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System Energy Resources, Inc.
1340 Echelon Parkway
Jackson, MS 39213

CNRO-2005-00008

February 14, 2005

U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001
Attention: Document Control Desk

DOCKET: 52-009

SUBJECT: Response to Request for Additional Information (RAI) Regarding the Environmental Portion of the Early Site Permit Application by System Energy Resources, Inc. (SERI) for the Grand Gulf ESP Site

REFERENCE: 1. System Energy Resources, Inc. (SERI) letter to USNRC – Early Site Permit Application (CNRO-2003-00054), dated October 16, 2003.

CONTACT:

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During a conference call on February 3, 2005, the U.S. Nuclear Regulatory Commission requested additional information to support environmental review of the SERI ESP Application. This letter transmits information as outlined in Attachment 1 to this letter.

Should you have any questions, please contact me.

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I declare under penalty of perjury that the foregoing is true and correct.
Executed on February 14, 2005.

Sincerely,

George A. Zinke
Project Manager
System Energy Resources Inc.

Attachment: Attachment 1

cc: Mr. R. K. Anand, USNRC/NRR/DRIP/RNRP
Mr. C. Brandt, PNL
Ms. D. Curran, Harmon, Curran, Spielberg, & Eisenberg, L.L.P.
Mr. W. A. Eaton (ECH)
Mr. B. S. Mallett, Administrator, USNRC/RIV
Mr. J. H. Wilson, USNRC/NRR/DRIP/RLEP

Resident Inspectors' Office: GGNS

ATTACHMENT 1

NRC Questions of 2/3/05

Gaseous Dose Assessment

Request G-1:

Explain why the 0-50 mile population used in the GASPAR calculation (approx. 395,200) is higher than the value given in the ER (approx. 332,369), and explain the differences in population distribution in the 0 – 10 mile distances from the site.

Response:

The population dose due to gaseous releases was based on the projected population distribution for year 2070. The value given in the ER, indicated in the Request G-1 above, is the population projection for year 2002.

The population distribution used in the calculation is given below:

Population Distribution used in Calculation
Year 2070

Sector	0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50	Total
N	0	14	0	0	0	10	833	539	749	450	2,595
NNE	0	14	0	29	0	0	25,628	21,740	7,823	245	55,479
NE	0	0	96	32	0	119	7,120	7,276	2,379	807	17,829
ENE	0	20	4	0	53	93	999	2,644	33,209	58,514	95,536
E	0	0	0	32	45	206	1,534	1,804	13,506	9,961	27,088
ESE	0	12	12	291	439	483	1,221	1,423	8,588	9,839	22,308
SE	0	0	0	962	2,246	748	1,472	1,979	5,092	23,293	35,792
SSE	0	17	6	189	0	291	831	573	2,093	5,015	9,015
S	0	0	0	0	17	19	4,180	2,382	1,331	1,165	9,094
SSW	0	6	0	26	0	1,610	1,146	8,602	17,251	11,361	40,002
SW	0	0	0	0	0	85	574	1,964	6,540	9,218	18,381
WSW	0	0	0	0	0	27	1,489	1,695	2,569	1,448	7,228
W	0	0	0	0	38	23	358	834	4,137	3,701	9,091
WNW	0	0	0	0	0	5	2,403	2,031	5,478	7,103	17,020
NW	0	0	0	0	0	1	128	294	1,740	8,588	10,751
NNW	0	0	0	0	0	0	873	4,163	10,352	2,581	17,969
Total	0	83	118	1,561	2,838	3,720	50,789	59,943	122,837	153,289	395,178

Subsequent to the calculation being issued, the population distribution was revised slightly, primarily based on changes to the Emergency Planning Zone (EPZ) 0-10 mile population distribution. The population distribution as given in ER Tables 2.5-1 and 2.5-6 for year 2070 is given below (numbers in the "total" row below differ slightly from those shown in the ER due to round-off, but the grand total is the same):

