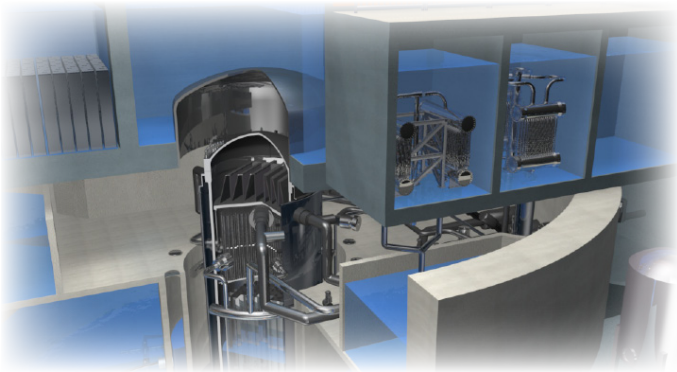
ESBWR passive safety

fact sheet



ESBWR passive safety

- The ESBWR passive safety systems require no AC power to actuate or operate - the only forces that are needed to safely cool the reactor are: the natural rising of steam, condensation, and gravity flow to the reactor
- Natural circulation cools the reactor core and transfers heat out of containment by the forces of nature rather than relying on mechanical pumps and forced cooling

Benefits of passive safety

- Passively provides safe shutdown, cools the reactor, and transfers decay heat out of containment
- Fewer number of plant systems and components, thereby reducing plant construction and O&M costs, while having the lowest core damage frequency of any Generation III or III+ reactor design
- Provides more than 7 days of reactor cooling without AC electrical power or human action
- Only simple actions are needed to extend cooling well beyond an initial 7 days

How does passive safety work?

- Powered by gravity and/or natural circulation
- DC power initiates GDCS, ADS, SLCS and BiMAC cooling
- ICS automatically initiates (fails safe) in the unlikely event DC battery power is lost

ESBWR passive safety systems

ICS - Isolation Condenser System

- Passive closed-loop cooling system that transfers decay heat to the atmosphere
- Water cooling the fuel turns into steam, rises to four isolation condenser heat exchangers, condenses into water, and then returns to cool the reactor again
- Allows for near-immediate plant restart after operation

PCCS - Passive Containment Cooling System

- Passively transfers decay heat out of containment in the unlikely event of a pipe break inside containment or depressurization of the reactor by ADS
- Steam inside containment rises into the six PCCS heat exchangers where it is condensed into water which returns to the GDCS pools for reuse

GDCS - Gravity Driven Cooling System

- Passively injects cooling water into the reactor in the unlikely event of a loss of coolant accident

ADS - Automatic Depressurization System

- Depressurizes the reactor (and keeps it depressurized) to allow GDCS injection or other low pressure refill

BiMAC core melt cooling

- A backup in the very unlikely event that the ICS, ADS, and GDCS systems are unable to function
- Quenches any high temperature corium by utilizing concrete protected inclined pipes filled with water from the GDCS pools. Steam transfers the decay heat into the PCCS heat exchangers where it is condensed, returns to the GDCS pools, and subsequently back into the BiMAC

SLCS - Standby Liquid Control System

- Passive backup shutdown capability via nitrogen-driven boron injection into the reactor

Simple actions for extended cooling

Simple refill actions are needed once the heat exchanger pool inventory is depleted. Low-pressure refill can be provided via:

- The permanently installed diesel-driven pump drawing from the on-site water storage tanks
- A fire truck or as little as a hand-carried, engine-driven water pump connected to rugged pipe connections outside the reactor building

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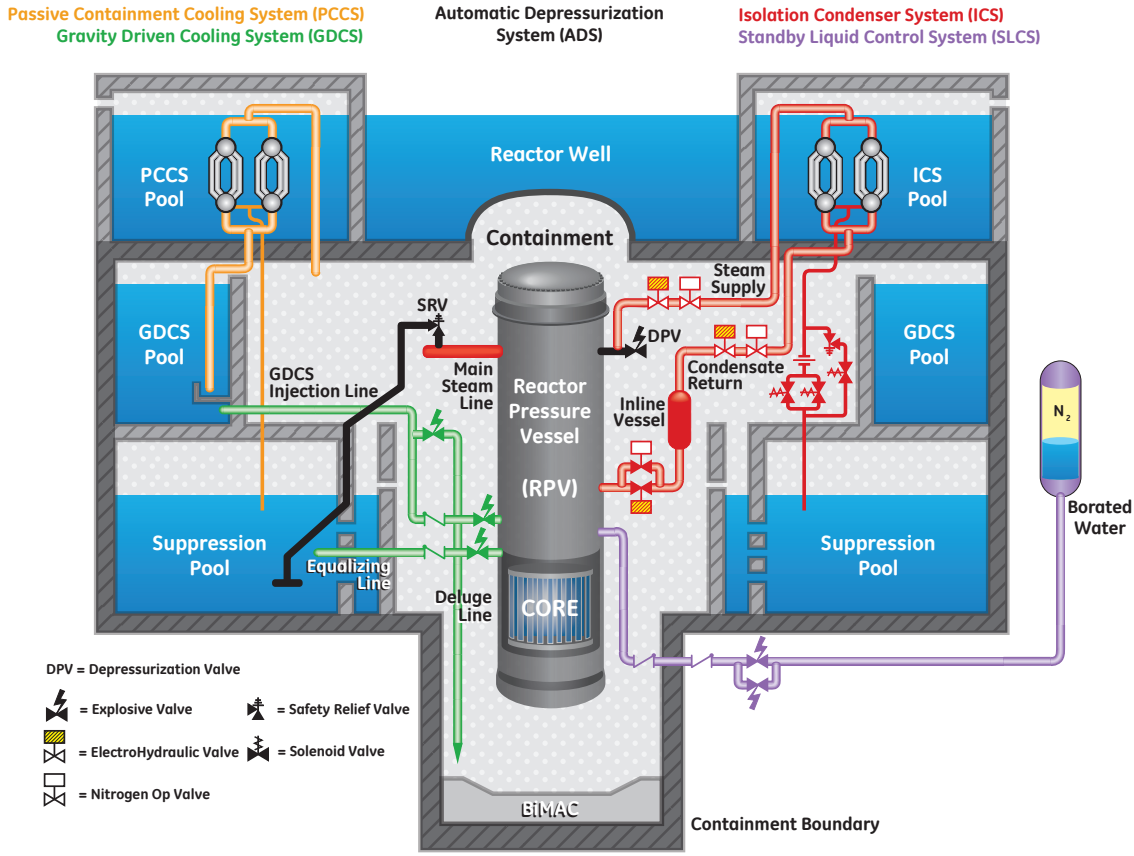
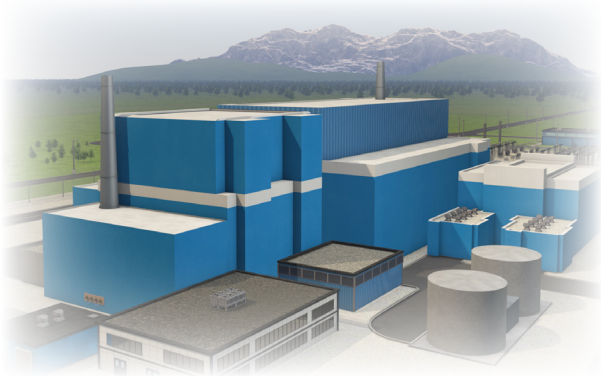
ESBWR passive safety systems



ESBWR



ESBWR has the lowest core damage frequency (industry standard measure of safety) of any Generation III or III+ reactor

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