Exelon Generation
300 Exelon Way, KSB-3S
Kennett Square, PA 19348

www.exeloncorp.com

Exelon Generation

10 CFR 2.790
Project No. 713

August 13, 2001

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

Subject: Application for Withholding Information from Public Disclosure

Dear Sir or Madam:

Exelon Generation Company (Exelon) hereby submits an application for withholding information from public disclosure pursuant to 10 CFR 2.790, (a) (4).

A meeting between Exelon and the US Nuclear Regulatory Commission staff is planned to take place on August 16, 2001 regarding attributes of the Pebble Bed Modular Reactor (PBMR) core and heat removal design, and use of analytical codes. Exelon is requesting that a portion of the meeting discussions and materials be withheld from public disclosure on the grounds that certain information planned for discussion contains information in the nature of trade secrets and commercial or financial information which is confidential. It is believed, however, that pre-application discussion of this information with NRC Staff will be beneficial to the Staff's understanding of the PBMR design where this type of discussion is consistent with the NRC's policy on Advanced Reactors, NUREG 1226. This will allow the Staff to provide important early input to Exelon regarding attributes of these activities, which are considered important to the Staff, such that these insights can be considered for inclusion in the PBMR safety evaluation.

Attachment 1 contains the discussion materials (i.e., core and heat removal design presentation), which show the specific areas, which are considered by Exelon to be confidential (i.e., proprietary). Attachment 2 contains a non-proprietary version (i.e. proprietary portion intentionally deleted) of the discussion materials.

D064

Exelon Generation
300 Exelon Way, KSB-3S
Kennett Square, PA 19348

www.exeloncorp.com

Exelon SM
Generation

This information is being submitted under affirmation, and the required affidavit is enclosed.

If you have any questions concerning this matter, please do not hesitate to contact us.

Very truly yours,

James A. Muntz
Vice President, Nuclear Projects

Enclosures: Affidavit
Attachments

cc: Thomas King, RES
William Borchardt, Associated Director NRR
James Lyons, NRR
Amy Cubbage, NRR
Diane Jackson, NRR
Stuart Rubin, RES

bcc: E. F. Sproat, III
C. A. McNeil
E. J. Cullen
O. D. Kingsley
R. M. Krich

Correspondence Control Desk - KSA 1-N-1
01-17007
DAC - KSA1-N

Affidavit of James A. Muntz

Commonwealth of Pennsylvania:
: ss.
County of Chester :

James A. Muntz being duly sworn, deposes and states as follows:

1. I am Vice President, Nuclear Projects, Exelon Generation Company, L.L.C. (Exelon), and I am authorized to execute this affidavit in support of a request to withhold certain information, described in paragraph (2) below, from public disclosure and in accordance with Section 2.790(a)(4) of the Commission's regulations.

2. The information sought to be withheld is contained in the letter, J. A. Muntz (Exelon Generation Company, L.L.C.) to the U. S. Nuclear Regulatory Commission Document Control Desk, Project No. 713.

3. The information which is sought to be withheld from public disclosure is proprietary information of Pebble Bed Modular Reactor (Pty) Limited, a Republic of South Africa corporation ("PBMR Co"), and has been provided to Exelon subject to an agreement that it will be treated as confidential and proprietary information and not be disclosed publicly. Exelon has contributed substantial funds for the development of the information and holds a beneficial ownership interest in PBMR Co.

4. In making this application for withholding of proprietary information, Exelon relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOLA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR Section 9.17(a)(4) and Section 2.790(a)(4) for "trade secrets and commercial or financial information obtained from a person and privileged or confidential." The material for which exemption from disclosure is here sought is all "confidential commercial information," and some portions also qualify under the narrower definition of "trade secret," within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d128O (DC Cir. 1983).

5. Some examples of categories of information which fit into the definition of proprietary information and which are applicable here are:

    a) Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by the Company's competitors without license from Exelon Generation Company, L.L.C. constitutes a competitive economic advantage over other companies;

b) Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the performance of outages or the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product.