ER Tables 2.5-1 and 2.5-6 Population Distribution
Year 2070

Sector	0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50	Total
NORTH	0	3	0	0	0	10	833	539	749	450	2,584
N-NE	0	11	0	0	0	3	25,628	21,740	7,823	245	55,450
NE	0	0	0	0	34	4	7,120	7,276	2,379	807	17,620
E-NE	0	17	0	53	32	121	999	2,644	33,209	58,514	95,589
EAST	0	20	0	100	81	205	1,534	1,804	13,506	9,961	27,211
E-SE	0	0	0	0	0	1,010	1,221	1,423	8,588	9,839	22,081
SE	0	0	12	0	252	3,930	1,472	1,979	5,092	23,293	36,030
S-SE	0	7	9	0	50	609	831	573	2,093	5,015	9,187
SOUTH	0	0	4	0	0	103	4,180	2,382	1,331	1,165	9,165
S-SW	0	0	0	0	0	1,616	1,146	8,602	17,251	11,361	39,976
SW	0	0	0	0	0	7	574	1,964	6,540	9,218	18,303
W-SW	0	0	0	0	0	105	1,489	1,695	2,569	1,448	7,306
WEST	0	0	0	0	0	108	358	834	4,137	3,701	9,138
W-NW	0	0	0	0	0	6	2,403	2,031	5,478	7,103	17,021
NW	0	0	0	0	0	35	128	294	1,740	8,588	10,785
N-NW	0	0	0	0	0	0	873	4,163	10,352	2,581	17,969
Grand Totals	**0**	**58**	**25**	**153**	**449**	**7872**	**50789**	**59943**	**122837**	**153289**	**395415**

A comparison of the total population by distance from the site below illustrates that the major differences are in the 0-10 mile populations. The minor differences between the calculation numbers and the ER Tables numbers in the totals for the 10-50 mile distances are due to round off.

Distance (miles) =>	0-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50	Total
Total (Calc)	0	83	118	1,561	2,838	3,720	*50,789*	*59,943*	*122,837*	*153,289*	**395,178**
Total ER Table	0	58	26	153	449	7,872	*50,788*	*59,944*	*122,838*	*153,288*	**395,416**

The values used in the calculation for the 0-10 mile distances have a higher population closer to the site. This would produce conservative calculation results.

To quantify the effect of these differences in the 0 – 10 mile radial area, the calculation compared the population doses using the original 2002 population distributions with the original 2002 distribution values given in ER Tables 2.5-1 and 2.5-6 (although not exactly the same as reported in the ER, the distribution differences between these two sets of data is similar to that shown above). For distances greater than 10 miles, the population distribution given in the dose calculation was used. The 0-10 mile population distributions used in this sensitivity study are given below.

Population Distribution for 2002
Original Draft ER Tables 2.5-1 and 2.5-6

Distance	0-1	1-2	2-3	3-4	4-5	5-10
Totals	0	51	22	129	378	6657

Original Population Distribution used in Dose Calculation
Population Distribution for 2002

Distance	0-1	1-2	2-3	3-4	4-5	5-10
Totals	0	74	99	1320	2397	3143

Using these two distributions, test cases were run using identical values for all other GASPAR input parameters. The relevant results are given below:

Results using Original Draft ER Tables 2.5-1 and 2.5-6population distribution:

```
GGNS ESP Airborne Effluents
  ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

  PATHWAY   T.BODY     GI-TRACT     BONE      LIVER      KIDNEY     THYROID     LUNG       SKIN
 ---------+----------+----------+----------+----------+----------+----------+----------+----------+
 *TOTAL*  : 2.83E+00 : 2.84E+00 : 3.54E+00 : 2.84E+00 : 2.85E+00 : 6.46E+00 : 2.91E+00 : 6.34E+00 :
```

Results using original population distribution used in dose calculation:

```
GGNS ESP Airborne Effluents
  ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

  PATHWAY   T.BODY     GI-TRACT     BONE      LIVER      KIDNEY     THYROID     LUNG       SKIN
 ---------+----------+----------+----------+----------+----------+----------+----------+----------+
 *TOTAL*  : 2.95E+00 : 2.96E+00 : 3.60E+00 : 2.96E+00 : 2.97E+00 : 6.81E+00 : 3.04E+00 : 6.72E+00 :
```

As seen from the above results, the population distribution used in the calculation results in higher total population doses than the 2002 EPZ (ER) distribution. Based on this, the population dose based on the projected year 2070 population distribution given in the calculation will bound the population dose using the ER population distribution in Table 2.5-1 for the 0 – 10 mile area. Consequently, the 2070 population distribution used in the normal gaseous dose calculation is conservative compared to the ER population distribution.

Request G-2:

The Appendix I inhalation dose at site boundary for child is 3.93 rem. The dose via the vegetable consumption pathway at the nearest garden is higher. Why isn't the vegetable pathway dose at nearest garden used?

