

Dominion Nuclear Connecticut, Inc.  
Millstone Power Station  
Rope Ferry Road  
Waterford, CT 06385



October 20, 2004

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

Serial No.: 04-607  
NLOS/PRW Rev. 0  
Docket No.: 50-423  
License No.: NPF-49

**DOMINION NUCLEAR CONNECTICUT, INC.**  
**MILLSTONE POWER STATION UNIT 3**  
**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**  
**REGARDING PROPOSED TECHNICAL SPECIFICATION CHANGES FOR**  
**IMPLEMENTATION OF ALTERNATE SOURCE TERM**

In a letter dated May 27, 2004, Dominion Nuclear Connecticut, Inc. (DNC) requested an amendment in the form of changes to the Technical Specifications to Facility Operating License Number NPF-49 for Millstone Power Station Unit 3. The proposed changes were requested based on the radiological dose analysis margins obtained by using an alternate source term consistent with 10 CFR 50.67. In a facsimile dated August 20, 2004, the NRC requested additional information to facilitate the technical review being conducted by the staff. In a letter dated September 27, 2004, DNC forwarded the response to the request for additional information.

In a facsimile dated September 22, 2004, the NRC forwarded a second request for additional information. Attachment 1 of this letter provides the response to the request for additional information.

In accordance with 10 CFR 50.91(b), a copy of this License Amendment Request is being provided to the State of Connecticut.

If you should have any questions regarding this submittal, please contact Mr. Paul R. Willoughby at (804) 273-3572.

Very truly yours,

Leslie N. Hartz  
Vice President – Nuclear Engineering

Attachment

Commitments made in this letter: None.

cc: U. S. Nuclear Regulatory Commission  
Region I  
475 Allendale Road  
King of Prussia, PA 19406-1415

Mr. V. Nerses  
Senior Project Manager  
U. S. Nuclear Regulatory Commission  
One White Flint North  
11555 Rockville Pike  
Mail Stop 8C2  
Rockville, MD 20852-2738

Mr. S. M. Schneider  
NRC Senior Resident Inspector  
Millstone Power Station

Director  
Bureau of Air Management  
Monitoring & Radiation Division  
Department of Environmental Protection  
79 Elm Street  
Hartford, CT 06106-5127

COMMONWEALTH OF VIRGINIA    )  
  )  
COUNTY OF HENRICO            )

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Leslie N. Hartz, who is Vice President - Nuclear Engineering of Dominion Nuclear Connecticut, Inc. She has affirmed before me that she is duly authorized to execute and file the foregoing document in behalf of that company, and that the statements in the document are true to the best of her knowledge and belief.

Acknowledged before me this 20<sup>TH</sup> day of October, 2004.

My Commission Expires: May 31, 2006.

Vicki L. Huel  
Notary Public

(SEAL)

**ATTACHMENT 1**

**PROPOSED TECHNICAL SPECIFICATION CHANGES**  
**IMPLEMENTATION OF ALTERNATE SOURCE TERM**  
**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

**DOMINION NUCLEAR CONNECTICUT, INC.**  
**MILLSTONE POWER STATION UNIT 3**

**PROPOSED TECHNICAL SPECIFICATION CHANGES**  
**IMPLEMENTATION OF ALTERNATE SOURCE TERM**  
**RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION**

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Below is the response to the request for additional information:

**NRC Background Statement**

The license amendment request (LAR) identifies a proposed volume quench spray (QS) coverage of 49.63% starting at 72.5 sec and lasting to (or for) 7480 sec. The current QS (FSAR) coverage is 50.27%. In addition, the LAR proposes to credit the effectiveness of the recirculation spray (RS), at 840 sec (starts at 660 sec) increasing the volume coverage to 64.5% when the RS becomes effective. After the QS is secured, even though the RS continues, no credit is taken for iodine removal.

**NRC Question 1**

It appears that the reduced QS coverage is a result of the identified change in the containment free volume from  $2.32 \times 10^6$  to  $2.35 \times 10^6$  ft<sup>3</sup> (LAR Table 2.6-1). That is the sprayed volume remains the same at about 1,166,200 ft<sup>3</sup> and with the increased free volume considered to be part of the unsprayed volume the QS sprayed volume percentage is reduced.

Provide a reference to the revised containment free volume calculation and summarize the basis for the new volume value and spray coverage value.

