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August 24, 2006
GO2-06-108

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

Subject: **COLUMBIA GENERATING STATION, DOCKET NO. 50-397 RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION RELATED TO ALTERNATIVE SOURCE TERM LICENSE AMENDMENT REQUEST**

References:
1) Letter dated August 9, 2006 from B Benney (NRC) to JV Parrish (Energy Northwest), "Columbia Generating Station - Request for Additional Information Re: License Amendment Application On Alternative Source Term (TAC No. MC4570)"
2) Letter dated September 30, 2004, DK Atkinson (Energy Northwest) to NRC, "License Amendment Request – Alternative Source Term"
3) Letter dated August 7, 2006, WS Oxenford (Energy Northwest) to NRC, "Response to Request for Additional Information Related to Alternative Sources Term License Amendment Request"

Dear Sir or Madam:

Transmitted herewith in the attachment is the Energy Northwest response to the subject Request for Additional Information (Reference 1). This response provides additional justification for the Energy Northwest Alternative Source Term (AST) License Amendment Request (LAR) (Reference 2) and supplements the responses provided on August 7, 2006 (Reference 3).

There are no new commitments being made. If you have any questions or require additional information, please contact Greg Cullen at (509) 377-6105.

A001

I declare under penalty of perjury that the foregoing is true and correct. Executed on the date of this letter.

Respectfully,

BJ Ridge
Acting Vice President, Technical Services
Mail Drop PE08

Attachment: Response to Request for Additional Information

cc: BS Mallett – NRC RIV
BJ Benney – NRC NRR
NRC Senior Resident Inspector/988C
RN Sherman – BPA/1399
WA Horin – Winston & Strawn

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Responses to the initial 5 questions of the NRC Staff's request for additional information can be found in the attachment to the August 7, 2006 RAI response letter from Energy Northwest. Responses to the remaining 8 questions are provided below.

Item 1

What is the instrument accuracy on the gauge that measures secondary containment pressure and how does Columbia account for this in the SR?

Response

The currently calculated total instrument inaccuracy of 0.47 in water gauge (wg) takes into consideration instrument loop inaccuracies (0.199 in. wg) as well as the location of the sensing differential pressure instruments and the effect of building pressure gradients due to inside/outside air temperature differences (0.267 in. wg). Wind loads are accounted for by use of the instrument that provides the least pressure differential relative to the exterior of the reactor building.

This SR will be satisfied by verification that the indicated secondary containment pressure is greater than the calculated instrument inaccuracy (currently 0.47 in wg vacuum). This value, in whole or in part, provides assurance that the initial assumptions of the draw down analysis (i.e., 0.0 secondary containment pressure) are preserved, that the building will remain negative to ensure significant release paths are monitored in accordance with General Design Criteria (GDC) 64, and lastly to provide a level of confidence that there are no gross leakage pathways in the secondary containment.

Item 2

Where is the pressure measured? How does Columbia determine that this is a limiting pressure? Is it connected with the general secondary containment atmosphere?

Response

During normal plant operation, reactor building differential pressure is measured by the reactor building pressure control system. This system has two redundant instrument loops which continuously measure the reactor building differential pressure at each of the four sides of the reactor building at an elevation of approximately 576.5 ft. This elevation corresponds to approximately 60% of the 230 ft of building height above ground.

Having instruments on each side of the building accounts for the effect of wind. A windward side instrument would see a different pressure differential than a leeward side instrument. An automatic selection of the least of these measured pressure differentials is used to control building ventilation.

In addition, as discussed in the response to Item 1 above, the actual indicated value used as acceptance criteria for completion of this surveillance includes an adjustment to account for the location of the sensing instruments with respect to all other areas of the secondary containment.

These instruments directly communicate with the general secondary containment atmosphere. The floor that houses these instruments is open to the remainder of the reactor building via open equipment hatches and ventilation ducting.

Item 3

How was the draw down analysis validated? Has Columbia conducted an actual test and compared the test results with the prediction of the model?

