

November 20, 2001

ORGANIZATION: Exelon Generation (Exelon)

SUBJECT: SUMMARY OF PRE-APPLICATION MEETING ON THE PEBBLE BED
MODULAR REACTOR (PROJECT 713)

On September 19, 2001, representatives of Exelon met with the Nuclear Regulatory Commission (NRC) to discuss the status of the pre-application review, proposed licensing approach, and legal and financial white papers for the Pebble Bed Modular Reactor (PBMR). Enclosure 1 is the meeting agenda; Enclosure 2 is a listing of the meeting attendees; and Enclosure 3 is a copy of the handout provided by the staff.

The Office of Research staff provided a presentation on the expectations of the pre-application review. The presentation objectives were to define the expectations for the scope and outcome of pre-application interactions with Exelon and the Department of Energy (DOE) on PBMR technical issues as envisioned in SECY-01-0070 "Plan for Preapplication Activities on the Pebble Bed Modular Reactor (PBMR);" to seek feedback from Exelon and DOE; and to reach a common understanding of the technical issues, information needs, and end products to be addressed in the PBMR pre-application interactions. The review expectations envisioned in SECY-01-0070 were to identify key safety and licensing issues, identify a path for their resolution, and seek Commission guidance on policy issues. In the meeting, the staff provided an overview of the key technical issues that should be addressed during the pre-application review, including design basis events, source term, fuel, materials, safety analysis, and confinement/ containment. Follow-up items included the need to address the issues on the schedule envisioned; to get feedback from Exelon/DOE on whether such information could be provided and by when; and for the NRC to document the request in a letter.

The staff provided feedback from the NRC's Risk-Informed Licensing Panel regarding Exelon's proposed licensing approach. The staff indicated that the approach can be a basis for conceptually defining safety margin and the use of probabilistic risk assessment (PRA) methods to address individual events by considering ranges of frequency and consequence for each family of events, including uncertainties, appears to be reasonable. However, the acceptability of the approach will depend on the decision-making methods used to derive design and operational limits and special treatment requirements and these decision-making methods should be depicted more explicitly. The staff stated that design assumptions need to be explicitly highlighted so as to make the applicant accountable for validating them, and the basic principles in Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions On Plant-Specific Changes to the Licensing Basis," ought to be used as appropriate. The staff also indicated that, in applying RG 1.174 principles, challenging questions are likely to arise that are unique to the PBMR. An example is the application of the defense-in-depth attributes contained within RG 1.174 which caution against over-reliance on programmatic activities. The safety case for the PBMR relies on fuel characteristics to a large extent which is assured through programmatic activities relative to manufacturing, monitoring and testing.

The staff provided feedback on the three remaining legal and financial white papers to complete a follow-up action item from the July meeting. First, the staff informed Exelon that the white paper on the antitrust review is still under staff review and will be addressed separately from the other white papers. The staff also told Exelon that the Commission's position on the financial protection white paper was addressed in two letters (see letter from Dennis K. Rathbun (Director of Congressional Affairs, NRC) to U.S. Senator Frank Murkowski, dated July 26, 2001, ADAMS ML012110067; and letter from Dennis K. Rathbun (Director of Congressional Affairs, NRC) to U.S. Senator Jeff Bingaman, dated July 26, 2001, ADAMS ML012130057). Finally, the staff indicated that there appears to be nothing which precludes the possibility that the Commission may combine into a single license the individual Part 52 combined licenses (COLs) for reactor modules of a substantially similar design co-located at a single site. However, the licensed period for a single combined COL would be limited to 40 years from the date of issuance of the COL; that is, sequential 40-year terms for each reactor module would not be possible with a single license.

A few additional follow-up items were discussed at the meeting. In the September 5, 2001, meeting, a member of the public asked if the August 30 Exelon letter, which included an overview of the PBMR design concept, would be available on the NRC website. The staff informed the public that it has checked with Exelon to ensure no proprietary information was included in the document and that it would post the letter on the NRC website. The staff informed Exelon that it received additional copies of the overview document for the Advisory Committee on Reactor Safeguards, which completed an action item from a previous meeting.