**DNC Response**

Calculation 12179-ES-227, Revision 0, dated 02/04/80 is the basis for the containment free volume. This calculation indicates that the maximum free volume is  $2.35 \times 10^6$  ft<sup>3</sup>. This value was utilized in the current analysis since use of the maximum containment free volume results in a larger unsprayed volume. The containment free volume previously used (i.e.  $2.32 \times 10^6$  ft<sup>3</sup>) is a value within the range of containment free volume calculated in Calculation 12179-ES-227, Revision 0. The difference between the two volumes (i.e.  $0.03 \times 10^6$  ft<sup>3</sup>) has been categorized as unsprayed volume in the current submittal.

The basis for the Quench Spray System (QSS) spray coverage percentage is unchanged from the current and previously approved spray coverage basis. First the QSS sprayed volume above the operating deck is determined. This volume is equal to the area inside the crane wall from the operating deck at elevation 51' – 4" to the upper QSS ring header at elevation 168' - 0". This volume is reduced by approximately 12% to account for equipment present in the QSS sprayed volume above the operating deck. There are several spaces inside the crane wall and below the operating deck that are sprayed. The spaces include: 1) the refueling cavity volume, 2) the refueling canal volume, 3) the hoist space volumes and 4) steam generator cubicle volumes. These volumes are added to the free volume above the operating deck, but below the QSS spray ring at elevation 168'- 0" to determine the QSS sprayed volume. The QSS sprayed volume is then divided by the maximum containment free volume to determine the QSS spray coverage percentage.

**NRC Question 2**

The staff reviewed Quench Spray Coverage calculation 08506 US(B)-369 dated 5/19/99 as background material on how the coverage was calculated. This appears to yield a QS coverage fraction of 33.85%, as summarized in this table (with the LAR values added for clarification – QS LAR is 49.63%):

Calc note 369: Zone	V <sub>s</sub> = Sprayed (ft <sup>3</sup> )	V <sub>u</sub> = Unsprayed (ft <sup>3</sup> )	Total (ft <sup>3</sup> )	V <sub>s</sub> /C <sub>vol</sub>
I	465,269	253,108	718,377	0.6477
II	259,005	191,870	450,875	0.5744
III	71,097	1,109,651	1,180,748	0.0602
Total	795,371	1,554,629	2,350,000	0.3385
<b>LAR for AST</b>				
QS	1,166,200	1,183,800	2,350,000	0.4963 <sup>1</sup>
QS + RS	1,515,858	834,142	2,350,000	0.6450
RS	Δ 349,658	Δ -349,568	0	n/a

<sup>1</sup> 0.5027 if C<sub>vol</sub> = 2.32x10<sup>6</sup> ft<sup>3</sup>. From FSAR Table 15.6-9 Assumptions Used for the Radiological Consequences of a LOCA Analysis (Rev 16)

Provide a description, or the calculation title, of the QS LAR volume coverage fraction in sufficient detail to understand the volume values and the QS coverage fractions, and to what extent, if any, the values derived are considered to be conservative for the intended use. The current FSAR calculation would be sufficient if the staff's interpretation of the reduced LAR value is correct. If the methodology employed in calculation 369 was used, describe the difference in sufficient detail to understand the new QS value.

### **DNC Response**

The methodology utilized in Calculation US(B)-369 was not used. The methodology used is consistent with the current plant license. This methodology is documented in Calculation US(B)-341. The Calculation US(B)-341 methodology is described above in the response to Question 1. Conservatism present in the calculation include application of the maximum containment free volume and no credit for QSS spray reaching certain portions of containment (e.g. containment annulus area). An example calculation of the QSS sprayed volume percentage is provided in Enclosure 1.

### **NRC Question 3**

The LAR proposes to credit the RS.

Provide a description, or the calculation file, of the RS LAR volume coverage fraction in sufficient detail to understand the volume values and the RS coverage fractions, and to what extent, if any, the values derived are considered to be conservative for the intended use. If the methodology employed in calculation 369 was used, describe the difference in sufficient detail to understand the RS value.

