



South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

Designated ORIGINAL

October 29, 2009
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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

South Texas Project
Units 3 and 4
Docket Nos. 52-012 and 52-013
Response to Requests for Additional Information

Attached are responses to NRC staff questions included in Request for Additional Information (RAI) letter numbers 266, 267, 271, and 275, related to Combined License Application (COLA) Part 2, Tier 2, Sections 11.2, 11.5, and 12.2. This submittal completes the response to the letters listed.

Attachments 1 through 6 contain responses to the RAI questions listed below:

- | | |
|---------|----------|
| 11.02-7 | 11.05-7 |
| 11.02-8 | 12.02-8 |
| 11.02-9 | 12.02-11 |

When a change to the COLA is indicated, the change will be incorporated into the next routine revision of the COLA following NRC acceptance of the RAI response.

There are no commitments in this letter.

If you have any questions regarding these responses, please contact me at (361) 972-7136 or Bill Mookhoek at (361) 972-7274.

DO91
NRD

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 10/27/09



Scott Head
Manager, Regulatory Affairs
South Texas Project Units 3 & 4

scs

Attachments:

1. Question 11.02-7
2. Question 11.02-8
3. Question 11.02-9
4. Question 11.05-7
5. Question 12.02-8
6. Question 12.02-11

cc: w/o attachment except*
(paper copy)

Director, Office of New Reactors
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, Texas 76011-8064

Kathy C. Perkins, RN, MBA
Assistant Commissioner
Division for Regulatory Services
Texas Department of State Health Services
P. O. Box 149347
Austin, Texas 78714-9347

Alice Hamilton Rogers, P.E.
Inspection Unit Manager
Texas Department of State Health Services
P. O. Box 149347
Austin, Texas 78714-9347

C. M. Canady
City of Austin
Electric Utility Department
721 Barton Springs Road
Austin, TX 78704

*Steven P. Frantz, Esquire
A. H. Gutterman, Esquire
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Ave. NW
Washington D.C. 20004

*George F. Wunder
* Raj Anand
*Michael Eudy
*Jessie Muir
Two White Flint North
11545 Rockville Pike
Rockville, MD 20852

(electronic copy)

*George Wunder
*Raj Anand
*Michael Eudy
*Jessie Muir
Loren R. Plisco
U. S. Nuclear Regulatory Commission

Steve Winn
Eddy Daniels
Joseph Kiwak
Nuclear Innovation North America

Jon C. Wood, Esquire
Cox Smith Matthews

J. J. Nesrsta
R. K. Temple
Kevin Pollo
L. D. Blaylock
CPS Energy

RAI 11.02-7**QUESTION:**

The Condensate Storage Tank (CST) is listed in FSAR Liquid Waste Management System (LWMS) Sections 11.2.1.2.4.2, 11.2.2, 11.2.2.1, 11.2.3, LWMS Table 11.5-4, shown in Figure 9.2-4, and denoted (to and from CST) on LWMS Figure 11.2-1. Staff could not evaluate the functions of the Condensate Storage Tank from the information provided throughout the FSAR. Please provide information concerning the Condensate Storage Tank radioactive source term, overall function and volume similar to all other associated LWMS tanks, and the method of containing the release of all the liquid radwastes to prevent the release of this radwaste to the environment. (Reference FSAR Section 15.7 and 2.4.13).

RESPONSE:

The CST is part of the Makeup Water-Condensate (MUWC) System as described in Section 9.2.9 of the DCD and shown in COLA Figure 9.2-4. DCD Section 9.2.9 is incorporated by reference in the COLA without any departures from the DCD.

The CST is not part of the LWMS, but is addressed in COLA Section 11.2 because it is an alternative for the disposition of treated radioactive water. Specifically, if treated water from the LWMS meets the quality requirements for the MUWC, it can be recycled via the CST to the MUWC. Since the CST is not part of the LWMS, the details of the system, including items such as function and volume, are not discussed in COLA Section 11.2. This is similar to the treatment of other potentially contaminated components, such as the CUW Backwash Receiving Tank. Instead, these details are provided in the applicable sections of the COLA or DCD (i.e., DCD Section 9.2.9).

No COLA change is required as a result of this response.

