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SUBJECT: Forwards response to NRC 990211 RAI re util request for amend to secondary containment & SBGTS TS.

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April 12, 1999
GO2-99-067

Docket No. 50-397

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

Gentlemen:

Subject: **WNP-2, OPERATING LICENSE NPF-21 REQUEST FOR AMENDMENT TO SECONDARY CONTAINMENT AND STANDBY GAS TREATMENT SYSTEM TECHNICAL SPECIFICATIONS (ADDITIONAL INFORMATION)**

Reference: Letter, dated February 11, 1999, C Poslusny (NRC) to JV Parrish (SS), "Request for Additional Information for the Washington Public Power Supply System (WPPSS) Nuclear Project No. 2 (WNP-2) (TAC NO. M96928)"

In the reference, the staff requested that additional information be provided to support review of our pending request for an amendment to secondary containment and standby gas treatment system Technical Specifications.

The additional information is included as an attachment. Should you have any questions or desire additional information regarding this matter, please call me or PJ Inserra at (509) 377-4147.

Respectfully,

D. W. Coleman

DW Coleman
Manager, Regulatory Affairs
Mail Drop PE20

Attachment

cc: EW Merschoff - NRC RIV
JS Cushing - NRR
NRC Sr. Resident Inspector - 927N
DL Williams - BPA/1399
PD Robinson - Winston & Strawn

A001

Question 1: A loss of offsite power (LOOP) has been assumed for the selected analyses. The conservatism of this assumption should be justified since the normal heat load would be much higher than the loads considered under LOOP conditions. Without such supporting justification, a case including offsite power should be added to the case matrix.

Response:

WNP-2 assumed the LOOP loss-of-coolant accident (LOCA) as the analyzed event, which includes a failure of emergency diesel generator E-DG-1 and loss of power to all of Division 1 (most severe single failure) coincident with the LOCA in primary containment.

The reactor building normal heat load was determined by monitoring the flow and temperature rise of the reactor exhaust air/reactor outside air normal ventilation system over a 24-hour period, and averaging the results to obtain a value heat load in Btu per minute. The normal heat load is assumed to be split equally across the reactor building floors, and that this load will drop linearly to zero after one hour into the accident. Standard Review Plan (SRP) Section 6.2.3 states that in meeting the requirements of General Design Criterion 16 regarding functional capability of the secondary containment, the analysis of the pressure and temperature response of the secondary containment to a LOCA occurring in the primary containment should be based on the assumption of LOOP and the most severe single active failure in the emergency power system.

Since a LOOP is assumed coincident with the LOCA, all the emergency room coolers will be powered by diesel generators. One electrical division is assumed to be lost, resulting in the loss of some room coolers, a train of the standby gas treatment system, and a loop of standby service water. However, the drawdown analysis assumes that the heat loads remain when the electrical division is lost. The room cooler performance data assumes that the room coolers operate with a 65% cooling coil efficiency (i.e., a measure of cooling coil fouling). That efficiency was lowered to 50% for the most limiting drawdown analysis.

The analyses are, therefore, justified by the inclusion of both the most conservative heat load (normal and emergency) as well as the most conservative power conditions (LOOP/LOCA) and the loss of the most limiting service water division. In addition, room cooler efficiency was lowered to 50% for the most limiting drawdown analysis.

Question 2: Many of the files refer to GOTHIC as a best estimate code. Since the analyses represent design basis accident (DBA) conditions, provide a discussion of the safety margins that are available to change the best estimate results to conservative results.

Response:

The following is a list of conservatisms incorporated into the GOTHIC models:

1. There is a conservative assumption in the drawdown analysis of a 20-minute delay, allowing unfiltered release from secondary containment (reactor building) to bound the offsite dose (no filtration credit is taken until the building is negative 0.25-inch w.g.). The most limiting calculated drawdown is less than 12 minutes.

2. No credit is taken for leakage out of secondary containment during the time that building pressure is positive. The outside atmosphere leakage into secondary containment is modeled using boundary conditions and flow paths that are sized to give 2240 cfm inleakage at standard temperature and pressure. The measured plant leakage has been less than 1,000 cfm since the 1990 time-frame when we began to record surveillance data.

3. Actual meteorological data was used. This is conservatively realistic since more accurate data is incorporated as a result of actual weather information collected over a longer period of time (six-year span from January 1, 1984, to January 1, 1990) than the original licensing analysis.