Response:

Standard Review Plan NUREG-1555, Section 5.4.1, states that the following receptor locations are to be considered:

- to a distance of 8 km (5 mi), identify the receptor and its location for the nearest residence, milk cow, milk goat, meat animal, and vegetable garden larger than 50 m^2

Based on the current site survey, the nearest garden (as evaluated) does not meet the above criteria since the area was less than 50 m^2. The current site survey (ER Section 4.5 Reference No. 2) gives the following data:

- Nearest garden = 0.67 mi, 100 ft^2
- Nearest garden = 2.66 mi, 500 ft^2

If the individual doses was evaluated at the nearest garden that meets the SRP criteria, the dose would be significantly less. However, the garden located at 0.67 miles ENE was used to provide a conservative dose estimate. The dose to the thyroid of a child at this garden (at 0.67 miles distant) is higher than at the site boundary as seen from the following results:

- Nearest Garden Vegetable Consumption Child Thyroid = 1.88E+01 mrem (two units)
- Site Boundary Child Inhalation Thyroid = 3.93E+00 mrem (two units)

Therefore, the maximum individual dose for comparison with Appendix I criteria in Table 5.4-11B should have been the dose at the nearest garden.

Request G-3:

The results given in ER Tables 5.4-11A and 5.4-11B do not appear to be on a per unit basis. Why weren't the results divided by two to get per unit basis.

Response:

The results listed in these tables are based on two units and should be divided by two for comparison with the 10CFR50 Appendix I criteria. The current results in the listed tables for comparison with Appendix I, including the maximum dose from the vegetable garden pathway are as follows:

TABLE 5.4-11B
COMPARISON OF MAXIMUM INDIVIDUAL DOSE TO 10 CFR 50, APPENDIX I CRITERIA – GASEOUS PATHWAY

Type of Dose	Design Objective[1]	Point of Evaluation	Calculated Dose
	Gaseous Effluents (Noble Gases Only)		
Gamma air dose	10 mrad	Exclusion Area Boundary	4.16E-01 mrad
Beta air dose	20 mrad	Exclusion Area Boundary	2.53E+00 mrad
Total body dose	5 mrem	Exclusion Area Boundary	2.44E-01 mrem
Skin dose	15 mrem	Exclusion Area Boundary	1.69E+00 mrem
	Radioiodines and Particulates		
Vegetable Consumption	15 mrem	Nearest Garden	9.40E+00 mrem (thyroid, child)

NOTES:
1. 10 CFR 50, Appendix I

The above changes to Tables 5.4-11B will not be incorporated into the next revision of the ER. Instead, the doses will be recalculated using the current X/Q values provided in a previous RAI response (CNRO-2004-0045) and the most current 0 to 10 mile population distribution discussed above. The recalculated EAB values may increase by approximately 14% (see discussion in response to Request G-4, below), while the individual doses for other locations should be lower by approximately 40%.

Request G-4:

The accident dose evaluations used updated X/Q values based on GGNS site meteorological data from years 2002-2003. Were these updated X/Q values used for the normal dose calculations?

Response:

The X/Q values reported in the ER (Table 2.7-117) were updated to use meteorological data from 2002-2003 instead of data from 1996-2000 due to concerns with the accuracy of data measured prior to the installation of the new meteorological tower at the GGNS site (CNRO-2004-0067). A comparison of the X/Q values using the 1996-2000 data with the 2002-2003 data is given below:

				1996-2000 Combined Meteorological Data			2002-2003 Combined Meteorological Data		
Location	Direction From Site	Distance (miles)	Distance (meters)	X/Q (sec/m3) No Decay Undepleted	X/Q (sec/m3) No Decay Depleted	D/Q (per sq. meter)	X/Q (sec/m3) No Decay Undepleted	X/Q (sec/m3) No Decay Depleted	D/Q (per sq. meter)
SITE BOUNDARY	SW	0.85	1364	**7.70E-06**	6.80E-06	7.00E-09	6.80E-06	6.00E-06	8.70E-09
SITE BOUNDARY	WSW	0.85	1364	5.60E-06	5.00E-06	3.80E-09	**8.80E-06**	7.80E-06	6.80E-09
NEAREST HOME	N	0.81	1310	2.90E-06	2.60E-06	8.00E-09	**2.20E-06**	1.90E-06	6.60E-09
NEAREST HOME	ENE	0.63	1021	**3.70E-06**	3.30E-06	7.20E-09	1.70E-06	1.50E-06	5.40E-09
NEAREST GARDEN	SSW	1.05	1686	3.10E-06	2.70E-06	4.70E-09	**2.00E-06**	1.70E-06	4.40E-09
NEAREST GARDEN	ENE	0.63	1021	**3.70E-06**	3.30E-06	7.20E-09	1.70E-06	1.50E-06	5.40E-09

As seen from the results, the limiting site boundary X/Q changed from 7.7E-06 to 8.8E-06 (an increase of 14%) and the direction changed from SW to WSW. For the nearest home, the X/Q value changed from 3.7E-06 to 2.2E-06 (a decrease of 41%) and the direction changed from ENE to N. For the nearest garden, the X/Q value changed from 3.7E-06 to 2.0E-06 (a decrease of 46%) and the direction changed from ENE to SSW. From the above comparison, the X/Q values based on the 2002-2003 data are, in general, smaller than the results using the 1996 – 2000 data. Using the new values for X/Q would generally result in lower doses.