RAI 11.02-8**QUESTION:**

Section 11.2.1.2.4 of the FSAR identifies several radwaste system design features that address 10 CFR 20.1406 requirements. However, design features identified in Section 11.2 of the ABWR DCD that address 10 CFR 20.1406 requirements applicable to the Condensate Storage Tank (CST) are not included in Section 11.2 of the FSAR. Specifically, the ABWR DCD states "The Condensate storage tank, which is located outdoors, has liquid level monitoring with alarms in the control room. The tank overflows, drains and sample lines are routed to the radwaste system. A dike is provided around the tank to prevent runoff in the event of a tank overflow. A drain within the dike is routed to the radwaste system." Additionally, Section 11.2.1.2 of the ABWR DCD appears to be the only documentation that states that the CST will be located outdoors.

Based on past and current industry experience with Boiling Water Reactor (BWR) condensate storage tanks, please provide the following additional information, and FSAR discussion, concerning the Condensate Storage Tank:

- Clarify if the CST's for STP 3 and 4 will be located outdoors.
- Clarify if any, or all, of the design features from the ABWR DCD (identified above) for the CST will be included in STP 3 and 4.
- Clarify if piping runs to and from the CST will be placed directly underground or located in trenches or tunnels, and include any design or programmatic considerations that will address 10 CFR 20.1406 requirements for the Makeup Water Condensate (MUWC) system.

RESPONSE:

Section 11.2.1.2 of the ABWR DCD was replaced by Section 11.2 of the STP 3 & 4. The COLA does not include the discussion of the design provisions for the CST to prevent releases from the CST. A discussion similar to the discussion in the ABWR DCD will be added to COLA Section 11.2.1.2.4. The following specific responses are provided.

- The CST's for STP 3 & 4 are shown on COLA Figure 1.2-37 – Plot Plan. They are identified as items 3-12 and 4-12 on the Figure and are located in the yard adjacent to the west side of the Turbine Building. This documents that the CST's are located outdoors, consistent with the original design in the DCD as accepted in the FSER (NUREG-1503, page 9-19).
- The CST's will include overflows, drains and sample lines that are routed to the radwaste system. A dike is provided to prevent runoff in the event of tank overflow, and the drain within the dike is routed to the radwaste system. The tank contains level monitoring

instrumentation that alarms in the control room. This information is provided in DCD Section 9.2.9, and will be added to COLA Section 11.2.1.2.4 as indicated below.

- The piping to and from the CST that has the potential to contain contaminated liquid is provided with design features to contain and collect any leakage and to route any leakage to the radwaste system. These features will prevent the spread of contamination from the CST and piping associated with the Makeup Water-Condensate (MUWC) system to comply with 10 CFR 20.1406 requirements.

The following COLA change will be made as a result of this response.

11.2.1.2.4 Minimization of Contamination and Radwaste Generation

The LWMS radwaste system, including mobile units as applicable, is designed to minimize contamination of the facility and environment, facilitate decommissioning, and minimize the generation of radioactive waste, in compliance with 10 CFR 20.1406. The following radwaste system design features meet 10 CFR 20.1406 requirements:

- Leakage is controlled and collected to reduce contamination of building floors and interconnecting systems (by use of curbing, floor sloping to local drains, floor-to-floor seals over expansion joints, wall-to-floor joint seals, sheathed hoses, drip pans or containment boxes, backflow preventers, siphon breakers, self-sealing quick disconnects, etc.).
- The Condensate Storage Tank is not a part of the LWMS, but may contain slightly contaminated recycled water. The Condensate Storage Tank, which is located outdoors, has liquid level monitoring with alarms in the control room. The tank overflows, drains and sample lines are routed to the LWMS. A dike is provided around the tank to prevent runoff in the event of a tank overflow. A drain within the dike is routed to the LWMS.
- The radwaste system design minimizes embedding contaminated piping in concrete, to the extent practicable.