/RA by A. Cabbage for:/

Diane T. Jackson, Project Manager
New Reactor Licensing Project Office
Office of Nuclear Reactor Regulation

Project No. 713

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OFFICE	PM:NRLPO*	DD:NRLPO		
NAME	DJackson (aec for:)	MGamberoni		
DATE	11/8/2001	11/16/2001	/ /2001	/ /2001

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Distribution for Meeting Summary dated November 20, 2001

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NRLPO R/F
D. Jackson
A. Cabbage
J. Lyons
M. Gamberoni

E-MAIL:

PUBLIC
S. Collins
J. Johnson
B. Sheron
R. Borchardt
D. Matthews
F. Gillespie
J. Strosnider
T. Collins
G. Holahan
S. Black
B. Boger
W. Dean
J. Zwolinski
C. Carpenter
J. Moore, OGC
S. Duraisamy, ACRS
T. King, RES
S. Rubin
G. Bagchi
D. Horn
J. Zimmerman
M. Reinhart
M. Cheok
H. Nigh
S. Morris
G. Mizuno
A. Thadani, RES
J. Shea
OPA
NRLPO Group
D. Loveless

D. Carlson
R. Tripathi
M. El-Zeftawy
J. Collins
M. McConnell
R. Taylor
J. Flack

cc: Mr. Ralph Beedle
Senior Vice President
and Chief Nuclear Officer
Suite 400
1776 I Street, NW
Washington, DC 20006-3708

James Muntz
Vice President Nuclear Projects
Exelon Generation
300 Exelon Way
Kennett Square, PA 19348

Edward F. Sproat, III
Vice President-Int'l Projects
Exelon Generation
300 Exelon Way
Kennett Square, PA 19348

Kevin Borton
Exelon Generation
300 Exelon Way
Kennett Square, PA 19348

Rod M. Krich, Vice President
Licensing Projects
Exelon Nuclear
4300 Winfield Road
2nd Floor
Warrenville, IL 60555

Steven P. Frantz
Morgan, Lewis and Bockius
1800 M Street, N. W.
Washington, D.C. 20036-5869

David Lochbaum
Union of Concerned Scientists
1707 H Street, NW
Washington, DC 20006-3919

Dr. Gail Marcus
U.S. Department of Energy
Office of Nuclear Energy, Science
and Technology
NE-1, Room 5A-143
1000 Independence Avenue, SW
Washington, DC 20585

William D. Magwood, IV
U.S. Department of Energy
Office of Nuclear Energy, Science
and Technology
NE-1, Room 5A-143
1000 Independence Avenue, SW
Washington, DC 20585

Mr. Paul Gunter
Nuclear Information & Resource
Service
1424 16th Street, NW, Suite 404
Washington, DC 20036

Ms. Wenonah Hauter
Public Citizen's Critical Mass Energy
Project
211 Pennsylvania Avenue, SE
Washington, DC 20003

Mr. Ron Simard
Nuclear Energy Institute
Suite 400
1776 I Street, NW
Washington, DC 20006-3708

Mr. Stephen Antonelli
Research Associate on Nuclear
Energy
Public Citizens Critical Mass Energy
and Environment Program
215 Pennsylvania Avenue, SE
Washington, DC 20003

Pebble Bed Modular Reactor
Pre-application Meeting
September 19, 2001

Meeting Plan

Objectives of the meeting:

- 1) To close discussions on Exelon's legal and financial white papers and licensing approach
- 2) To discuss expectations for the pre-application review
- 3) Discuss, if necessary, follow-on issues from September 5, 2001 meeting on application content and other meetings.

September 19 morning

- 9:00 - 9:15 - Introduction
- 9:15 - 10:00 - Pre-application Review Expectations
- 10:00 - 11:00 - Licensing Approach
- 11:00 - 11:30 - Legal and Financial White papers

Pebble Bed Modular Reactor
Pre-application Meeting
September 19, 2001

Attendance List

Name	Affiliation	Telephone	E-mail
Farshid Shahrokhi	Framatome-ANP	434-832-2923	fshahrokhi@framatech.com
Jenny Weil	McGraw-Hill	202-383-2161	jenny_weil@plafts.com
Roger Huston	Licensing Support Services	703-671-9738	Roger@licensing-support.com
Deann Raleigh	LIS, Scientech	301-258-2551	draleigh@scientech.com
Russ Bell	NEI	202-739-8087	rjb@nei.org
Charles Brinkman	Westinghouse	301-881-7040	brinkmcb@westinghouse.com
Tom Bergman	OEDO/NRC	301-415-1725	tab@nrc.gov
Jennifer Ober	Framatome, USA	703-527-4747	jober@framatomeusa.com
Lane Hay	SERCH Bechtel	301-228-6312	hlhay@bechtel.com
Edward Burns	Washington Group Intl.	202-969-1352	edward.burns@wsms.com
Jose Ibarra	NRC/RES	301-415-6345	jgi@nrc.gov
David Terao	NRC/NRR/EMEB	301-415-3317	dxt@nrc.gov
Alan Rae	NRC/NRR/NRLPO	301-415-1102	alanrae@hotmail.com
Bob Palla	NRC/NRR/SPSB	301-415-1095	rlp3@nrc.gov
Alan Rubin	NRC/RES/DRAA	301-415-6776	amr@nrc.gov
Diane Jackson	NRC/NRLPO	301-415-8548	dtj@nrc.gov
Steve Frantz	Morgan, Lewis & Bockius	202-467-7460	sfrantz@morganlewis.com
Jim Muntz	Exelon	610-765-5660	james.muntz@exeloncorp.com
Kevin Borton	Exelon	610-765-5528	kevin.borton@exeloncorp.com
Greg Krueger	Exelon	610-765-5973	gregory.krueger@exeloncorp.com
Stuart Rubin	NRC/RES	301-415-7480	sdr1@nrc.gov
Amy Cabbage	NRC/NRLPO	301-415-2875	aec@nrc.gov
Eric Benner	NRC/NRLPO	301-415-1171	ejb1@nrc.gov