Based on this comparison, the EAB doses (site boundary) would be expected to increase by about 14% and the dose due to vegetable consumption would decrease by approximately 46%. Considering these changes, the maximum individual doses will continue to meet the 10CFR50, Appendix I criteria considering both the population distribution differences and the use of the 2002 – 2003 GGNS site meteorological data.

ESP Application Document Revisions

As a result of the use of the 2002 – 2003 meteorological data in the calculation for airborne doses for normal operation, changes will be required to the ER. The following parts of the application will require revision, and will be included in Revision 1 when issued.

- ER Table 3.0-8 will be revised to correct the ACR-700 contributors to the liquid pathway source term, and the isotopes included as indicated above.
- ER Section 5.4.3 will be revised to make some editorial corrections to table numbering
- ER Section 5.4.3.2 will be revised to indicate the X/Q and D/Q values used in determination of dose from airborne pathways are those documented in ER Table 2.7-117, instead of those in Sections 2.7.6 and 2.7.7 of the ER. Those in Sections 2.7.6 and 2.7.7 of the ER are used for accident dose calculations.
- ER Table 5.4-11A will be revised to correct the distance to the Nearest Garden; 0.67 miles vice 0.63 miles.
- The following tables will be revised to include the revised doses based on the gaseous normal dose calculation revision using the more recent meteorological data, from years 2002 – 2003, and to reflect the latest population distribution in the EPZ, 0 – 10 miles from the site. The doses reported will be on a per-unit basis in the revised table. Tables potentially affected are: 5.4-11A, 5.4-11B, 5.4-12, 5.4-13, 5.4-16, 5.4-17 and 5.4-18.
- Similar information for gaseous dose is provided in the Site Safety Analysis Report, and will require revision. This includes: Section 3.2.3, Tables 3.2-3A, 3.2-3B, 3.2-4, 3.2-5, and 3.2-9.

As indicated above in the response to Requests G-3 and G-4, the calculation results for the EPZ doses would be less than that shown in the ER (and SSAR) because of the reduction in the X/Q and consideration of dose on a per-unit basis. There may be a small increase in EAB doses; however the criteria of 10 CFR 50 Appendix I will continue to be met.

Liquid Dose Assessment

Request L-1:

Explain discrepancies noted in the liquid release source term in the LADTAP output compared to ER Table 3.0-8, "Normal Operations Liquid Release Source Term." It appears that the source term in the ER is larger than that in the LADTAP output, and some of the isotopes listed are different.

Response:

Review of ER Table 3.0-8 confirmed that discrepancies exist between this table and the LADTAP output file that was used in determination of the liquid release doses. The discrepancies are attributed to a revised source term provided by Atomic Energy of Canada Limited (AECL) subsequent to preparation of ER Table 3.0-8.

As part of the Early Site Permit (initiative), AECL provided predicted emissions from a two-unit, ACR-700 plant. These predicted releases were incorporated into the composite release for normal operations presented in Table 3.0-8. Subsequently, AECL revised their original estimates to credit ACR design changes. These changes were documented in AECL Memo to M. Soulard, from P. J. Allsop & C. R. Boss, "Waterborne Emissions Gross β–γ from a US-ACR", File No. 115-01250-240-001, April 9, 2003. The revised ACR source term was incorporated in the composite source term used in the LADTAP calculation of offsite doses due to normal releases; however, ER Table 3.0-8 of the ER was inadvertently not updated. Nine isotopes in the composite release were impacted (reduced) by the revised ACR source term; C-14, Cr-51, Co-60, Fe-59, Zr-95, Nb-95, Sb-122, Sb-124, and Sb-125. The corrected values are provided in the table below. Sb-122 and Sb-125 are no longer predicted in ACR waterborne emissions. As they are not found in the AP1000 or ABWR emissions either, they have been removed from Table 3.0-8. In addition, Co-56 is not used in LADTAP, and therefore, it will be removed from the ER Table 3.0-8. Note 1 of the table will be corrected to point to ER Table 3.0-1 Section 10.3 for liquid source term, vice Section 9.5 which is for airborne.

