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Nuclear Energy

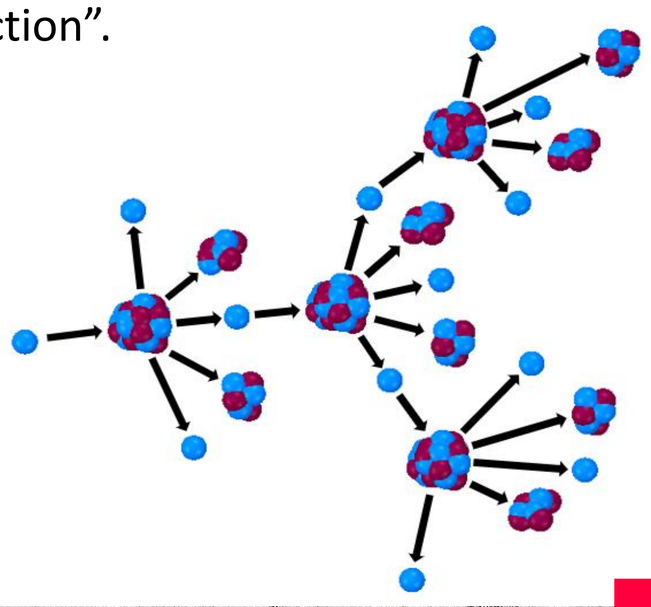
Fission reaction

Current nuclear power plants are based on the exploitation of the fission reaction, in which a neutron induces the splitting of a heavy nuclide (e.g. uranium) into two lighter ones. A significant release of energy takes place in this process, which is used to feed a steam cycle, leading to the production of electricity.

Chain reaction

Neutrons are also produced in fission reactions. Such neutrons can induce more fission reactions and lead to the so-called “chain reaction”.

A correct design of the system can lead to a controlled chain reaction, generating a self-sustained fission process, in which energy is produced continuously for long periods of time.



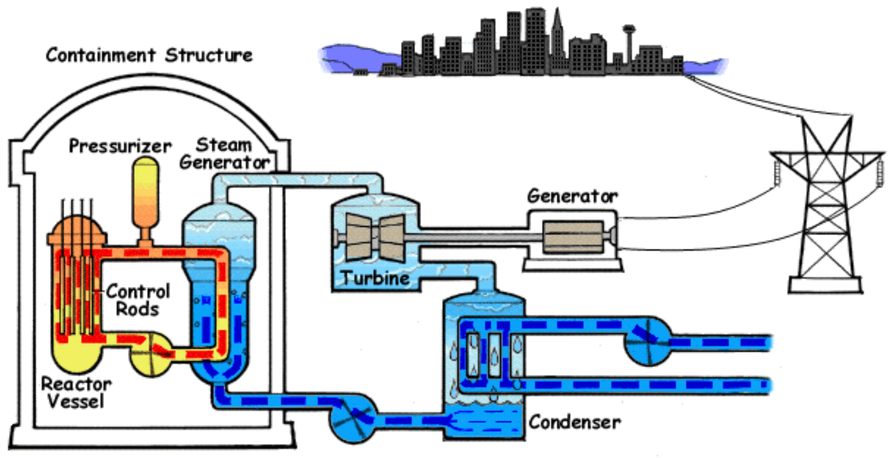
High energy density

Over 11% of the world's electricity is produced in 454 operating nuclear reactors, which can sustain operation for up to two years without refueling.

Technology

Many types of nuclear fission reactor exist. The most common types are the pressurized water reactor (PWR) and the boiling water reactor (BWR), which accounts for the 82% of the current reactors worldwide. Other types are: PHWR/CANDU, AGR, FNR and advance reactors.

PWR operating scheme

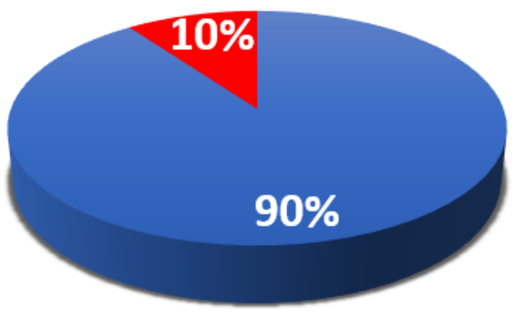


Did you know?

The gas coming from a nuclear power plant cooling tower is just water vapour. Neither carbon dioxide nor sulfur emissions, which are major contributors to the greenhouse effect and acid rain, are produced in a nuclear power plant.

Nuclear power plants are safe facilities. Only three major accidents have occurred in over 17000 cumulative reactor-years.

Nuclear power plant radioactive waste



- Low-Level Waste and short-lived Intermediate-Level Waste: similar to some hospital wastes and those of certain industrial sectors.
- High-Level Waste and Long-lived Intermediate-Level Waste: not particularly hazardous to manage either, specially when compared to other toxic industrial waste.

UNED, G. Pedroche, AJ. López, R. Juárez

Acknowledgements & references

http://nuclearconnect.org/know-nuclear/applications/energy
https://www.nrc.gov/reading-rm/basic-ref/students/animated-pwr.html
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Coordinated Support Action in the H2020 EURATOM NFRP12 Support for careers in the nuclear field (2016-2017)