6. The information sought to be withheld is being submitted to the U. S. Nuclear Regulatory Commission ("NRC") in confidence. The information is of a sort customarily held in confidence by Exelon, and is in fact so held. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in (7) and (8) following. The information sought to be withheld has, to the best of my knowledge and belief, is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence.

7. Initial approval of proprietary treatment of a document is made by the Vice President, Nuclear Projects, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge.

8. The procedure for approval of external release of such a document typically requires review by a Vice President, Exelon Generation, or his designee, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside Exelon Generation Company, L.L.C. are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

9. The information identified in paragraph (2) is classified as proprietary because it contains core and heat removal design, analytical code applications, and results related to the Pebble Bed Modular Reactor (PBMR).

10. Public disclosure of the information sought to be withheld is likely to cause substantial harm to Exelon's and others contributing to the PBMR Project competitive position and foreclose or reduce the availability of profit-making opportunities. The core design and heat renewal design issues related to the PBMR provide commercial value to Exelon and its partners. The research, development, engineering, analytical, and NRC review costs comprise a substantial investment of time and money by Exelon and its partners.

    Exelon's and its partners' competitive advantage will be lost if its competitors are able to use the design information.

    The value of this information would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide

competitors with a windfall, and deprive Exelon of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment.

11. He has read the foregoing affidavit and the matters stated therein are true and correct to the best of his knowledge, information and belief.

James A. Muntz

Subscribed and sworn to
before me this 13th day
of August 2001.

Staci L. Cooper
Notary Public

Notarial Seal
Staci L. Cooper, Notary Public
Kennett Twp., Chester County
My Commission Expires Sept. 20, 2004
Member, Pennsylvania Association of Notaries

Attachment 2

Non-Proprietary

Version of

"PBMR Core Design" presentation

and

"PBMR Heat Removal" presentation

PBMR CORE DESIGN

Johan Slobber, Ph.D.
PBMR, Pty
16 August 2001

P B M R

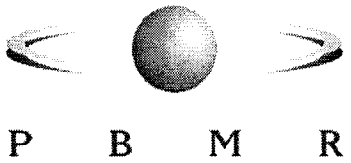
Objective

- Inform and educate NRC regarding key safety design features
- Describe application of analytical codes used by PBMR Pty.
- Reach agreement on what constitutes sufficient design information and analytical methodologies to support a US license application

