http://www.energetics.com/resourcecenter/products/communication/samples/Documents/ge_nuc_reactor_factsheet.pdf

General Electric – ESBWR

In 1992, GE began to design a natural circulation, boiling water reactor (BWR) featuring passive safety systems. This effort produced a 670 MWe reactor known as the Simplified BWR (SBWR). The development program was later re-directed to design a larger reactor that used economies of scale, proven technology, and components from the Advanced BWR (ABWR) to create a new reactor at reduced capital cost. The new advanced reactor is known as the Economic Simplified BWR (ESBWR).

Electric Output: 1,560 MWe

Reactor Power: 4,500 MWt

Fuel Type: GE14 (10x10 fuel assembly)

Design Life: 60 years

Design Certification: Pre-application review is on-going. Application is anticipated in mid-2005. Certification is anticipated 43 months thereafter.

Overnight Cost Cost: $1,160-1,250 kWe (vendor estimate for the power block)

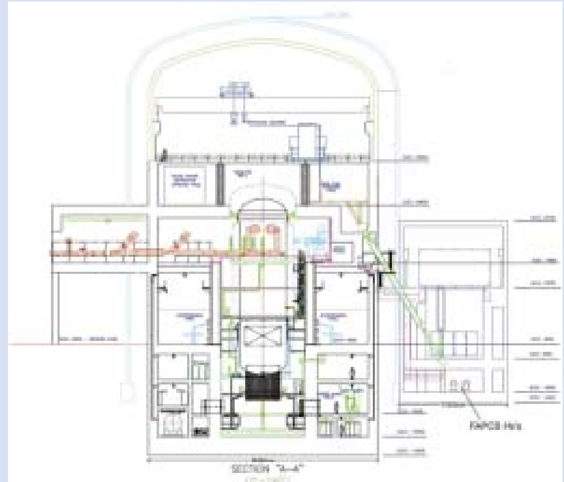
Description: The ESBWR plant design relies on the use of natural circulation and passive safety features to enhance the plant performance and simplify the design. The use of natural circulation allows the elimination of several systems. The ESBWR utilizes the isolation condenser system for high pressure inventory control and decay heat removal. After initiation of the automatic depressurization system, low pressure inventory control is provided by the gravity driven cooling system. Containment cooling is provided by the Passive Containment Cooling System (PCCS). The primary intent of the ESBWR is to significantly reduce both capital and O&M costs of the earlier SBWR and ABWR plants.

Construction Methods/Schedule: The ESBWR will rely on ABWR construction techniques, primarily the use of open top modular construction. A construction schedule of 45 months from first concrete to commercial operation is anticipated for the first-of-a-kind unit (vendor estimate).

Challenges to Building

Degree of Technical Maturity: There is high confidence in the design because it uses standard, proven equipment including extensive use of ABWR components and fully tested passive safety features from the SBWR. Testing was performed to verify natural circulation and the use of several components in new applications.

First of a Kind Engineering (FOAKE): Major remaining FOAKE items include (1) performing the safety analysis (and obtaining NRC approval for the AOO and ATWS computer analyses) and (2) qualifying digital instrumentation (detailed design and testing of plant controls and safety systems, designing an all-digital control room and simulator, and implementing the NRC human factors requirements).



At a Glance – Advanced Design Features

- Passive safety systems
- Simplified plant design
- Natural circulation replaces recirculation pumps
- Incorporates ABWR technology
- Modular construction
- Reduction in number of plant systems/building volumes
- Reduction in operator actions

Equipment Supply: This design relies heavily on the same basic components as the ABWR, which has been installed previously. Vendors are available to furnish the necessary equipment to support the design.

Challenges to Combined Construction and Operating License (COL):

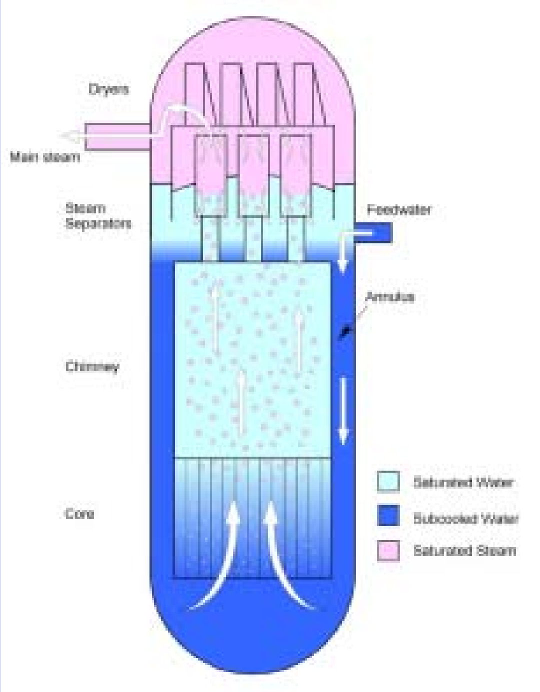
Detailed integrated plant design including system and structural design, and site-specific items will be deferred to the COL stage.

General Electric Qualifications: General Electric has significant experience in the design, construction, and fabrication of nuclear components. GE has been involved in the construction of 64 BWRs. There are currently 54 GE BWRs operating worldwide.

