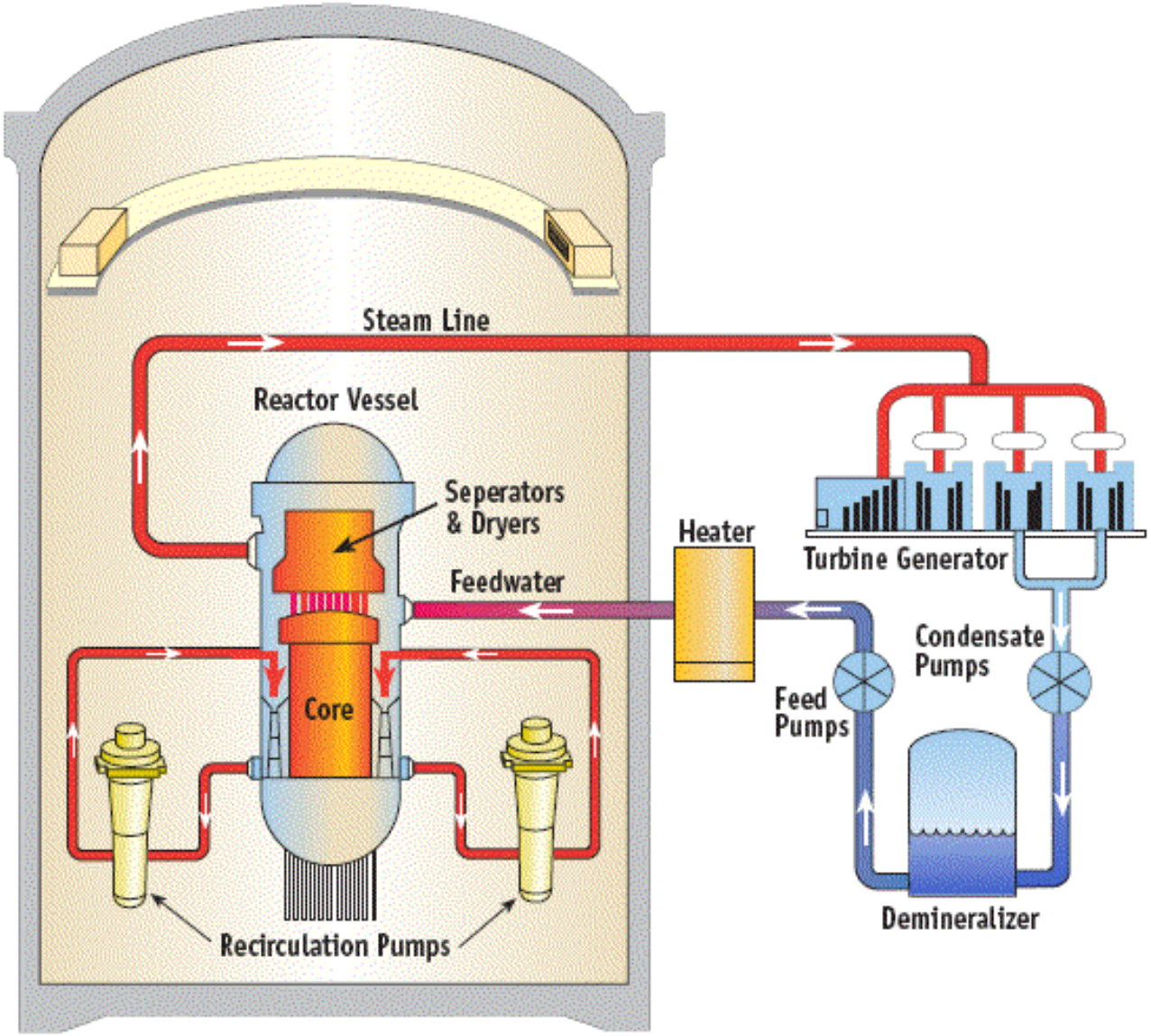
SH2705 Simulation Course

BWR

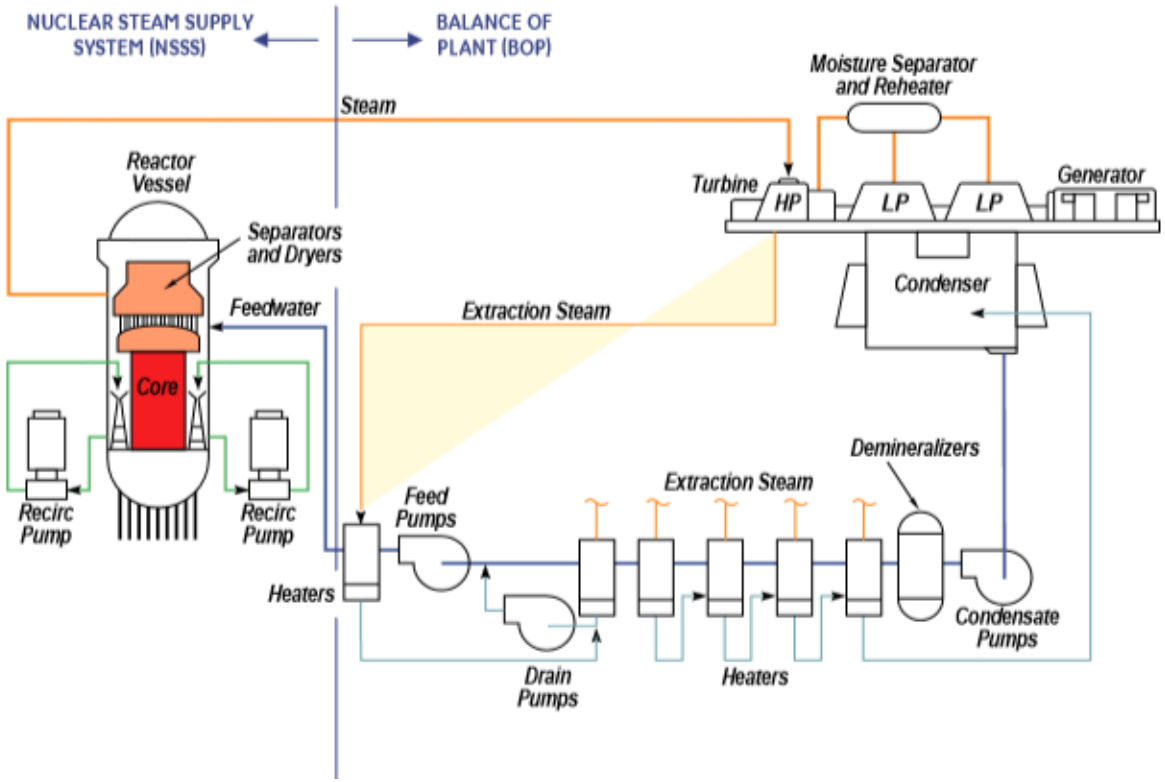
Overviw

- BWR system
- BWR Components
- BWR Power Cycle
- BWR vs. PWR

