



# GE-BW Reactor

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An Introduction to the:  
General Electric Boiling Water  
Nuclear Power Plant

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# Shimane Nuclear Power Plant





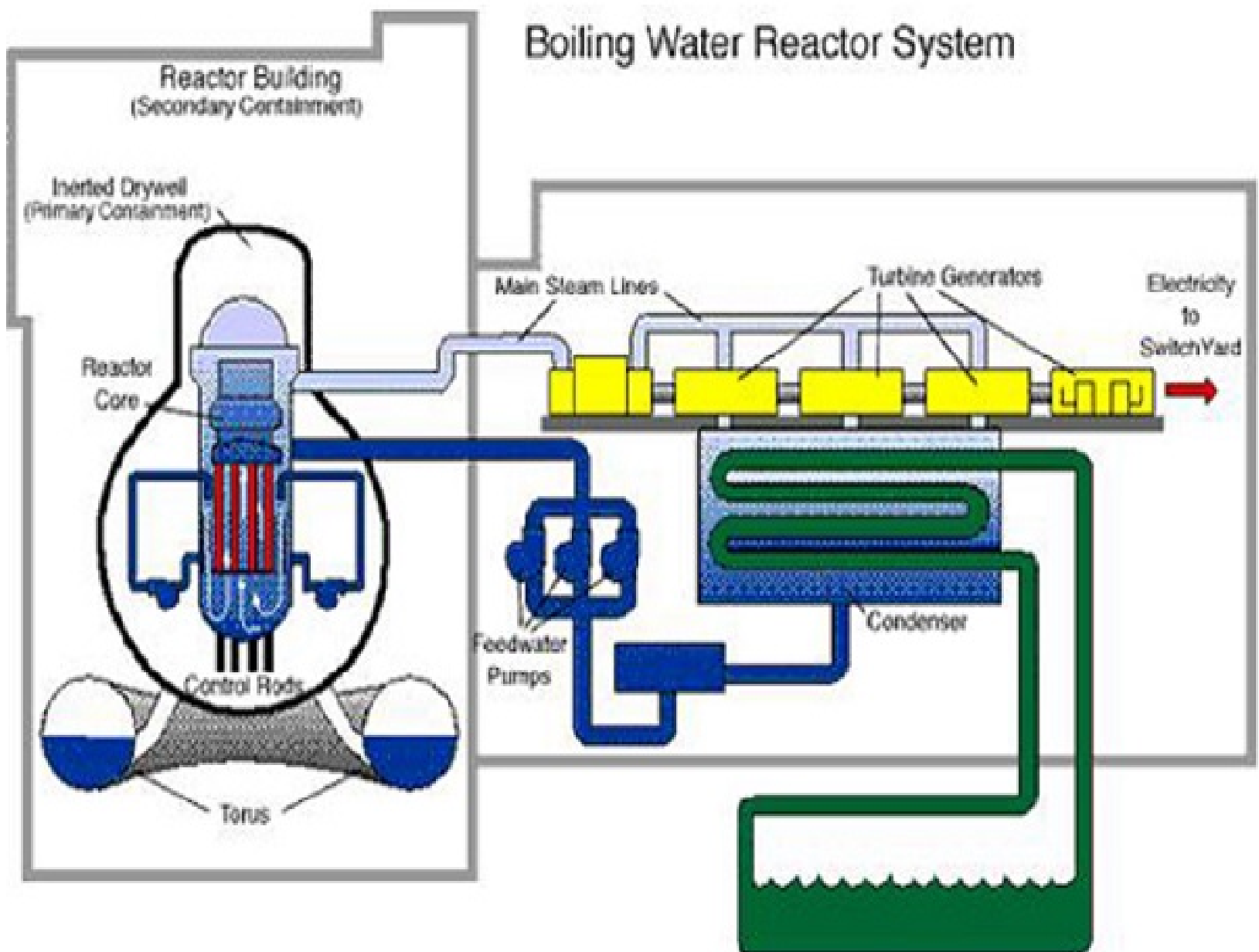
# Boiling Water Reactor



- ❑ A **boiling water reactor (BWR)** is a type of light water nuclear reactor used for the generation of electrical power.
- ❑ The **Boiling water reactor is** the second most common type of electricity-generating nuclear reactor after the pressurized water reactor (PWR).
- ❑ The main difference between a BWR and PWR is that in a BWR, the reactor core heats water, which turns to steam and then drives a steam turbine. In a PWR, the reactor core heats water, which does not boil. This hot water then exchanges heat with a lower pressure system, which turns water into steam that drives the turbine.
- ❑ The BWR was developed by the Argonne National Laboratory and General Electric (GE) in the mid-1950s.
- ❑ The main present manufacturer is GE Hitachi Nuclear Energy, which specializes in the design and construction of this type of reactor.

