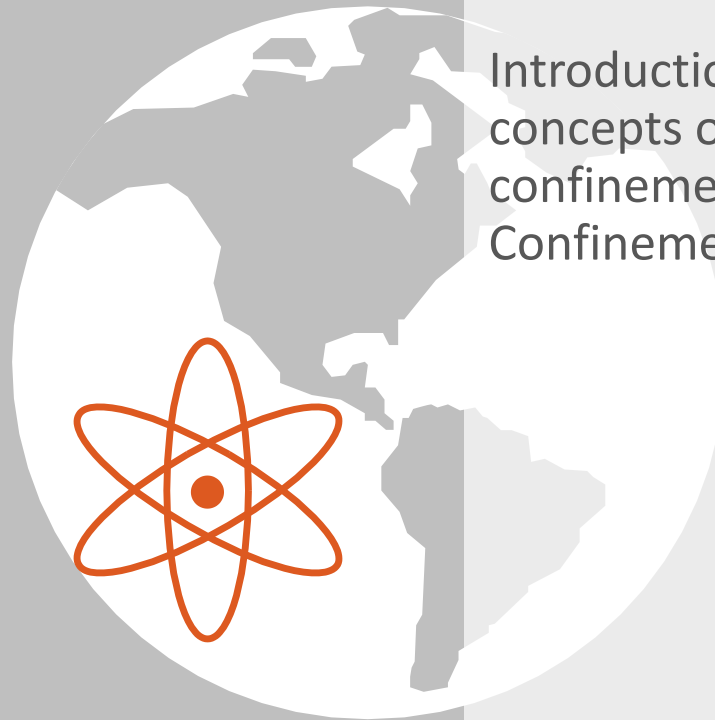


HOW TO CREATE FUSION ON EARTH

Introduction to the concepts of ignition, density, confinement and Magnetic Confinement Fusion.



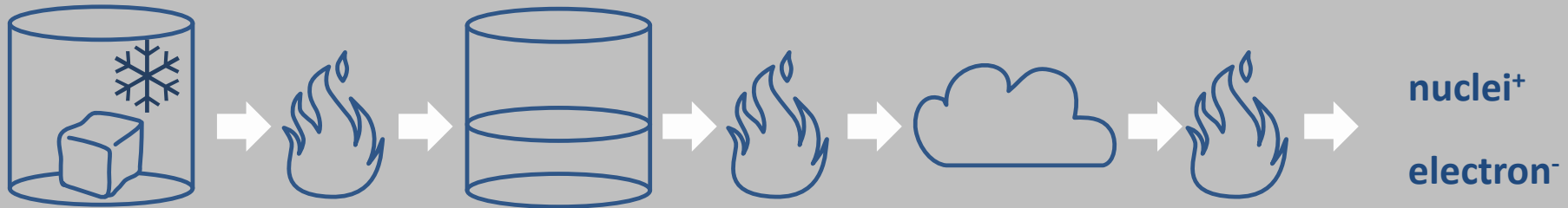
PLASMA IS THE MOST COMMON STATE OF MATTER IN THE UNIVERSE. IT MAKES UP 99% OF ALL OBSERVABLE MATTER.



100 million degrees are required to overcome the repulsion between nuclei. Inside a deuterium-tritium fusion reactor matter enters the state of **plasma**.

THE FOUR STATES OF MATTER

Heating solid substance leads to melting, it becomes liquid. Heating fluid leads to gas phase. Heating of gas leads to plasma.



IGNITION: CREATING A SELF-SUSTAINING FUSION REACTION

In order to start a fusion reaction you have to simultaneously:

Understanding **plasma physics** is essential for creating fusion.



1

keep its
temperature high



2

keep the plasma
confined in volume



3

prevent it from
losing heat

DENSITY IS A
MEASURE OF
HOW CROWDED
A SYSTEM IS

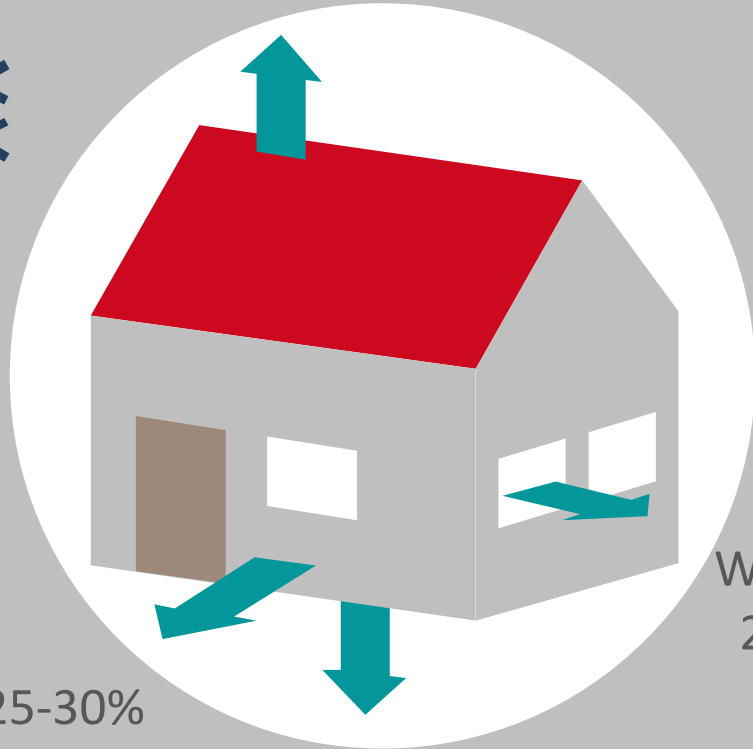


CONFINEMENT
TIME IS A
MEASURE OF HOW
WELL A SYSTEM IS
INSULATED

Heat losses



Roof 25-30%



Windows
25-30%

Walls 25-30%

Floor 10-20%

PLASMA CONFINEMENT IS THE KEY TO ACHIEVING FUSION

Stars are so massive that they rely on

gravitational confinement

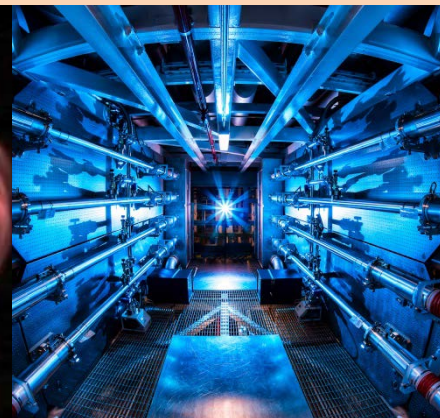


On Earth nuclear fusion does not happen naturally, so we rely mainly on two approaches

magnetic confinement



inertial confinement



MAGNETIC CONFINEMENT FUSION

The plasma is squeezed and its particles spiral along **magnetic field** lines, while **electric fields** heat it

Density is very low:
250 thousand times
less than the Earth's
atmosphere

Confinement time is
long: >seconds