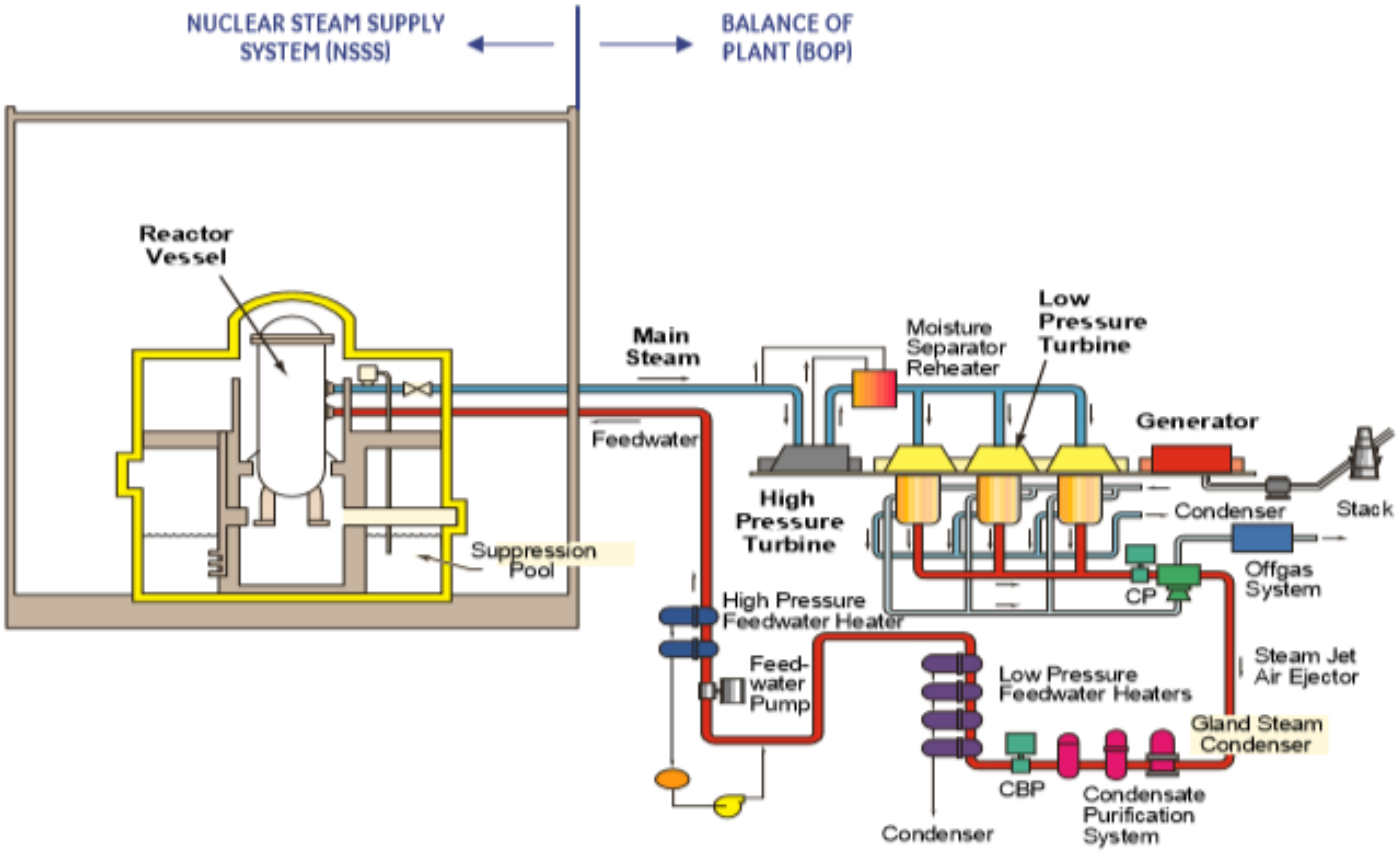
The big picture



External Pump BWR Power Cycle

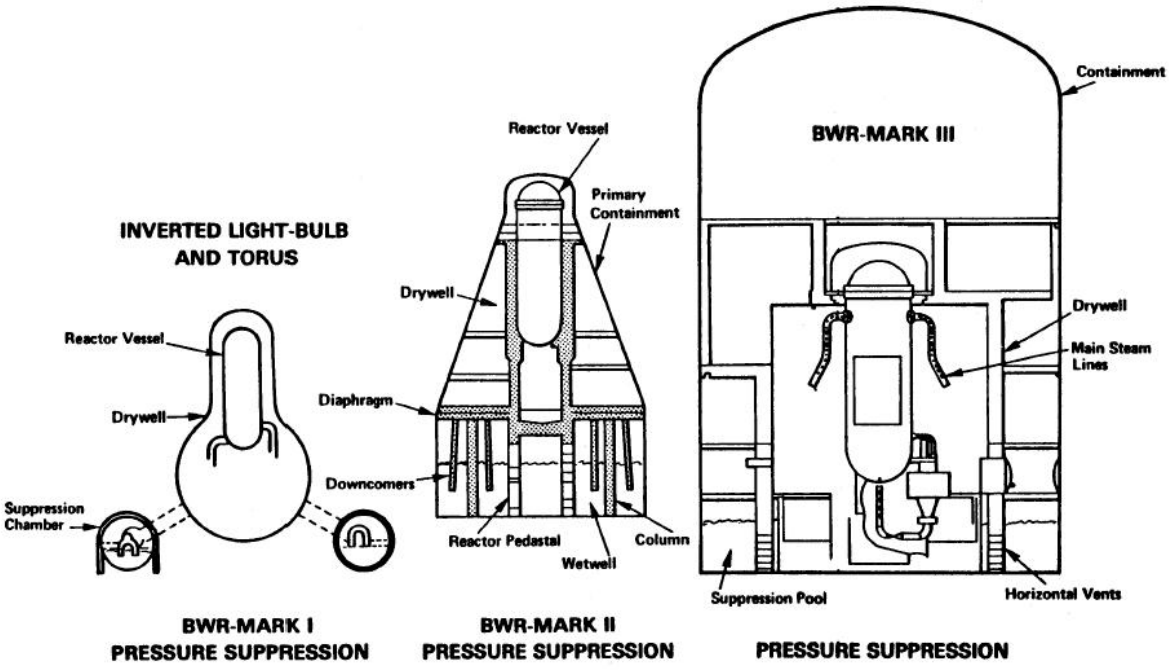


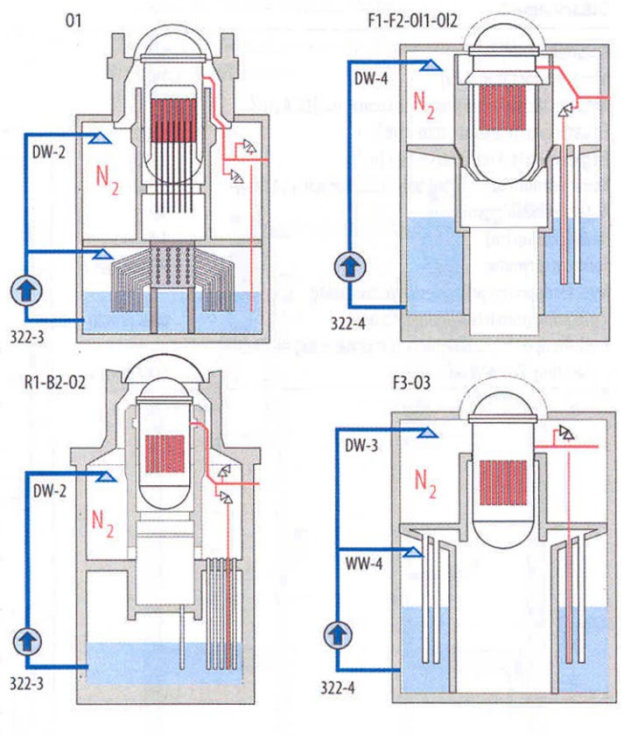
Internal Pump BWR Power Cycle



