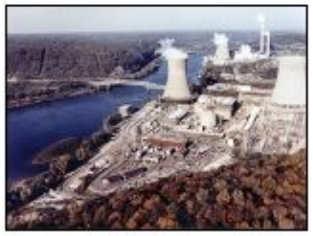
Types of Nuclear Reactors Safety Features

By: Tiffany Yuan

Generation IV: Nuclear Energy Systems Deployable no later than 2030 and offering significant advances in sustainability, safety and reliability, and economics

Generation I

Early Prototype Reactors



- Shippingport
- Dresden, Fermi I
- Magnox

Generation II

Commercial Power Reactors

- LWR-PWR, BWR
- CANDU
- VVER/RBMK

Generation III

Advanced LWRs

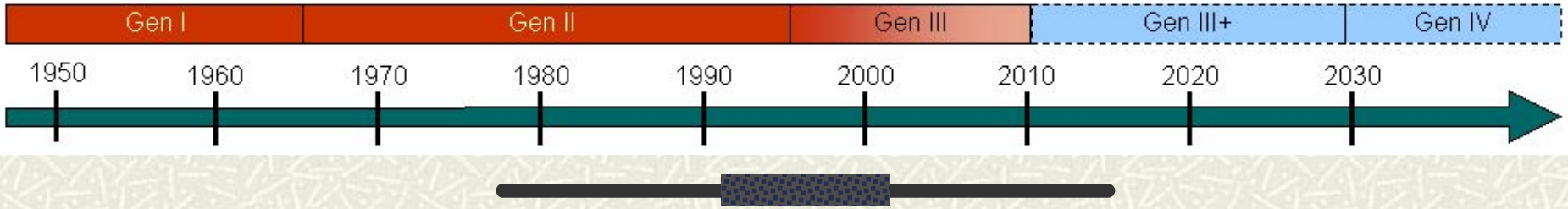
- ABWR
- System 80+
- AP600
- EPR

Near-Term Deployment

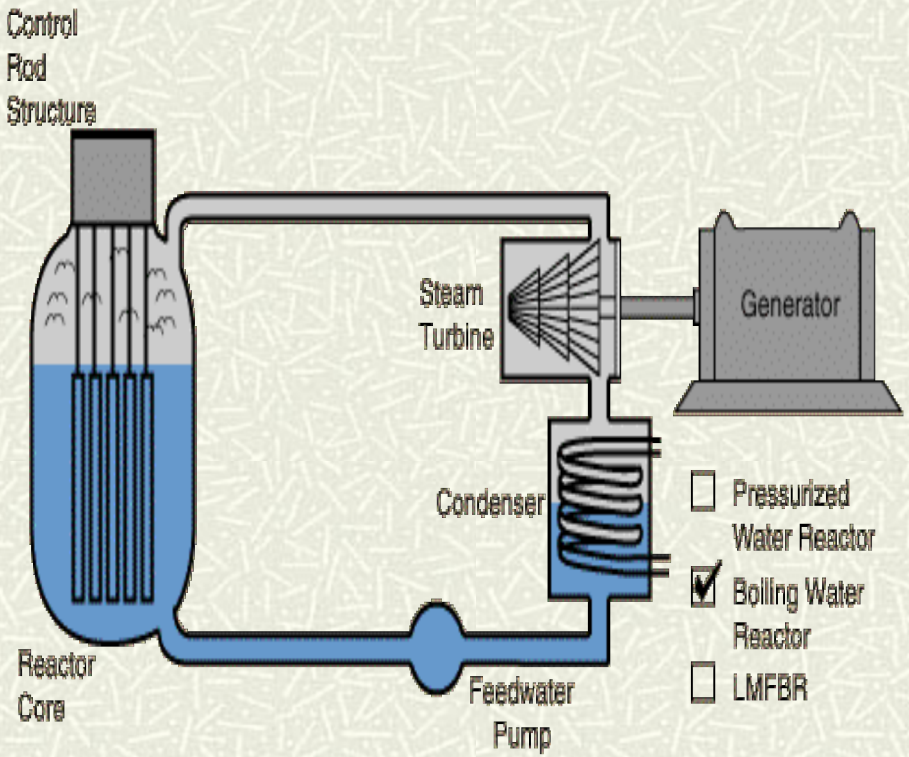
Generation III+ Evolutionary Designs Offering Improved Economics