4. Containment peak pressure is assumed constant at P_a. Conservatively bounding, the pressure condition is assumed to peak at time zero and results in a constant high leak rate for the 30-day period.

5. For the most limiting (winter) case, leakage is assumed to be 60% at ground level and 40% at roof level. This places the potential for leakage in the location that results in the longest drawdown time for the winter meteorological conditions.

6. The model conservatively assumes atmospheric pressure at an elevation consistent with maximum inleakage conditions. Atmospheric pressure was defined at the 444-foot elevation for winter conditions and at the 606-foot elevation for summer conditions. This assumption results in conservative drawdown times.

7. The design basis for room cooler efficiency is 65%; however, it is assumed in the most limiting drawdown analysis that the room coolers operate with a 50% cooling coil efficiency.

8. One electrical division is assumed to be lost, resulting in the loss of some room coolers, one train of standby gas treatment and one loop of standby service water. However, the heat loads are assumed to remain when the division is lost.

9. Standby service water is available at 2.17 minutes (130.2 seconds) into the transient following a LOOP. The high pressure core spray system is actually available at 1.00 minute but is modeled to come on at 2.17 minutes.

10. The decay heat load for the spent fuel pool is conservatively assumed constant for six months.

11. Non-adiabatic boundary conditions were conservatively assumed for the surface of the secondary containment structure exposed to the outside environment for summer cases. Adiabatic heat transfer was used for the winter cases. This results in the most conservative drawdown times.

Question 3: Material provided on the docket indicates the inleakage rate is established based on a linear relationship with pressure. This is the most conservative approach. However, the files show leakage based on a best fit of the data taken from secondary containment tests. This data shows that the actual leakage response is somewhere between linear and the square root of pressure. Verify that the linear relationship has been used for the reanalysis.

Response:

The best-fit leakage relationship used a nonlinear equation to establish the plant leakage surveillance test acceptance criteria, rather than provide input to the secondary containment analysis models. The differential pressure associated with standby gas treatment system flow rate is a combination of linear and quadratic effects due to leakage through seams in the secondary containment superstructure and through doorways. In contrast, the building drawdown analysis does not accept any input as a function of variable pressure, and there is no equation installed in the model to drive the boundary condition. Instead, a constant peak containment pressure is used to maximize the analyzed radiological release.

Question 4: The docketed material indicates that a primary to secondary leakage rate of 0.5%/day has been included in the analysis. However, within the files there is evidence that this leakage has been neglected. Indicate what was assumed. If neglected, show why it will not impact the results.

Response:

The maximum allowable leakage from primary to secondary containment is 0.5 wt%/day, which is approximately 4 scfm at P_a. This is considered negligible compared to standby gas treatment system flow of 5000 cfm when used for the drawdown analysis. However, this leakage is accounted for in the radiological analysis.

Question 5: The reanalysis assumes that the initial pressure is at zero gauge. The current analysis assumed an initial pressure of a negative 0.25 inch w.g. Therefore, the technical specifications (TSs) contain daily surveillance of secondary containment pressure. The proposal deletes all pressure surveillance. However, there remains a need to assure that positive pressure is never achieved. Under the proposed deletions it is unclear as to how assurance can be provided that positive pressures are never reached. Address how this condition would become known without any pressure surveillance.

Response:

Pressure surveillances are performed in accordance with Operations procedures for shift and daily instrument checks during Modes 1 through 5, as applicable. The FSAR will also describe that secondary containment is normally maintained at a negative pressure, and any additional changes to the FSAR related to this design will be controlled pursuant to the provisions of 10 CFR 50.59. These surveillances will continue to be performed to comply with the FSAR.

Question 6: Although the TSs are being changed, the Final Safety Analysis Report (FSAR) will not be changed as part of this request. For consistency, the FSAR should be also modified along with the TSs. Confirm that this will be the approach.

