

Greg Gibson  
Vice President, Regulatory Affairs

750 East Pratt Street, Suite 1600  
Baltimore, Maryland 21202



10 CFR 50.4  
10 CFR 52.79

February 24, 2010

UN#10-020

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

Subject: UniStar Nuclear Energy, NRC Docket No. 52-016  
Response to Request for Additional Information for the  
Calvert Cliffs Nuclear Power Plant, Unit 3,  
RAI No. 199, Radiation Protection Design Features

- References:
- 1) Surinder Arora (NRC) to Robert Poche (UniStar Nuclear Energy), "FINAL RAI No. 199 CHPB 4066," email dated December 17, 2009
  - 2) UniStar Nuclear Energy Letter UN#10-010, from Greg Gibson to Document Control Desk, U.S. NRC, Response to RAI No. 199, Radiation Protection Design Features, dated January 19, 2010

The purpose of this letter is to respond to the request for additional information (RAI) identified in the NRC e-mail correspondence to UniStar Nuclear Energy, dated December 17, 2009 (Reference 1). This RAI addresses Radiation Protection Design Features, as discussed in Section 12.3 of the Final Safety Analysis Report (FSAR), as submitted in Part 2 of the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 Combined License Application (COLA), Revision 6.

Reference 2 provided a February 24, 2010 schedule for the responses for RAI 199, Questions 12.03-12.04-6 through 12.03-12.04-9. The enclosure provides our responses to RAI No. 199, Questions 12.03-12.04-6 through 12.03-12.04-9. Our responses include revised COLA content and do not include any new regulatory commitments. A Licensing Basis Document Change Request has been initiated to incorporate these changes into a future revision of the COLA.

DOG  
LRO

This letter does not contain any sensitive or proprietary information.

If there are any questions regarding this transmittal, please contact me at (410) 470-4205, or Mr. Wayne A Massie at (410) 470-5503.

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

Executed on February 24, 2010



Greg Gibson

Enclosure: Responses to NRC Request for Additional Information RAI No. 199, Questions 12.03-12.04-6 through 12.03-12.04-9, Radiation Protection Design Features, Calvert Cliffs Nuclear Power Plant, Unit 3

cc: Surinder Arora, NRC Project Manager, U.S. EPR Projects Branch  
Laura Quinn, NRC Environmental Project Manager, U.S. EPR COL Application  
Getachew Tesfaye, NRC Project Manager, U.S. EPR DC Application (w/o enclosure)  
Loren Plisco, Deputy Regional Administrator, NRC Region II (w/o enclosure)  
Silas Kennedy, U.S. NRC Resident Inspector, CCNPP, Units 1 and 2  
U.S. NRC Region I Office

UN#10-020

**Enclosure**

**Responses to NRC Request for Additional Information  
RAI No. 199, Questions 12.03-12.04-6 through 12.03-12.04-9,  
Radiation Protection Design Features,  
Calvert Cliffs Nuclear Power Plant, Unit 3**

**RAI No. 199**

**Question 12.03-12.04-6**

In response to RAI 157, Question 12.03-12.04-3, the applicant deleted from the FSAR the discussions on 40 CFR 190, 10 CFR 50 Appendix I and the Radiation Protection and ALARA Program.

Because the Radiation Protection and ALARA program description in Section 12.3-12.4 of the FSAR and ER addresses 10 CFR 20.1101(b) requirements, please replace the text following the heading "Radiation Protection and ALARA Program" that was removed in response to Question 12.03-12.04-3.

**Response**

The dose to the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 construction workers will be from CCNPP Units 1 and 2 operations. The CCNPP Units 1 and 2 ALARA Program will include consideration of the CCNPP Unit 3 construction workers. Therefore, CCNPP Unit 3 COLA Section 12.3.5.1 is being revised to identify that the CCNPP Units 1 and 2 ALARA Program will be extended to address potential exposures to CCNPP Unit 3 construction workers. When the CCNPP Unit 3 Radiation Protection Program is implemented, the ALARA Program elements for construction workers will be coordinated between CCNPP Units 1 and 2 and CCNPP Unit 3.

