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September 24, 2012

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

BELL BEND NUCLEAR POWER PLANT
RESPONSE TO RAI NO. 115 QUESTIONS
09.02.05-18 THROUGH 09.02.05-26, 09.02.05-30
AND 09.02.05-31
BNP-2012-247 Docket No. 52-039

References: 1) M. Canova (NRC) to R. R. Sgarro (PPL Bell Bend, LLC), Bell Bend COLA – Final Request for Information No. 115 (RAI No. 115) – BPTS 6436, email dated June 11, 2012

2) BNP-2012-184, R. R. Sgarro (PPL Bell Bend, LLC) to U.S. NRC, "Response to RAI No. 115 Questions 09.02.05-28 and 09.02.05-34 and Schedule Information," dated July 30 2012

The purpose of this letter is to respond to the Request for Additional Information (RAI) identified in Reference 1. In Reference 2, PPL Bell Bend, LLC (PPL) indicated that PPL would provide a response to RAI No. 115, Questions 09.02.05-18 through 09.02.05-26, 09.02.05-30 and 09.02.05-31 on or before September 24, 2012. This RAI addresses the Ultimate Heat Sink as discussed in Section 9.2.5 of the Final Safety Analysis Report (FSAR), as submitted in Part 2 of the Bell Bend Nuclear Power Plant (BBNPP) Combined License Application (COLA).

Enclosure 1 provides our response to RAI No. 115, Questions 09.02.05-18 through 09.02.05-26, 09.02.05-30 and 09.02.05-31 which includes revised COLA content. The revised COLA content will be included in a future revision of the BBNPP COLA.

Enclosure 2 contains Sensitive Unclassified Non-Safeguards Information (SUNSI) related to the Question 09.02.05-20 response, PPL is requesting the NRC to withhold this information from public disclosure in accordance with the requirements of 10 CFR 2.390.

The future revision of the COLA is the only new regulatory commitment in this letter.

Enclosure 2 to this letter contains Sensitive Unclassified Non-Safeguards Information (SUNSI). Upon separation from Enclosure 2, this transmittal is decontrolled.

DID 2
NRD

Should you have questions, please contact the undersigned at 610.774.7552.

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

Executed on September 24, 2012.

Respectfully,

Rocco R. Sgarro

RRS/kw

Enclosures: As stated

cc: (w/ Enclosures)

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Enclosure 1

Responses to RAI No. 115,
Questions 09.02.05-18 through 09.02.05-26,
09.02.05-30 and 09.02.05-31

RAI No. 115
Question 09.02.05-18

Standard Review Plan 9.2.5, "Ultimate Heat Sink", Section II, "Acceptance Criteria," states that relevant Commission regulations related to the UHS are GDC 2, 4, 5, 44, 45 and 46. The Commission regulations should also apply to the emergency makeup water system (ESWEMS), which is an extension of the UHS heat sink and cooling towers. BBNPP FSAR Section 9.2.5 does not specifically state whether the Commission regulations (GDC 2, 4, 5, 44, 45 and 46) have been evaluated for the ESWEMS.

Specifically, the applicant should add this information to the BBNPP FSAR.

Response

The Emergency Service Water Emergency Makeup Systems (ESWEMS) performs the function of the Ultimate Heat Sink (UHS) Makeup System and allows the UHS to meet its 30 day run time requirement. The ESWEMS has been designed to meet GDC 2, 4, 5, 44, 45, and 46. This will be clarified in the Bell Bend Nuclear Power Plant (BBNPP) Final Safety Analysis Report (FSAR).

COLA Impact

The BBNPP FSAR will be revised as follows:

9.2.5.1 Design Basis

{For BBNPP, the ESWEMS performs the function of the Ultimate Heat Sink (UHS) Makeup System. To support the UHS, the ESWEMS is also designed to GDC 2, 4, 5, 44, 45, and 46. The seismic design of the ESWEMS meets the requirements of RG 1.29. The ESWEMS is schematically represented in Figure 9.2-3.

