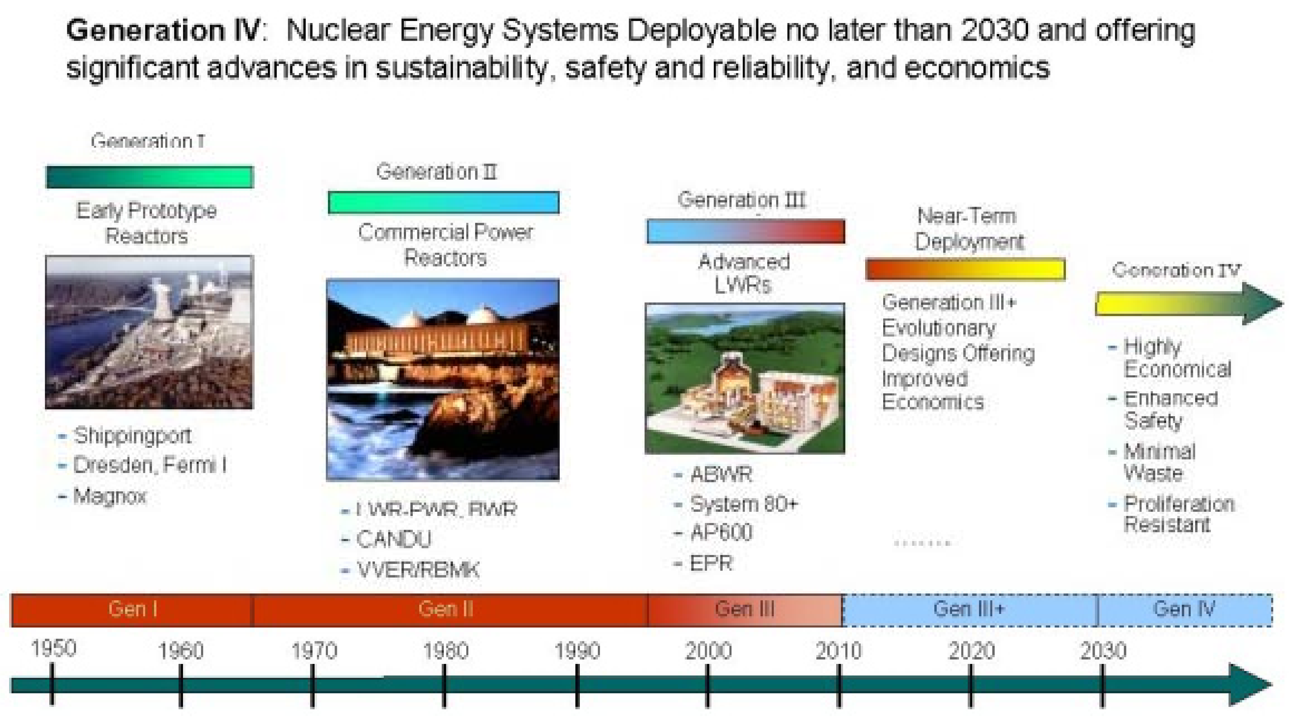
NTech Lehrstuhl für Nukleartechnik

INNOVATIVE NUCLEAR DESIGNS

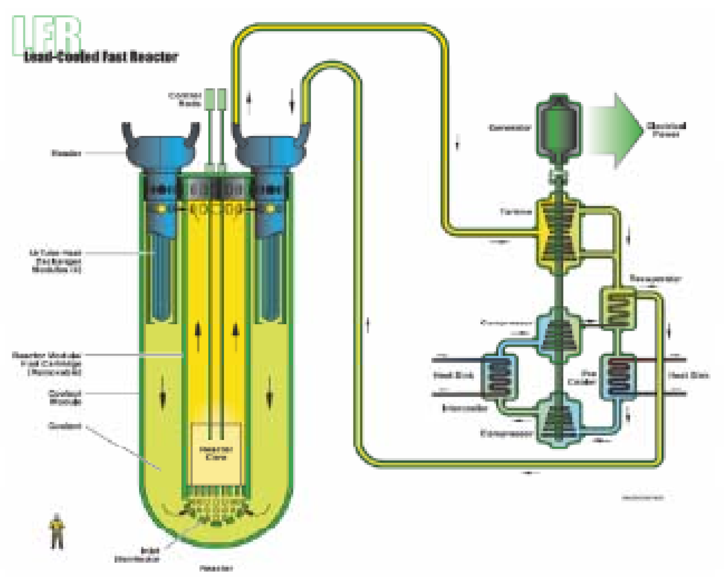
THE FUTURE OF NUCLEAR ENERGY



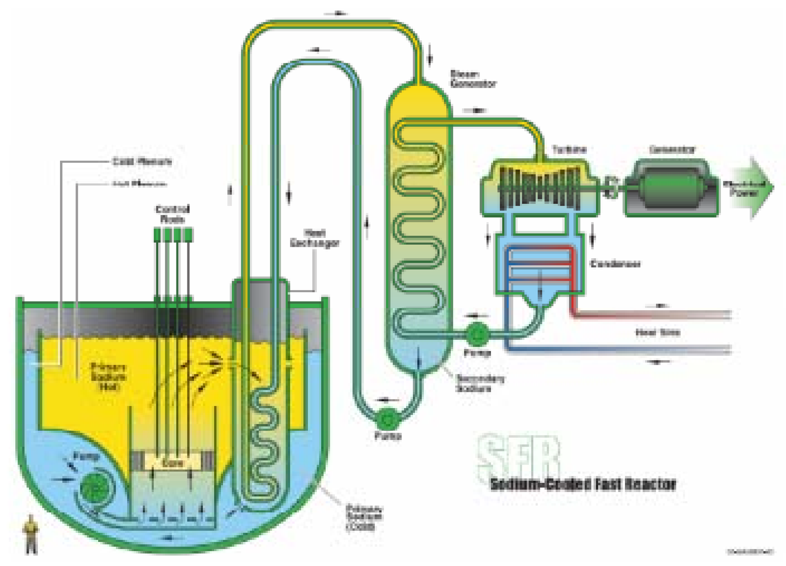
Generation IV reactors aim at providing a sustainable, economical and reliable source of energy with:

- No CO_2 emissions
- Enhanced safety
- Better usage of resources. Higher burn-up