Topics

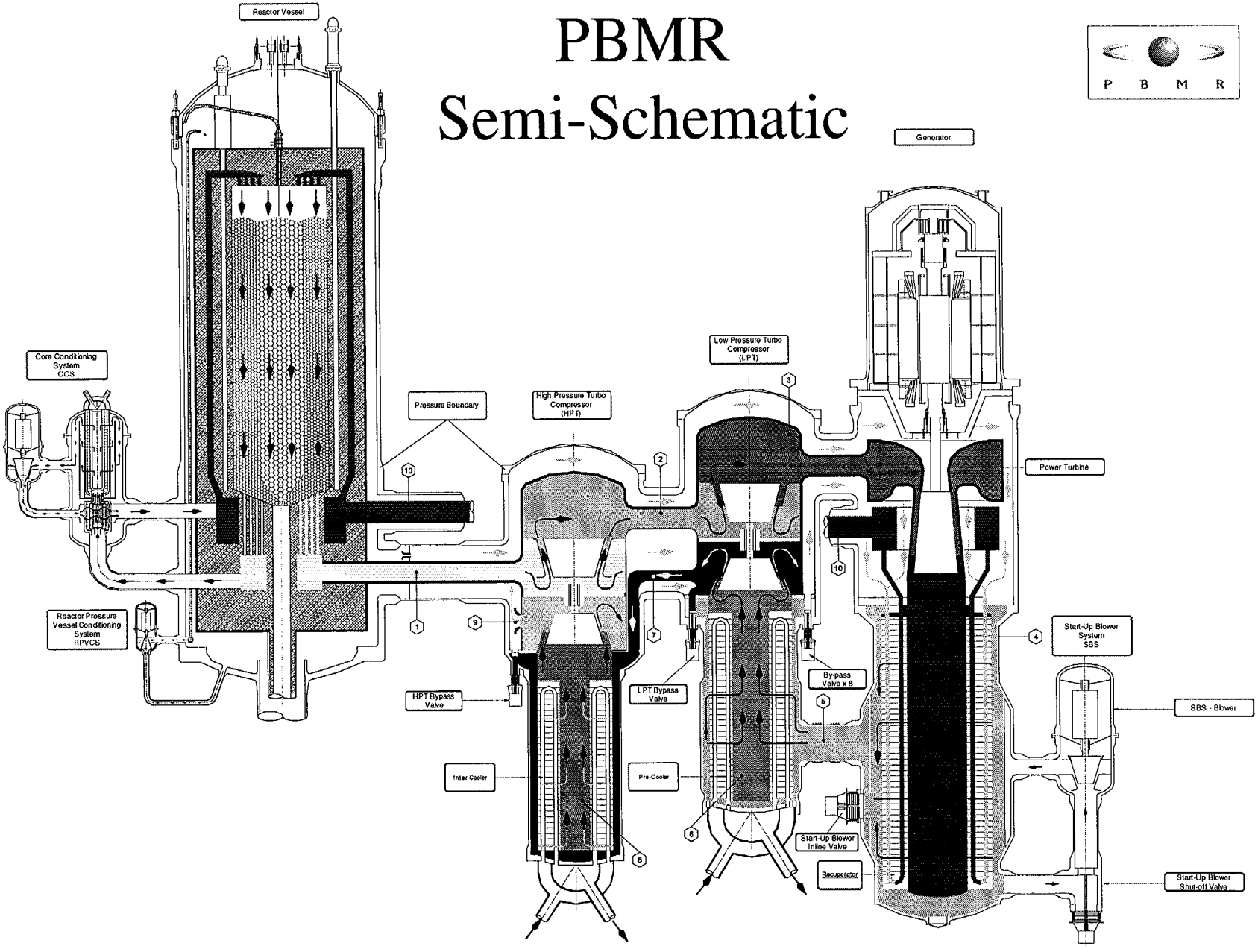
- Physical Layout
- Pebble Flow Overview
- Core Calculations
- Conclusions

Introduction



- Safety characteristics as basis for design
- HTR-MODUL Reactor Unit (RU) design as reference
  - Control elements in reflector only
  - H/D ratio increased 1:1 to 3:1
- Introduction of "graphite column" as central reflector