ABWR

Containments

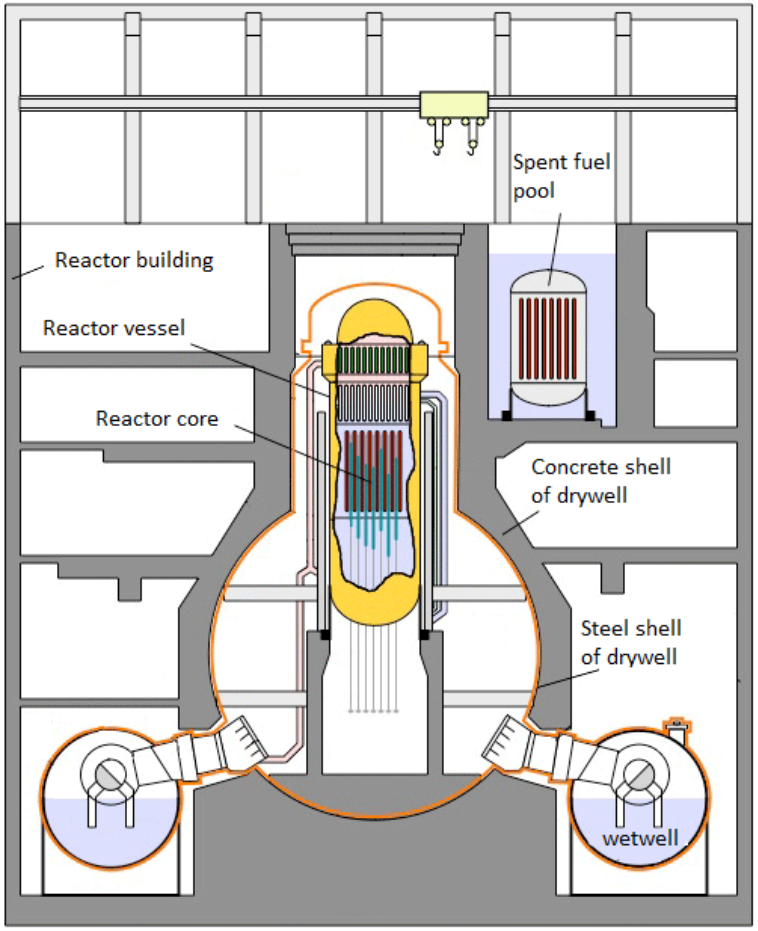


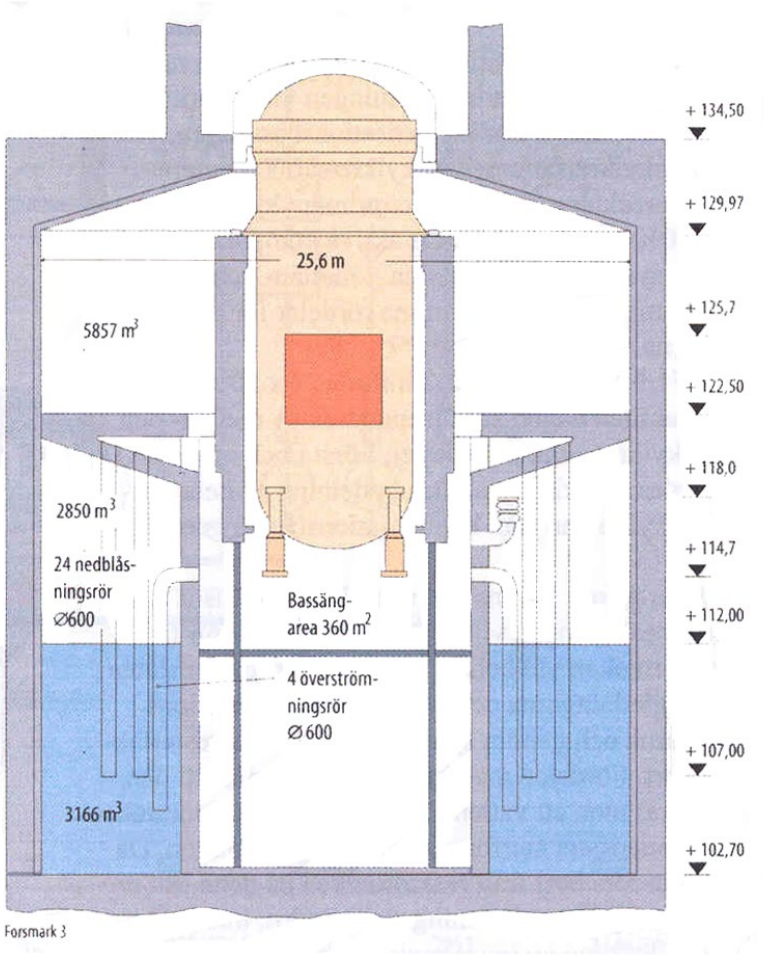


GE design

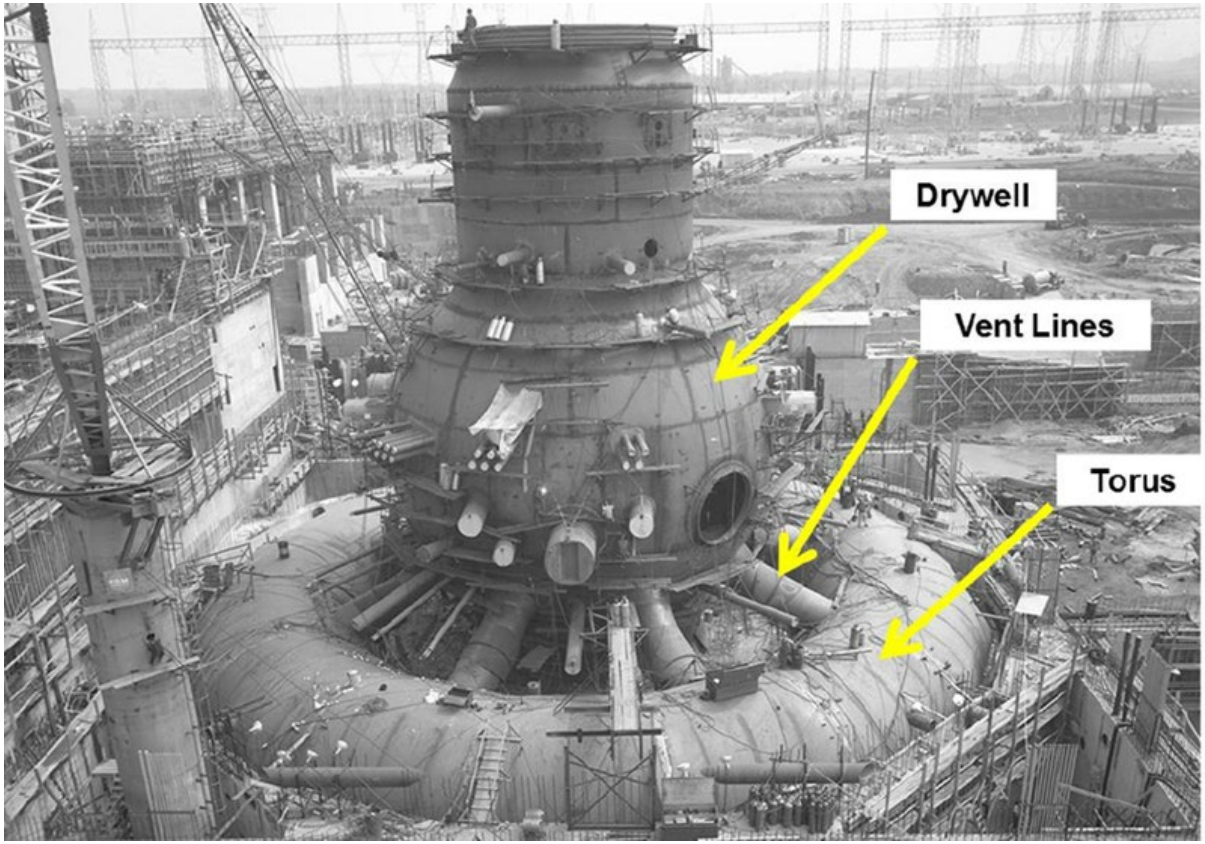
ABB Design

Containments cont.

