In Inertial Confinement Fusion (ICF) a capsule or target containing cryogenic deuterium and tritium is compressed directly (using lasers or a magnetic field) or indirectly (using x-rays). ICF has the advantage that it primarily uses easily available isotopes of hydrogen and has no radioactive waste products. However, at least two challenges need to be overcome before the successful operation of a fusion power plant – ignition and a demonstration of a test fusion facility. The former is discussed in this talk. The holy grail of fusion research is ignition – when more energy is released in the fusion process than the input energy.

This talk will primarily focus on laser driven ICF, describing the physics of ICF implosions. Scaling laws are used to illustrate the physics parameters that determine ignition. Laser direct drive experiments are conducted on the OMEGA laser and at the National Ignition Facility with the goal of studying the physics of implosions. Some results from these experiments are described. The status of ICF, including challenges towards achieving ignition, is discussed.