

A photograph of a nuclear power plant at night. Several large, dark, cylindrical cooling towers are visible, with white steam or smoke rising from them into a dark blue sky. The plant's lights are reflected in a body of water in the foreground. The overall scene is dimly lit, with the primary light sources being the plant's own lights and the steam.

Nuclear Fission

"And lord, we're especially thankful for nuclear power, the cleanest safest energy source there is. Except for solar, which is just a pipe dream." -Homer Simpson

The gasoline it uses (Not literal gasoline)



- The most used fissile fuel is Uranium Oxide
 - The used uranium is mostly the Uranium-235 isotope
 - About 0.72% of the uranium available in the nature is U-235
- Plutonium-239, which is created in nuclear fission, is also a suitable fuel for some reactors
 - Plutonium can be produced with U-238, which is more common in nature than U-235
- Uranium-233 can also be used in a nuclear reactor and can be bred from thorium (Th-232)
 - By breeding thorium the uranium could last for over 10 000 years



90 Th 232,0	94 Pu	92 U 238,0
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I fucking cannot stand it at all that all nuclear power plants do is boil water. The history of humanity is nothing but boiling water. In the future there will be new ways to boil water and that's it. Fuck it.

- Nuclear fission is based on releasing the bound energy of atoms.
- Nuclear fission is used in condensing power plants.
- The energy released is used to boil water which is then used to spin a turbine

Nuclear energy in Italy

- In the early days of nuclear energy in the late 1940's and the 50's, Italy played a leading role in nuclear energy research, establishing the first scientific body to pursue it.
- By 1964, Italy had built 3 different nuclear power plants, and in May of 1978, a fourth one started operation. This was the last nuclear power plant built by Italy.
- After the Chernobyl nuclear disaster in April of 1986, trust in nuclear energy around the world fell greatly. This eventually led to a referendum in Italy on the abolition of nuclear power production and the phasing out of its power plants. This was overwhelmingly accepted by the population.
- In September of 2021, a poll conducted by Statista Research Department (3,200 respondents), around 51% were in favour of restoring nuclear power production in Italy in one form or another

Nuclear fission in Finland.

- Finland has 5 nuclear reactors and 2 nuclear power plants
 - 2 of the reactors are in Loviisa and 3 in Olkiluoto
- 27% of Finland's energy production is nuclear fission.
- The Olkiluoto 3 reactor is the 8. most expensive building in the world



FUSION POWER: THE ENERGY SOURCE OF THE FUTURE (RAHHH)

- Not currently possible
 - Requires at least 10 million degrees of heat to work
 - Fuel is really rare
- You know it's good because the sun uses it
 - Nuclear fusion produces 4 times as much energy as nuclear fission on a mass basis
- The solar opposite of fission: Instead of ripping things apart they are combined together
- Instead of radioactive elements, very light elements are used instead
 - Current experimental reactors have mostly been using tritium (^3H) and deuterium (^2H)
 - Tritium, being very rare, is usually produced from irradiating lithium
 - Some scientists see helium-3 as a possible alternative
 - A lot of helium-3 is thought to be able to harvest from the moon

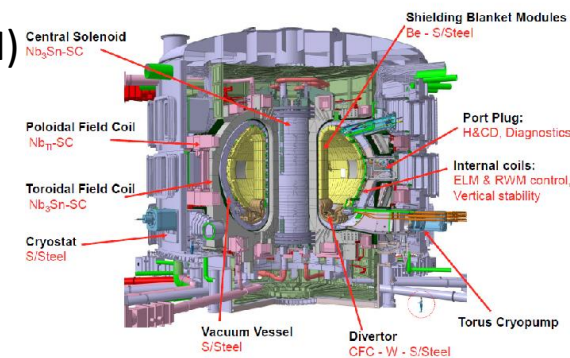
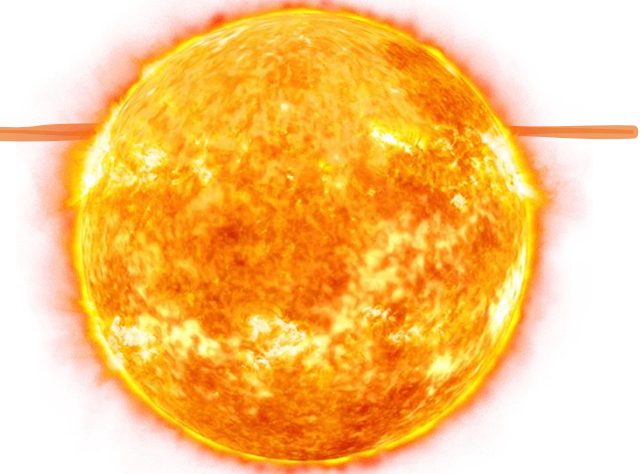