RAI 11.02-9**QUESTION:**

Section 9.2.9.1 and Table 11.5-4 of the ABWR DCD are incorporated by reference in the STP 3 and 4 FSAR. Section 9.2.9.1 of the ABWR DCD states "The condensate storage tank shall have a capacity of 2110 m³." and Table 11.5.4 of the ABWR DCD contains a requirement for a weekly sample of the CST for gross beta-gamma activity with minimum sensitivity of 3.7×10^{-5} MBq/L. Based on this information, the CST will contain a very large volume of low level radioactive water. However, the staff was unable to locate any discussion in the FSAR identifying the CST as a radiation source, maximum allowable activity concentration specification for the CST, or calculation of dose rates in the area surrounding the CST.

Please provide additional information concerning the radioactive source term, maximum expected radioactivity concentration in the CST, and dose rate calculations for the CST similar to other LWMS tanks and components.

RESPONSE:

The CST is part of the Makeup Water-Condensate (MUWC) System and therefore is not addressed as part of the Liquid Waste Management System (LWMS). Radiation sources are described in ABWR DCD Section 12.2, which is incorporated by reference in the COLA. The certified ABWR design in the DCD has been previously approved by the NRC and it is STP's position that as such it has finality.

No COLA change is required as a result of this response.

RAI 11.05-7**QUESTION**

In FSAR Section 11.5.5.2, Calibration, STD DEP 11.5-1, under 11.5.5 Calibration and Maintenance, the sentence stating, "Each continuous monitor is calibrated during plant shutdown or during the refueling outage if the detector is not accessible during power operation." has been changed from the DCD.

In order to follow normal calibration procedures for continuous effluent monitors of this type, the word "shutdown" should be changed back to "operation" so that if the monitor is not able to be calibrated on its normal required frequency of "R" or every 18 months, due to the length of the fuel cycle, or the monitor's accessibility, it can be calibrated during the refueling outage to be able to meet the calibration requirement in the Offsite Dose Calculation Manual (ODCM).

RESPONSE:

The change, as noted in the RAI question, will be implemented in a future revision of the COLA as shown in the attached markup. The change is identified with gray shading.

11.5.5.2 Calibration

STD DEP 11.5-1

Calibration of radiation monitors is performed using certified commercial radionuclide sources traceable to the National Institute of Standards and Technology. ~~The overall reproducibility of calibration is limited to $\pm 15\%$. The source-detector geometry during primary calibration will be mechanically precise enough to ensure that positioning errors of either instruments or radiation sources do not affect the calibration accuracy by more than $\pm 3\%$.~~ Each continuous monitor is calibrated during plant operation shutdown or during the refueling outage if the detector is not ~~readily~~ accessible during power operation. Calibration can also be performed on the applicable instrument by using liquid or gaseous radionuclide standards or by analyzing particulate iodine or gaseous grab samples with laboratory instruments.

RAI 12.02-8**QUESTION:**

FSAR Section 12.2.2.5 Liquid Releases addresses COL License Information Item 12.5. This section states that STP has re-performed the liquid dose analysis using site-specific parameters to determine conformance with 10CFR 20 and 10CFR50 Appendix I (See Subsection 12.2.3 for COL license information), concluding that the identified limits are not exceeded.

FSAR Section 12.2.3.1 Compliance with 10CFR20 and 10CFR50 Appendix I, states, Using site-specific parameters, the average annual liquid releases and the average annual airborne releases to the environment have been computed and are shown in Tables 12.2-20 through 12.2-23.

Staff review has determined that insufficient site-specific parameters are provided to independently confirm the calculated liquid effluent doses with respect to the dose objectives of Appendix I to 10 CFR50, and the dose limits in 10 CFR 20. In order to address RG 1.206 sections C.I.11.2.1 and C.I.11.2.3, the staff requests that the applicant address the following items and revise their FSAR accordingly:

1. A complete description of how the applicant derived all the values, including all assumptions made;
2. Citations to any reference material used (for documents not publicly available, please provide a copy for the NRC staff's use).
3. A detailed breakdown of individual doses and MEI doses by pathway and organ; and
4. A detailed breakdown of population doses by pathway and organ.
5. Provide the basis for all parameters and values used in the LADTAP II code or equivalent.

RESPONSE:

The level of detail requested is beyond the level of detail typically included in the DCD and COLA Part 2, Tier 2. However, the following is presented as a summary of information in COLA Part 2, Tier 2, Section 12.2; COLA Part 3, Section 5.4; and related responses to NRC RAIs.

