

# Nuclear fission and nuclear fusion – what's the difference?

[Environment](#), [Nature](#)



With 450 power plants in operation and producing over 14% of the electricity used worldwide. Needless to say, nuclear energy is one of the most frequently used energy on Earth. Nuclear energy, defined as the energy that is released during the process of nuclear reaction, is produced by the process of nuclear fusion and fission. Nuclear fusion and fission are both nuclear phenomena that release a huge amount of energy due to the high-powered atomic bonds found in a nucleus. How are these two processes different? Does it affect the nuclear energy that it is produced?

To give a simple difference between these two, we could say that nuclear fission is the process a large atom splitting into two, nuclear fusion is the combination of two atoms into one. These two are opposing processes, which gives these two their own features.

The word “ fission” literally means breaking or splitting into different parts. Heavy elements with atomic numbers greater than 90 are fissionable. Nuclear fission happens when a large, unstable isotope is bombarded by high-speed particles, which are in most cases neutrons. After the neutrons are accelerated, they slam into the unstable isotope, causing nuclear fission. It splits the unstable isotope into smaller particles. The nucleus that the accelerated neutron hits is mostly Uranium-235. After nuclear fission, there are two smaller isotopes (barium-141 nucleus, and krypton-92 nucleus), three neutrons and a huge amount of energy. Nuclear fission is much cheaper than nuclear fusion. And it could also produce a large amount of energy with a relatively smaller amount of fuel. But the biggest problem with nuclear fission is the radioactive waste produced during the process.

Radioactive wastes could emit radiation for thousands of years that could pollute the air and the water. Nuclear fission normally does not occur naturally. The reason is because nuclear fission requires a large mass and an incident neutron. It is predicted that the last naturally occurring nuclear fission happened approximately two billion year ago.

The word fusion means “ a merging of separate elements into a unified whole”. Nuclear fusion refers to the “ union of atomic nuclei to form heavier nuclei resulting in the release of enormous amounts of energy”. Nuclear fusion is the process of atomic nuclei being fused together to form a single heavier nuclei. Nuclear fusion requires extreme high temperature and pressure. Nuclear fusion requires approximately 100 million degree Celsius and hydrogen atoms must be squeezed within  $1 \times 10^{-15}$  meters for nuclear fusion to occur. Nuclear fusion does not produce any radioactive waste or greenhouse gases. Also, the hydrogen fuel is basically unlimited. It is available no matter when or where. But the problem with nuclear fusion is that nuclear fusion is extremely challenging to produce in Earth. The extremely high temperature and pressure, which is required for the process, is a huge challenge to create on Earth.

In my opinion, nuclear fission and nuclear fusion, these two processes of generating nuclear energy could bring human a huge leap in technology. Hopefully, one day, people would be able to use nuclear energy, with nobody fearing nuclear energy because of the radioactive wastes.