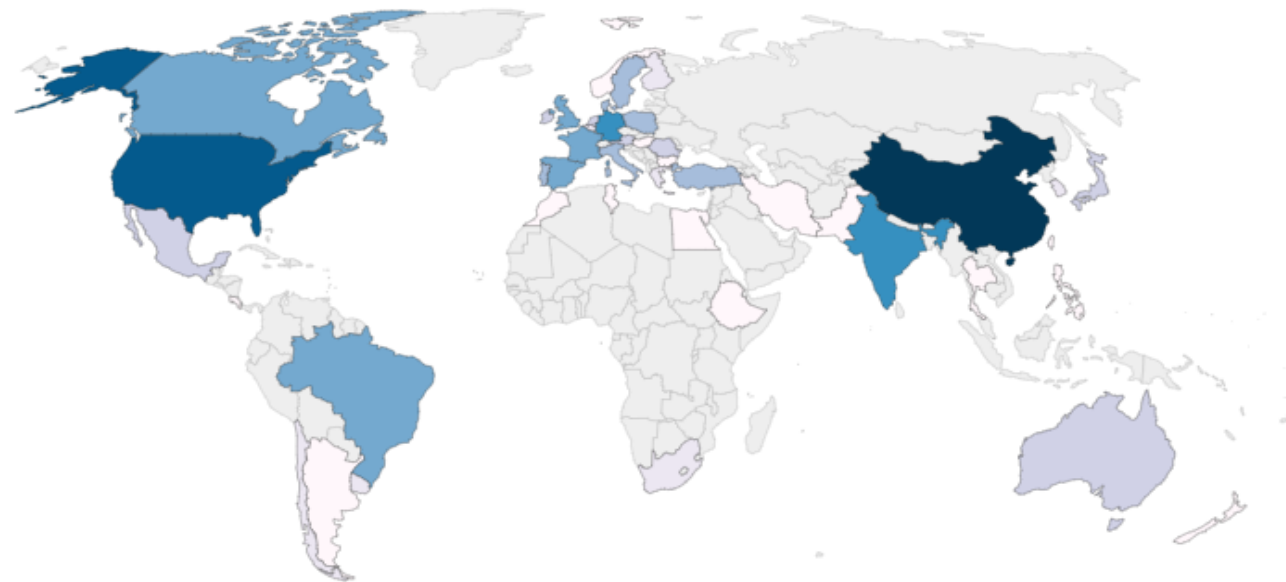
Wind energy

Global perspective

Cumulative installed wind energy capacity, gigawatts, 2016

Cumulative installed wind energy capacity including both onshore and offshore wind sources, measured in gigawatts (GW).