Response

The drawdown analysis was developed using GOTHIC which is an industry accepted computer code for the modeling of containment building pressure and temperature transients. The code has been subjected to a QA review and is part of the vendor's Appendix B program. Users of the code are provided with error notifications as part of the Appendix B program. The code is validated upon installation by the analyst. The building model developed using this computer code is formally documented and design verified by an independent reviewer. The analysis was further subjected to extensive cross-discipline reviews.

A benchmark of the GOTHIC model using the drawdown surveillance test results from refueling outage 17 was performed. Applicable internal plant heat loads and the environmental conditions that existed at the time of the surveillance were inputted into the GOTHIC model. The model calculated a drawdown time of approximately 62 seconds. Given the conservatisms built into the model, the calculated time compares well with the measured time of approximately 37 seconds. Therefore, this benchmark provides confidence that the model provides reasonable and bounding results.

To further validate the model's performance, a series of sensitivity studies (12 cases) on a variety of conditions were prepared. These were specifically selected to understand the range of expected times that may occur during surveillance testing. These sensitivity studies produced drawdown time ranging from approximately 0.5 minutes to 9 minutes. Past surveillances have provided results on the lower end of the time spectrum which is reasonable given these surveillances have usually been performed during moderate weather conditions with minimal heat loads in the building. These sensitivity studies also demonstrate that longer drawdown times could be seen under more challenging surveillance test conditions involving higher internal heat loads and high winds. Details of these 12 sensitivity cases were provided in the enclosure to the August 7, 2006 RAI response. Table 6 of the reference enclosure provides a description of the 12 cases and Table 14 provides the resulting drawdown times.

Based upon these efforts Energy Northwest has demonstrated the model is valid and provides a conservative representation of the drawdown time.

Item 4

Section 50.36 of 10 CFR requires an SR on parameters used in design-basis analyses such as the draw down time. Please state clearly the basis for substituting an analysis for an SR that measures the parameter directly with emphasis on how 10 CFR 50.36 requirements for surveillances are satisfied.

Response

10 CFR 50.36(c)(3) states, "Surveillance requirements are requirements relating to test, calibration or inspection to assure that the necessary quality of systems and components are maintained, that facility operation will be within safety limits and that the limiting conditions for operation will be met." As discussed in the response to item 3, acceptable drawdown times can vary substantially depending upon conditions. For example, achieving a drawdown time of equal to 2 minutes under favorable environmental conditions could provide false confidence in the quality and functional capability of the secondary containment and standby gas treatment (SGT) system. It is Energy Northwest's contention that the drawdown surveillance test in SR 3.6.4.1.4 does not provide assurance of the drawdown capability as credited in the plant's design and therefore a surveillance of this type is not required by 10 CFR 50.36(c)(3).

In order to establish the confidence required by regulations in the quality and functional capability of the secondary containment and SGT system, Energy Northwest proposes to rely on two separate surveillance tests described in more detail below:

<u>Modified SR 3.6.4.1.5 (renumbered as 3.6.4.1.4)</u>
This surveillance test establishes a measure of confidence in the quality and functional capability of the secondary containment by determining if "in-leakage" is being maintained within the values assumed in the safety analysis. Since test conditions (e.g., wind speed, wind direction, temperature, and fan flowrates) will vary somewhat from that assumed in the safety analysis, it is necessary to make a correlation to determine an equivalent inleakage value using the data obtained during the test. This correlation would then provide a more accurate indication of the existing condition of the Secondary Containment. This would provide a meaningful indication of secondary containment performance that could be trended over time.

<u>Modified SR 3.6.4.3.3</u>

This surveillance test establishes a measure of confidence in the quality and functional capability of each SGT subsystem. Ensuring the SGT fan can achieve greater than or equal to 4800 cfm within 2 minutes demonstrates the SGT system performance is being maintained consistent with that assumed in the safety analysis. Ensuring each SGT subsystem can achieve greater than or equal to 4800 cfm within 2 minutes provides confidence in the functional capability of the SGT subsystem to drawdown the secondary containment within the input parameters assumed in the safety analysis.