Simplified Plant Design: The ESBWR has achieved its basic plant simplification by incorporating innovative adaptations of operating plant systems into the plant design (i.e., combining shutdown cooling and reactor water cleanup systems). The only major new system is the PCCS. The reactor building is reduced in volume. Nearly all safety systems are now located in containment or directly above it. This allows significant reductions in the volume and footprint of other buildings. The ESBWR design benefited greatly by FOAKE performed for the ABWR and the detailed design and testing of the SBWR.

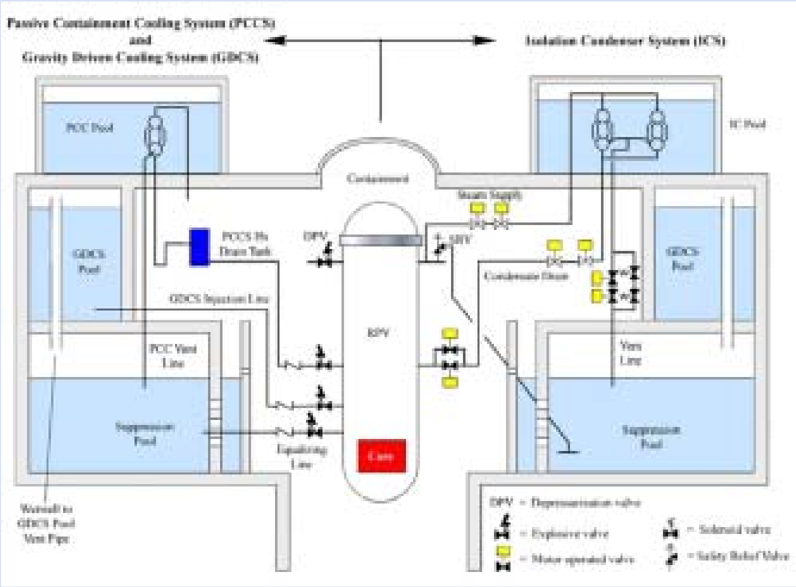
Technology Common to ABWR and ESBWR

- Materials and water chemistry
- Fine motion control rod drives
- Multiplexing and fiber optic data transmission
- Control room design
- Plant layout for ease of maintenance
- Reinforced concrete containment technology
- Pressure suppression horizontal vents
- Passive severe accident mitigation features
- Radwaste technologies
- Computer codes and analytical methods
- Information management technology



Natural circulation is established because of density differences between water in the vessel annulus and the steam/water mixture inside the shroud and chimney. Natural circulation is enhanced by the shorter fuel, 8.6 meter chimney, improved steam separator, and opening the flow path between the downcomer and the lower plenum.

Safety Systems: The safety systems in the ESBWR are passive and include the following:



Automatic Depressurization System (ADS) - The ADS consists of (a) 10 safety relief valves (SRVs) mounted on top of the main steam lines that discharge steam to the suppression pool and (b) 8 depressurization valves (DPVs) that discharge steam to the drywell.

Gravity Driven Cooling System (GDCS) - The makeup water gravity flows into the vessel after the ADS depressurizes the reactor vessel. The GDCS pool capacity is primarily determined by containment geometrical considerations. The GDCS and ADS are the plant's Emergency Core Cooling System (ECCS).

Isolation Condenser System (ICS) - The ICS removes decay heat from the reactor following transient events involving reactor scram including station blackout. The ICS consists of four independent high pressure loops, each containing a heat exchanger that condenses steam on the tube side. The tubes are in a large pool, outside the containment. The system uses natural circulation to remove decay heat.

Passive Containment Cooling System - The PCCS removes heat from inside containment following a loss of-coolant accident (LOCA). The system consists of four safety-related low-pressure loops. Each loop has a heat exchanger open to the containment, a condensate drain line and a vent discharge line submerged in the suppression pool. The four heat exchangers, similar in design to the isolation condensers, are located in cooling pools external to the containment. The PCCS limits containment pressure to < 40 psig.

General Electric – ESBWR

Parameter	Value
Plant Life (years)	60
Thermal Power	4,500 MW
Electrical Power	1,560 MW
Plant Efficiency	34.7 %
Reactor Type	Boiling Water Reactor
Core	
Fuel Type	Enriched UO_2
Fuel Enrichment	4.2% [3]
No. of Fuel Bundles	1,132
Coolant	light water
Moderator	light water
Operating Cycle Length[1]	12-24 months
Outage Duration[2]	~14 days
Percent fuel replaced at refueling	See footnote 4
Average fuel burnup at discharge	~50,000 MWd/MT
Number of Steam Lines	4
Number of Feedwater Trains	2
Containment Parameters	
Design Temperature	340°F
Design Pressure	45 psig
Reactor Parameters	
Design Temperature	575°F
Operating Temperature	550°F
Design Pressure	1,250 psig
Nominal Operating Pressure	1,040 psia
Feedwater & Turbine Parameters	
Turbine Inlet/Outlet Temperature	543/93°F
Turbine Inlet/Outlet Pressure	985/0.8 psia
Feedwater Temperature	420°F
Feedwater Pressure	1,050 psia
Feedwater Flow	4.55×10^4 gpm
Steam mass flow rate	19.31×10^6 lbs/hr
Yearly Waste Generated	
High Level (spent fuel)	50 metric tons
Intermediate Level (spent resins, filters, etc.) and Low Level (compactables/non-compactables) Waste	1,765 cubic feet

[1] Days of operation between outages

[2] For refueling only

[3] For a 24 month cycle

[4] 20% for a 12 month cycle, 42% for a 24 month cycle