Question 09.02.05-19

The staff determined that BBNPP FSAR Section 9.2.5 was missing information related to RG 1.27, "Ultimate Heat Sink".

U.S. EPR FSAR Section 9.2.5.3.1, "Mechanical Draft Cooling Towers," states that the division four cooling tower shares use with the dedicated ESW train and can transfer severe accident (SA) heat loads to the environment under worst-case ambient conditions.

For the BBNPP FSAR Section 9.2.5, the staff was unable to find any discussion or reference to the dedicated ESW train for severe accidents.

Specifically, the applicant should add this information to the BBNPP FSAR related to severe accident; that the emergency makeup water system (ESWEMS) provides water makeup to the UHS, division four.

Response

The BBNPP FSAR will be revised to clarify there is a dedicated train of Essential Service Water (ESW) for severe accidents and it utilizes the Division 4 ESW Cooling Tower supplied by the Division 4 Essential Service Water Emergency Makeup System (ESWEMS).

COLA Impact

The BBNPP FSAR will be revised as follows:

9.2.5.3.2 Piping, Valves, and Fittings

No departures ~~or supplements~~.

{The following sections are added as a supplement to the U.S. EPR FSAR.

The following components of the Essential Service Water Emergency Makeup System (ESWEMS) each have one dedicated train for each of the division four UHS systems. During a severe accident the ESWEMS provides water makeup to the UHS, division four. Each ESWEMS train is made up of the components listed below.

Question 09.02.05-20

The staff determines that BBNPP FSAR Section 9.2.5 was missing information related to GDC Criterion 44, "Cooling Water" and RG 1.27. BBNPP FSAR Section 9.2.5.3.2 describes the emergency makeup water system (ESWEMS) pumphouse bar screens; however, the staff was unable to locate the bar screens on any FSAR drawings in order to complete its review.

Specifically, the applicant should add this information to the BBNPP FSAR Figures.

Response

ESWEMS Pump House bar screens will be added to FSAR Figures 9.2-5, 9.2-7 and 9.2-8 and Part 3, Environmental Report (ER) Figure 3.4-9 and Figures 9.2-5 and 3.4-9 will be added to Part 9.

COLA Impact

The BBNPP FSAR, ER and Part 9 will be revised as follows:

FSAR, Figure 9.2-5

[This figure contains Sensitive Unclassified Non-Safeguards Information (SUNSI), see Enclosure 2 for the figure]

ER, Figure 3.4-9

[This figure contains Sensitive Unclassified Non-Safeguards Information (SUNSI), see Enclosure 2 for the figure]

Figure 9.2-7

Figure 9.2-7- (Plant Arrangement - ESW/EMB Pumphouse Section C-C)