# Boiling Water Reactor

## Schematic Diagram of GE Hitachi Boiling Water Reactor



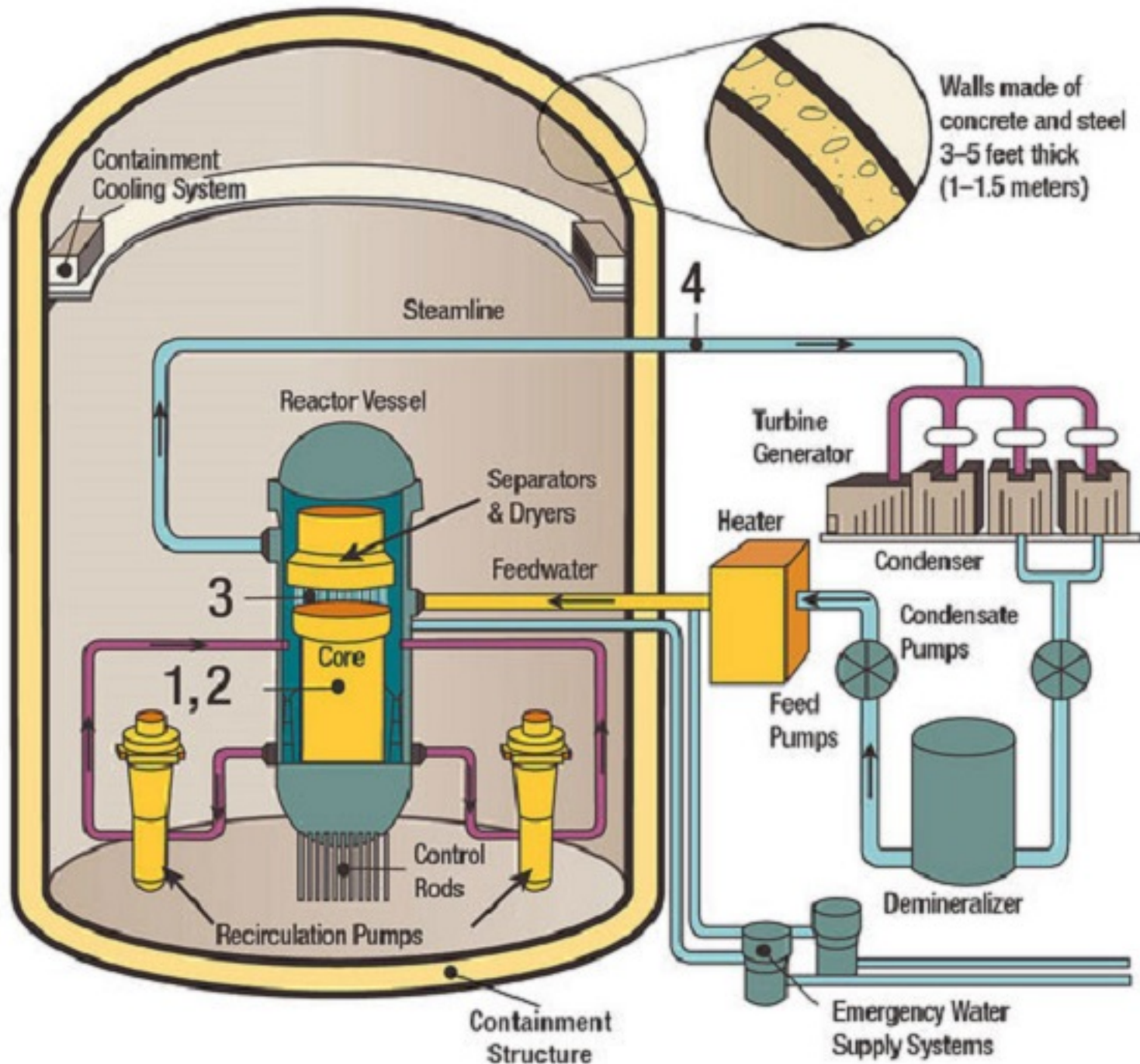


# Boiling Water Reactor

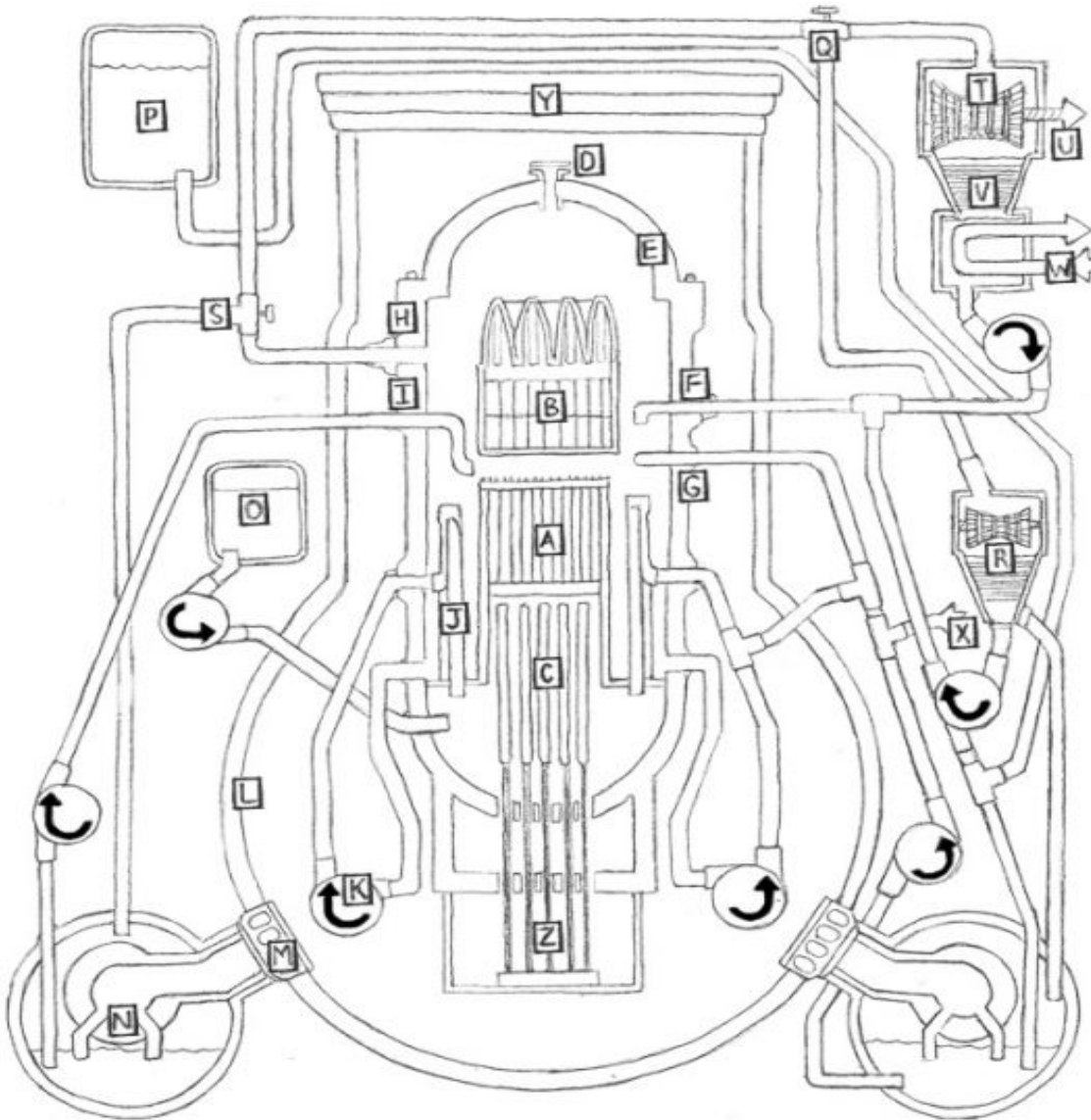


- ❑ The **Boiling Water Reactor (BWR)** uses demineralized water (light water) as a coolant and neutron moderator.
- ❑ The reactor core transfers the fission energy, primarily kinetic energy created by recoil of the fission fragments in the fuel rods into thermal energy of the water which is both the moderator and the cooling agent in a Light Water Reactor
- ❑ The steam-water mixture produced moves upward through the core absorbing heat.
- ❑ The steam-water mixture leaves the top of the core and enters the two stages of water separation where the water droplets are removed and the steam is dried before entering the steam lines.
- ❑ The steam line directs the steam to the main turbine causing it to turn the turbine which is connected to the generator to create electrical power.
- ❑ The unused steam is condensed into water.
- ❑ The resulting water is pumped out of the condenser with a series of pumps, reheated and pumped back to the reactor vessel.

