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SCE&G®
A SCANA COMPANY

June 1, 2009
NND-09-0145

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

ATTN: Document Control Desk

Subject: Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 Combined License Application (COLA) - Docket Numbers 52-027 and 52-028 Response to NRC Request for Additional Information (RAI) Letter No. 047

Reference: Letter from Ravindra G. Joshi (NRC) to Alfred M. Paglia (SCE&G), Request for Additional Information Letter No. 047 Related to SRP Section 6.4 for the Virgil C. Summer Nuclear Station Units 2 and 3 Combined License Application, dated April 30, 2009.

The enclosure to this letter provides the South Carolina Electric & Gas Company (SCE&G) response to the RAI items included in the above referenced letter. The enclosure also identifies any associated changes that will be incorporated in a future revision of the VCSNS Units 2 and 3 COLA.

Should you have any questions, please contact Mr. Al Paglia by telephone at (803) 345-4191, or by email at apaglia@scana.com.

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

Executed on this 1st day of June, 2009.

Sincerely,

Ronald B Clary

Ronald B. Clary
General Manager
New Nuclear Deployment

AMM/RBC/am

Enclosure

D083
NRO

c (w/o attachment):

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NRC RAI Letter No. 047 Dated April 30, 2009

SRP Section: 6.4 – Control Room Habitability System

Question from Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)

NRC RAI Number: 06.04-3

1. Justify the data used in the ALOHA Analysis that is described in VCSNS Response to NRC RAI Number 06.04-2.

1.a Provide the detailed calculation formula for the data of 0.391 air exchange per hour used in the ALOHA analysis.

1.b Why use 1500 cfm for the outside air exchange rate instead of 1925 cfm as described in AP1000 DCD Table 15.6.5-2?

1.c It is noted that there is virtually no margin for the toxic gas concentration in the main control room (MCR) with respect to the IDLH limit of 28% ammonium hydroxide. The toxic gas concentration is also sensitive to the outside air intake rate and the chemical inventory and location. How will the VCSNS control the outside air intake rate and the chemical inventory and location in order to assure that the toxic gas concentration in the MCR will not exceed the IDLH limit?

1.d During the toxic gas release accident, the HVAC volume will serve as a toxic gas source volume since it will continuously exchange the HVAC air with outside air containing toxic gas while the toxic gas will accumulate in the HVAC volume if the toxic gas in the HVAC air is not filtered out. After considering the outside air exchange rate of 1500 cfm from HVAC volume and the interaction between HVAC volume and MCR in terms of flow rate 3015 cfm and volumes of 69500 ft3 and 36000 ft3, respectively, it appears that the equivalent air exchange rate input to ALOHA should be around 1.0 per hour (assuming constant toxic gas concentration from outside).

Justify the use of 0.391 air exchange per hour in ALOHA analysis with respect to the above mentioned actual two-volume configuration consisting of HVAC volume and MCR.

VCSNS RESPONSE:

1.a Please see the response to item 1.c below.

1.b Please see the response to item 1.c below.

1.c The original toxicity analysis for the 28% ammonium hydroxide located near the VCSNS Unit 1 water treatment plant took into consideration several conservative assumptions to determine a concentration inside the control room as described in Section 2.2.3.1.3.1 of the VCSNS Units 2 and 3 FSAR. Specifically:

- Pasquill Stability Class F selected to represent the worst 5% of meteorological conditions observed.

- A low wind speed of 1 meter-per-second selected to represent the worst 5% conditions. Low wind speed conditions prevent the vapor cloud from dispersing as it travels.

- The time of day selected was 12:00 p.m. on July 1, 2006. This day and time were chosen because temperatures are highest in the summer during the midday. Higher temperatures lead to a higher evaporation rate, and thus, a larger vapor cloud.

- The tank was filled to capacity and a catastrophic tank failure was assumed where the total amount of the substance leaked forming a 1-centimeter-thick puddle. A 1-centimeter-thick puddle allows for greater evaporation, and thus, a larger vapor cloud.

- There are no physical obstructions that interfere with the toxic vapor cloud from reaching the control room intake.

With all these conservatisms the outdoor concentration was 2,220 ppm at the control room intake (distance to IDLH of 12,672 ft). The IDLH for ammonium hydroxide (as ammonia) is 300 ppm.

Rather than relying on the HVAC system operation to assure the calculated concentration would be below toxicity limits, the initial calculation assumptions have been revised to remove some excessive conservatism. The original assumption of a large puddle with a 1 cm depth is extremely conservative given the actual physical configuration of the area surrounding the ammonium hydroxide tank. This tank is located within a dammed area with a trough draining to a waste neutralizing basin. The total dammed area, including the drain troughs and waste neutralizing basin, has an equivalent radius of 6.1 meters. The ALOHA analysis was re-performed using the assumptions described in the FSAR Section 2.2.3.1.3.1 (see above) except that the contents of the tank were limited to the confines of the dammed area with a radius of 6.1 meters. This is still a conservative assumption since any fluid within the dammed area would actually drain to the waste neutralizing basin. The neutralizing basin consists of a 15 foot deep reservoir with a large liquid inventory that would serve to dilute the ammonium hydroxide, thus lowering its vapor pressure and thereby reducing the amount that would evaporate.

The revised analysis shows that, with the dammed area surrounding the tank limiting the puddle size, the ammonium hydroxide spill would result in a maximum safe distance of 4,041 ft. This is less than the actual distance of 4,264 ft from the tank to the control room. This results in a maximum outside concentration of 271 ppm, which is less than the 300 ppm IDLH.