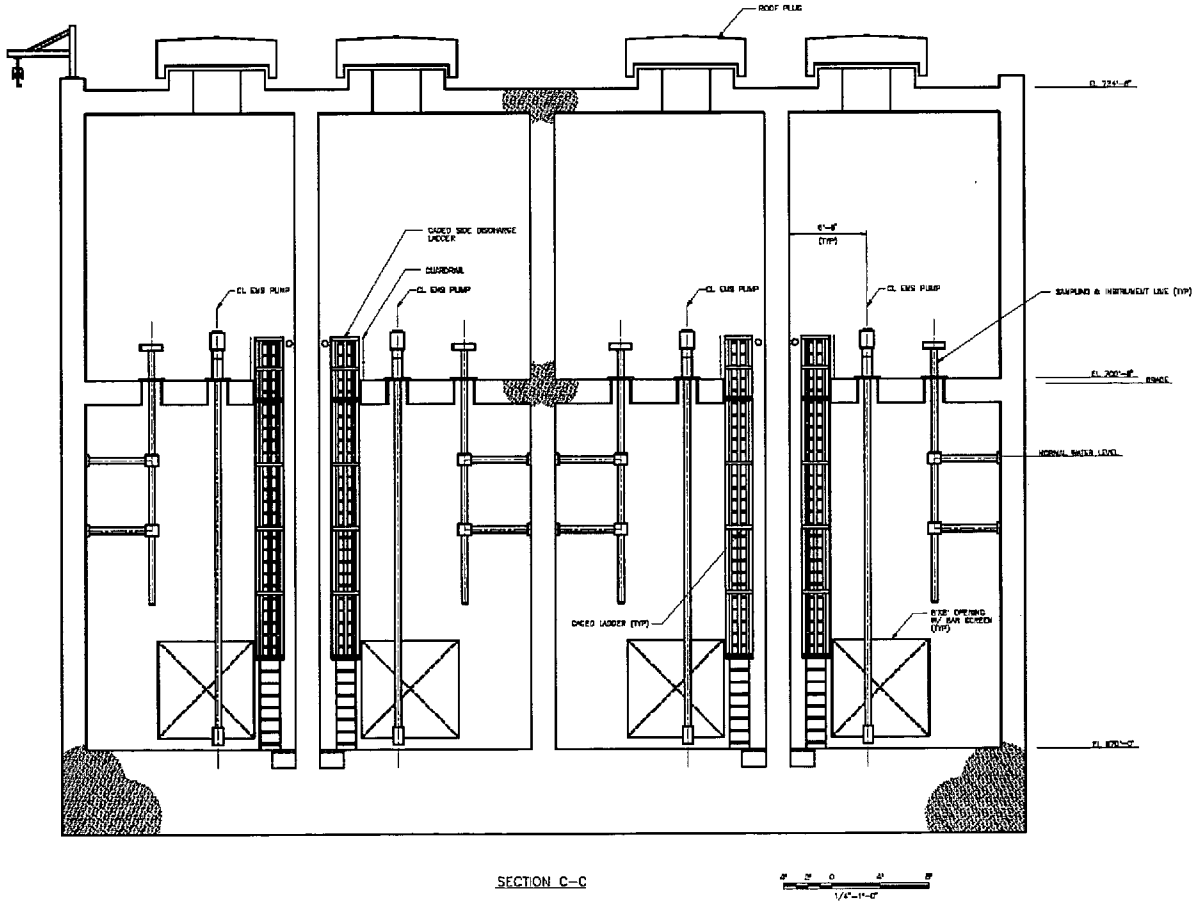
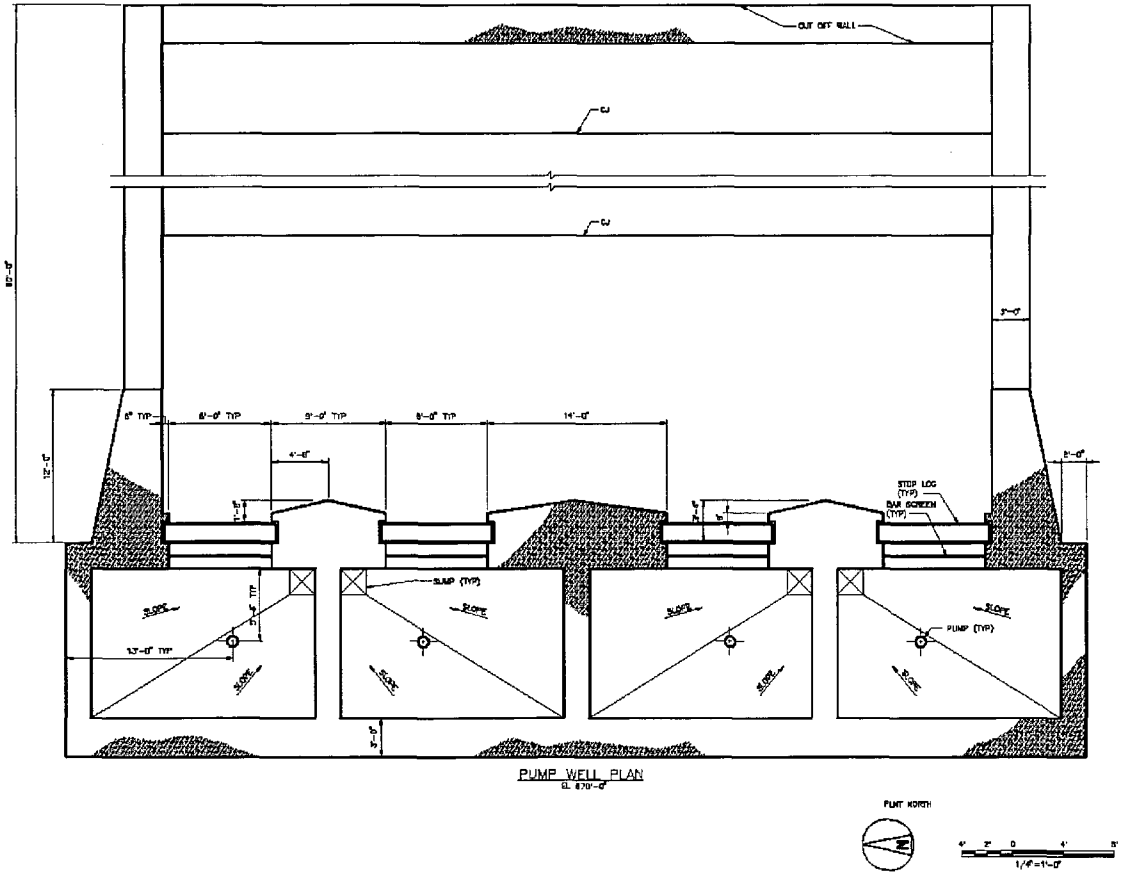


