# Deuterium Fusion

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The most practical source of inexhaustible energy is D-D-T fusion. D-D-T fusion requires the abundant, non-radioactive isotope of hydrogen, deuterium, which has one proton and one neutron in its nucleus. Deuterium occurs in the seas at a rate of 1 part in 6500 of hydrogen. It can be transported to the fusion power plant as heavy water ($D_2O$). It is estimated that at current power consumption levels, there's enough deuterium on Earth to supply 50 million years of electric power.

Fusion power plants consist of a reactor and an AC generator. The reactor is a magnetic confinement torus known as a tokomak. The tokomak confines deuterium plasma at 400 million degrees kelvin in order to fuse deuterium as per the following reactions:

$$(1) \quad D + D \rightarrow He^3 + n + 3.27meV$$

$$(2) \quad D + D \rightarrow T + H + 4.03meV$$

The first reaction releases the non-radioactive isotope of helium, $He^3$, whereas the second reaction releases standard hydrogen. The tritium reaction product in equation (2) is reabsorbed by the plasma, and reacts with the deuterium as follows:

$$(3) \quad D + T \rightarrow He^4 + n + 17.6meV$$

It is possible to regulate the reactions so that Eq.(2) occurs more often than Eq.(1). This is called autoflux fusion. The result is that Eq.(3) occurs more often, resulting in a significant power upgrade.

The tokomak requires extensive computer controls in order to confine a deuterium plasma. High-speed supercomputers are used here. One of the reasons why D-D-T fusion wasn't available in the past was because these computers weren't available. Now that Multipeg Towers of Chicago has been solved, these computers are available (the Multipeg puzzle provides a massive computer speed boost). These computers are petaflop computers, meaning $10^{15}$ calculations per second (quantum computers). In order to reach the Lawson criterion for self-sustaining D-D-T fusion, such computers are needed to model the deuterium plasma.