Generation IV

- Highly Economical
- Enhanced Safety
- Minimal Waste
- Proliferation Resistant



Light Water Reactors (LWR)



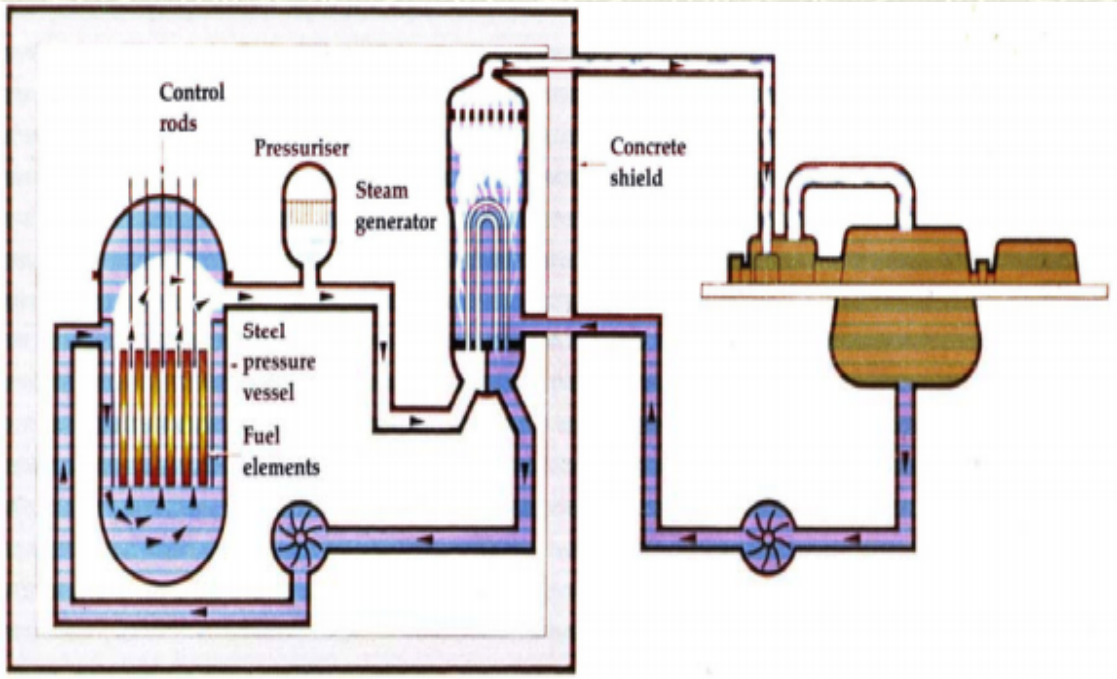
- Boiling water reactor (BWR)

  -Fukushima Power Plant
- Pressurized water reactor (PWR)- similar but with 2 loops

  -3 Mile Island

CANDU Reactor

- CANada Deuterium Uranium
- Uses natural uranium instead of enriched uranium.
- Costs less.