### **DNC Response**

The methodology utilized in Calculation US(B)-369 was not used. The methodology used in calculating the sprayed volume is consistent with the methodology utilized in Calculation US(B)-341. Only the combined spray coverage for the Recirculation Spray System (RSS) and QSS is credited in the analysis. As discussed in the introduction of the RAI, after QSS is secured, even though the RSS continues to operate, no credit is taken for iodine removal. An RSS alone spray coverage volume has not been determined or used. Relative to the RSS and QSS spray coverage, this methodology is documented in Calculation US(B)-341. The Calculation US(B)-341 methodology is similar to that described in the response to Question 1 for QSS. The RSS headers are physically located above the crane wall. A significant portion of the RSS spray will fill the containment annulus area (i.e. the area between the outside of the crane wall and the containment liner). A 50% spray coverage factor is used for the containment annulus area. This factor includes congestion for equipment. Conservatism present in the calculation include application of the maximum containment free volume and no credit for either RSS or QSS spray reaching certain portions of containment (e.g. a significant portion of the containment annulus area). An example calculation of the RSS and QSS sprayed volume is provided in Enclosure 1.

**ENCLOSURE 1**

**PROPOSED TECHNICAL SPECIFICATION CHANGES**  
**IMPLEMENTATION OF ALTERNATE SOURCE TERM**

**QSS SPRAYED VOLUME PERCENTAGE**  
**RSS AND QSS SPRAYED VOLUME**

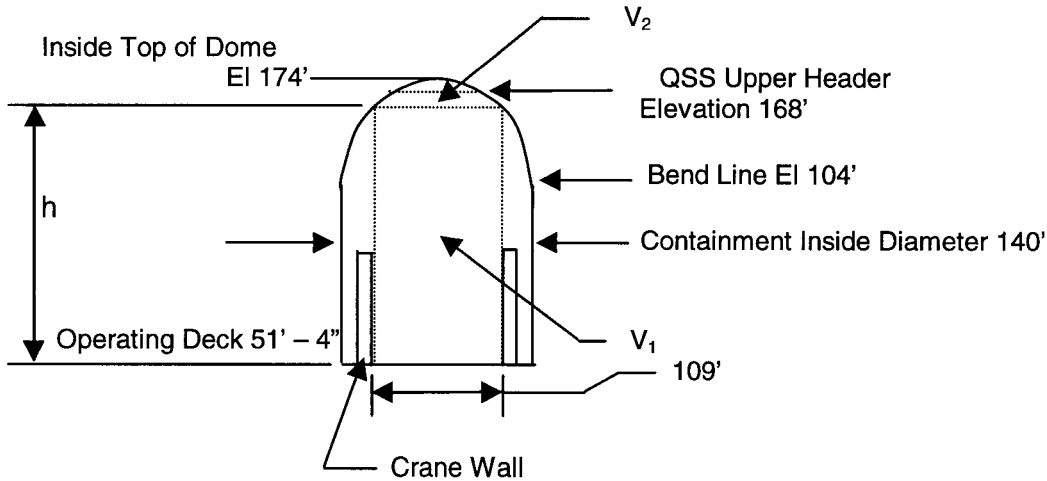
**DOMINION NUCLEAR CONNECTICUT, INC.**  
**MILLSTONE POWER STATION UNIT 3**



V (containment Quench Spray System sprayed volume):

The containment sprayed volume is  $V = 1,166,200 \text{ ft}^3$ . (See the following pages for derivation)

The containment sprayed volume was determined as documented below:



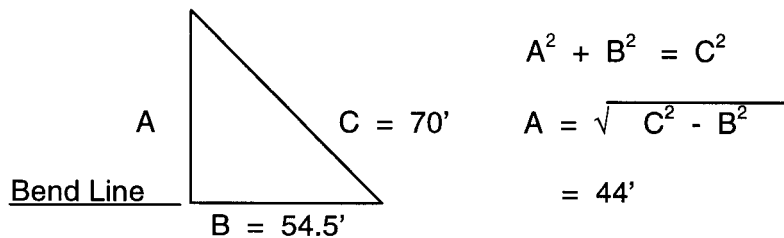
Note: The inside crane wall diameter specified is for elevations below the operating deck elevation of 51' - 4". The crane wall inside diameter is 110' from elevation 51' - 4" and higher. This calculation utilizes the smaller more conservative diameter of 109'