TABLE 3.0-8

NORMAL OPERATIONS LIQUID RELEASE SOURCE TERM [1]

Radionuclide	Composite Normal Release [2] (Ci/yr)	Radionuclide	Composite Normal Release [2] (Ci/yr)
I-131	2.826E-02	Zr-95	2.080E-03 ~~1.838E-02~~
I-132	5.200E-03	Nb-95	3.820E-03 ~~3.900E-02~~
I-133	2.000E-02	Mo-99	1.659E-03
I-134	3.400E-03	Tc-99m	1.600E-03
I-135	1.503E-02	Ru-103	9.860E-03
H-3	6.200E+03	Rh-103m	9.860E-03
C-14	8.800E-04 ~~1.514E-03~~	Ru-106	1.470E-01
Na-24	5.622E-03	Rh-106	1.470E-01
P-32	3.600E-04	Ag-110	2.800E-04
Cr-51	1.541E-02 ~~1.946E-02~~	Ag-110m	2.100E-03
Mn-54	5.200E-03	~~Sb-122~~	~~8.220E-04~~
Mn-56	7.622E-03	Sb-124	1.358E-03 ~~3.560E-03~~
~~Co-56~~	~~1.038E-02~~	~~Sb-125~~	~~4.000E-04~~
Co-57	1.438E-04	Te-129	3.000E-04
Co-58	6.720E-03	Te-129m	2.400E-04
Co-60	1.822E-02 ~~2.700E-02~~	Te-131	6.000E-05
Fe-55	1.162E-02	Te-131m	1.800E-04
Fe-59	4.000E-04 ~~1.016E-03~~	Te-132	4.800E-04
Ni-63	2.800E-04	Cs-134	1.986E-02
Cu-64	1.503E-02	Cs-136	1.260E-03
Zn-65	8.200E-04	Cs-137	2.664E-02
Br-84	4.000E-05	Ba-137m	2.490E-02
Rb-88	5.400E-04	Cs-138	3.800E-04
Rb-89	8.811E-05	Ba-140	1.104E-02
Sr-89	2.200E-04	La-140	1.486E-02
Sr-90	7.027E-05	Ce-141	2.400E-04
Y-90	6.216E-06	Ce-143	3.800E-04
Sr-91	1.800E-03	Ce-144	6.320E-03
Y-91	2.200E-04	Pr-143	2.600E-04
Y-91m	2.000E-05	Pr-144	6.320E-03
Sr-92	1.600E-03	W-187	2.600E-04
Y-92	1.200E-03	Np-239	6.216E-03
Y-93	1.800E-03	All Others	4.000E-05
		Total All w/o Tritium	6.941E-01
		Total Tritium	6.200E+03

NOTES:

1. See PPE Table 3.0-1, Section 10.3.
2. Composite source term based on highest Radionuclide release for all plant types considered.

Request L-2:

Table 5.4-8 of the ER compares the liquid pathway maximum individual dose to 10 CFR 50, Appendix I criteria. From the LADTAP output file it appears that the adult maximum individual dose was used for comparison rather than the teen or child which are higher. Please explain.

Response:

Maximum individual doses were calculated for a hypothetical individual from ingestion of aquatic foods and external exposure from shoreline activities using appropriate usage factors. The hypothetical individual evaluated represents the maximally exposed individual within 50 miles of the proposed site. Adults, teens and children were evaluated. For the total body dose, an adult was found to receive the maximum individual body dose. The maximum organ dose was determined to be that for the bone of a child.

The estimated maximum individual offsite doses that would result from normal liquid releases for the proposed plant that may be located on Grand Gulf Nuclear Station site are given in Table 5.4-8 of the ER. These doses are compared to 10 CFR 50, Appendix I criteria. Table 5.4-8 will be clarified with new Notes 2 and 3 to identify the limiting individual for the total body and maximum organ dose.

TABLE 5.4-8
LIQUID PATHWAY
COMPARISON OF MAXIMUM INDIVIDUAL DOSE TO
10 CFR 50, APPENDIX I CRITERIA

Pathway	Annual Dose Total Body [2]	Maximum Organ [3] (bone)	Dose Limit [1]
Aquatic Foods	2.17	4.09	Total Body: 3 Any organ: 10
Shoreline Use	3.06E-03	3.56E-03	
Total	2.17	4.10	

NOTES:
1. 10CFR50 Appendix I Limits.
2. An adult was found to receive the maximum individual total body dose.
3. A child was found to receive the maximum individual organ dose.

bcc: Mr. R. J. Bell (NEI)
Mr. M. Bourgeois (ECH)
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Mr. F. G. Burford (ECH)
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Corporate File [13]