1. COLA, Part 3 Environmental Report (ER), Section 5.4 describes the use of the NRC-endorsed LADTAP II code used to calculate doses from liquid effluents release. This code is referenced as 5.4-4 "LADTAP II Technical Reference and User Guide," NUREG/CR-4013, NRC Office of Nuclear Reactor Regulation, Washington, DC, April 1986. The following important exposure pathways are considered in LADTAP II:
 - Ingestion of aquatic organisms as food
 - External exposure to contaminated sediments deposited along the shoreline (shoreline exposure)

Doses, calculated by LADTAP II, to biota from liquid effluents from Units 3 & 4 are shown in ER Table 5.4-10.

COLA Part 2, Tier 2, Subsection 12.2.2 further describes use of the LADTAP II code to calculate liquid effluent pathway doses and compliance with 10 CFR 50 Appendix I and 10 CFR 20.

STP's response to ER RAI 5.4.1-3 discusses the LADTAP input files used for Units 3 & 4 and the relationship with COLA Part 2, Tier 2, Table 12.2-22. As discussed in that response, all normal radiological release liquid pathway analyses were initially based on DCD Table 12.2-22. After the initial analysis, the annual average liquid releases were revised based on use of the GALE computer code. Those revised values are also given in COLA Part 2, Tier 2, Table 12.2-22.

The response also indicated that ER Table 3.5-1 lists 55 nuclides. The table shows that nine (C-14, Co-56, Co-57, Rb-89, Y-90, Rh-103m, Rh-106, Sb-124, and La-140) of those 55 nuclides have an annual release of zero to the Main Cooling Reservoir (MCR). The fractions of an additional nine nuclides (I-132, I-134, Mn-56, Sr-92, Y-92, Cs-134, Cs-136, Cs-137, and Cs-138) that reach the Little Robbins Slough Area are zero. Those 18 nuclides were not included in LADTAP2.DAT because LADTAP requires non-zero source terms.

The additional nuclide that is included in ER Table 3.5-1, but is not in the LADTAP input files, including LADTAP2.DAT, is Np-239. That nuclide was inadvertently left out of the LADTAP input files used to simulate the normal radiation liquid pathway discharge impacts. Supplemental LADTAP runs were performed that included the Np-239 source term; the results of those runs show that the contribution of Np-239 to the liquid pathway doses is negligible. No numerical dose results presented in the COLA change as a result of including Np-239.

2. STPNOC's response to ER RAI 5.9.5-1 stated that the doses to biota living in and around the MCR were calculated using LADTAP II. Such biota would be exposed to MCR waters. Lake hydrodynamics were simulated using LADTAP's *Completely Mixed* and *Partially Mixed (with plug flow)* impoundment models. The latter was found to give doses to biota greater (by up to 8%) than the former and was used to report the liquid pathway biota doses.

Further given in that response, LADTAP II input and output files simulate 4-unit plant cooling water system outflow to the MCR. All LADTAP II input and output files will be provided in the electronic reading room. LADTMCR1 (*.DAT are input files, *.OUT are output files) simulates Units 1 & 2 liquid releases to the MCR (except tritium), LADTMCR2 simulates Units 3 & 4 releases to the MCR (except tritium), H3MCR1 simulates tritium releases from Units 1 & 2, and H3MCR2 simulates Units 3 & 4 tritium releases to the MCR. Radionuclide release rates to the MCR are the same as those used in ER Section 5.4. All impoundment simulations account for 95% of the MCR releases settling out of solution in accordance with the Offsite Dose Calculation Manual except for tritium; 100% of tritium remains in solution.

STP's response to ER RAI 2.3-6 discussed simulation and description of fifty plus years of daily MCR behavior, including volume, blowdown flow rate, and evaporation rate. Long-

term averages of those parameters (for 4-unit, 100% power operation) were incorporated into the LADTAP II analysis. Radionuclides other than tritium are discharged from the MCR, at the concentration of the MCR, with the long-term average blowdown of 16.5 cfs. Tritium is discharged from the MCR, again at its concentration in the MCR, with both the blowdown and evaporation (long-term average evaporation is 146 cfs = 106,000 acre-feet/year); the sum of blowdown and evaporation rates is the LADTAP discharge rate for the tritium simulations. In all cases the MCR discharge is modeled with a dilution factor of 1 and transit time of 0.1 hours, thus simulating doses to biota exposed to MCR concentrations.

