

Wenda

May 29, 2001

Note To: Jesse Funches

From: Jim Turdici

Today, Tom King, RES, Betsy, OCA and I met with two representatives from Exelon (James A. Muntz and Kevin F. Borton). They provided the attached paper which lays out their funding approach and estimates for PBMR. In essence they plan to ask the Congress to fund the Federal costs associated with the research and licensing approvals. Their estimate is \$42.9M over seven years.

They asked Tom to see if the numbers they projected are in the ball park. They plan to visit the Senate staffers within the next two weeks and then the House sometime after that.

Attachment: as

cc: Pete Rabideau

1

B/10

## Funding Proposal for US PBMR Licensing and Fuel Testing

Exelon is involved as a minority investor in a venture to create a new nuclear reactor vendor. Other investors include BNFL, Eskom, and the Investment Development Corporation, 'IDC'. This entity, 'Pebble Bed Modular Reactor, Proprietary, ('PBMR , Pty' or just 'PBMR') proposes to commercialize the pebble bed reactor technology which has been successfully demonstrated in Germany and is under evaluation in several countries. Current plans include construction of a full-scale demonstration unit near Cape Town, South Africa. Exelon is also the likely first US customer, as our core competencies as a nuclear operator and wholesale marketer of electricity are well established.

Exelon, on behalf of PBMR, has entered into pre-application discussions with the US NRC. Exelon is attempting to determine if a known, stable licensing process can be established for this 'Near Term Deployment' advanced reactor technology. Our intention at this time is to use the untried 10CFR52 process to license the first US plant. This new process was established, in part, to minimize the delay and uncertainty associated with the 10CFR50 process under which all current operating commercial reactors were licensed, and under which numerous reactors were cancelled or significantly delayed. Exelon has also been engaged in discussions with DOE, NRC and NEI concerning other aspects of enabling a new generation of reactors, including training on the new technology, computer codes, development of industry and regulator expertise on this promising new technology, and the fuel testing program that will be required to qualify PBMR fuel.

Exelon and PBMR are heartened by the positive reception and reactions of all parties to date. There have been many indications of government willingness to help fund various aspects of this project. Given the current energy climate in the US, the untested licensing processes, and the high degree of regulatory and technological innovation required and risks involved in this project, Exelon and PBMR believe it is appropriate for limited government funding of certain select activities. There is ample precedent for this in recent examples of government funding at a 'matching' level for other advanced light water reactor designs.

Concurrent with the revival in interest in the nuclear option, numerous parties are seeking funding for a wide variety of projects. It is our view that many of these efforts do not have schedules that support commercially viable deployment of this near-term technology, are aimed more at obtaining funding and expanding questions about new technologies rather than arriving at near-term answers that will enable early deployment of the next generation of designs. Many of these diffuse requests may have priorities inconsistent with establishing and expanding a deregulated, low cost, competitive electricity market. To illustrate the current environment, the list of current initiatives and funding requests that Exelon/PBMR are aware of is attached as Appendix 1. These are duplicative in some cases, or have too long a time horizon for completion to benefit near-term deployment initiatives.

We suggest if each of the topic areas in Appendix 1 are approached individually, there is virtually no chance of delivering a commercially viable PBMR in any reasonable time frame. Therefore, PBMR suggests a different approach to government funding support for this promising technology. Exelon

Exelon/PBMR have developed a cost estimate for the tasks of creating, submitting, and obtaining an Early Site Permit (ESP), a Combined Operating License (COL) for the first PBMR site, a Design Certificate (DC) for the generic design, and for doing the required fuel qualification testing, code validation, and materials testing outlined in Appendix 2. This work is expected to take approximately 6 to 7 years to accomplish, and cost about \$94 million. Just under half of this is expected to be spent at government direction and at government facilities (fuel testing at national labs) or on other government regulatory activities (NRC review of a new regulatory framework for gas reactors, initial license applications under 10CFR52, etc.) Our proposal is to specify certain tasks and expenditures performed by Exelon/PBMR that would qualify to offset government billings that Exelon/PBMR would normally receive, in the form of a direct appropriation to NRC. This would allow NRC to complete their respective activities required to license this new technology and confirm its safety.