# Boiling Water Reactor



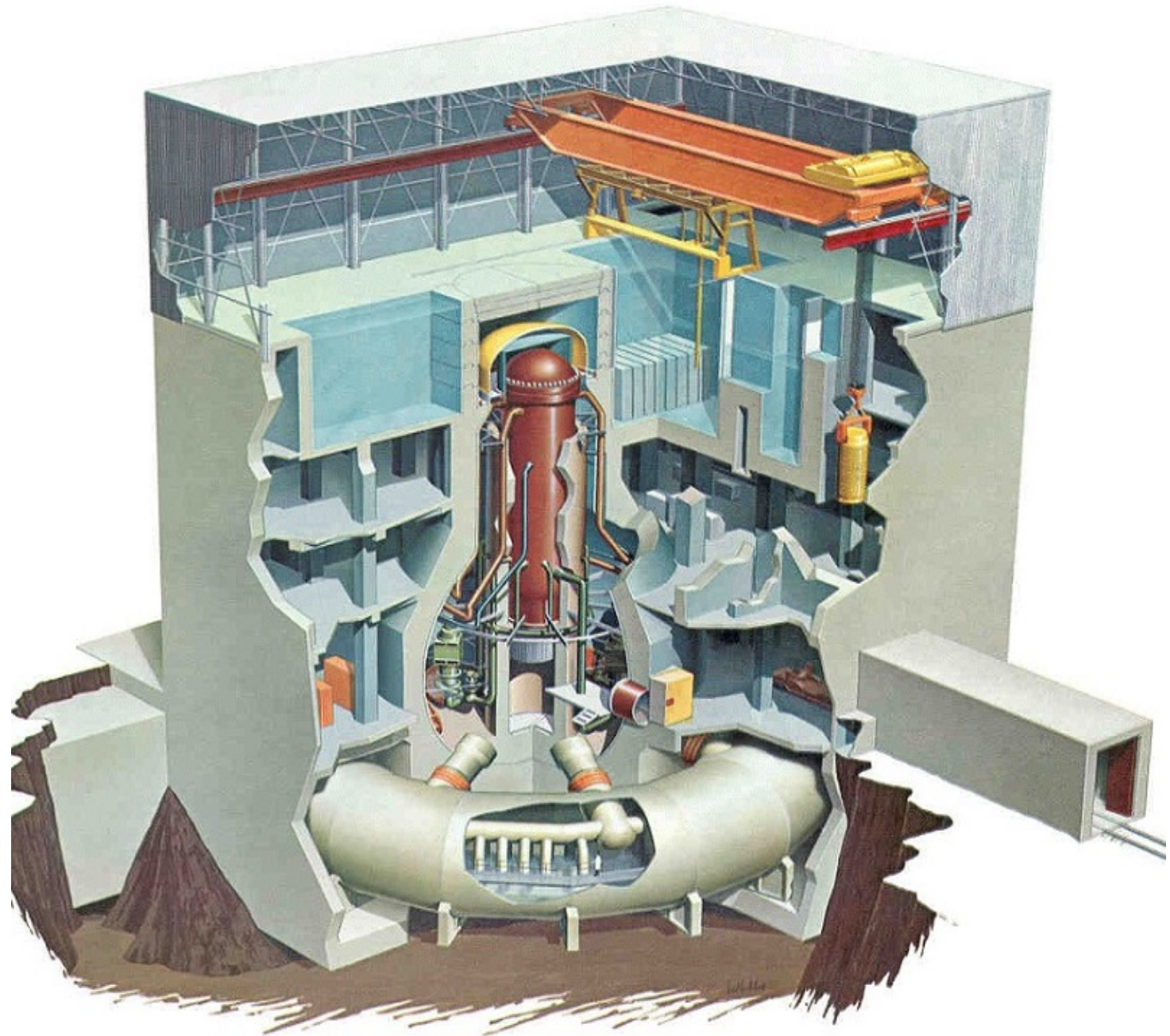
# Boiling Water Reactor



## Mark I Reactor Components

- A. Uranium fuel rods
- B. Steam Separator and dryer assemblies
- C. Graphite control rods
- D. Vent and head spray
- E. Reactor Vessel
- F. Feedwater inlet
- G. Low pressure coolant injection inlet
- H. Steam Outlet
- I. Core spray inlet
- J. Jet pump
- K. Recirculation pump
- L. Concrete Shell "Drywell"
- M. Venting System
- N. Suppression pool
- O. Boron tank
- P. Condensate storage tank
- Q. High pressure coolant injection system
- R. HCIS turbine
- S. Automatic depressurization system
- T. Main Turbine
- U. Connection to generator
- V. Condenser
- W. Circulating Water
- X. Connection to outside water
- Y. Concrete shield plugs
- Z. Control rod drive

# GE-Mark I Plant Layout



DRYWELL TORUS





# Boiling Water Reactor

Components of a *boiling water reactor* (BWR):

1. Reactor pressure vessel
2. Nuclear fuel element
3. Control rods
4. Recirculation pumps
5. Control rod drives
6. Steam
7. Feedwater
8. High-pressure turbine
9. Low-pressure turbine
10. Generator
11. Exciter
12. Condenser
13. Coolant
14. Pre-heater
15. Feedwater pump
16. Cold-water pump
17. Concrete enclosure
18. Connection to electricity grid