In conclusion, the combination of these two surveillances will ensure the necessary quality and capability of both the secondary containment and SGT system will be maintained and the initial conditions assumed in the LOCA analysis with regard to the performance of these two systems are preserved. This, therefore, is consistent with the basis for surveillance requirements as established in 10 CFR 50.36(c)(3).

Item 5

What are the uncertainties in the analytical model? How are these uncertainties accounted for by conservatism or defense in depth?

Response

The uncertainties in the LOCA analysis GOTHIC model are associated with modeling inputs associated with Heat Transfer, Operator Action Times, and System Performance. These are addressed in the analysis by establishing conservative values used as inputs. These are described in the assumptions and include items listed below:

- no credit is taken for secondary containment building outleakage
- fouled equipment coolers assumed
- normal ventilation coast down not credited
- conservative fan flow assumed
- manual start of fuel pool cooling conservatively delayed for 12 hours
- conservative representation of primary containment response used
- heat transfer to the atmosphere from the building is not credited

As discussed in response to item 3, the benchmark performed on this model demonstrates the model is reasonably conservative and provides credible results. Therefore, the uncertainties in the model are appropriately and conservatively accounted for.

Item 6

What is the pressure transient for the secondary containment during a LOCA accident? Can the secondary containment go positive and lose its integrity because of the transient? What is the secondary containment design pressure?

Response

The secondary containment pressure transient post-LOCA is based on the AST LAR drawdown analysis that shows the peak pressure occurring at 120 seconds post-accident. In the AST drawdown analysis, the SGT fan is assumed to start and achieve a flow of 4800 CFM at t=120 seconds. Under design basis accident conditions, the building will be positive for a short period of time (the first 5 minutes post-accident). During the first 5 minutes, the maximum pressure will correspond to a positive pressure of 1.25 in. wg (0.045 psig).

The secondary containment design is based upon a pressure range of +6.9 in. wg to -7.26 in. wg. The maximum pressure calculated in the above scenario is well below the building's design pressure.

Item 7

What are the problems associated with conducting a draw down test? It was stated that draw down could be achieved in 30 seconds? It would appear that if draw down could be demonstrated in 2 minutes (current TSs) that the impact of heat loads, external temperatures, wind, et al., would be small when spread out over the entire secondary volume. As the draw down time got longer, these effects would be more noticeable.

Response

The acceptance criterion for the current surveillance test is a single time value of 120 seconds to reach 0.25 in wg vacuum. As discussed in the response to item 3, a wide range of drawdown times, including ones that could exceed 2 minutes, is possible depending on plant conditions outside of the control of this surveillance (e.g., external wind and temperature). There are also conditions where a surveillance result of less than 2 minutes could be unacceptable. With the 120 seconds as the only time criterion necessary to pass the test, it is possible to satisfy this test criterion with favorable wind conditions when the building leakage performance is not bounded by that assumed in the drawdown analysis. Therefore, the building performance is not adequately demonstrated by drawdown time alone.

Item 8

Realizing that draw down under cold (ideal) conditions does not reflect the draw down under accident conditions, would it be more feasible to conduct a draw down under cold (ideal) conditions and adjust the results for accident conditions by use of an analysis? By doing this, Columbia would have a measured value or SR and a defendable basis for relating it to an accident-based draw down time.

Response

The limitation and value of performing a timed drawdown surveillance has been discussed in the above responses. The ability of the secondary containment and the SGT system to perform their design basis function (i.e., support an acceptable drawdown time) is best monitored and assured by assessing building inleakage and fan flow. Surveillance requirements are provided to ensure the quality and capability of these functions at the basic level. Drawdown time is a derived value that is a product of these two physical capabilities. These physical structures, systems and components are the parts of the design that can be directly managed, maintained and monitored to ensure continued compliance with the plant's licensing basis. Therefore, a defendable basis for relating the performance of the secondary containment and the SGT fans to an acceptable drawdown time without the need to measure drawdown time has been provided.