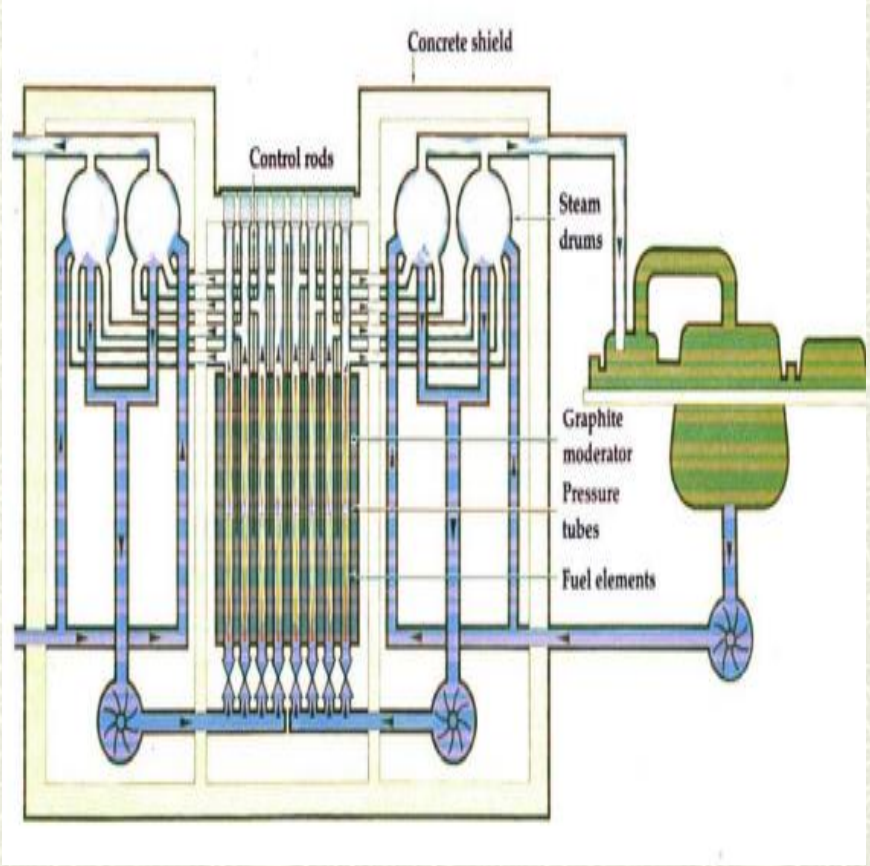


RBMK (*reaktor bolshoy moshchnosti kanalniy*)

- Chernobyl

  -Hydrogen leak -> Fire -> damaged turbine

  -Discussion on replacing turbine for future safety



Advanced LWRs

- Advanced Boiling Water Reactor (ABWR)
- System 80+: pressurized water reactor
- AP 600: less core damage frequency, design not adapted yet
- European Pressurized Reactor (EPR): pressurized water reactor, under construction

Safety Features

- 2 Main purposes:

  -Prevent radiation

  -Remove heat

- Radiation absorbed measured in Rad and Gy (Gray)