1.d Please see the response to item 1.c above.

This response is PLANT SPECIFIC.

ASSOCIATED VCSNS COLA REVISIONS:

The following FSAR changes will be made in a future revision of the COLA.

The final paragraph of Section 2.2.3.1.3 will be revised as follows:

For each of the identified chemicals with the exception of ammonium hydroxide, it was conservatively assumed that the entire contents of the vessel leaked, forming a 1-centimeter-thick puddle, where accommodated by the model. For those identified hazardous materials in the gaseous state, it was conservatively assumed that the entire contents of the vessel or pipeline were released over a 10-minute period into the atmosphere as a continuous direct source (Reference 229). The effects of toxic chemical releases from onsite and offsite sources are summarized in Table 2.2-209 and are described in the following subsections relative to the release sources.

The second and third paragraphs of Section 2.2.3.1.3.1 will be revised as follows:

As described in Subsection 2.2.3.1.3, the identified hazardous materials were analyzed using the ALOHA dispersion model to determine whether the formed vapor cloud would reach the control room intake and what the concentration of the toxic chemical would be in the control room following an accidental release. Nitrogen concentration was determined at the control room following a release from the largest storage vessel. In this case, the concentration of asphyxiant at the control room (96.2 ppm of nitrogen) would not displace enough oxygen for the control room to become an oxygen-deficient environment, nor would it be otherwise toxic at this concentration (Reference 228). The remaining chemical analysis indicates that the control room can safely remain habitable for the worst-case toxic release scenario. ~~While the distance from the source to the selected toxicity limit for 28% ammonium hydroxide is greater than the distance to the Unit 2 control room, the concentration inside the control room never reaches the toxicity limit.~~

In evaluating the 28% ammonium hydroxide storage tank spill~~, along with the other identified hazardous materials,~~ the following inputs were used in the model:

- Pasquill Stability Class F selected to represent the worst 5% of meteorological conditions observed.

- A low wind speed of 1 meter-per-second selected to represent the worst 5% conditions. Low wind speed conditions prevent the vapor cloud from dispersing as it travels.

- The time of day selected was 12:00 p.m. on July 1, 2006. This day and time were chosen because temperatures are highest in the summer during the midday. Higher temperatures lead to a higher evaporation rate, and thus, a larger vapor cloud.

- The tank was filled to capacity and a catastrophic tank failure was assumed where the total amount of the substance leaked ~~forming a 1-centimeter-thick puddle~~into a basin with an equivalent radius of 6.1 meters. ~~A 1-centimeter-thick puddle allows for greater evaporation, and thus, a larger vapor cloud.~~ The ammonium hydroxide storage tank is located within a dammed area with a trough draining to the waste neutralizing basin. The total dammed area, including the drain troughs and waste neutralizing basin, has an equivalent radius of 6.1 meters. Assuming that the entire contents of the tank would be contained in the dammed area is conservative given that any fluid within the dammed area would actually drain to a waste neutralizing basin consisting of a 15 foot deep reservoir with a large liquid inventory. This would serve to dilute the ammonium hydroxide, thus lowering its vapor pressure and thereby reducing the amount that evaporates.

- There are no physical obstructions that interfere with the toxic vapor cloud from reaching the control room intake.

Table 2.2-209 will be revised as follows:

Source	Chemical	Quantity	IDLH	Distance to Unit 2 control room (ft)[(d)]	Distance to Unit 3 control room (ft)[(d)]	Distance to IDLH (ft)	~~Maximum Control Room Concentration~~
Norfolk Southern Railroad Line	Cyclohexylamine	132,000 lbs	30 ppm TEEL-3[(c)]		4,200	4,818	~~5.5 ppm~~
Onsite (Includes Unit 1)	28% Ammonium Hydroxide	56,000 lbs	300 ppm	4,264		~~12,672~~ 4,041	~~291 ppm[(e)]~~
	Carbon Dioxide	20,000 lbs	40,000 ppm	3,999		1,452	~~393 ppm~~
	Chlorine	50 lbs	10 ppm	4,264		2,220	~~0.225 ppm~~
	Gasoline[(a)] (50,000 lbs tanker truck)	50,000 lbs	300 ppm TWA[(e)]	2,362		1,932	~~24.1 ppm~~
	35% Hydrazine (as 100%)	280 lbs	50 ppm	3,600		411	~~0.132~~
	Nitrogen	4,000 lbs	Asphyxiant	4,624		Asphyxiant	~~96.2 ppm~~
	Sodium Hypochlorite 12%	45 lbs	10 ppm	3,600		<33	~~Not Significant~~
Nearby Facilities	Fuel Oil[(b)]	800,000 gal	None Listed		7,267	Never exceeds IDLH	~~0.672~~
Highway-Bounded by onsite gasoline tanker truck							

(a) Onsite delivery tanker truck that refuels the Gasoline UST at Unit 1.
(b) Tank location is 7,267 feet from Unit 3, near the Parr Combustion Turbines.
(c) Temporary emergency exposure limit (TEEL)
(d) ~~ALOHA does not report values after 1 hour because it assumes that the weather conditions or other release circumstances are likely to change after the first hour.~~ Distance from source is provided for the most limiting Unit only.
(e) Time-weighted average (TWA)

ASSOCIATED ATTACHMENTS:

None