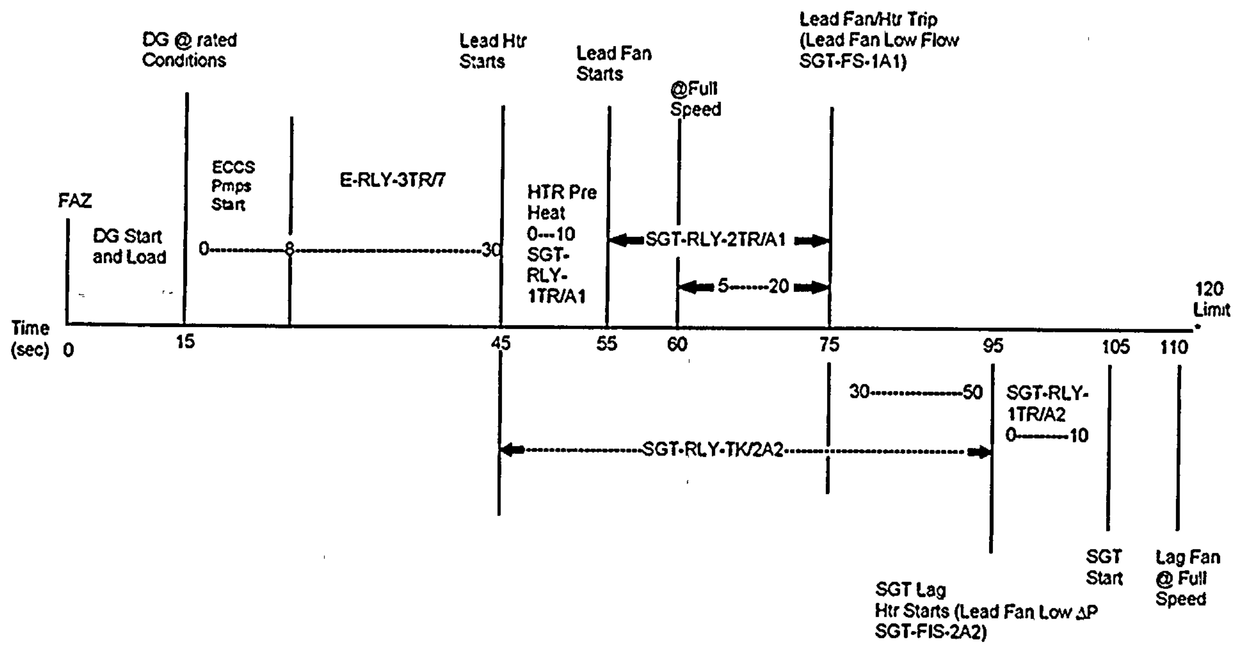
Response:

In accordance with plant procedures, and pursuant to 10 CFR 50.71(e), the FSAR will be revised accordingly pending approval of this Technical Specification amendment request.

Question 7: It is indicated that the standby gas treatment (SGT) system will not be initiated until 2 minutes after the loss of coolant accident (LOCA). Describe why it is taking so long to start the SGT.

Response:

Standard Review Plan Section 6.2.3 states that any delay due to system design in actuating the secondary containment depressurization and filtration system should be considered. The timeline for the start of a standby gas treatment system lead and lag fan following an accident signal is shown as follows:



The timeline shows 15 seconds for an FAZ signal to diesel generator start and load; 30 seconds for sequencing on of the lead standby gas treatment system heater; 10 seconds for heater warm up; 20 seconds for failure of lead fan to develop a minimum flow rate; and 10 seconds for the lag heater to start and warm up, at which time the lag fan would start.

Question 8: Figure 3: WNP-2 Design Basis Meteorology states: "Meteorology Enveloped by this Curve >95%." The lower starting point of the curve reflects 0 wind speed and 0°F. Please discuss the source of this curve and why the assumptions are conservative.

Response:

The weather conditions outside the reactor building influence the drawdown analysis by means of heat transfer to the standby service water spray ponds and through the reactor building exterior walls (summer case only). The outside weather conditions also influence the outside pressure distribution (i.e., boundary conditions are impacted) and building inleakage. It was determined that selecting 95 percent of the WNP-2 site-specific data was sufficient to characterize the reactor building drawdown response following a design basis accident, based on guidance contained in Regulatory Guide 1.145 and discussions with the NRC reviewers. The site specific meteorological data consisted of pressure, temperature, wind speed and relative humidity measurements.

The WNP-2 site-specific meteorological data were used for a six-year span from January 1, 1984, to January 1, 1990. The actual data used to evaluate the 95% wind and temperature envelope, as the design basis meteorology for the secondary containment, is shown in Table 1. The data includes the incidence (in hours) of particular weather conditions of temperature and wind speed in the six year time span.

A corresponding calculation was performed and the Table 1 curve was generated which encompasses a minimum of 96.1% of all WNP-2 weather conditions, and excludes approximately four percent as a conservative approximation of 95%/5%. The percent of weather conditions excluded is summed across the bottom of the table. The shaded blocks on Table 1 indicate the winter and summer cases analyzed in the calculation.