The congestion factor for the containment volume is determined below (Reference Calculation ES-227, page 178):

$$\text{Congestion Factor} = \frac{\text{Volume of Containment Internal Structures (etc.)}}{\text{Gross Containment Volume}}$$

$$= \frac{3.13 \times 10^5}{2.62 \times 10^6} \approx 12\%$$

Determination of h:



$$h = 44' + (104' - 51.33') = 96.67'$$

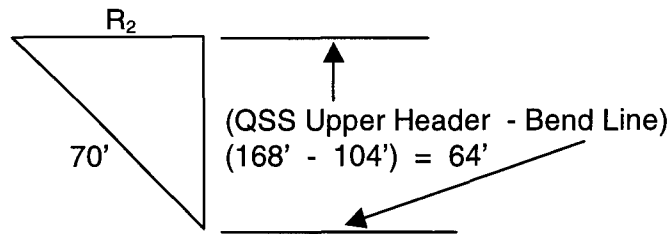
$$V_1 = \pi * \frac{D^2}{4} * h = \pi * \frac{109^2}{4} * 96.67 = 902,000 \text{ ft}^3 \text{ (Volume of a right cylinder)}$$

$V_2 =$

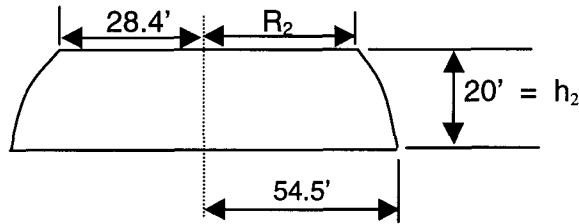
Height of Volume  $V_2$  ( $h_2$ ):

QSS Upper Header Elevation - (Operating Deck Elevation + h)  
 $168' - (51.33' + 96.67) = 20'$

Radius of Upper Horizontal Circular Surface,  $R_2$



$$R_2 = \sqrt{70^2 - 64^2} = 28.4'$$



$$V_2 = 1/6 * \pi * 20 * [(3 * (54.5)^2 + 3 * (28.4)^2 + (20)^2)] = 122,800 \text{ ft}^3$$

Therefore, the total sprayed volume above the operating deck is equal to:

$$(V_1 + V_2) * (100\% - \text{containment congestion factor})$$

$$= (902,000 + 122,800) * (0.88) = 902,000 \text{ ft}^3$$

Additional volumes are sprayed below the operating deck at elevation 51' - 4". These additional sprayed volumes are summarized below:

The steam generator cubicles from 3' - 8", refueling cavity and canal, and hoist space down to 3' - 8".

Refueling cavity volume	= 40,164
Refueling canal volume	= 6,133
Hoist space	= 13,417
Hoist space	= 10,813
Steam generator A	= 49,501
Steam generator B	= 47,334
Steam generator C	= 47,334
Steam generator D	= 49,501
<u>Total</u>	<u>= 264,200 ft<sup>3</sup></u>

Grand total of Quench Spray System sprayed volume = 902,000 + 264,200 = 1,166,200 ft<sup>3</sup>

Dividing by the total volume (Reference Calculation ES-227) of  $2.35 \times 10^6$  ft<sup>3</sup> yields a **QSS sprayed volume percentage** of: **49.63%**.

### RSS and QSS Sprayed Volume

The two recirculation spray headers are located at elevation 141' – 9" and 145' – 3". The two headers are positioned nearly over the containment crane wall. The spray pattern of the recirculation spray results in spray coverage of the containment annulus area (i.e. coverage of the area between the crane wall and the containment exterior wall). An estimate of the spray coverage area is estimated to be 50% of the annulus area from the elevation of the crane wall to the containment mat (including a the congestion factor).

Top of Crane Wall EL	→	105' – 7"
Mat High Point EL	→	(-) 24' – 6"
Annulus Height	→	130' – 1"
Containment Inside Radius	→	70.0'
Crane Wall Outside Radius	→	57.5' = 55' + 2.5'

The recirculation spray coverage of the annulus area is estimated to be:

$$\Pi \times (70^2 - 57.5^2) \times 130.08' \times 50\% = 325650 \text{ ft}^3$$

The recirculation spray coverage above the crane wall is:

$$\Pi \times (57.5^2 - 55.0^2) \times (145.25 - 105.58) = 35140 \text{ ft}^3$$

The total recirculation spray coverage is:

$$325650 + 35140 = 360790 \text{ ft}^3$$

The combined **RSS and QSS sprayed volume** is:

$$1166200 + 360790 = \underline{\underline{1526990 \text{ ft}^3}}$$

Note the RSS and QSS spray coverage volume of 1,515,858 ft<sup>3</sup> was conservatively used in the analysis.