Figure 9.2-8

Figure 9.2-8 - (Plant Arrangement - ESWEMS Pumpwell Plan)



Question 09.02.05-21

Follow-up to RAI Letter# 84 (3990) Question 09.02.05-4 part 12.

Bell Bend FSAR Figure 9.2-3 indicates that the ESWEMS auto strainer debris flush lines and the ESWEMS recirculation return lines are non-safety-related Seismic Category II. However, the description in Bell Bend FSAR Section 9.2.5 does not justify the conclusion that these functions are not necessary to ensure the long-term operability of the cooling towers (in which case, they would have to be designated as safety-related, Seismic Category 1).

The staff reviewed the applicant's response to RAI Letter# 84 (3990) Question 09.02.05-4 part 12 and found it unacceptable. Since both the strainer blowdown line and recirculation line which discharge to the pond are needed for operability of the ESWESM and an open flow path to the pond should be maintained, the non-safety, non-seismic classification is unacceptable since the nonsafety-related line could become blocked or the pipe could be crimped from a missile.

Specifically the applicant should address the following in the FSAR:

Provide assurance that there is an open flow path for the ESWEMS strainer blowdown line and recirculation line during a DBA and 30 days post DBA which discharges to the pond.

Response

Per BBNPP FSAR section 9.2.5.3.2, the ESWEMS self cleaning strainers remove debris from the process flow that could cause sedimentation buildup in the ESWS Cooling Tower basins. Additionally, the strainers have a setpoint to start the backflush cycle that is based on ESWEMS pump sizing. This means the strainer backflush function is necessary for the ESWEMS system to meet its accident analysis requirements. The makeup flow to the ESWS Cooling Tower meets minimum flow requirements considering coincident backflush flow. Therefore, the backflush and recirculation line shall be designed to ASME Section III, Class 3 standards.

COLA Impact

The BBNPP FSAR and Part 10 will be revised as follows:

9.2.5.3.2 Piping, Valves and Fittings

ESWEMS Self Cleaning Strainers

The strainers remove debris from the process flow that could cause sedimentation buildup in the ESWS Cooling Tower basins. The pressure relief backflush process of the strainer is initiated by either the signal of the differential pressure measuring transmitter or via manual operator initiation. The strainer setpoint will be based on limiting the differential pressure across the strainer to the value assumed in the ESWEMS pump sizing basis calculation. Effluent from the strainers is returned to the ESWEMS Retention Pond through the ESWEMS recirculation/bypass line~~.~~, which is designed to ASME Section III, Class 3 requirements.