**COLA Impact**

FSAR Section 12.3.5 will be updated as follows in a future COLA revision (This markup includes a portion of the changes proposed with the response to RAI 157, Question 12.03-12.04-3<sup>1</sup>, to the extent necessary to indicate placement of the new text):

**12.3.5 DOSE ASSESSMENT**

**12.3.5.1 Overall Plant Doses**

**10 CFR 20.1301**

The 10 CFR 20.1301 (CFR, 2007a) limits annual doses from licensed operations to individual members of the public to 0.1 rem (1 mSv) TEDE (total effective dose equivalent.) In addition, the dose from external sources to unrestricted areas must be less than 0.002 rem (0.02 mSv) in any one hour. This applies to the public both outside of and within controlled areas. ~~Given that the relevant sources are relatively constant in time, the hourly limit is met if the annual limit is met.~~ The maximum dose rates by zone are given in Table 12.3-9. For an occupational year, i.e., 2,200 hours onsite, the maximum dose would be on the road by the ISFSI or the Resin Storage Area, where the dose would be 0.0388 rem (0.388 mSv) and less than 0.002 rem (0.02 mSv) in any one hour. This assumes the worker stood on the road for 2,200 working hours in one year. This value is less than the limits specified above for members of the public. ~~Therefore, construction workers can be considered to be~~

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<sup>1</sup> G. Gibson (UniStar Nuclear Energy) to Document Control Desk (U.S. NRC), Letter UN#09-448, Response to RAI 157, Radiation Protection, dated October 30, 2009.

~~members of the general public for the purpose of not requiring radiation protection training or monitoring.~~

**Radiation Protection and ALARA Program**

Due to the exposures from CCNPP Units 1 and 2 normal operations, the CCNPP Units 1 and 2 Radiation Protection and ALARA Program will be extended to include the CCNPP Unit 3 construction workers. This program meets the guidance of Regulatory Guide 8.8 (NRC, 1978) to maintain individual and collective radiation exposures ALARA. This program also meets the requirements of 10 CFR 20.1302.

**Question 12.03-12.04-7**

In section 12.3-12.4 of the applicant's FSAR the unit conversion from Rem to Sievert has been done incorrectly. Please correct these numbers in the FSAR.

**Response**

The FSAR Section 12.3 and ER Section 4.5.3 locations containing unit conversion errors from Rem to Sievert will be corrected.

**COLA Impact**

FSAR Section 12.3.5 will be updated as follows in a future COLA revision:

**12.3.5 DOSE ASSESSMENT**

**12.3.5.1 Overall Plant Doses**

**Offsite Gaseous and Liquid Effluent Doses**

The Annual Radioactive Effluent Release Report for 2005 provides a whole body dose of 0.005 mrem (~~0.05~~ 5.0E-08 Sv) and a critical organ dose of 0.095 mrem (~~0.95~~ 9.5E-07 Sv) to the maximally exposed member of the public due to the release of gaseous effluents from the existing units. The Annual Radioactive Effluent Release Report for 2005 provides a whole body dose of 0.004 mrem (~~0.04~~ 4.0E-08 Sv) and a critical organ dose of 0.017 mrem (~~0.17~~ 1.70E-07 Sv) to the maximally exposed member of the public due to the release of liquid effluents from the existing units. The controlling pathway was the fish and shellfish pathway. Construction workers will not ingest food (edible plants or fish) grown in effluent streams as part of their work activity, therefore, only external pathways will be considered.

FSAR Table 12.3-2 will be updated as follows in a future COLA revision:

**Table 12.3-2— {Historical All-Source Compliance for Offsite General Public}**

Limits	Historical Site Boundary Doses Reported to NRC (mrem/year)/(mSv/year)			Percent of 40 CFR 190 Limit by Year of Operation		
	75	25	25	Percent of Limit		
Year	Thyroid	WB	Other Organs	Thyroid	WB	Other Organs
2006	0.052/0.00052	0.004/0.00004	0.010/0.00010	0.07	0.02	0.04
2005	0.006/0.00006	0.005/0.00005	0.095/0.00095	0.01	0.02	0.38
2004	0.007/0.00007	0.002/0.00002	0.006/0.00006	0.01	0.01	0.02
2003	0.006/0.00006	0.004/0.00004	0.023/0.00023	0.01	0.02	0.09
2002	0.003/0.00003	0.007/0.00007	0.174/0.00174	0.00	0.03	0.70
2001	0.005/0.00005	0.010/0.00010	0.351/0.00351	0.01	0.04	1.40
2000	0.018/0.00018	0.018/0.00018	0.211/0.00211	0.02	0.07	0.84
1999	0.011/0.00011	0.013/0.00013	0.686/0.00686	0.01	0.05	2.74
1998	0.005/0.00005	0.005/0.00005	0.302/0.00302	0.01	0.02	1.21
1997	0.005/0.00005	0.009/0.00009	0.235/0.00235	0.01	0.04	0.94
1996	0.005/0.00005	0.012/0.00012	0.245/0.00245	0.01	0.05	0.98
1995	0.007/0.00007	0.017/0.00017	0.132/0.00132	0.01	0.07	0.53
1994	0.024/0.00024	0.039/0.00039	0.473/0.00473	0.03	0.15	1.89
1993	0.099/0.00099	0.125/0.00125	0.466/0.00466	0.13	0.50	1.86
1992	0.125/0.00125	0.114/0.00114	0.420/0.0042	0.17	0.46	1.68
1991	0.167/0.00167	0.045/0.00045	0.292/0.00292	0.22	0.18	1.17
1990	0.070/0.00070	0.070/0.00070	0.370/0.0037	0.09	0.28	1.48
1989	0.526/0.00526	0.113/0.00113	0.674/0.00674	0.70	0.45	2.70
1988	1.130/0.00443 0.0113	0.120/0.00120	0.500/0.00500	1.51	0.48	2.00
1987	0.381/0.00381	0.250/0.00250	1.360/0.01360	0.51	1.00	5.44
1986	0.685/0.00685	0.093/0.00093	0.643/0.00643	0.91	0.37	2.57
1985	0.800/0.00800	0.010/0.00010	0.030/0.00030	1.07	0.04	0.12
1984	0.710/0.00710	0.110/0.00110	0.020/0.00020	0.95	0.44	0.08
1983	0.150/0.00150	0.060/0.00060	0.030/0.00030	0.20	0.24	0.12
1982	0.220/0.00220	0.034/0.00034	0.080/0.00080	0.29	0.14	0.32
1981	0.100/0.00100	0.002/0.00002	0.080/0.00080	0.13	0.01	0.32
1980	0.170/0.00170	0.009/0.00009	N/A/N/A	0.23	0.04	N/A

FSAR Table 12.3-9 will be updated as follows in a future COLA revision:

**Table 12.3-9—{Projected Dose Rates from all Sources by Construction Zone}**

Maximum Construction Zone Dose Rates (mrem/year) Assuming 2,200 Hours per Year Occupancy		
Zone	Zone Description	Dose Rate mrem/2,200 hours (mSv/2,200 hours)
B	Batch Plant	0.07 (0.0007)
C	Construction on main structures	1.35 (0.0135)
L	Laydown	21.49 (0.2149)
O	Office/Trailer	0.04 (0.0004)
P	Parking	20.32 (0.2032)
R	Roads	38.87 (0.3887)
S	Shoreline, tunnel, barge, in/out flow	0.48 (0.0048)
T	Tower/Basin/Desalinization	0.02 (0.0002)
W	Warehouse	0.04 (0.0004) (0.0004)

FSAR Table 12.3-13 will be updated as follows in a future COLA revision:

**Table 12.3-13—{Projected Collective Dose for Construction Worker by Zone}**

Zone	Zone Description	Collective Dose (person-rem) (person-Sv) by Zone						By Zone
		2010	2011	2012	2013	2014	2015	
B	Batch Plant	0.000/ 0.00000	0.000/ 0.00000	0.001/ 0.00001	0.001/ 0.00001	0.001/ 0.00001	0.000/ 0.00000	<b>0.002/ 0.00002</b>
C	Construction on Main Structures	0.165/ 0.00165	0.749/ 0.00749	1.384/ 0.01384	1.454/ 0.01454	1.524/ 0.01524	1.281/ 0.01281	<b>6.556/ 0.06556</b>
L	Laydown	0.024/ 0.00024	0.103/ 0.00103	0.185/ 0.00185	0.188/ 0.00188	0.191/ 0.00191	0.156/ 0.00156	<b>0.847/ 0.00847</b>
O	Office/Trailer	0.008/ 0.00008	0.035/ 0.00035	0.061/ 0.00061	0.062/ 0.00062	0.062/ 0.00062	0.050/ 0.00050	<b>0.279/ 0.00279</b>
P	Parking	0.083/ 0.00083	0.385/ 0.00385	0.724/ 0.00724	0.773/ 0.00773	0.822/ 0.00822	0.701/ 0.00701	<b>3.488/ 0.03488</b>
R	Roads	0.133/ 0.00133	0.602/ 0.00602	1.107/ 0.01107	1.157/ 0.01157	1.208/ 0.01208	1.012/ 0.01012	<b>5.219/ 0.05219</b>
S	Shoreline, Tunnel, barge, In/Out Flow	0.021/ 0.00021	0.092/ 0.00092	0.162/ 0.00162	0.162/ 0.00162	0.162/ 0.00162	0.130/ 0.00130	<b>0.731/ 0.00731</b>
T	Tower/Basin/ Desalinization	0.002/ 0.00002	0.008/ 0.00008	0.014/ 0.00014	0.014/ 0.00014	0.014/ 0.00014	0.0014/ 0.011/ 0.00011	<b>0.063/ 0.00063</b>
W	Warehouse	0.000/ 0.00000	0.001/ 0.00001	0.001/ 0.00001	0.001/ 0.00001	0.001/ 0.00001	0.001/ 0.00001	<b>0.005/ 0.00005</b>
	<b>By Year</b>	<b>0.437/ 0.00437</b>	<b>1.976/ 0.01976</b>	<b>3.638/ 0.03638</b>	<b>3.812/ 0.03812</b>	<b>3.985/ 0.03985</b>	<b>3.343/ 0.03343</b>	<b>17.190/ 0.17190</b>

ER Section 4.5.3.1 will be updated as follows in a future COLA revision:

#### **4.5 RADIATION EXPOSURE TO CONSTRUCTION WORKERS**

##### **4.5.3 HISTORICAL DOSE RATES**

###### **4.5.3.1 Gaseous and Liquid Effluent Historical Measurements**

The doses listed in Table 4.5-2 are to the maximally exposed member of the public due to the release of gaseous and liquid effluents from CCNPP Units 1 and 2 and are calculated in accordance with the existing units' ODCM (CCNPP, 2005). The maximum individual doses are from historical CCNPP Units 1 and 2 Annual Radiological Environmental Operating Reports and, prior to that, the Radiological Environmental Monitoring Program Annual Reports. The Annual Radioactive Effluent Release Report for 2005 provides a whole body dose of 0.005 mrem (~~0.05~~ 5.0E-08 Sv) and a critical organ dose of 0.095 mrem (~~0.95~~ 9.5E-07 Sv) to the maximally exposed member of the public due to the release of gaseous effluents from the existing units. The Annual Radioactive Effluent Release Report for 2005 provides a whole body dose of 0.004 mrem (~~0.04~~ 4.0E-08 Sv) and a critical organ dose of 0.017 mrem (~~0.17~~ 1.70E-07 Sv) to the maximally exposed member of the public due to the release of liquid effluents from the existing units. The controlling pathway was the fish and shellfish pathway. Construction workers will not ingest food (edible plants or fish) grown in effluent streams as part of their work activity, therefore, only external pathways will be considered.

ER Table 4.5-2 will be updated as follows in a future COLA revision:

**Table 4.5-2—Historical All-Source Compliance for Offsite General Public**

(Historically the receptors have been offsite;  
 therefore the dose is dominated by gaseous and liquid effluents.)

