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Exelon SM
Nuclear

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April 13, 2004

Document Control Desk
U.S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

Subject: Submission of Requested Information

RE: Exelon Generation Company, LLC (EGC) Early Site Permit (ESP) Application, Submitted September 25, 2003

The U.S. Nuclear Regulatory Commission (NRC) visited the Clinton Power Station property on March 1 through 3, 2004 for the purpose of performing an environmental site visit in connection with the referenced application. During this visit, the NRC viewed certain information marked as the confidential property of Pebble Bed Modular Reactor (Pty) Ltd (PBMR) that was used in the preparation of the referenced application. Subsequently, the NRC verbally requested a copy of this PBMR information with the understanding that the NRC intended to make the PBMR information publicly available. Enclosed herewith is the requested PBMR information. While the information continues to be marked as PBMR confidential, EGC has nonetheless obtained the permission of PBMR to provide this data to the NRC and with the understanding that the enclosed information will be made publicly available.

The enclosed information also supplements the "Early Site Permit Environmental Report Sections and Supporting Documentation" dated May 15, 2003, provided by Dominion Resources Services, Inc., in connection with its ESP application, NRC docket no. 52-007 (see ADAMS ML040860222 and ML040580285), which is also applicable to the referenced application. Should you have any questions, please feel free to contact the undersigned or Tom Mundy at 610-765-5662.

Sincerely,

Marilyn C. Kray
Vice President, Project Development

Enclosure: PBMR Ltd Calculation MF100-016344-2053 dated March 6, 2003.

cc: NRC Regional Office
Thomas Kenyon, NRC
Maurice Magugumela, PBMR (Pty) Ltd.
Rod Krich (w/o enclosure)
Thomas O'Neill (w/o enclosure)
Steven Frantz (w/o enclosure)
ESP Project Correspondence File

A001

CALCULATIONAL RECORD

Unique Number: MF100-016344-2053 | **Page 1 of 3**

SCOPING CALCULATION: SPENT FUEL ACTIVITIES AFTER 5 YEARS DECAY

	Name	Signature	Date
Author:	CC Stoker		11/03/2003
Reviewer:	F Reitsma		11/03/2003
Approved:	J Slabber		2003-03-11

NOTE: With this calculational record the record MF100-015140-2053 is obsolete.

The fission product and actinide activities have been calculated for different fuel spheres and different burn-up values. Using ORIGEN-S with the 302 MW 6 pass ORIGEN-S library [1], the activities were calculated for the following parameters.

Parameter	Case 1	Case 2
Reactor Power (MW)	400	400
Burn-up (GWD/TU)	92	133
Reactor Fuel Spheres	451545	451545
Full Power Days	~935	~1351
Fuel Sphere U Mass (g)	9	9
Enrichment (%)	9.6	12.9
Reactor Flux <0.5 eV ($n.cm^{-2}.s^{-1}$)	6.82×10^{13}	6.35×10^{13}

Note that the ORIGEN-S cross section library has been generated with the reactor spectrum calculated for the following conditions:

- Dynamic central column PBMR model.
- Equilibrium core based on 8.46% enriched fuel spheres and 80 WD/T(U) burn-up.

Therefore, this ORIGEN-S cross section library will not be directly suitable for Cases 1 and 2, but has been used for scoping purposes. Note that the neutron flux was chosen such that the spent fuel burn-up was reached.

The fission product and actinide activities, after a five-year decay period, are tabulated in Tables 1 and 2. The activities are provided as curies per ton initial uranium mass.