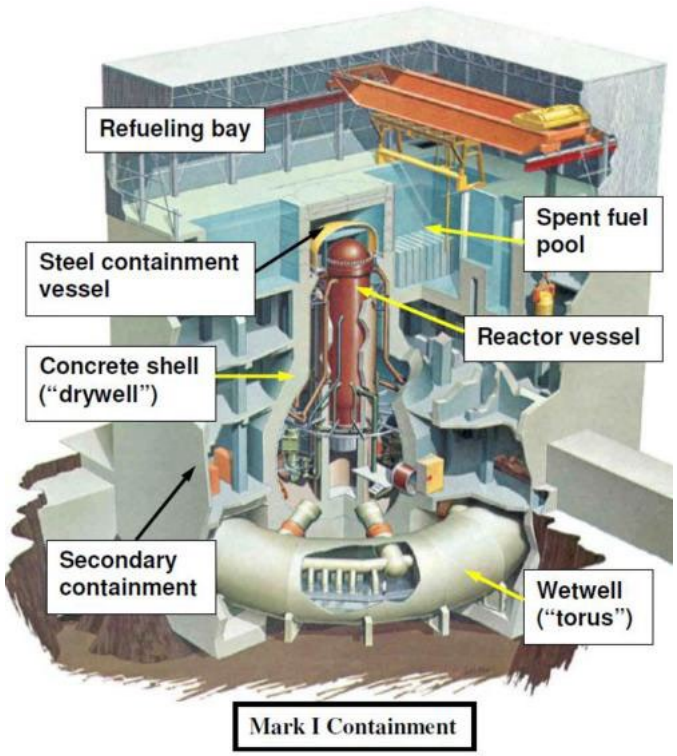


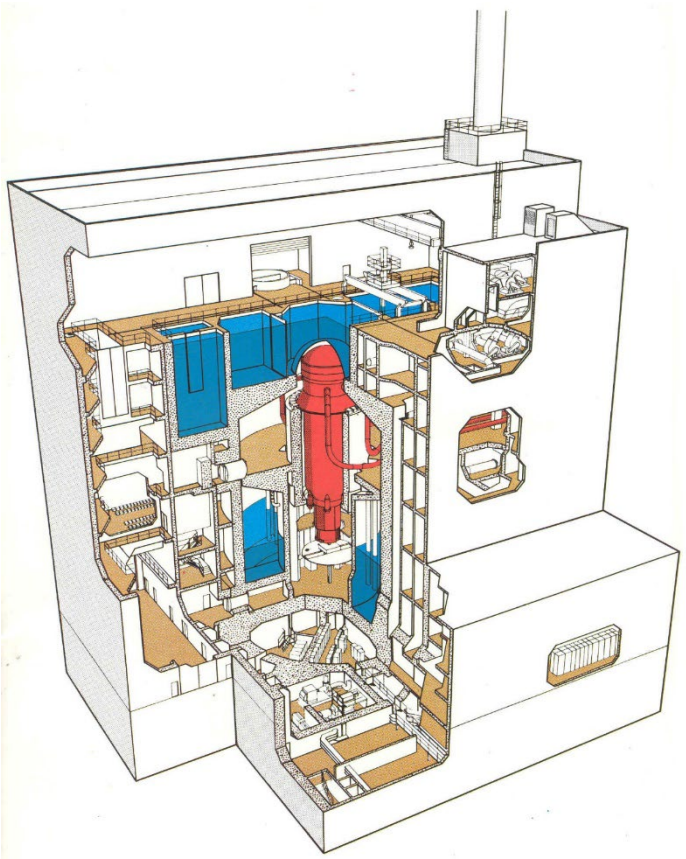


Containments cont.

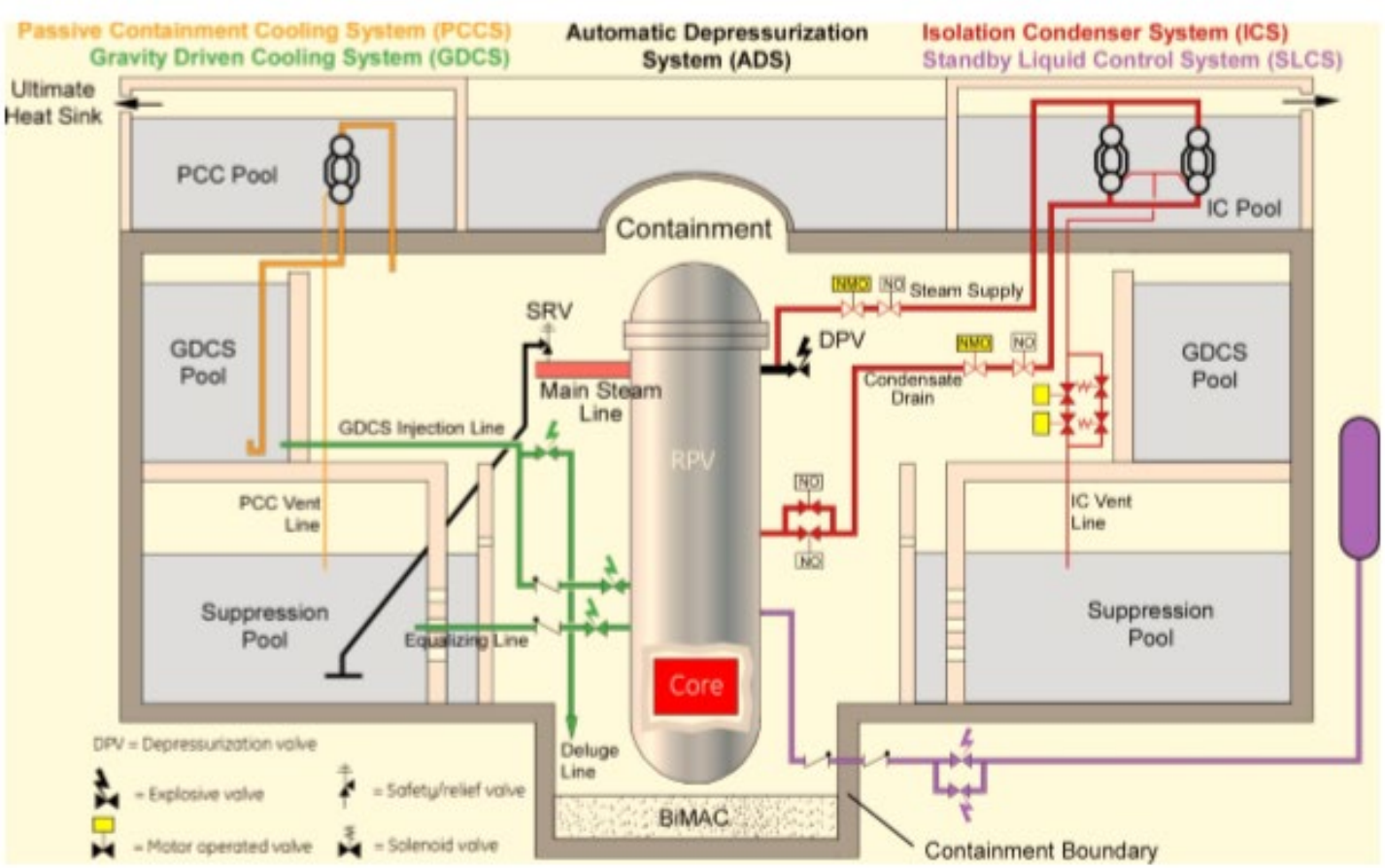


Containments cont.