PBMR
Semi-Schematic



PBMR RPV Layout

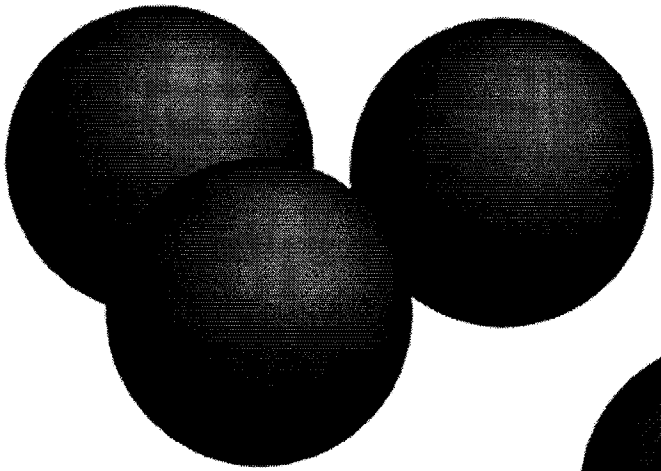
Proprietary Information Removed

PBMR FHSS Schematic

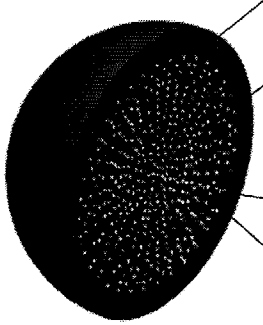
Proprietary Information Removed

Fuel Sphere Design

P B M R



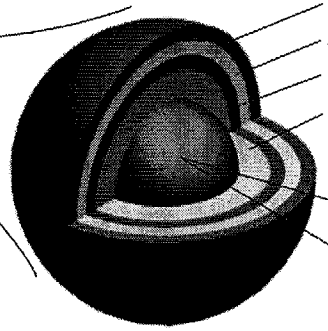
Dia. 60mm
Fuel Sphere



5mm Graphite layer

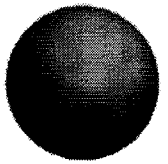
Coated particles imbedded in Graphite Matrix

Half Section



Pyrolytic Carbon 40/1000mm
Silicon Carbite Barrier Coating 35/1000mm
Inner Pyrolytic Carbon 40/1000mm
Porous Carbon Buffer 95/1000mm

Dia. 0,92mm
Coated Particle



Dia.0,5mm
Uranium Dioxide
Fuel

Geometry

- Pebble Flow Experiments
  - R&D Final Report by Siemens
- Computer Simulation
  - Model development at FZJ
- Select Benchmark Experiment
  - Compare experiment and computer model
- Verify VSOP pebble flow model

PFC-3D code

- The *PFC*^{3D} code used for PBMR analysis is divided into two parts:
  - Analysis of the top of the core in a cylindrical vessel
  - Analysis of the pebble flow through the core

Filling the Vessel

Proprietary Information Removed

Core Sphere Flow Analysis

Proprietary Information Removed

Core Sphere Flow

Proprietary Information Removed

Proprietary Information Removed

Flow Lines

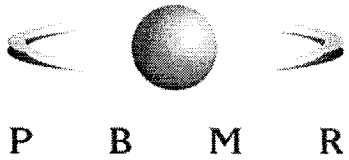
Local Distribution vs. Core Radius

Proprietary Information Removed

Calculational Approach

- Prepare input models for:
  - Fuel
  - Geometry
  - Pebble flow
  - Core compositions
- Perform equilibrium and/or initial core calculations
- RU status is preserved for later restart

Comments on Pebble Flow Experiments



Proprietary Information Removed

Flow of Pebbles

- Model Description:
  - Parallel flow in the upper part of the pebble bed
  - Effect of cone and discharge tube in the bottom region
  - Transition from parallel flow to flow pattern via interpolation

VSOP Implementation

Proprietary Information Removed

VSOP RU Model

Proprietary Information Removed

Calculational Logic

Proprietary Information Removed

Temperature Coefficients

P B M R

Proprietary Information Removed

Radial Fast Flux Distribution at Various Axial Positions

Proprietary Information Removed

Radial Thermal Flux Distribution from Top of Core

Proprietary Information Removed

RCSS Position: Inserted

Proprietary Information Removed

RCSS Characteristics

Proprietary Information Removed

Reactivity Balance

Proprietary Information Removed

Xenon Transient

Proprietary Information Removed

Benchmarking using PBMR

Proprietary Information Removed

PBMR HEAT REMOVAL

Johan Slabber

PBMR Pty.

OBJECTIVE

- Inform and educate NRC regarding key safety design features
- Describe application of analytical codes used by PBMR Pty.
- Reach agreement on what constitutes sufficient design information and analytical methodologies to support a US license application