- Lower waste generation. Transmutation of Transuranid elements

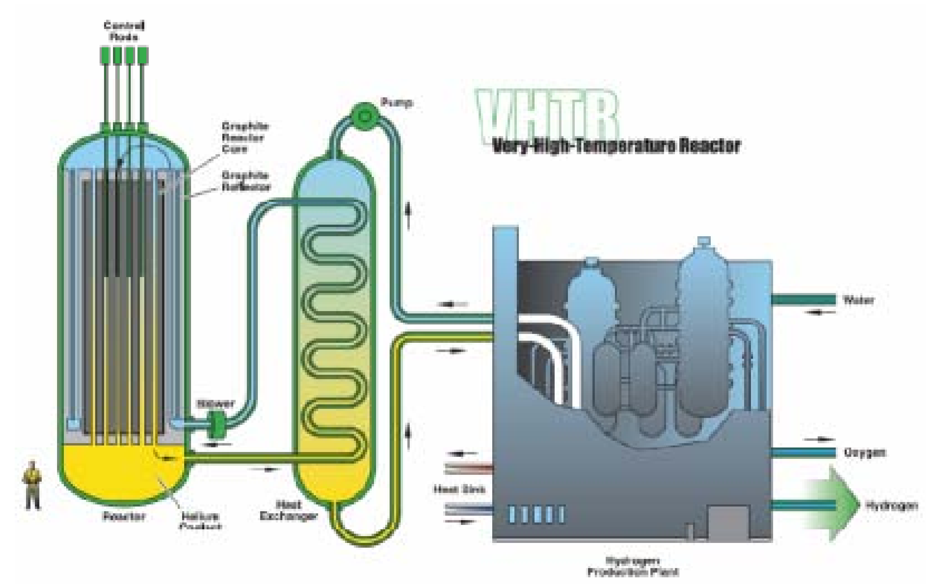
The GenIV International Forum (GIF) approved the study of 6 possible designs:



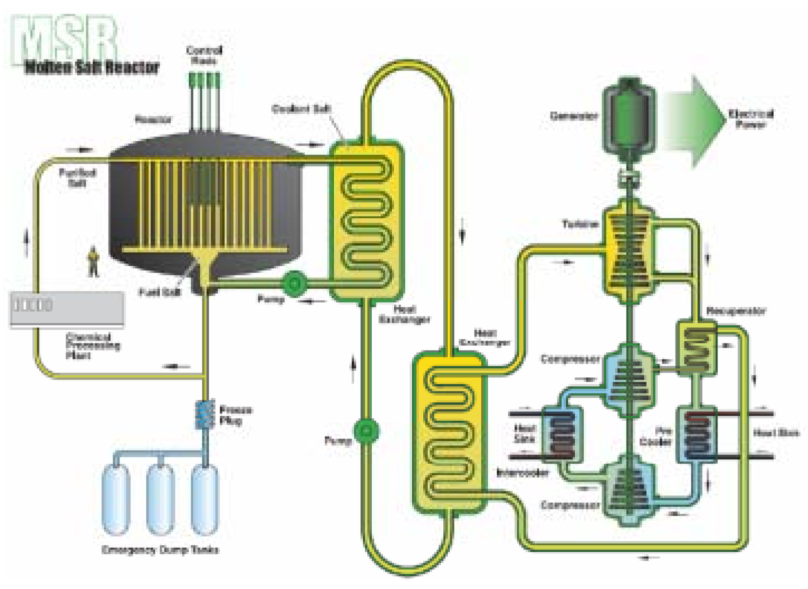
Lead-Cooled Fast Reactor (LFR)
A fast-spectrum lead or lead-bismuth eutectic liquid-metal-cooled reactor and a closed fuel cycle for efficient conversion of fertile uranium and management of actinides