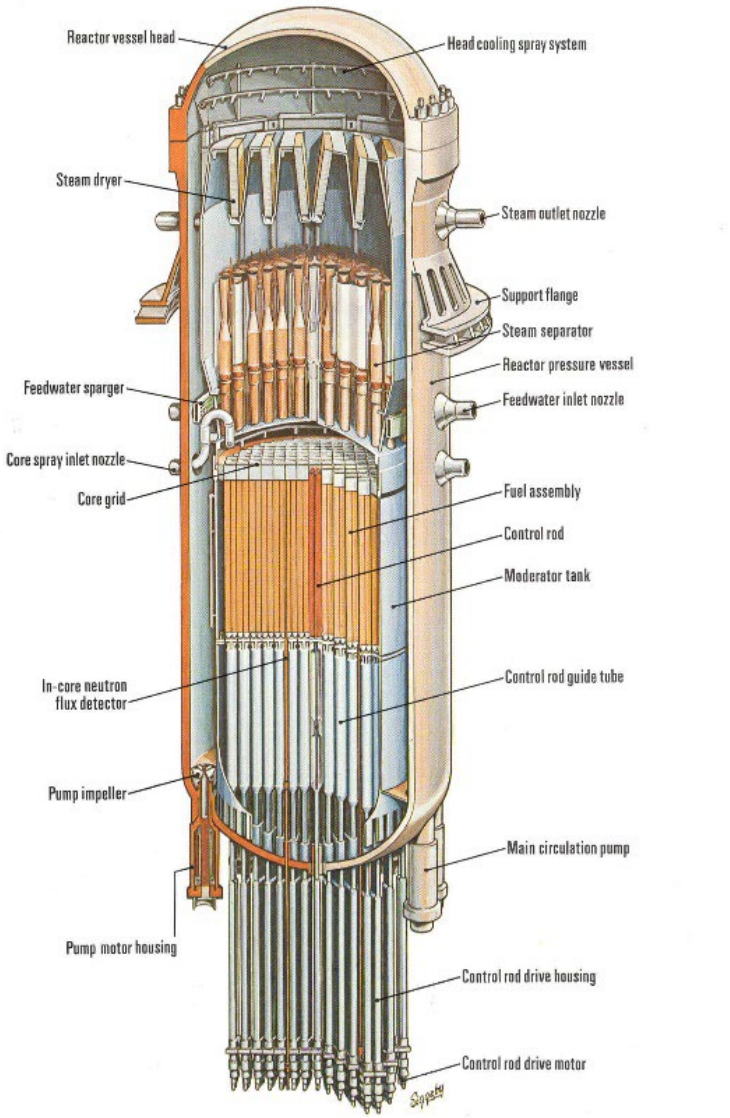


Containments cont.

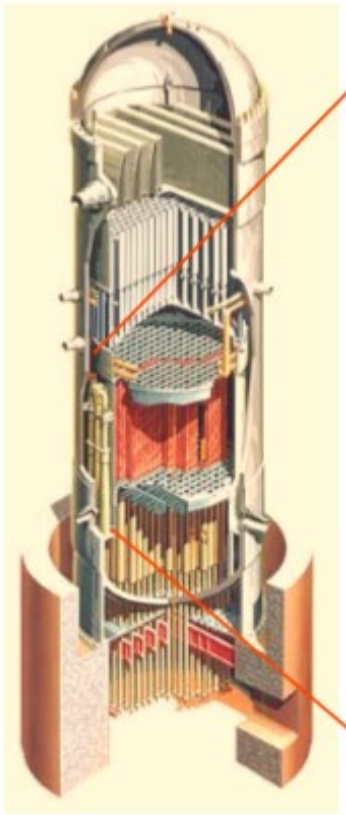


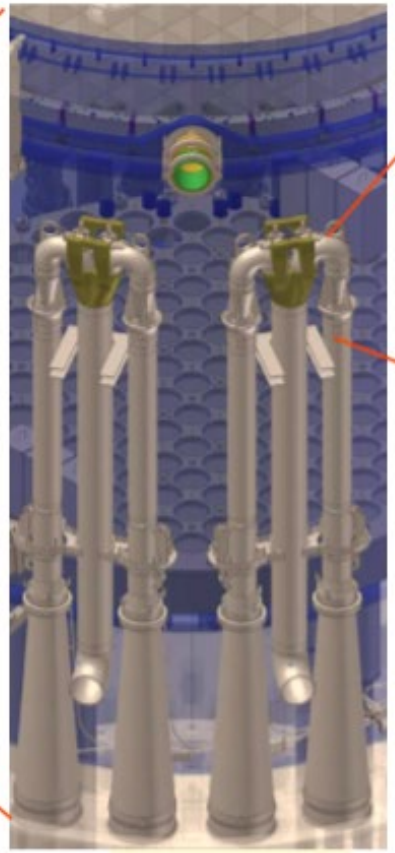
ESBWR

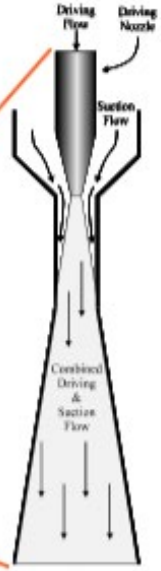
Reactor Pressure Vessel



Jet Pumps

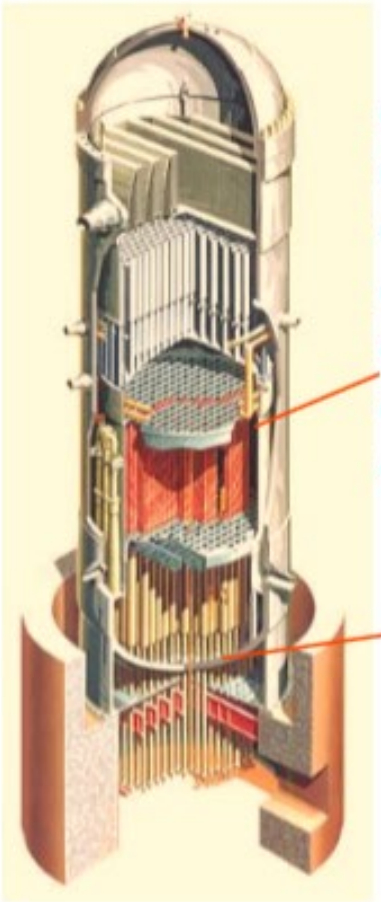




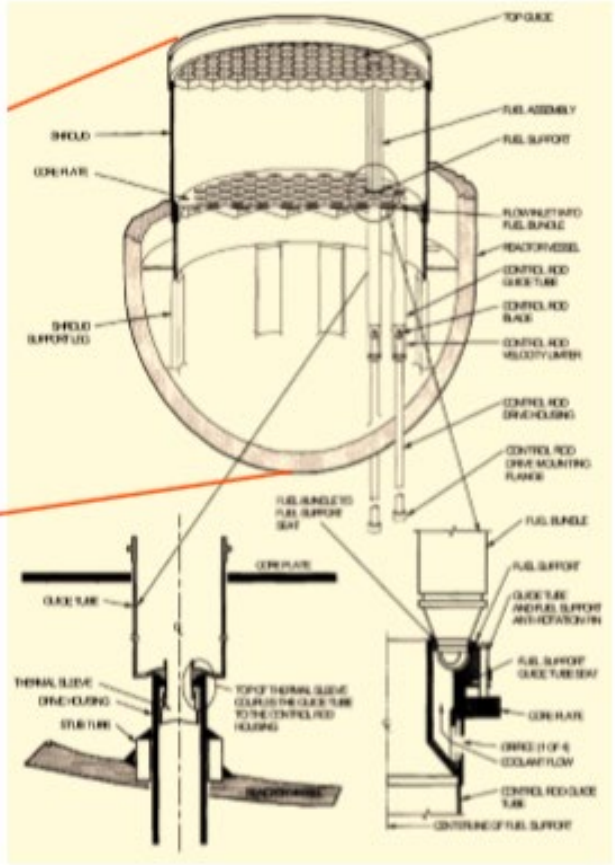


- Provide core flow to control reactor power which yields higher power level without increasing the Rx size
- Provide part of the boundary required to maintain 2/3 core height following a recirculation line break event