Our World
in Data

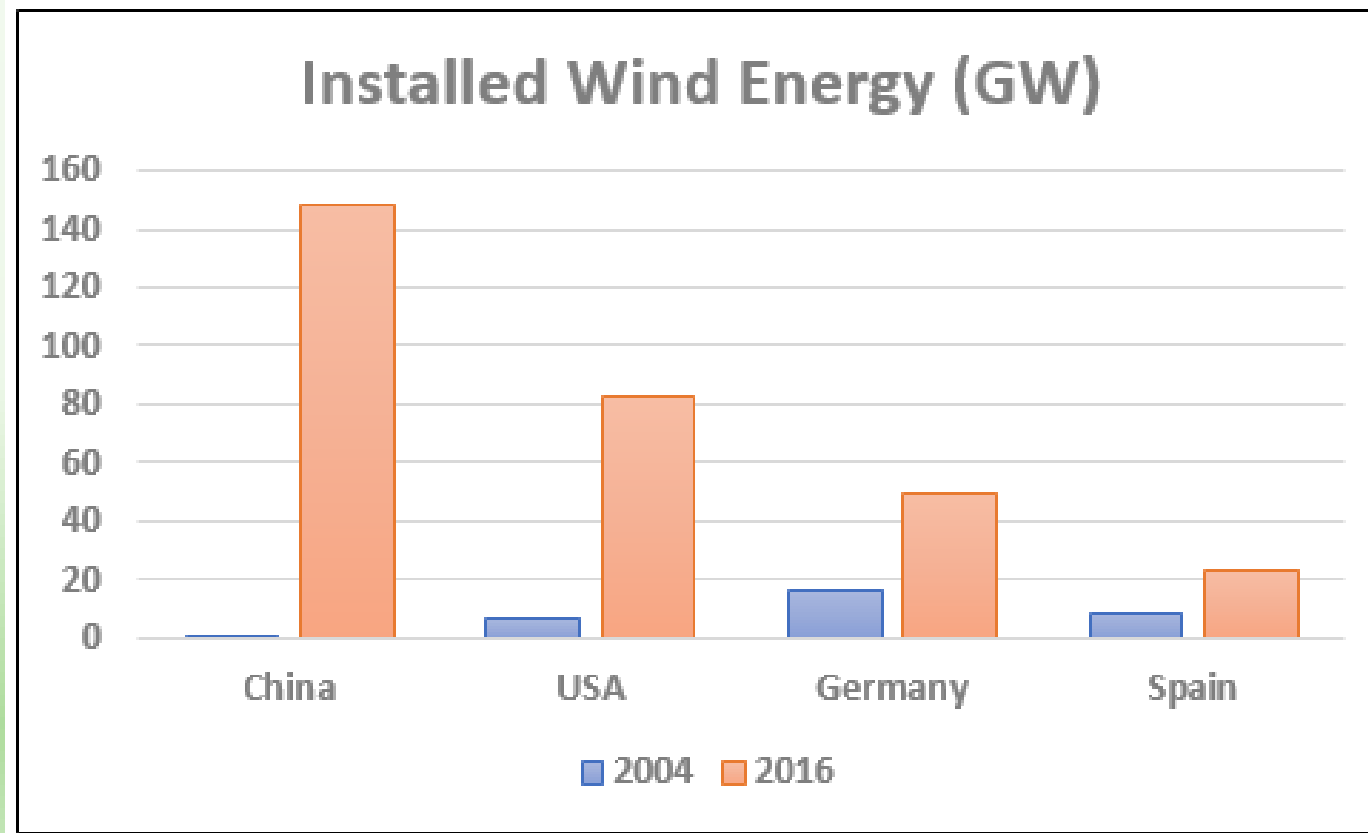


Source: BP Statistical Review of Global Energy

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Wind energy

Global perspective



Wind energy

Advantages

Green

Potential

Low cost

Wind energy

Disadvantages



Wildlife threat



Intermittent

Wind turbines look



Colégio
Paulo VI



How can we save energy?



Every day...

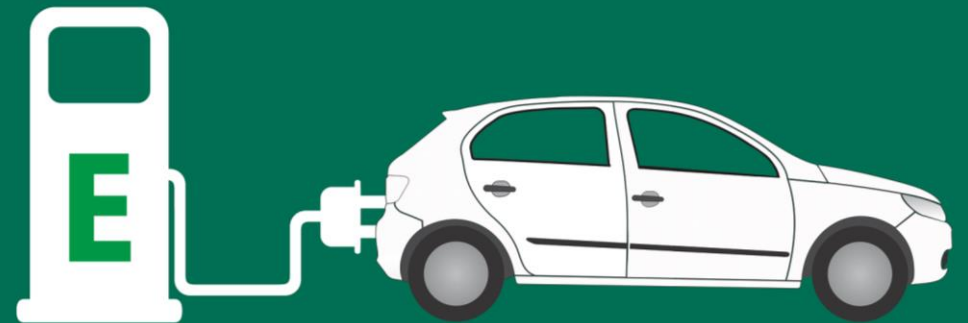
- Take full advantage of natural light and use artificial light only when necessary;
- Use of economical lamps;
- Switch off the appliances, avoiding standby mode;
- Do not leave phone chargers or tablets plugged in;
- Opting for more efficient class A+++ air conditioning solutions reduces energy consumption;
- Turn off lights whenever leaving a room;
- Reuse, reduce and recycle strategy.



Long-term...

Use of electric cars;
Self sufficient houses;
Green transportation.

Electric cars :



Economical lamps:





Colégio
Paulo VI



9ºA / 9ºD