PBMR FACT SHEET

Pebble Bed Modular Reactor

Vendor/Applicant: Exelon Generation

Reactor type: Modular high-temperature gas-cooled reactor with pebble-type fuel

Power output: 110 - 140 Mwe per module

Features:
- Up to 10 modules linked per control room
- TRISO coated, UO_2, 7.8 - 8.5% enriched pebbles
- closed-cycle helium cooled reactor and vertical Brayton-cycle turbine
- core: 330,000 fuel pebbles; 110,000 graphite pebbles for central reflector
- multi-pass, continuous on-line reload
- passive decay heat removal

The PBMR is a modular high temperature gas-cooled reactor. Each module will be up to 140 MWe. On one site, up to 10 modules could be linked by one control room.

The reactor core contains approx. 330,000 fuel pebbles and approx. 110,000 graphite-only pebbles. The pebble is 60 mm in diameter (about the size of a cueball or racquetball). The graphite pebbles create a central reflector column in the core. This shifts the peak power outward radially and enables higher power production. The core is 8.44 m in height and 3.5 m in diameter. The pebbles are loaded from 8 positions around the periphery of the core, through the top reflector. There are top, bottom, side reflectors, and the center graphite balls act as a reflector. The average helium temperature entering the reactor is 500°C. The average exit temperature is 900°C.

Refueling is performed on-line continuously (daily). Each pebble is expected to pass through the core approximately 10 times. Burnup for each pebble will be 80,000 MWD/MTU.

The helium gas is in a closed cycle from the reactor to the turbine-generator. Each module will have its own turbine-generator, which are a vertical design. The turbine will work on the Brayton cycle.

Prevention of radiation release: The TRISO coated particle is designed to withstand 1600°C that will retain the radionuclides under all accident conditions. Due to a strong negative temperature coefficient, the reactor will shut itself down if helium is lost. The pressure boundary includes the reactor unit pressure vessel and power conversion unit pressure vessel (turbine/generator). The "confinement" building is vented and non-pressure retaining.

During normal operations, changes in power are made by adjusting the pressure and mass flow rate of the helium. The design also includes the reactivity control and shutdown system (RCSS) consists of two independent systems: the reactivity control system (RCS) which consists of 18 control rod systems and the reserve shutdown system (RSS) which consists of 17 small absorber sphere (SAS) shutdown systems.

The reactor cavity cooling system (RCCS) dissipates the heat from the reactor vessel during normal operation, including shutdown. The system also removes decay heat during the loss of heat transfer functions of the power conversion unit (loss of forced cooling). The RCCS includes three independent units each providing 100% cooling capacity for several days. The RCCS is not relied upon to protect the nuclear fuel from exceeding its design temperature. Heat transport through the concrete structures is sufficient to ensure the maximum core temperature is not exceeded.

Exelon-Proposed Target Dates:

Licensing methods framework - December 2001
Legal/ Financial issues - December 2001
Pre-application - Ongoing, ~December 2002

ESP Application 2002
COL application (complete SAR) submittal - Late 2003