# Pressure Vessel-One





# Pressure Vessel-Three

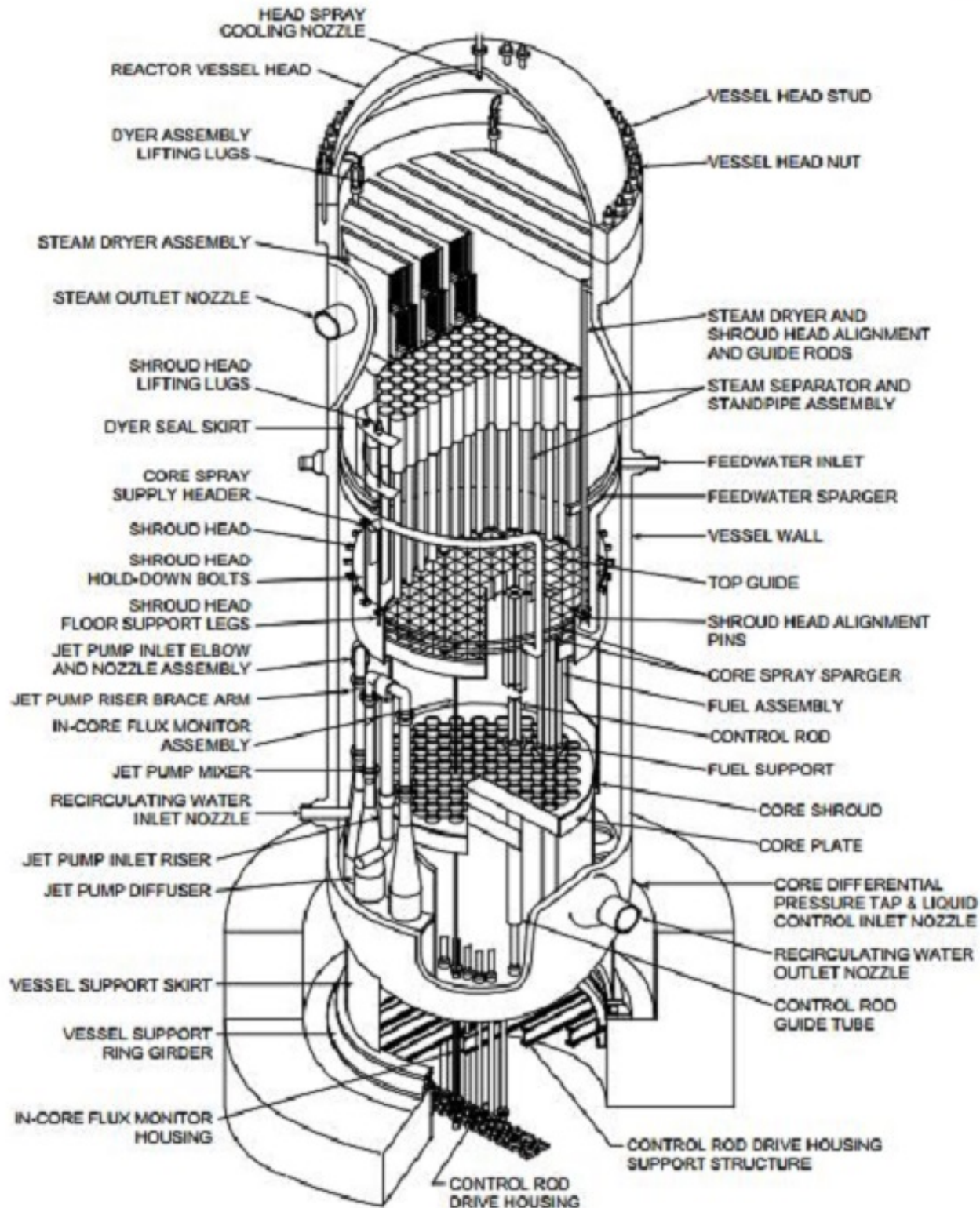


Figure 2.1-1 Reactor Vessel Cutaway

# Fuel Assembly/Control Rods

## BWR/6 FUEL ASSEMBLIES & CONTROL ROD MODULE

- 1.TOP FUEL GUIDE
- 2.CHANNEL FASTENER
- 3.UPPER TIE PLATE
- 4.EXPANSION SPRING
- 5.LOCKING TAB
- 6.CHANNEL
- 7.CONTROL ROD
- 8.FUEL ROD
- 9.SPACER
- 10.CORE PLATE ASSEMBLY
- 11.LOWER TIE PLATE
- 12.FUEL SUPPORT PIECE
- 13.FUEL PELLETS
- 14.END PLUG
- 15.CHANNEL SPACER
- 16.PLENUM SPRING