PBMR HEAT REMOVAL

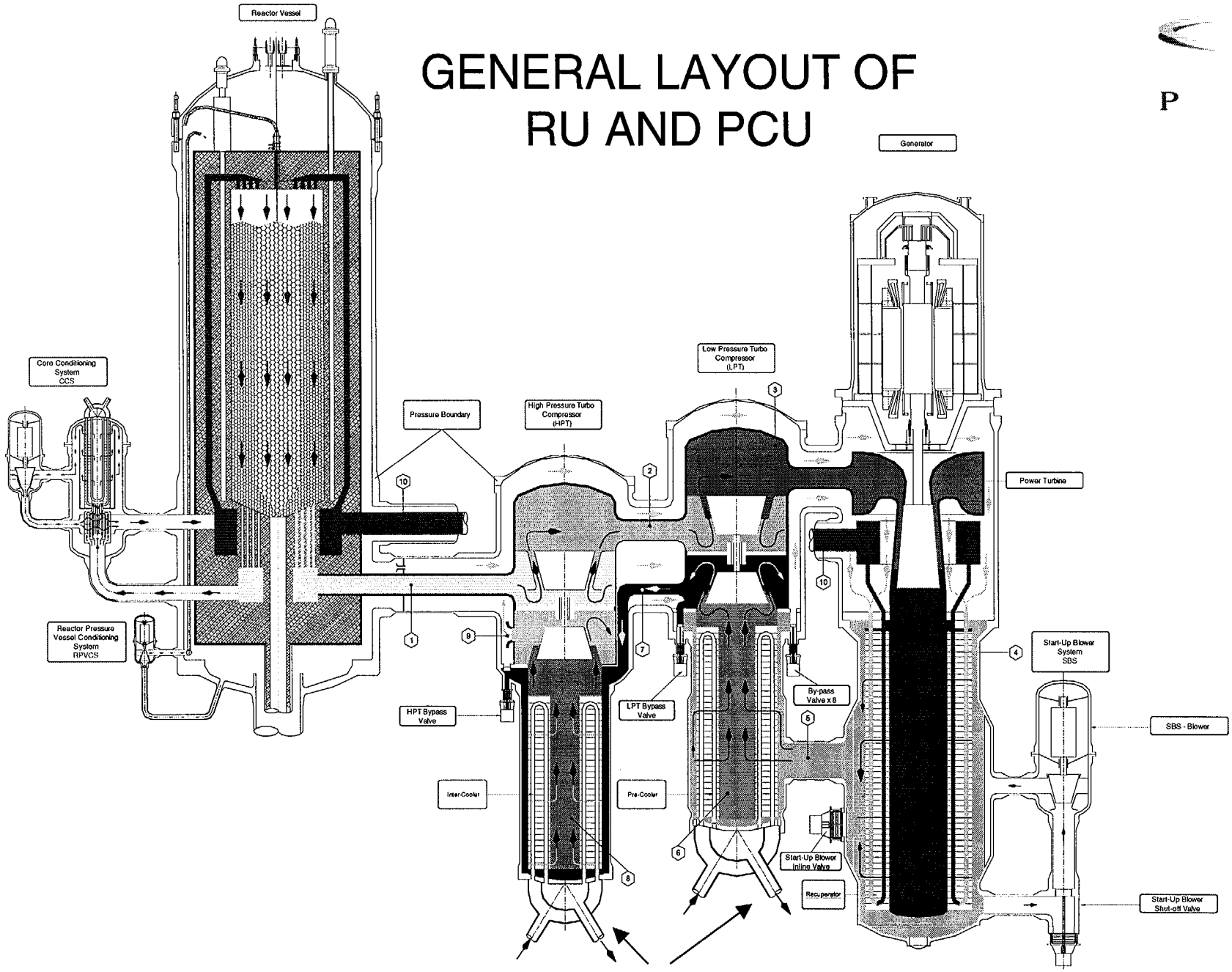
ACTIVE COOLING DURING

- Start-up
- Normal Operation
- Planned shut-down
- Unplanned shut-down
- Maintenance shut-down

REACTOR CAVITY COOLING SYSTEM (RCCS)

- Operation in active mode
- Operation in passive mode

GENERAL LAYOUT OF RU AND PCU



Active Cooling System

START-UP (Equilibrium core)