The temperature and wind conditions were determined so that the drawdown times would essentially be equal or bounded by the case with no wind for both the summer and winter cases (i.e., the winter cases have approximately equal drawdown times and the summer cases have approximately equal drawdown times).

For ease of reference, the following table shows the drawdown times for the shaded areas on Table 1. Cases one through four are winter conditions and cases five through seven are summer cases. The drawdown times were based on 65% room cooler efficiency and 75°F standby service water system temperature.

Case	Temperature (°F)	Wind Speed (mph)	Drawdown Time (sec)
1	0	0	632
2	18	9	628
3	34	13	625
4	52	17	625
5	74	17	484
6	88	9	508
7	94	0	525

For the various atmospheric conditions considered, the winter cases yielded longer drawdown times than the summer cases. The limiting case is when the atmospheric temperature is 0°F with no wind, with a standby service water system spray pond temperature of 75°F, Division 2 electrical power (i.e., Division 1 fails), and one train of the standby gas treatment system in operation. The drawdown time for this case is 632 seconds (10.53 minutes).

Zero wind speed and zero degrees temperature was used because the temperature effect on the differential pressure is the prominent factor, due to the higher differential temperature between the inside and outside temperatures.

The most limiting drawdown analysis presented in our submittal is based on a more conservative assumption of 50% room cooler efficiency (versus 65%) and a standby service water system temperature of 77°F (versus 75°F).[1] This resulted in a more conservative drawdown time of 711 seconds (11.85 minutes), but had no impact on the Table 1 curve.

1 Letter GO2-96-199, dated October 15, 1996, PR Bemis (SS) to NRC, "Request for Amendment to Secondary Containment and Standby Gas Treatment System Technical Specifications"

The effects of wind dispersal for offsite dose calculation are also accounted for in the derivation of X/Q as was discussed in our December 1997 follow-up letter.[2] In the calm, stable conditions, the release rises to a limited height and stratifies, spreading over an increased area, and causes the highest ground concentrations, versus higher wind velocities which support faster dispersal of a release.

Question 9: It has been indicated that the GOTHIC code has been validated by comparing results of a high energy line break (HELB) event in the secondary containment with results using RELAP. This is not appropriate since the event is not applicable to the secondary containment response without a high energy line break. The validation needs to compare results to similar conditions. For example, data taken during normal ventilation system operation could be used to compare with a GOTHIC analysis. Therefore, an acceptable method of validation should be provided for this application of the GOTHIC code.

Response:

It was necessary to perform a benchmark of the GOTHIC code specific to the low flow/natural circulation conditions present in secondary containment under the building conditions prior to a LOCA. The benchmarking effort is discussed as follows:

1. A model of secondary containment using the HELB model from the GOTHIC benchmark analysis discussed in Attachment 5 of our original submittal was utilized to analyze the "no leak" condition. The leaks were removed, the standby gas treatment system turned off to simulate normal conditions, and normal ventilation was added. The model was reviewed for stability and ability to simulate plant conditions and no stability problems were noted.

2. A model of secondary containment using the secondary containment long-term drawdown model discussed in our original submittal was utilized to analyze the no leak/natural circulation condition. The containment leakage was removed, the standby gas treatment system turned off, and normal ventilation added. The model was reviewed for stability and ability to simulate plant conditions and the results proved the model is stable under normal heat load conditions.

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2 Letter GO2-97-218, dated December 4, 1997, DW Coleman (SS) to NRC, "Request for Amendment to Secondary Containment and Standby Gas Treatment System Technical Specifications (Additional Information)"

3. The drawdown model in item 2 above was modified to use outside weather data for input to the boundary condition for building leakage, and secondary containment initial conditions were set to agree with plant data. Building auxiliary heating was used to maintain room temperatures. The results of this benchmark model were compared to plant temperature data.

   The results of the benchmark analysis show close agreement with plant data and most of the data points were within 5°F of the calculated values. At least one node was needed per floor to approximate the natural recirculation conditions and yield accurate temperature profiles, and greater accuracy was obtained by subdividing the floor nodes based on plant air flow restrictions.

   The temperature predictions for the higher elevations (i.e., 548-foot and 572-foot) were slightly above plant data and the predictions for the 522-foot elevation were slightly lower. These are reasonable results for the temperature profiles.

   The flow velocities for two floors were also examined and found to be under 5 ft/sec, which demonstrates consistent flow stability for the solutions.