[1] PBMR 302 MW 6 Pass ORIGEN-S Library, PBMR 011862-333, Rev 1, April 2002

Table 1 Spent fuel fission product activities (Curies/tu)

Isotope	Activity (Curies/tu)		Isotope	Activity (Curies/tu)	
	Case 1	Case 2		Case 1 cont.	Case 2 cont.
h 3	9.79E+02	1.36E+03	sb124	6.10E-07	8.30E-07
be 10	8.19E-06	1.19E-05	sb125	5.62E+03	6.79E+03
c 14	3.30E-04	4.77E-04	te125m	1.38E+03	1.66E+03
se 79	1.89E-01	2.71E-01	sn126	1.39E+00	1.92E+00
kr 81	7.01E-07	1.22E-06	sb126	1.94E-01	2.70E-01
kr 85	1.91E+04	2.63E+04	sb126m	1.39E+00	1.92E+00
rb 87	6.18E-05	9.02E-05	te127	2.72E-01	2.34E-01
sr 89	2.27E-05	1.71E-05	te127m	2.78E-01	2.40E-01
Y 89m	2.11E-09	1.59E-09	xe127	4.63E-22	4.12E-22
sr 90	2.04E+05	2.92E+05	te129	3.13E-12	2.62E-12
y 90	2.04E+05	2.92E+05	te129m	4.88E-12	4.10E-12
y 91	9.19E-04	6.99E-04	i129	9.01E-02	1.24E-01
nb 91	1.52E-08	2.09E-08	ba133	4.59E-05	5.93E-05
nb 92	3.62E-11	4.98E-11	cs134	6.42E+04	1.09E+05
zr 93	3.46E+00	5.00E+00	cs135	1.04E+00	1.59E+00
nb 93m	8.44E-01	1.36E+00	cs137	2.69E+05	3.82E+05
nb 94	2.41E-04	3.33E-04	ba137m	2.54E+05	3.61E+05
zr 95	8.16E-03	6.46E-03	la138	5.66E-10	8.17E-10
nb 95	1.80E-02	1.42E-02	ce139	2.18E-05	2.33E-05
nb 95m	9.59E-05	7.60E-05	ce141	3.68E-11	2.99E-11
tc 98	1.54E-06	3.03E-06	ce142	7.78E-05	1.12E-04
tc 99	3.84E+01	5.34E+01	ce144	3.58E+04	3.22E+04
rh102	1.07E-01	1.76E-01	pr144	3.58E+04	3.22E+04
ru103	2.90E-08	2.50E-08	pr144m	5.00E+02	4.51E+02
Rh103m	2.90E-08	2.49E-08	nd144	4.77E-09	7.52E-09
ru106	4.26E+04	4.53E+04	pm145	7.30E-04	1.29E-03
rh106	4.26E+04	4.53E+04	sm145	2.53E-05	5.28E-05
pd107	2.83E-01	3.96E-01	pm146	5.07E-01	8.08E-01
ag108	9.19E-05	1.69E-04	sm146	4.41E-08	1.06E-07
Ag108m	1.06E-03	1.94E-03	pm147	1.36E+05	1.37E+05
Ag109m	9.64E-06	1.52E-05	sm147	1.47E-05	1.86E-05
cd109	9.64E-06	1.52E-05	pm148	1.33E-10	1.33E-10
ag110	5.93E-01	8.48E-01	pm148m	2.51E-09	2.53E-09
Ag110m	4.36E+01	6.23E+01	sm148	8.60E-11	1.61E-10
cd113	4.29E-14	4.06E-14	sm149	1.71E-12	1.58E-12
Cd113m	5.39E+01	7.94E+01	eu149	9.90E-13	8.83E-13
in114	7.19E-11	1.48E-10	sm151	9.14E+02	1.08E+03
In114m	7.51E-11	1.54E-10	eu152	4.92E+00	6.34E+00
Cd115m	3.34E-10	3.08E-10	gd152	2.60E-12	4.43E-12
in115	2.54E-11	2.78E-11	gd153	2.24E-01	4.29E-01
In115m	3.70E-14	3.40E-14	eu154	6.22E+03	1.01E+04
Sn119m	7.76E-01	7.62E-01	eu155	1.91E+03	2.93E+03
sn121	4.17E+00	5.70E+00	tb160	6.28E-05	8.49E-05
Sn121m	5.37E+00	7.34E+00	ho166m	1.23E-03	3.11E-03
sn123	7.37E-02	6.06E-02	tm170	3.22E-09	2.92E-09
te123	2.12E-13	5.48E-13	tm171	1.32E-03	1.52E-03
Te123m	3.18E-05	6.62E-05	Total	1.32E+06	1.78E+06