Limits	Historical Site Boundary Doses Reported to NRC (mrem/year)/(mSv/year)			Percent of 40 CFR 190 Limit by Year of Operation		
	75	25	25	Percent of Limit		
Year	Thyroid	WB	Other Organs	Thyroid	WB	Other Organs
2006	0.052/0.00052 0.00052	0.004/0.0004 0.0004	0.010/0.0010 0.00010	0.07	0.02	0.04
2005	0.006/0.00006	0.005/0.00005	0.095/0.00095	0.01	0.02	0.38
2004	0.007/0.00007	0.002/0.00002	0.006/0.00006	0.01	0.01	0.02
2003	0.006/0.00006	0.004/0.00004	0.023/0.00023	0.01	0.02	0.09
2002	0.003/0.00003	0.007/0.00007	0.174/0.00174	0.00	0.03	0.70
2001	0.005/0.0005 0.00005	0.010/0.00010	0.351/0.00351	0.01	0.04	1.40
2000	0.018/0.00018	0.018/0.00018	0.211/0.00211	0.02	0.07	0.84
1999	0.011/0.00011	0.013/0.00013	0.686/0.00686	0.01	0.05	2.74
1998	0.005/0.00005	0.005/0.00005	0.302/0.00302	0.01	0.02	1.21
1997	0.005/0.00005	0.009/0.00009	0.235/0.00235	0.01	0.04	0.94
1996	0.005/0.00005	0.012/0.00012	0.245/0.00245	0.01	0.05	0.98
1995	0.007/0.00007	0.017/0.00017	0.132/0.00132	0.01	0.07	0.53
1994	0.024/0.00024	0.039/0.00039	0.473/0.00473	0.03	0.15	1.89
1993	0.099/0.00099	0.125/0.00125	0.466/0.00466	0.13	0.50	1.86
1992	0.125/0.00125	0.114/0.00114	0.420/0.0042	0.17	0.46	1.68
1991	0.167/0.00167	0.045/0.00045	0.292/0.00292	0.22	0.18	1.17
1990	0.070/0.00070	0.070/0.00070	0.370/0.0037	0.09	0.28	1.48
1989	0.526/0.00526	0.113/0.00113	0.674/0.00674	0.70	0.45	2.70
1988	1.130/0.00113 0.0113	0.120/0.00120	0.500/0.00500	1.51	0.48	2.00
1987	0.381/0.00381	0.250/0.00250	1.360/0.001360 0.01360	0.51	1.00	5.44
1986	0.685/0.00685	0.093/0.00093	0.643/0.00643	0.91	0.37	2.57
1985	0.800/0.00800	0.010/0.00010	0.030/0.00030	1.07	0.04	0.12
1984	0.710/0.00710	0.110/0.00110	0.020/0.00020	0.95	0.44	0.08
1983	0.150/0.00150	0.060/0.00060	0.030/0.00030	0.20	0.24	0.12
1982	0.220/0.00220	0.034/0.00034	0.080/0.00080	0.29	0.14	0.32
1981	0.100/0.00100	0.002/0.00002	0.080/0.00080	0.13	0.01	0.32
1980	0.170/0.00170	0.009/0.00009	N/A/N/A	0.23	0.04	N/A

ER Table 4.5-9 will be updated as follows in a future COLA revision:

**Table 4.5-9—Projected Dose Rates from all Sources by Construction Zone**

Maximum Construction Zone Dose Rates (mrem/year) Assuming 2,200 Hours per Year Occupancy		
Zone	Zone Description	Dose Rate mrem/2,200 hours (mSv/2,200 hours)
B	Batch Plant	0.007 0.07 (0.0007)
C	Construction on main structures	1.35 (0.0135)
L	Laydown	21.49 (0.2149)
O	Office/Trailer	0.04 (0.0004)
P	Parking	20.32 (0.2032)
R	Roads	38.87 (0.3887)
S	Shoreline, tunnel, barge, in/out flow	0.48 (0.0048)
T	Tower/Basin/Desalinization	0.02 (0.0002)
W	Warehouse	0.04 (0.0004)

ER Table 4.5-15 will be updated as follows in a future COLA revision:

**Table 4.5-15—CCNPP Unit 3 Collective Dose to Construction Worker**

Zone	Zone Description	Collective Dose (person-rem) (person-Sv) by Zone						By Zone
		2010	2011	2012	2013	2014	2015	
B	Batch Plant	0.000/ 0.00000	0.000/ 0.00000	0.001/ 0.00001	0.001/ 0.00001	0.001/ 0.00001	0.000/ 0.00000	<b>0.002/ 0.00002</b>
C	Construction on Main Structures	0.165/ 0.00165	0.749/ 0.00749	1.384/ 0.01384	1.454/ 0.01454	1.524/ 0.1524 0.01524	1.281/ 0.01281	<b>6.556/ 0.06556</b>
L	Laydown	0.024/ 0.00024	0.103/ 0.00103	0.185/ 0.00185	0.188/ 0.00188	0.191/ 0.00191	0.156/ 0.00156	<b>0.847/ 0.00847</b>
O	Office/Trailer	0.008/ 0.00008	0.035/ 0.00035	0.061/ 0.00061	0.061/ 0.00061	0.062/ 0.00062	0.050/ 0.00050	<b>0.279/ 0.00279</b>
P	Parking	0.083/ 0.00083	0.385/ 0.00385	0.724/ 0.00724	0.773/ 0.00773	0.822/ 0.00822	0.701/ 0.00701	<b>3.488/ 0.03488</b>
R	Roads	0.133/ 0.00133	0.602/ 0.00602	1.107/ 0.01107	1.157/ 0.01157	1.208/ 0.01208	1.012/ 0.01012	<b>5.219/ 0.05219</b>
S	Shoreline, Tunnel, barge, In/Out Flow	0.021/ 0.00021	0.092/ 0.00092	0.162/ 0.00162	0.162/ 0.00162	0.162/ 0.00162	0.130/ 0.00130	<b>0.731/ 0.00731</b>
T	Tower/Basin/Desalinization	0.002/ 0.00002	0.008/ 0.00008	0.014/ 0.00014	0.014/ 0.00014	0.014/ 0.00014	0.011/ 0.00011	<b>0.063/ 0.00063</b>
W	Warehouse	0.000/ 0.00000	0.001/ 0.00001	0.001/ 0.00001	0.001/ 0.00001	0.001/ 0.00001	0.001/ 0.00001	<b>0.005/ 0.00005</b>
	<b>By Year</b>	<b>0.437/ 0.00437</b>	<b>1.976/ 0.01976</b>	<b>3.638/ 0.03638</b>	<b>2.812/ 3.812/ 0.03812</b>	<b>3.985/ 0.03985</b>	<b>3.343/ 0.03343</b>	<b>17.190/ 0.17190</b>

**Question 12.03-12.04-8**

Operating experience has demonstrated that inadequately maintained vacuum breakers located in effluent discharge piping can result in large unmonitored releases to the environment. In Section 12.3-12.4 of the EPR FSAR, the applicant describes the use of a concentric guard pipe equipped with alarmed moisture detection monitors for effluent discharges. However, the use of vacuum breakers in effluent piping is site-specific and not addressed by the EPR DCA. If vacuum breakers are used for Unit 3, please describe design features and/or operational programs that would prevent or monitor leakage such that contamination of the facility and the environment is minimized in accordance with 10 CFR 20.1406.

**Response**

The current site-specific design of Calvert Cliffs Nuclear Power Plant Unit 3 does not include vacuum breakers in the effluent discharge piping.

**COLA Impact**

The COLA FSAR will not be revised as a result of this response.

**Question 12.03-12.04-9**

Operating experience has shown that buried piping can be the source of environmental contamination. Describe any site-specific buried piping (such as the effluent discharge pipe) that could potentially become contaminated and leak into the ground. Describe design features and/or monitoring programs that would demonstrate that environmental contamination from buried piping is being minimized in accordance with 10 CFR 20.1406.

**Response**

The effluent discharge piping radiation protection design features used to minimize contamination of ground water are described in U.S. EPR FSAR Section 12.3.6.2. There are no other site-specific buried pipes that contain or could contain licensed material for which there is a credible mechanism for the licensed material to reach ground water.

**COLA Impact**

The COLA FSAR will not be revised as a result of this response.