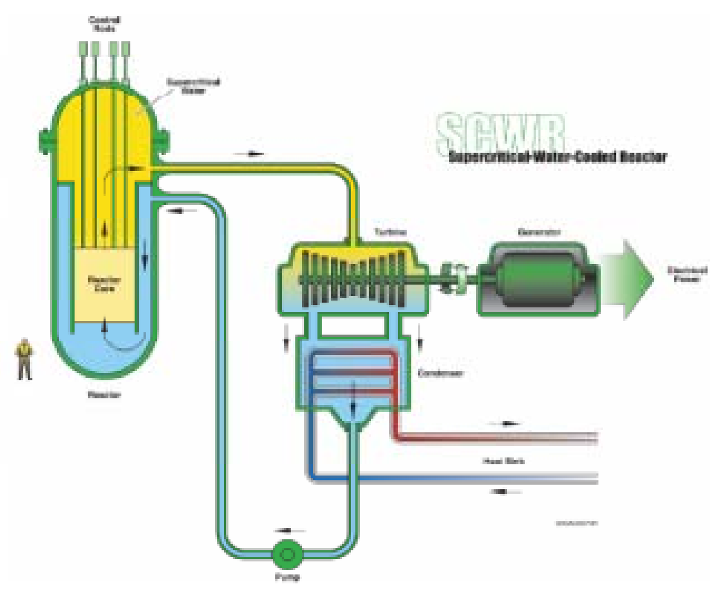
Sodium-Cooled Fast Reactor (SFR)
A fast-spectrum, sodium-cooled reactor and closed fuel cycle for efficient management of actinides and conversion of fertile uranium



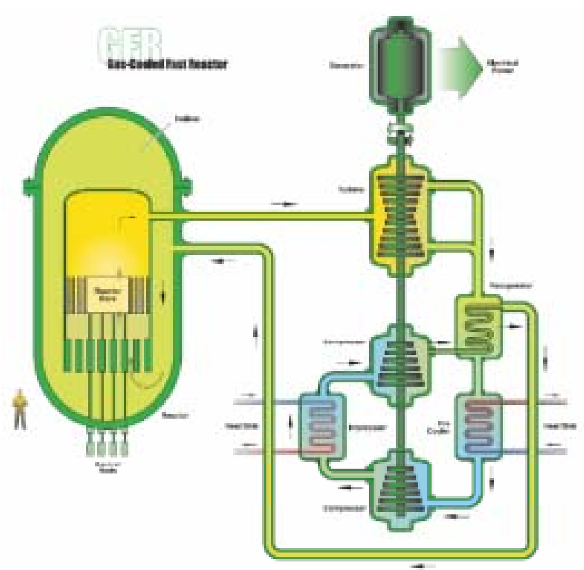
Very-High-Temperature Reactor (VHTR)
Graphite-moderated (thermal spectrum), helium-cooled reactor with a once-through uranium fuel cycle



Molten Salt Reactor (MSR)
It produces fission power in a circulating moten salt fuel mixture with an epithermal spectrum reactor and a full actinide recycle fuel cycle



Supercritical-Water-Cooled Reactor (SCWR)
High-temperature, high-pressure water cooled reactor that operates above the thermodynamic critcal point of water with thermal spectrum