In summary, the results of these three analyses demonstrate that GOTHIC reliably performs low flow condition calculations and that the secondary containment models used are adequate for the task of simulating reactor building conditions.

Table 1. Summary of WNP-2 Meteorological Data

Temp (°F)	Wind Speed (mph)										
	0-1	1-3	3-5	5-7	7-9	9-11	11-13	13-15	15-17	>17	Excluded
-15	4	20	13	11	5	4	2	2	0	0	
-10	5	5	10	2	3	1	2	1	0	1	
-8	1	7	4	5	2	3	0	0	0	0	
-6	3	9	6	3	3	4	0	0	0	0	
-4	3	9	5	0	2	3	0	0	0	0	
-2	5	15	8	1	1	1	4	0	0	0	
0	1	16	6	2	1	0	5	1	0	0	
2	9	24	7	1	3	3	6	5	1	0	
4	6	20	5	4	4	2	8	1	0	0	
6	4	28	18	7	0	7	7	1	0	0	
8	7	28	19	11	3	2	4	0	0	0	
10	10	51	29	10	6	1	0	2	1	0	
12	15	50	21	9	11	2	1	1	0	0	
14	12	84	54	15	14	6	3	0	0	0	
16	13	76	60	33	10	6	2	0	0	3	
18	17	79	72	40	11	5	5	1	1	3	
20	18	159	116	68	20	4	5	5	6	3	
22	58	311	171	51	17	10	4	2	4	9	
24	61	304	175	86	35	9	3	4	0	2	
26	100	423	206	70	48	14	3	0	0	2	
28	45	392	220	101	53	16	1	0	0	2	
30	107	525	319	142	60	15	7	1	0	7	
32	90	575	390	114	50	21	8	0	3	1	
34	84	605	359	161	47	24	13	4	2	4	
36	57	544	369	113	42	21	22	5	11	5	
38	70	485	355	192	88	30	25	14	2	2	
40	59	527	363	181	88	61	30	17	9	3	
42	62	532	380	234	132	80	21	8	2	3	
44	48	545	497	280	159	95	40	15	4	5	
46	53	564	541	325	181	114	35	19	14	9	
48	68	515	461	301	201	128	51	35	17	21	
50	61	545	458	263	169	143	61	36	24	21	
52	67	529	393	292	216	130	74	47	26	25	
54	67	540	430	307	231	136	65	38	19	19	
56	71	503	477	317	199	107	59	42	18	23	
58	60	511	503	351	183	100	68	27	18	20	
60	54	525	439	347	168	111	70	41	14	11	
62	48	471	471	289	214	125	59	38	31	13	
64	37	455	423	281	210	118	68	49	23	13	
66	31	455	407	250	169	113	57	34	20	13	
68	19	398	446	238	130	96	52	38	19	14	
70	30	362	444	230	121	85	50	30	13	12	
72	28	328	442	224	123	86	46	25	10	11	
74	12	293	393	230	99	65	44	17	10	11	
76	11	251	374	175	78	70	29	24	4	5	
78	7	205	357	175	78	52	30	19	9	6	
80	3	174	272	159	61	47	35	12	6	10	
82	1	136	273	136	63	42	24	14	10	3	
84	1	110	229	141	60	32	8	9	4	5	
86	0	81	218	120	65	33	13	7	1	1	
88	0	56	169	98	55	22	15	3	2	1	
90	0	39	108	79	43	19	6	2	4	2	
92	0	25	90	76	22	19	4	2	0	1	
94	0	17	59	40	17	5	4	4	2	2	
96	0	17	37	17	15	3	1	0	0	0	
98	0	9	19	17	11	2	0	2	1	1	
100	0	0	4	8	3	1	0	0	0	1	
102	0	0	0	0	1	7	0	0	0	0	
104	0	0	1	0	0	0	0	0	0	0	
106	0	0	0	0	0	0	0	0	0	0	
108	0	0	0	0	1	0	0	0	0	0	
110	0	0	0	0	0	0	0	0	0	0	
112	0	0	0	0	0	0	0	0	0	0	
114	0	0	0	0	1	0	0	0	0	0	
116	0	0	0	0	0	0	0	0	0	0	
118	0	0	0	0	1	0	0	0	0	0	
120	0	0	0	1	0	0	0	0	0	0	
	0.0672*	0.425*	0.4792*	0.4879*	0.4207*	0.3578*	0.3122*	0.2819*	0.3686*	0.7134*	3.9*

*Percent excluded per wind speed.