Exelon/PBMR intends to submit a proposal to create a multi-year program appropriation towards this goal. We suggest one way for the appropriation to work is to authorize the NRC to recognize PBMR expenditures for the development of first-of-a-kind technology applications, the creation of various licensing applications, development of training and education on the new technology for the industry and regulators, specialized research, etc. as credits against NRC and supporting national lab expenses that are normally translated to recoverable user fees. The level of government funding is estimated to be less than \$43 million total expenditure, over an approximately 6 or 7 year time frame from which Exelon/PBMR expect to have at least, and probably substantially more, 'qualifying expenditures'. This amount is based on total government expenditures, as shown in Appendix 2. The cash flow of the appropriations would reflect the actual expenditures of the NRC and its supporting national labs and contractors to the degree they are 'matched' by PBMR/Exelon expenses incurred while developing the licensing information and applications.

We believe this approach is also aligned with the current administration's goals related to aiding the political and industrial development of South Africa.

With respect to US jobs and infrastructure, Exelon/PBMR are willing to discuss any and all of the following with respect to this project:

- Exelon's willingness as a customer to:
  - commit to 40 or more units, provided it permits Exelon to supply power at competitive prices
  - commit to locate the second or third 'string' at a DOE site  
(There are an unknown number of construction jobs and about 100 permanent positions at each PBMR 'string' of 10 units.)

(It is our belief the nuclear industry is truly a global one; for example reactor pressure vessels sold by any vendor are liable to be made in the same countries/facilities. PBMR intends to adhere to the principle of using the lowest cost credible supplier, with an additional goal of developing jobs and industrial infrastructure in South Africa. It is expected, as in many industries, global companies that are willing to locate a facility in South Africa will have a better chance of landing a large contract to this South African majority-owned enterprise.)

- Exelon/PBMR's willingness to:
  - share any 'intellectual property' created by the initial use of the ESP and COL processes

-Locating a fuel fabrication facility and/or an enrichment facility at a DOE location in the future.

-With respect to the proposed government funding on fuel testing, code validation, and materials testing, we believe this work has generic application to particle fuel and other gas reactor designs, and the sharing of this information with other gas reactor suppliers is possible.

**Appendix 1 Summary of Different Initiatives**

<u>Issue</u>	<u>Timing</u>	<u>Amount</u>
<b><u>Development of New Safety Focused, Risk Informed Regulatory Framework</u></b>		
Exelon request to DOE to fund Gas Reactor Framework	2001	\$200K
EPRI funding of NEI request for new industry-supported framework	2001	\$60K
DOE funding of General Atomic participation in gas reactor framework development	2001	\$100K
DOE NTD TF Task D 6 recommendation for top down gas reactor framework	2002	\$500K
	2003	\$500K
DOE NTD TF Task G-1E development of generic risk-informed regulatory changes	2002	\$300K
	2003	\$300K
DOE NTD TF Task G-1D development of risk-informed regulatory framework	2002	\$100K
	2003	\$500K
MIT NFRI proposal to DOE to fund industry risk informed regulatory framework	2002	\$TBD
	2003	\$TBD
<b><u>Development of Gas Reactor Technology-Knowledgeable industry and regulatory workforce</u></b>		
Exelon requests DOE to fund credible Gas Reactor Fundamentals Training Development	2001	\$200K
DOE authorizes Oak Ridge to begin scoping the curriculum in 2001 for 2002 delivery		
DOE NTD TF Task D-4 Third party development of MHTGR fundamentals course	2002	\$400K
Exelon requests DOE to fund NRC participation in IAEA programs for gas reactors	2001-10	\$60K/year
<b><u>Development of Advanced Particle Fuel Performance Verification and Licensing Requirements</u></b>		
Exelon requests DOE to fund development of Particle Fuel Assessment Criteria	2001	\$100K
	2002	\$TBD
	2003	\$TBD
	2004	\$TBD
DOE NTD TF Task D-8 perform independent confirmatory tests of TRISO particle fuel	2002	\$4000K
	2003	\$6,000K
Domenici Bill (S.472) advanced fuel behavior program	2002	\$25,000K

### Demonstration of New Licensing Processes under 10CFR52

NEI request EPRI support for site selection guideline update	2001	\$200K
DOE NTD TF Task G-1A ESP pre-application support to NEI	2002	\$300K
	2003	\$300K
DOE NTD TF Task S-1 ESP FOAK Process Demonstrations (matching funds)	2002	\$10,000K
	2003	\$10,000K
NEI request to EPRI to fund industry Part 50 and 52 readiness activities	2001	\$200K
DOE NTD TF Task G-1B Part 52 process assist to industry	2002	\$200K
	2003	\$300K
DOE NTD TF Task G-1C Part 52 program assist to industry	2002	\$400K
Domenici Bill (S.472) ESP Demonstration Projects (3) matching cost share	2001	\$TBD
	2002	\$TBD
	2003	\$TBD
DOE NTD TF Task D-1, 2, 3 AP-1000 Design Specific Certification Support	2002	\$6,750K
	2003	\$4,750K
DOE NTD TF Task D-5 PBMR Specific pre-application and application support	2002	\$400K
	2004	\$5,000K