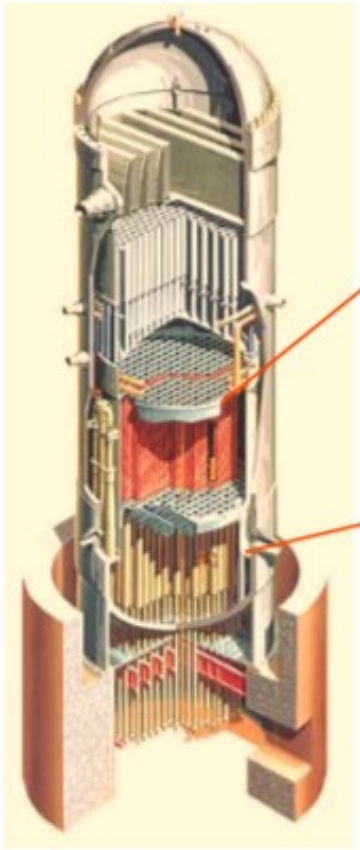
Lower Plenum

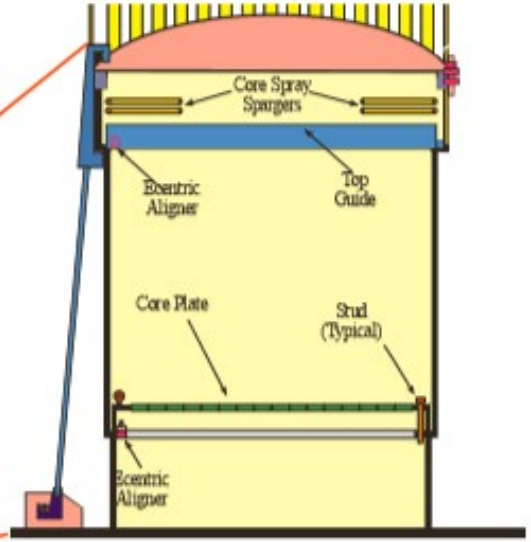


- CRD Guide Tubes
- CRBs
- CRD housings
- Stub Tubes
- In-core Housings
- Guide Tubes
- Flux monitor dry tubes



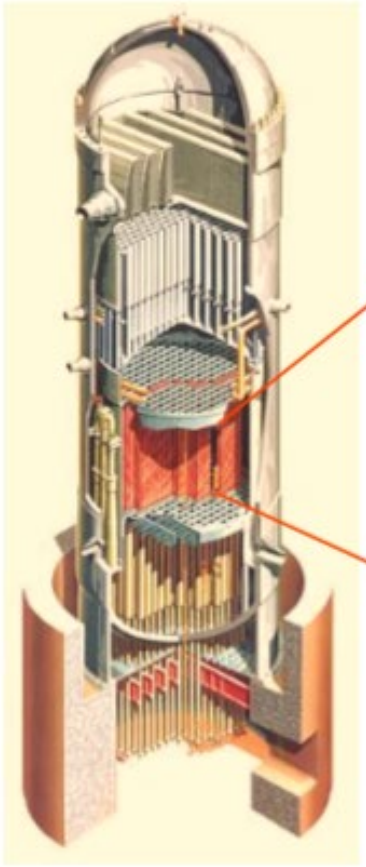
Core Shroud

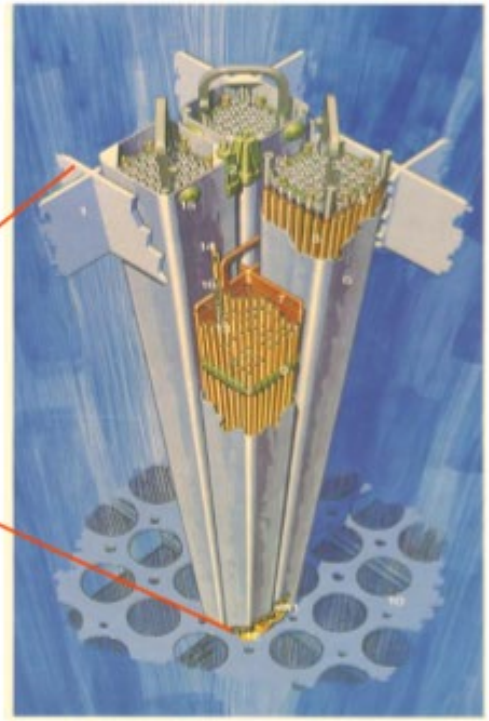


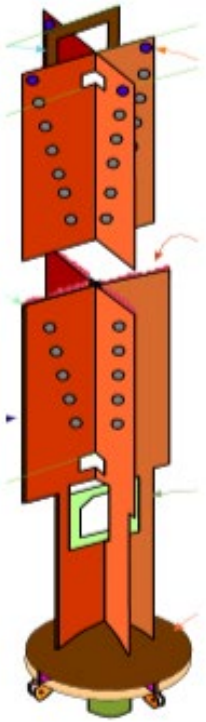


- Stainless Steel Cylinder
- Surrounds the Core
  - Separates upward flow through the core from downward flow in the downcomer annulus
  - Provides a 2/3 core height floodable volume