- In the start-up mode the reactor is cooled by the start-up blower system (SBS)
- The SBS will function at power levels up to 20% of full power
- Core temperature will be between 750 C and 900 C
- Heat removed via the pre- and intercoolers to the ultimate heat sink
- Heat removal quantity is regulated by blower speed and bypass valve manipulation
- The PTG is synchronized at low power levels

NORMAL OPERATION

- The Brayton cycle removes heat by cycling the helium through the core and the PCU
- Heat removed is proportional to the helium inventory
- The reactor power will adjust to the helium inventory level
- Below 40% of full power, control will be by opening the compressor bypass valves

PLANNED SHUTDOWN

- Power is reduced using helium inventory control
- Reactor is shutdown normally
- System is separated from the grid
- Brayton cycle collapses by opening of bypass valves
- SBS is activated to remove decay energy
- Heat is removed by Active Cooling System

UNPLANNED SHUTDOWN

- On reactor scram the Brayton cycle collapses by opening the bypass valves
- On load rejection the generator bypass valves prevent over-speeding, reactor is rundown and inventory is reduced
- Within a few minutes the SBS is started for continued active heat removal

MAINTENANCE SHUTDOWN

- The Reactor Unit Conditioning System (RUCS) is prepared for operation while the SBS cools the core.
- Heat removal is transferred to the RUCS and the system pressure is reduced to atmospheric as soon as convenient.
- The RUCS keeps the core at the required temperature while PCU maintenance is in progress

RCCS in Active Mode

- Coolant is pumped by pumps in the buffer circuit through an anti-syphoning device into the RCCS water pipes through three separate manifolds. Water enters and leaves through the top
- The system is sized to enable the removal of the full decay heat load after other means of cooling are disengaged

RCCS in Passive Cooling Mode

- Without the Brayton cycle, the SBS or the RUCS available all cooling is done by the RCCS
- The RCCS removes heat from the cavity during normal operation by circulating water at low volumes through the RCCS pipes
- The RCCS contains sufficient water to allow passive heat removal for about 5 days through boil-off.
- Defence in Depth is provided by the thermal capacity in the building and surroundings.
- There is no need for immediate operator actions.