### Computer Code Verification and Validation

Exelon requests DOE to fund NRC investigation of international gas reactor codes	2001	\$100K
DOE NTD TF Task D-7 Gas Reactor independent code verifications	2002	\$600K
	2003	\$2,000K

### Technology Developments for Advanced Reactors

DOE NTD TF Task G-1F Advanced information management technologies for construction	2002	\$900K
	2003	\$1,200K
DOE NTD TF Task G-1G R&D for short term technologies for existing certified designs	2002	\$1,000K
	2003	\$1,000K
DOE NTD TF Task D-9 Materials testing for graphite/carbon materials under radiation	2002	\$2,500K
	2003	\$3,000K
Exelon-endorsed request from Potchefstroom Univ. (RSA) for Brayton cycle modeling	2001-3	\$600K
Ohio Univ. requests DOE funding for advanced monitoring and instrumentation for PBMR	2001-2	\$TBD
Univ. of Cincinnati requests DOE funding for SNM and Safeguards research for PBMR	2001-2	\$TBD
Domenici Bill (S.472) funding for university study/research/engineering programs	2002+	\$34,200K
Domenici Bill (S.472) funding for Gen IV promising design development	2002-6	\$50,000K
Domenici Bill (S.472) funding for advanced fuel recycling for Gen IV reactors	2002	\$10M
Domenici Bill (S.472) funding for Nuclear Programs: Research Incentives	2002	\$60,000K

Domenici Bill (S.472) funding for Nuclear Programs: Nuclear Plant Optimization  
Domenici Bill (S.472) funding for Nuclear Programs: Domestic Mining Viability

2002 \$15,000K  
2002 \$18,000K

**Regulatory Reforms**

Domenici Bill (S 472) directs regulatory changes for foreign ownership,  
anti-trust review elimination, hearing procedures, decommissioning obligations,  
agency reporting to Congress.

2002 N/A

**PBMR First of a Kind Licensing Costs**

ESP	2001	2002	2003	2004	2005	2006	2007	Totals							
PBMR	150	500	1500	1000	1000	750	300								
NRC	100	100	100	2000	2000	1500	300	\$ 5,200							
payments	250	600	1600	3000	3000	2250	600	\$ 6,100							
								\$ 11,300							
<b>COI</b>															
PBMR	900	1600	3000	4750	1000	1400	1400	800	200	200	200	200	200	200	\$ 16,050
NRC	100	100	100	100	2660	2660	2660	500	500	500	500	500	500	300	\$ 11,480
payments	1000	1700	3100	4850	3660	4060	4060	1300	700	700	700	700	500	500	\$ 27,530
<b>DC</b>															
PBMR					2800	2000	1000	1000	1000	1000	1000	600	600		\$ 10,000
NRC					0	0	2000	1600	1600	1000	1000	1000	600	600	\$ 7,600
payments					2800	2000	3000	2600	2600	2000	1600	1200			\$ 17,600

<b>Program Totals</b>	
PBMR	\$ 31,250
NRC	\$ 25,380

Totals do not include costs associated with project delays or protracted hearings

**PBMR First of a Kind Development Costs Expected to be Required to Achieve NRC Approval**

- Fuel Performance Validation
- Fuel Manufacturing Process Qualification
- Code Development and V&V
- Materials Qualifications

**Total Development Costs**

PBMR	1500	2000	2000	4000	3000	2000	1000	1000	1000	1000	1000	1000			\$ 19,000	Note 1
NRC/Govt Labs	0	500	2000	2000	4000	4000	1000	1000	1000	1000	1000	1000			\$ 17,500	
payments	1500	2500	4000	6000	7000	6000	2000	2000	2000	2000	2000	2000			\$ 35,500	

Note 1 - These PBMR costs are expected to be the minimum values

**Grand Total PBMR Program Costs**

PBMR	1050	3600	6500	7750	6000	5150	6500	3800	2200	2200	2200	2200	800	900	\$ 50,750	Note 1
NRC/Govt	200	200	700	4100	6660	8160	6960	1500	3500	3100	3100	2500	1300	934	\$ 42,914	
payments	1250	3800	7200	11850	12660	13310	13460	5300	5700	5300	5300	4700	2100	1734	\$ 93,664	