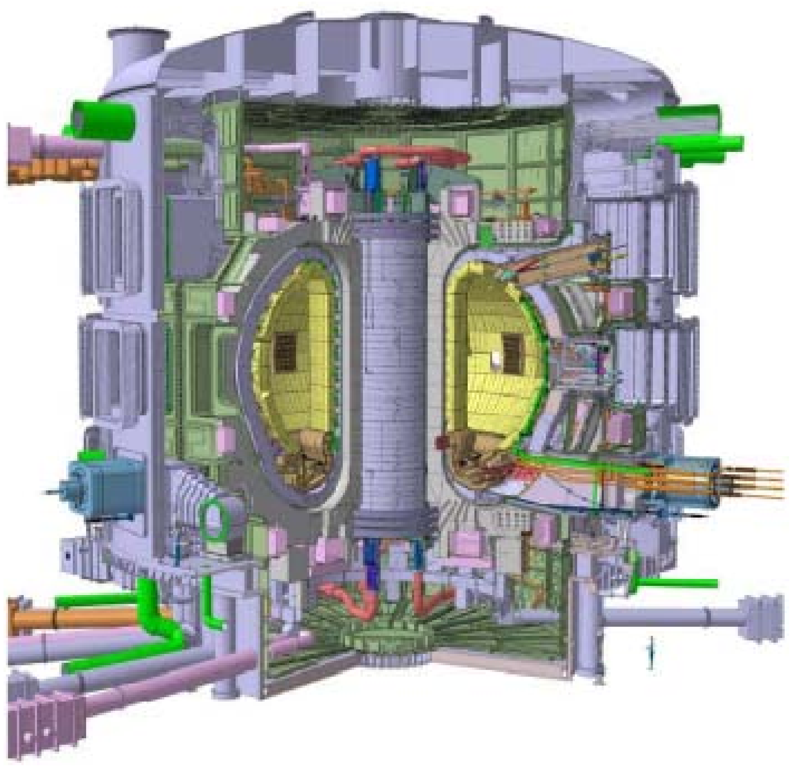


Gas-Cooled Fast Reactor (GFR)
A fast-neurtron-spectrum reactor with helium-cooled reactor and closed fuel cycle

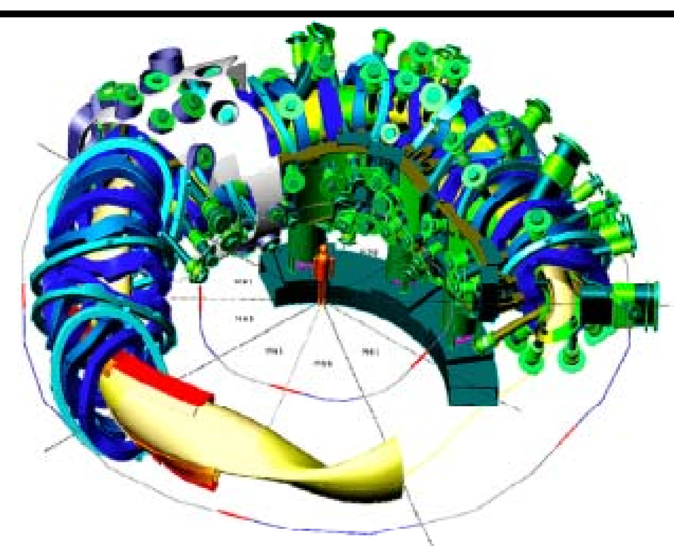
Thermonuclear Fusion is based on the interaction between two light nuclei to form a heavier nucleous.

- High energy density
- Fuel abundance
- No CO_2 emissions
- No high-activity waste

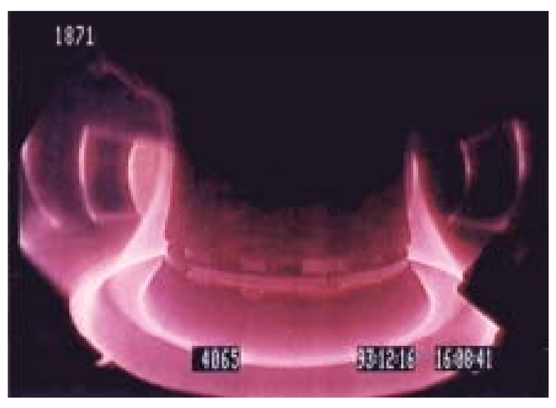
- Extreme conditions
- Tritium management issues
- Materials limitations



ITER will be the world's largest and most advanced experimental *tokamak* nuclear fusion reactor and will be constructed at Cadarache, France.
It is expected to produce its first plasma in 2019 and to produce fusion power in 2026.
It will provide enough data and knowledge to launch a commercial fusion reactor program.



Wendelstein 7-X is an experimental stellarator (nuclear fusion reactor) currently being built in Greifswald, Germany by the Max-Planck-Institut für Plasmaphysik (IPP), which will be completed by 2015.
It will be the largest facility of this kind in the world.



The tokamak fusion experiment **ASDEX Upgrade** (AUG) is a medium size divertor tokamak with an ITER-like configuration.
The similarity of ASDEX Upgrade to ITER makes it particularly suited to testing control strategies for shape, plasma performance and Magnetohydrodynamic (MHD) modes.
It is located at the Max-Planck-Institut für Plasmaphysik (IPP), in **Garching-Forschungszentrum**.