Figure 1. ITER cryostat and vacuum vessel with magnets

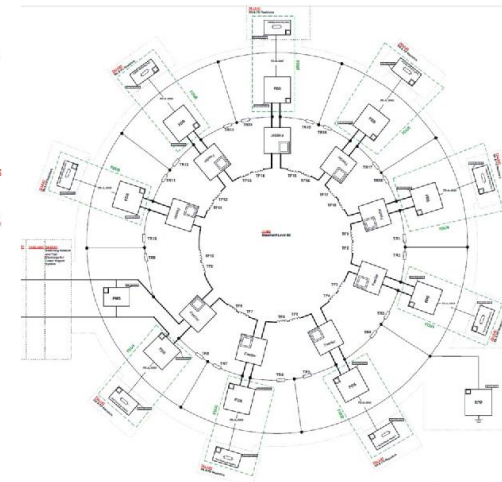
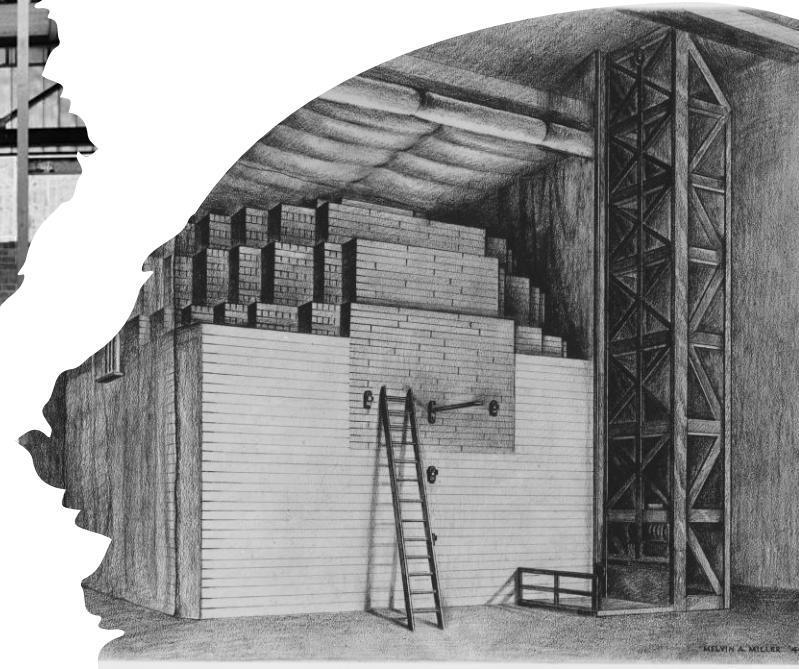
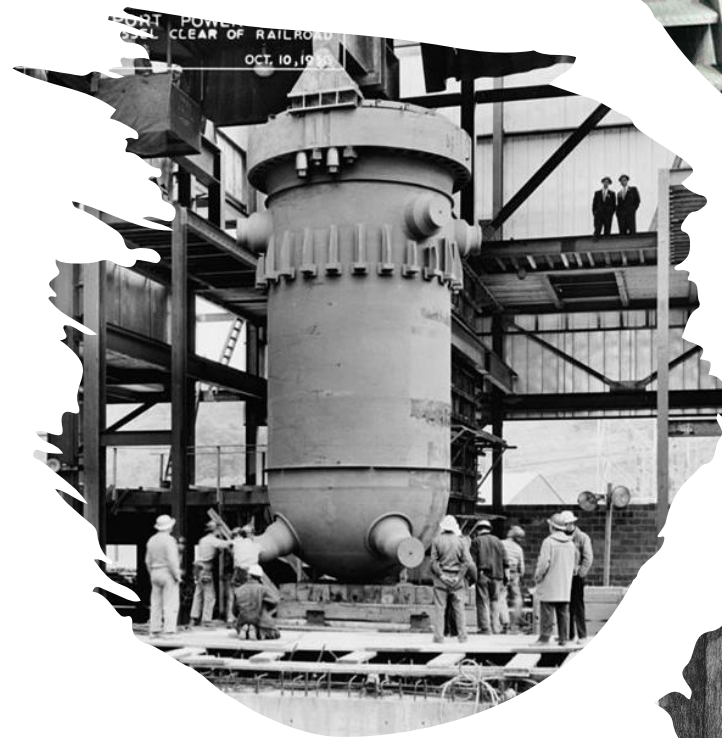


Figure 2. Nine pairs of toroidal coils around the vacuum vessel are electrically in series.

History of nuclear fission

- First reactor was build in chigago
 - Turned on 1942
 - Turned off 1943
 - It was used to build the first nuclear weapons
- First nuclear power plant (EBR-1) started to produce electricity 20.12.1951
 - It was only a testreactor.
 - It was only able to produce enough energy to light 4 incandesent light bulbs



Statistics

- Electricity sector
- **Total generation (in 2020):** 281 TWh
- **Generation mix:** natural gas 138 TWh (49%); hydro 48.6 TWh (17%); solar 24.9 TWh (9%); biofuels & waste 22.2 TWh (8%); wind 18.7 TWh (7%); coal 13.1 TWh (5%); oil 9.8 TWh (4%); geothermal 6.0 TWh (2%).
- **Import/export balance:** 32.2 TWh net import (39.8 TWh imports; 7.6 TWh exports)
- **Total consumption:** 275 TWh
- **Per capita consumption:** c. 4600 kWh in 2020
- More recently, in July 2021, a public opinion poll conducted on behalf of Comitato Nucleare e Regione found that over half of respondents would not exclude the future use of advanced nuclear technologies.