Table 2 Spent fuel actinide activities (Curies/tu)

Isotope	Activity (Curies/tu)		Isotope	Activity (Curies/tu)	
	Case 1	Case 2		Case 1 cont.	Case 2 cont.
tl207	1.09E-06	1.47E-06	pa233	5.51E-01	9.91E-01
tl208	6.49E-04	1.56E-03	pa234m	2.89E-01	2.73E-01
tl209	1.99E-10	6.44E-10	pa234	3.76E-04	3.56E-04
pb209	9.49E-09	3.07E-08	u232	2.46E-03	5.83E-03
pb210	5.00E-10	8.91E-10	u233	1.46E-05	2.67E-05
pb211	1.09E-06	1.47E-06	u234	1.31E-01	2.51E-01
pb212	1.80E-03	4.31E-03	u235	3.76E-02	2.80E-02
pb214	6.89E-09	1.11E-08	u236	8.19E-01	1.17E+00
bi210	5.01E-10	8.91E-10	u237	4.63E+00	4.66E+00
bi211	1.09E-06	1.47E-06	u238	2.89E-01	2.73E-01
bi212	1.80E-03	4.31E-03	np235	9.41E-05	2.08E-04
bi213	9.49E-09	3.07E-08	np236	1.17E-06	3.10E-06
bi214	6.89E-09	1.11E-08	np237	5.51E-01	9.91E-01
po210	5.01E-10	8.91E-10	np238	8.06E-02	1.03E-01
po211	3.00E-09	4.04E-09	np239	6.46E+01	1.29E+02
po212	1.16E-03	2.77E-03	pu236	1.52E-02	3.62E-02
po213	9.29E-09	3.00E-08	pu237	4.80E-13	1.12E-12
po214	6.89E-09	1.11E-08	pu238	5.40E+03	1.23E+04
po215	1.09E-06	1.47E-06	pu239	3.14E+02	2.99E+02
po216	1.80E-03	4.31E-03	pu240	9.13E+02	8.98E+02
po218	6.89E-09	1.11E-08	pu241	1.93E+05	1.94E+05
at217	9.49E-09	3.07E-08	pu242	8.36E+00	1.22E+01
rn219	1.09E-06	1.47E-06	pu243	3.23E-07	2.17E-06
rn220	1.80E-03	4.31E-03	am241	1.98E+03	2.04E+03
rn222	6.89E-09	1.11E-08	am242m	1.79E+01	2.30E+01
fr221	9.49E-09	3.07E-08	am242	1.78E+01	2.29E+01
fr223	1.50E-08	2.02E-08	am243	6.46E+01	1.29E+02
ra223	1.09E-06	1.47E-06	am245	5.40E-10	6.22E-09
ra224	1.80E-03	4.31E-03	cm242	5.49E+01	7.52E+01
ra225	9.49E-09	3.07E-08	cm243	2.90E+01	5.29E+01
ra226	6.89E-09	1.11E-08	cm244	5.13E+03	1.48E+04
ra228	8.44E-11	1.51E-10	cm245	4.28E-01	1.43E+00
ac225	9.49E-09	3.07E-08	cm246	1.33E-01	6.52E-01
ac227	1.09E-06	1.47E-06	cm247	3.23E-07	2.17E-06
ac228	8.44E-11	1.51E-10	cm248	7.67E-07	7.34E-06
th227	1.08E-06	1.44E-06	bk249	3.72E-05	4.29E-04
th228	1.80E-03	4.31E-03	bk250	7.87E-11	2.51E-09
th229	9.49E-09	3.07E-08	cf249	5.33E-06	6.37E-05
th230	5.31E-06	8.94E-06	cf250	2.16E-05	2.92E-04
th231	3.76E-02	2.80E-02	cf251	1.48E-07	2.23E-06
th232	2.69E-10	4.34E-10	cf252	9.03E-06	1.91E-04
th234	2.89E-01	2.73E-01	es254	7.86E-11	2.51E-09
pa231	8.03E-06	8.52E-06	Total	2.08E+05	2.26E+05