Name	Affiliation	Telephone	E-mail
N. P. Kadambi	NRC/RES	301-415-5896	npk@nrc.gov
J. E. Lyons	NRC/NRR/NRLPO	301-415-1126	jel@nrc.gov
Tom King	NRC/RES	301-415-7499	tlk@nrc.gov
John Flack	NRC/RES	301-415-5739	jhf@nrc.gov
Donald E. Carlson	NRC/RES	301-415-8507	dec1@nrc.gov
Marsha Gamberoni	NRC/NRLPO	301-415-1126	mkg@nrc.gov
Ray Reith	INEEL/DOE	301-903-2663	raymond.reith@hq.doe.gov
John M. Connelly	USDOE/EH-51	301-903-5722	john.connely@eh.doe.gov
Janice Moore	NRC/OGC	301-415-1797	jem@nrc.gov



Expectations for Pebble Bed Modular Reactor Preapplication Activities

**T.L. King
Office of Nuclear Regulatory Research
U.S. Nuclear Regulatory Commission
September 19, 2001**

Background

- **NRC's overall expectations for preapplication interactions with Exelon and the Department of Energy (DOE) on the Pebble Bed Modular Reactor (PBMR) were defined in SECY-01-0070:**
 - **identify key safety and licensing issues**
 - **identify a path for their resolution**
 - **seek Commission guidance on policy issues**
- **Document results in letters and Commission papers.**
- **Safety evaluation report on design was not envisioned.**

Presentation Objectives

- **To define NRC expectations for the scope and outcome of preapplication interactions with Exelon and DOE on PBMR technical issues as envisioned in SECY-01-0070.**
- **To seek feedback from Exelon and DOE.**
- **To reach a common understanding of the technical issues, information needs, and end products to be addressed in the PBMR preapplication interactions.**

Overview of Key Technical Issues Which Should be Addressed During Preapplication

- **PMBR design basis:**
 - events to be considered in the design and the basis for their selection
 - acceptance criteria
 - role and use of probabilistic risk assessment
 - safety classification of structure, system and components and its basis
 - what pedigree is implied by a “safety grade” classification?
 - role of the operator
- **PBMR source term for safety analysis:**
 - quantity, timing, chemical form, transport
 - basis, including any planned experimental work
 - graphite contribution

Key Technical Issues (Cont.)

- **PBMR Fuel:**
 - **design goals for performance**
 - **plan for qualifying PBMR production fuel**
 - ▶ **irradiation testing (e.g., test objectives, test conditions, quantity of fuel to be tested, acceptance criteria, etc.)**
 - ▶ **post irradiation examination**
 - ▶ **documentation**
 - **plans for ensuring fuel quality over the life of the plant**
 - **plans for fuel disposal**

Key Technical Issues (Cont.)

- **PBMR Materials:**
 - plans for graphite manufacture and determining its properties as a function of time, temperature, and irradiation
 - types of metals, service conditions, and design codes to be used for RPV and primary system piping
 - building design (conditions, codes and standards)
- **PBMR Safety Analysis:**
 - how will analytical tools be validated?
 - ▶ normal operation
 - ▶ accident analysis (e.g., decay heat removal)
 - role of South African demonstration plant in validation:
 - ▶ what tests?
 - ▶ what instrumentation?
 - ▶ what acceptance criteria?
 - ▶ what documentation?
 - ▶ when will tests be done?

Key Technical Issues (Cont.)

- **Containment vs. Confinement.**
 - **basis for PBMR proposal:**
 - ▶ **plant response to accidents, including offsite doses**
 - ▶ **advantages/disadvantages of containment vs. confinement**
 - ▶ **selection criteria (e.g., dose, defense-in-depth, etc.)**
 - **impact on offsite response**

Follow Up Actions

- **To address each of these issues on the schedule envisioned will require information to be submitted in writing for our review by December 2001.**
- **Feedback to be requested from Exelon/DOE on whether or not such information can be provided and by when.**
- **NRC to document this request in a letter.**