  1 rad = 1000 mrad = 10 mGy = 0.01 Gy

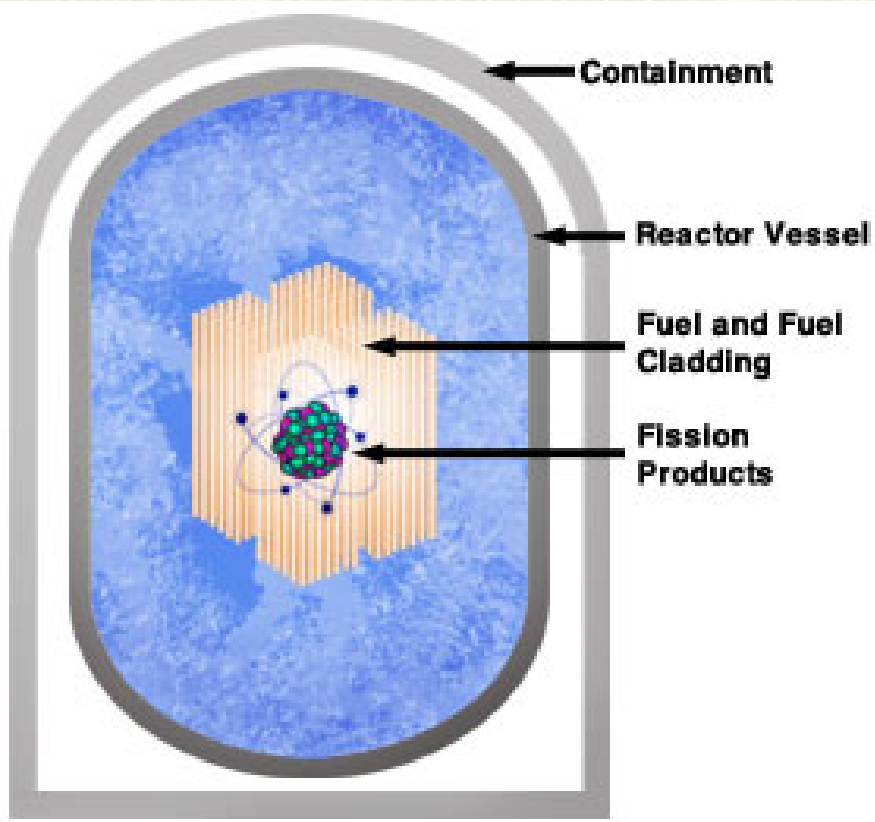
Safety Features- Barriers

- Highly radioactive and harmful fission products
- 3 Barriers:

  -Fuel Rods

  -Reactor vessel

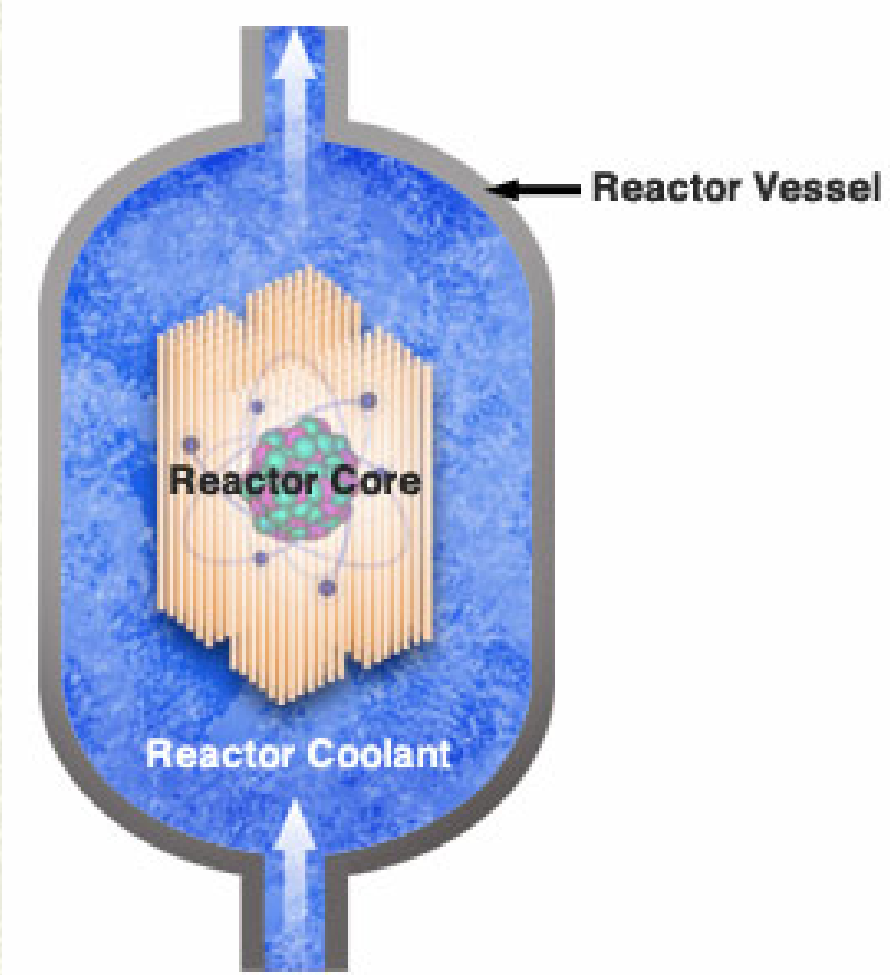
  -Containment



Fission Product Barriers

Safety Features- Back-Up Emergency Core Cooling System

- Removes decay heat, even after shutdown
- Ensures that coolant water continues to flow



What is Being Done to Prevent Future Nuclear Meltdowns

- International Congress on Advances in Nuclear Power Plants
- Nuclear Regulatory Commision -renew licenses for existing plants in U.S.

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