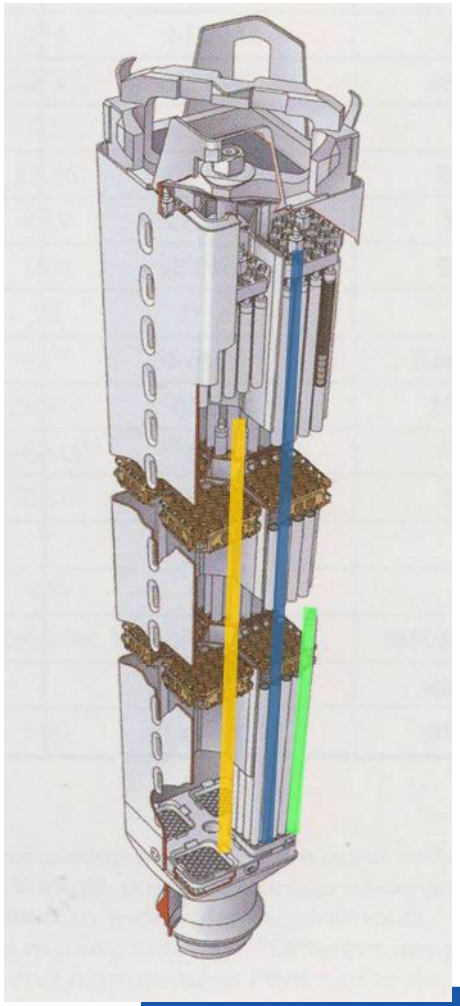
Fuel Assembly and Control Rods

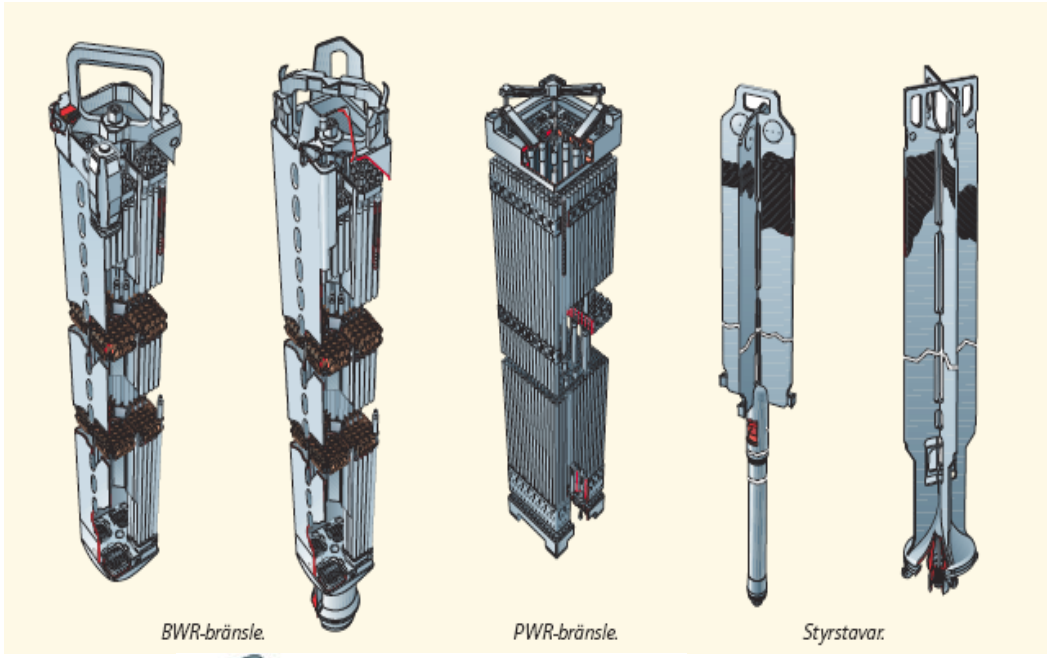


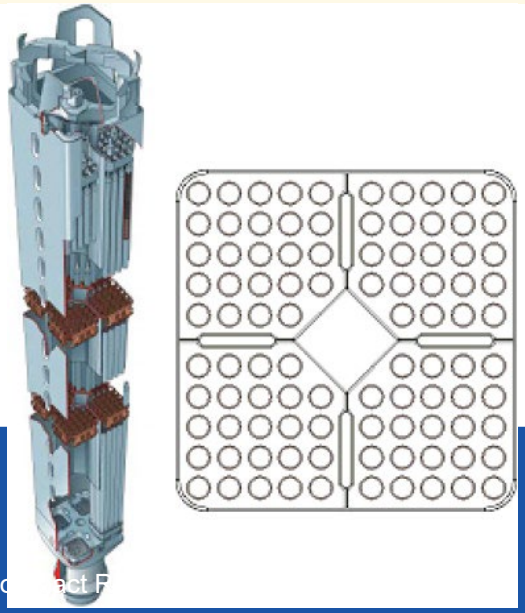


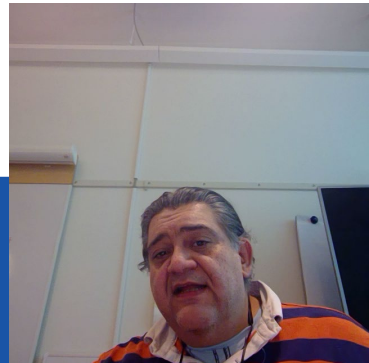


Fuel Assembley

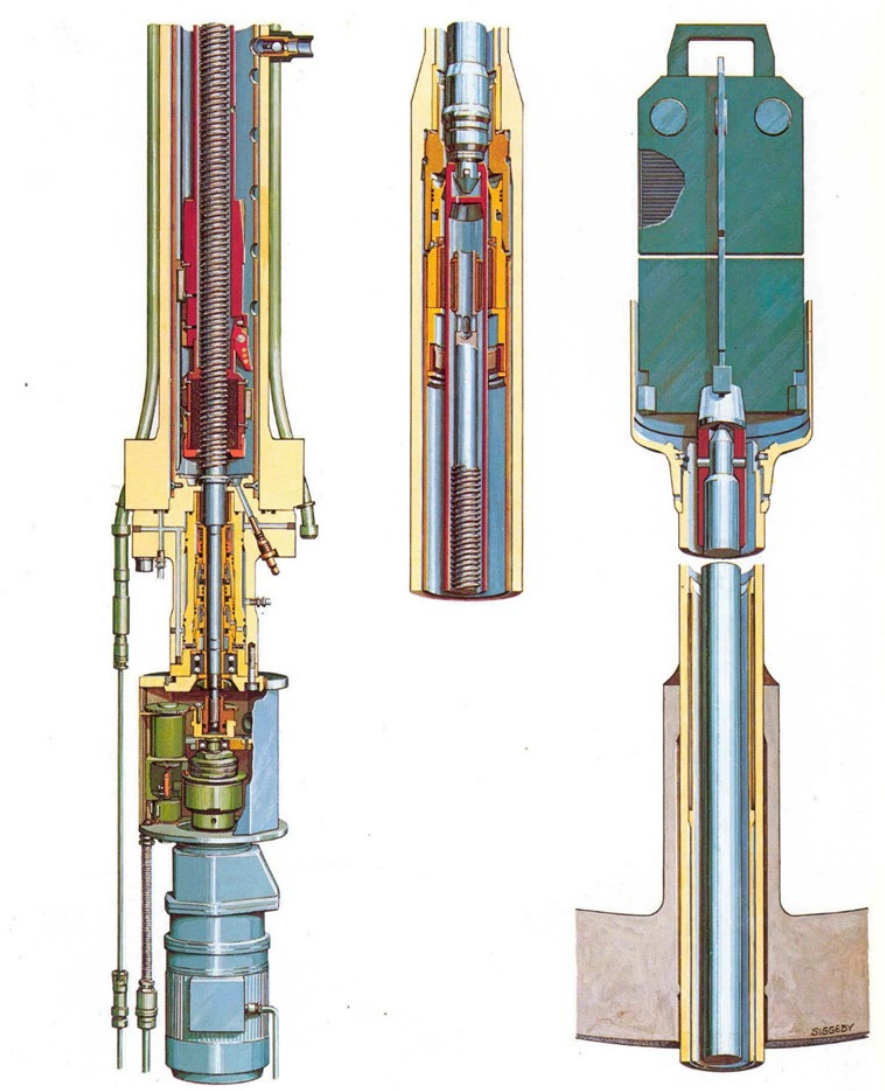




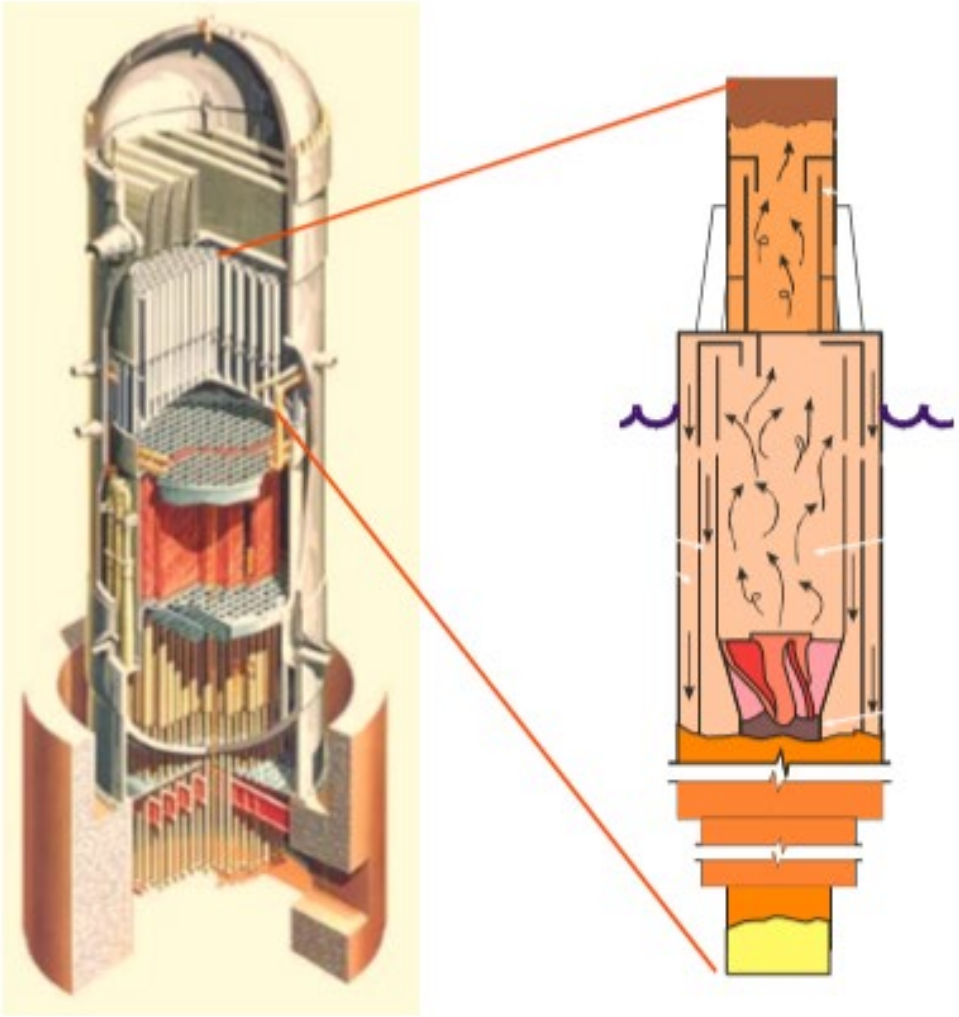




Control blades, rods and driver

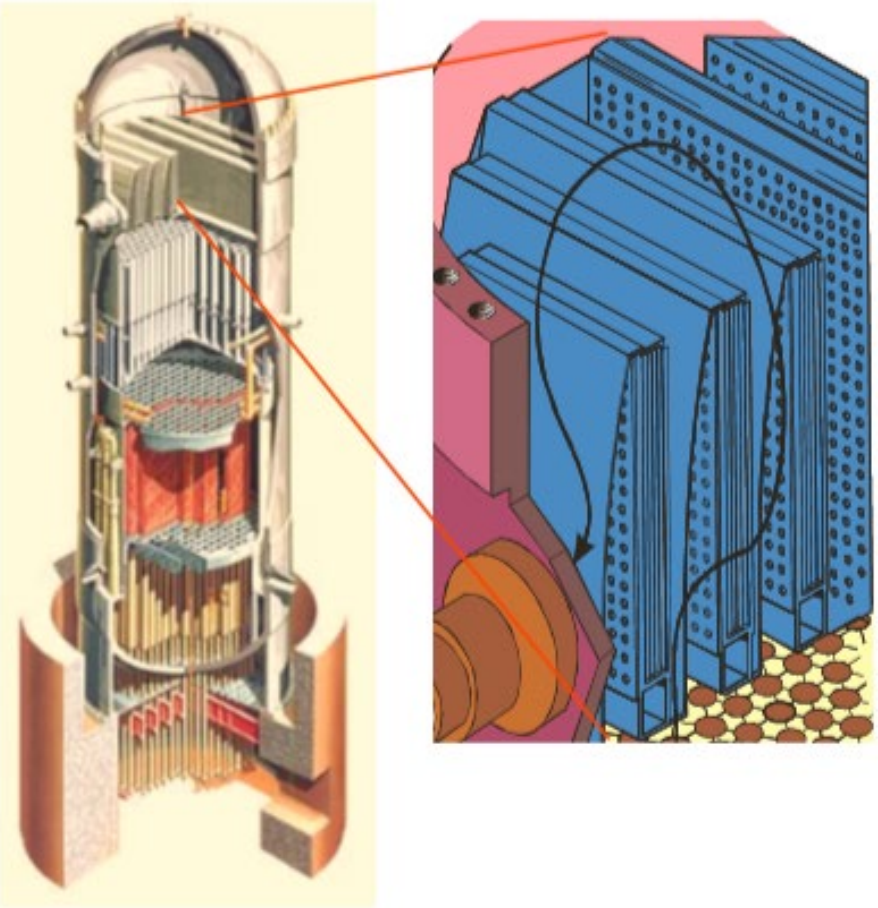


Steam Separator



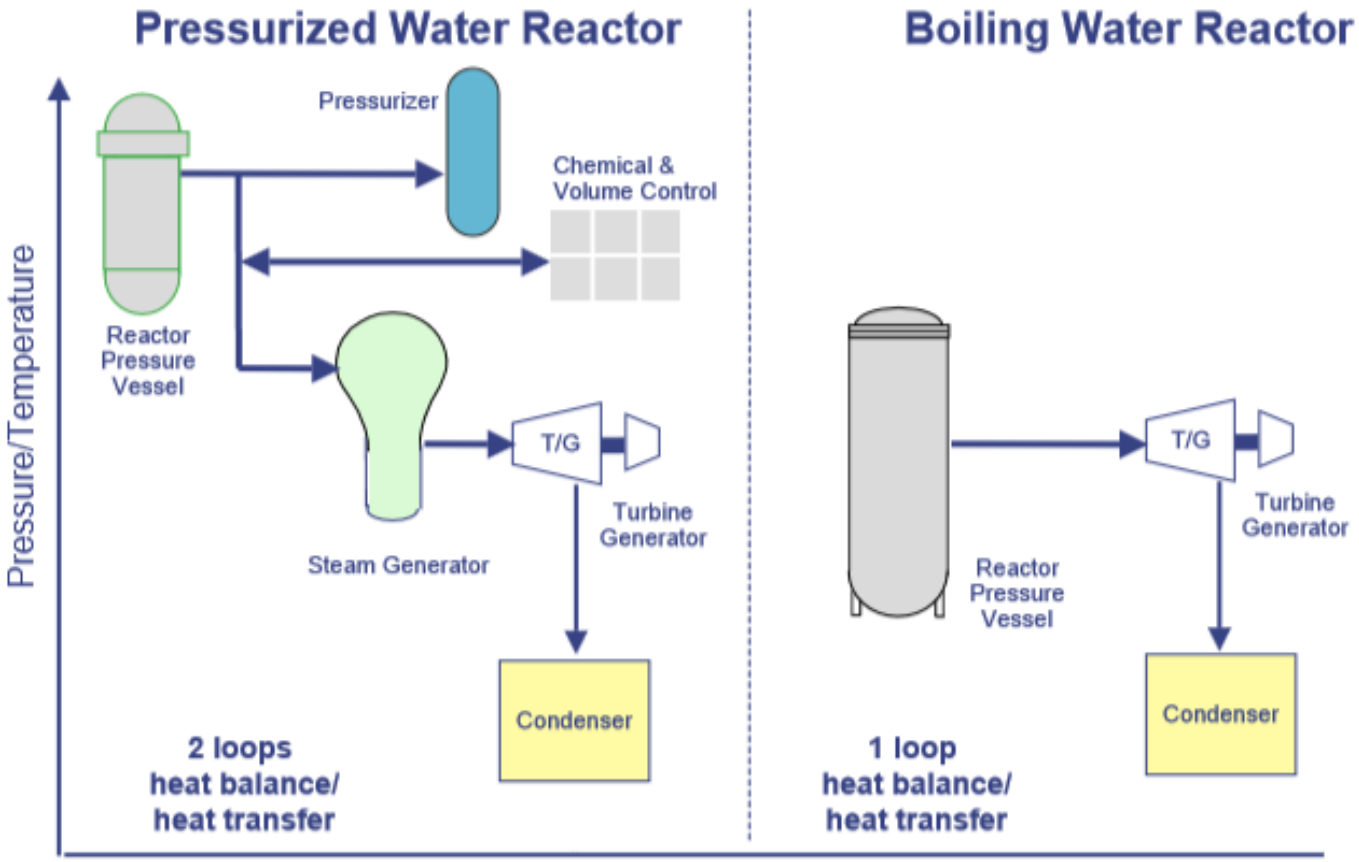
- Turning vanes impart rotation to the steam/water mixture causing the liquid to be thrown to the outside

Steam Dryer



- Provides $Q_{steam\ dryer}$ = 99.9% to the Main Turbine
- Wet steam is forced horizontally through dryer panels
  - Forced to make a series of rapid changes in direction
  - Moisture is thrown to the outside

BWR AND PWR


Pressurized Water Reactor
Boiling Water Reactor
Pressurizer
Chemical &
Volume Control
Reactor
Pressure
Vessel
T/G
Turbine
Generator
Steam Generator
Condenser
2 loops
heat balance/
heat transfer
Pressure/Temperature
T/G
Turbine
Generator
Reactor
Pressure
Vessel
Condenser
1 loop
heat balance/
heat transfer

Steam Generation

BWR

- RPV Pressure ~ 7 Mpa
- RPV Temperature 288 deg. C
- Steam generated i RPV (Steam Separators and Deryer)
- Boiling in RPV

PWR

- RPV Pressure ~ 15 Mpa
- RPV Temperature 326 deg. C
- Steam generated in Steam Generator (Second loop)
- NO Boiling in RPV