3. COLA Part 2, Tier 2, Table 12.2-23 and ER Table 5.4-5 present a summary of the liquid pathway doses to the maximum exposed individual (MEI) in mrem/yr for one unit. ER Subsection 5.4.2 discusses doses to the public and MEI and compliance with 10 CFR 20 and 10 CFR 50, Appendix I. Similar information is shown in ER Table 5.4-6 for gaseous pathway doses to the MEI.
4. ER Table 5.4-8 demonstrates that the total site liquid and gaseous effluent doses from Units 1 & 2 plus Units 3 & 4 would be well within the regulatory limits of 40 CFR 190. As indicated in NUREG-1555, demonstration of compliance with the limits of 40 CFR 190 is considered to be demonstrated if also in compliance with the 0.1 rem limit of 10 CFR 20.1301. ER Table 5.4-9 shows the collective total body dose to the population within 50 miles of the STP site that would be attributable to both Units 1 & 2 and Units 3 & 4. This collective dose is less than 0.001% of that received by the population from natural causes.
5. ER Subsection 5.4.2 discusses the liquid pathway parameters (ER Table 5.4-1) used in the LADTAP II computer program to calculate doses to the MEI and activities used to define the MEI. Annual doses from each Unit 3 or 4 unit-to-total body, thyroid, and maximum exposed organ (bone) are presented in ER Table 5.4-5. ER Subsection 5.4.3 further discusses methodologies and parameters used to assess the estimated radiological impact to individuals and population, which is presented in ER Table 5.4-7.

No COLA change is required as a result of this response.

RAI 12.02-11**QUESTION:**

FSAR Table 12.2-15L, "Solid Radwaste Component Inventories LW Receiving Tank" and FSAR Table 12.2-15A, "Solid Radwaste Component Inventories CUW Backwash Receiving Tank," indicate radionuclide values that are exactly the same in both tables. However, the volumes indicated in the FSAR used to calculate the radionuclide values are different, (50 m³ vs 28 m³). During the audit conducted by the NRC at the STP offices on July 28-29, 2009, STP engineers indicated that they had discovered this discrepancy and had recalculated the correct table values for Table 12.2-15L. The staff requests that the applicant revise the identified FSAR tables accordingly so that they indicate the proper tank source terms.

RESPONSE:

As the text of the question indicates, Tables 12.2-15a and 12.2-15l in the COLA are identical except for the volume of the tank. The first table is the activity in the CUW Backwash Receiving Tank, which is used to collect the backwash from the Reactor Water Cleanup (CUW) filter/demineralizer. The second table is the activity that is expected to be in the Liquid Waste (LW) Backwash Receiving Tank. The inputs to the LW Backwash Receiving Tank are the backwash from the membrane filters in the Low Conductivity Waste (LCW) and High Conductivity Waste (HCW) modular processing skids, and the reject from the reverse osmosis units in the LCW and HCW modular processing skids. The activity in the LW Backwash receiving tank is expected to be significantly less than the activity in the CUW Backwash Receiving tank.

A calculation was performed to determine the amount of activity accumulated on the LCW filter, the HCW filter and the rejects from the LCW and HCW reverse osmosis units over a typical collection period (approximately four months). All of this activity was then assumed to be backwashed to the LW Backwash Receiving Tank in order to estimate the activity in the tank that is to be used for shielding design.

Table 12.2-15l of the COLA is updated with the results of the calculation to reflect the activity in the LW Backwash Receiving Tank. Two copies of this table are attached. The first copy contains the current version of the table with strikeouts indicating the parameters that change. The second copy contains the new data with the new data highlighted. As expected, the activity in the LW Backwash Receiving Tank is much smaller than the activity in the CUW Backwash Receiving Tank because most of the activity in the CUW Backwash Receiving Tank is retained on the filter media. Only a fraction of this activity is processed by the LCW which, along with the activity in the equipment and floor drains, ends up in the LW Backwash Receiving Tank. Two additional minor changes to the table were made. The isotope labeled Pr-143 was changed to Pr-144 to correct a typographical error, and the daughter product Ba-137m was added.