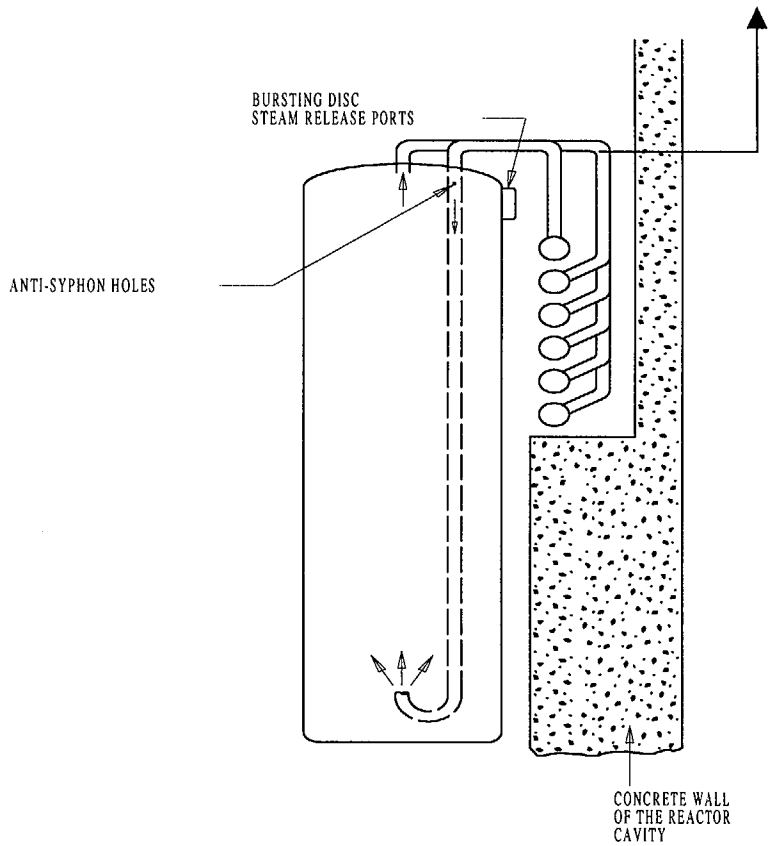
P B M R

Passive Cooling After an Event

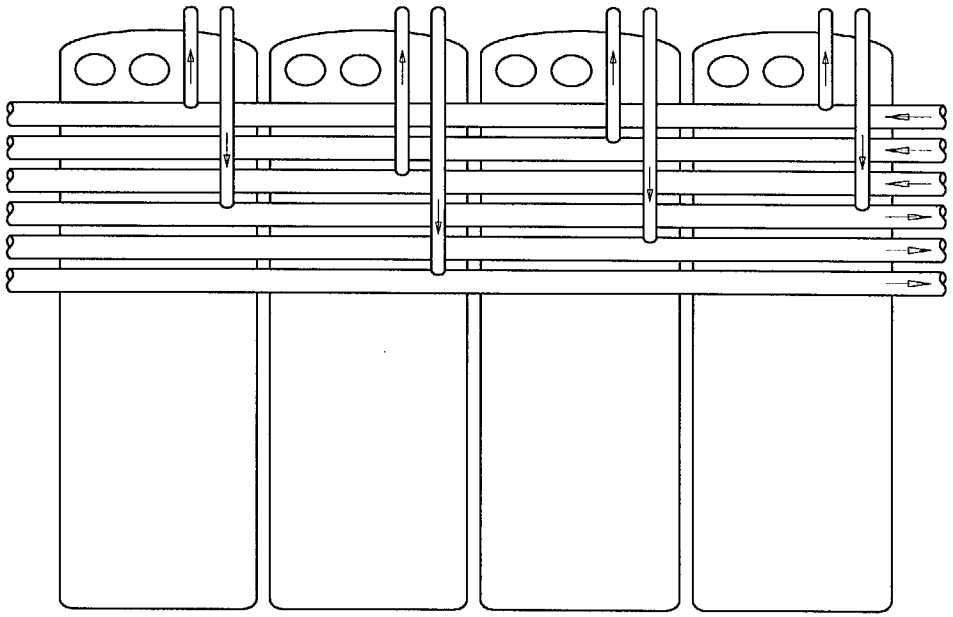
- **In the case of a pressurised or depressurised loss of forced cooling and assuming the active system is unavailable, the water in the RCCS will heat up over time until boiling off will commence. A rupture disc in the system will open the path to the atmosphere to enable water vapour to escape.**

P B M R

Arrangement of Pipes and Headers



Bursting discs release vapor from cavity



Temperature Calculations

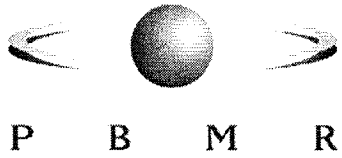
- Using a neutronics code coupled with a heat transport code, calculations on the time dependent heat up of the fuel and core components were performed with the RCCS at a constant 60 C
- The codes used are VSOP coupled to Thermix and STAR CD.

Depressurized Loss of Forced Cooling Graph

Proprietary Information Removed

Depressurized Loss of Forced Cooling Graph without RCCS

Proprietary Information Removed



T- axial Graph

Proprietary Information Removed

MESH USED IN ANALYSIS

Proprietary Information Removed

Reactor Temperature Distribution Pressurized Loss of Forced Cooling Graph

Proprietary Information Removed

Reactor Temperature Distribution Depressurized Loss of Forced Cooling Graph without RCCS

Proprietary Information Removed

RPV Temperatures

Proprietary Information Removed

AIR TEMPERATURES

Proprietary Information Removed

CONCRETE TEMPERATURES

Proprietary Information Removed

Cavity and RCCS Temperature View

Proprietary Information Removed