The following change to the COLA will be made as a result of this response:

Table 12.2-15I Solid Radwaste Component Inventories LW Receiving Tank

Source volume = 50 m ³							
Total MBq: 4.94E+8							
Halogens		Soluble fission Products		Insoluble fission Products		Activation Products	
Isotope	MBq	Isotope	MBq	Isotope	MBq	Isotope	MBq
I-131	2.41E+07	Rb-89	2.82E+04	Y-91	3.66E+05	Na-24	5.01E+06
I-132	3.06E+06	Sr-89	9.40E+05	Y-92	7.37E+05	P-32	4.32E+06
I-133	2.20E+07	Sr-90	7.27E+04	Y-93	4.36E+06	Cr-51	4.99E+07
I-134	2.01E+06	Y-90	7.27E+04	Zr-95	7.41E+04	Mn-54	7.12E+05
I-135	9.52E+06	Sr-91	4.27E+06	Nb-95	7.41E+04	Mn-56	4.44E+06
		Sr-92	9.76E+05	Ru-103	4.73E+05	Co-58	4.87E+06
		Mo-99	4.05E+06	Rh-103m	4.73E+05	Co-60	4.10E+06
		Tc-99m	4.05E+06	Ru-106	3.41E+04	Fe-55	5.41E+06
		Te-129m	3.36E+05	Rh-106	3.41E+04	Fe-59	2.73E+05
		Te-131m	9.27E+04	La-140	2.54E+06	Ni-63	4.03E+07
		Te-132	2.37E+05	Ce-141	2.58E+05	Cu-64	4.22E+07
		Cs-134	4.54E+05	Ce-144	3.09E+04	Zn-65	2.00E+06
		Cs-136	6.44E+04	Pr-143	3.09E+04	Ag-110m	4.00E+04
		Cs-137	4.23E+05			W-187	2.28E+05
		Cs-138	2.07E+05				
		Ba-140	2.51E+06				
		Np-239	4.44E+07				
Total	6.06E+07	Total	2.98E+07	Total	5.85E+06	Total	9.77E+07

Table 12.2-15I Solid Radwaste Component Inventories LW Backwash Receiving Tank

Source volume = 50 m ³							
Total MBq: 2.33E+6							
Halogens		Soluble fission Products		Insoluble fission Products		Activation Products	
Isotope	MBq	Isotope	MBq	Isotope	MBq	Isotope	MBq
I-131	1.36E+05	Rb-89	8.72E+01	Y-91	1.92E+04	Na-24	9.75E+03
I-132	5.40E+03	Sr-89	2.31E+04	Y-92	3.22E+03	P-32	1.23E+04
I-133	4.51E+04	Sr-90	3.65E+03	Y-93	2.83E+03	Cr-51	8.47E+05
I-134	3.39E+03	Y-90	3.65E+03	Zr-95	2.42E+03	Mn-54	3.46E+04
I-135	1.74E+04	Sr-91	2.40E+03	Nb-95	3.42E+03	Mn-56	8.54E+03
		Sr-92	1.71E+03	Ru-103	4.19E+03	Co-58	6.27E+04
		Mo-99	1.16E+04	Rh-103m	4.20E+03	Co-60	2.25E+05
		Tc-99m	1.12E+04	Ru-106	1.55E+03	Fe-55	5.43E+05
		Te-129m	6.57E+03	Rh-106	1.56E+03	Fe-59	7.16E+03
		Te-131m	2.02E+02	La-140	2.44E+04	Ni-63	5.84E+02
		Te-132	7.20E+01	Ce-141	5.50E+03	Cu-64	2.33E+04
		Cs-134	8.68E+03	Ce-144	1.50E+03	Zn-65	8.52E+04
		Cs-136	6.80E+02	Pr-144	1.50E+03	Ag-110m	4.62E+02
		Cs-137	2.52E+04			W-187	5.31E+02
		Ba-137m	2.35E+04				
		Cs-138	3.56E+02				
		Ba-140	2.11E+04				
		Np-239	3.86E+04				
Total	2.08E+05	Total	1.82E+05	Total	7.55E+04	Total	1.86E+06