Figure 9.2-3

Figure 9.2-3 – {ESWEMS Schematic}

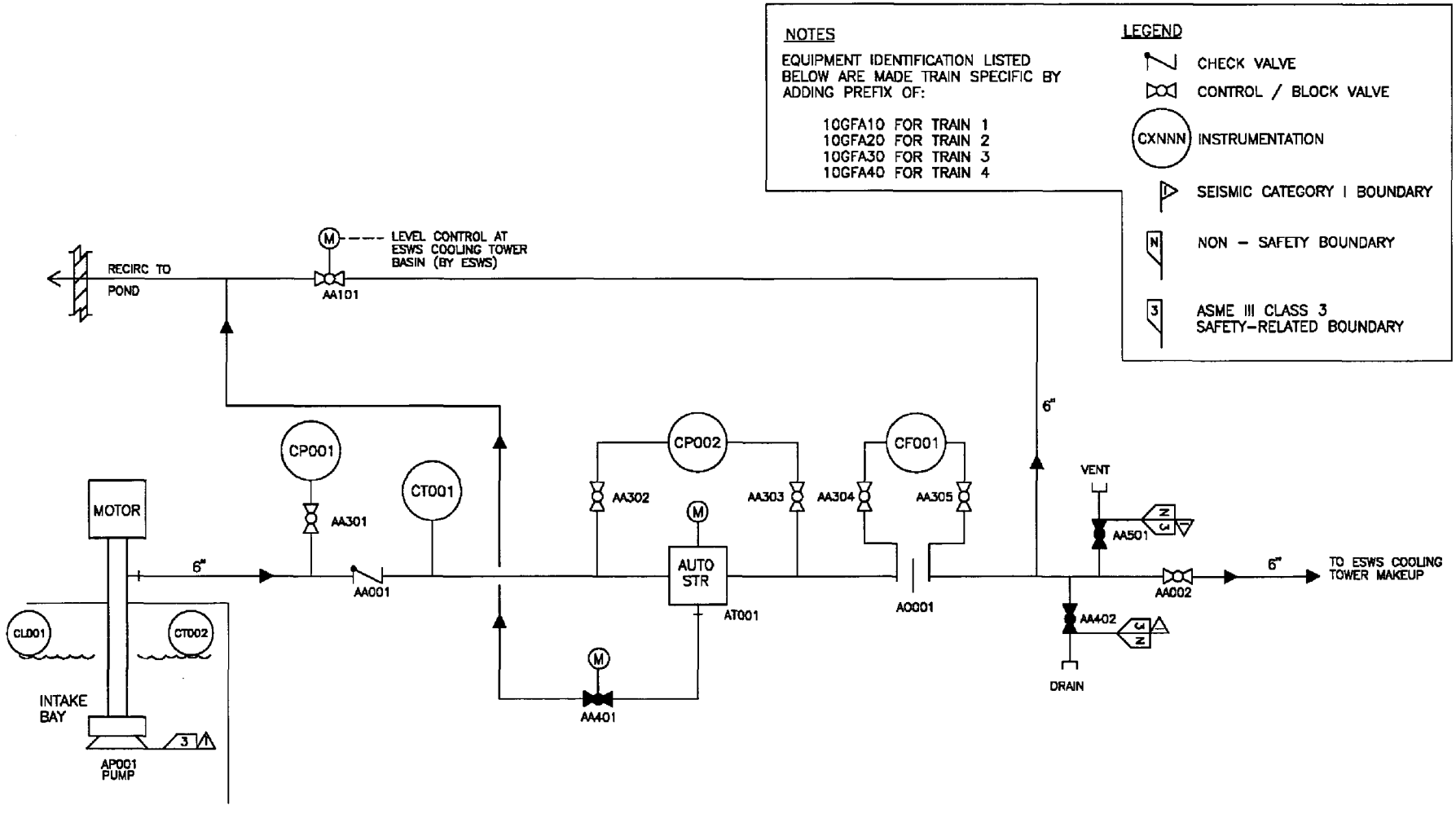
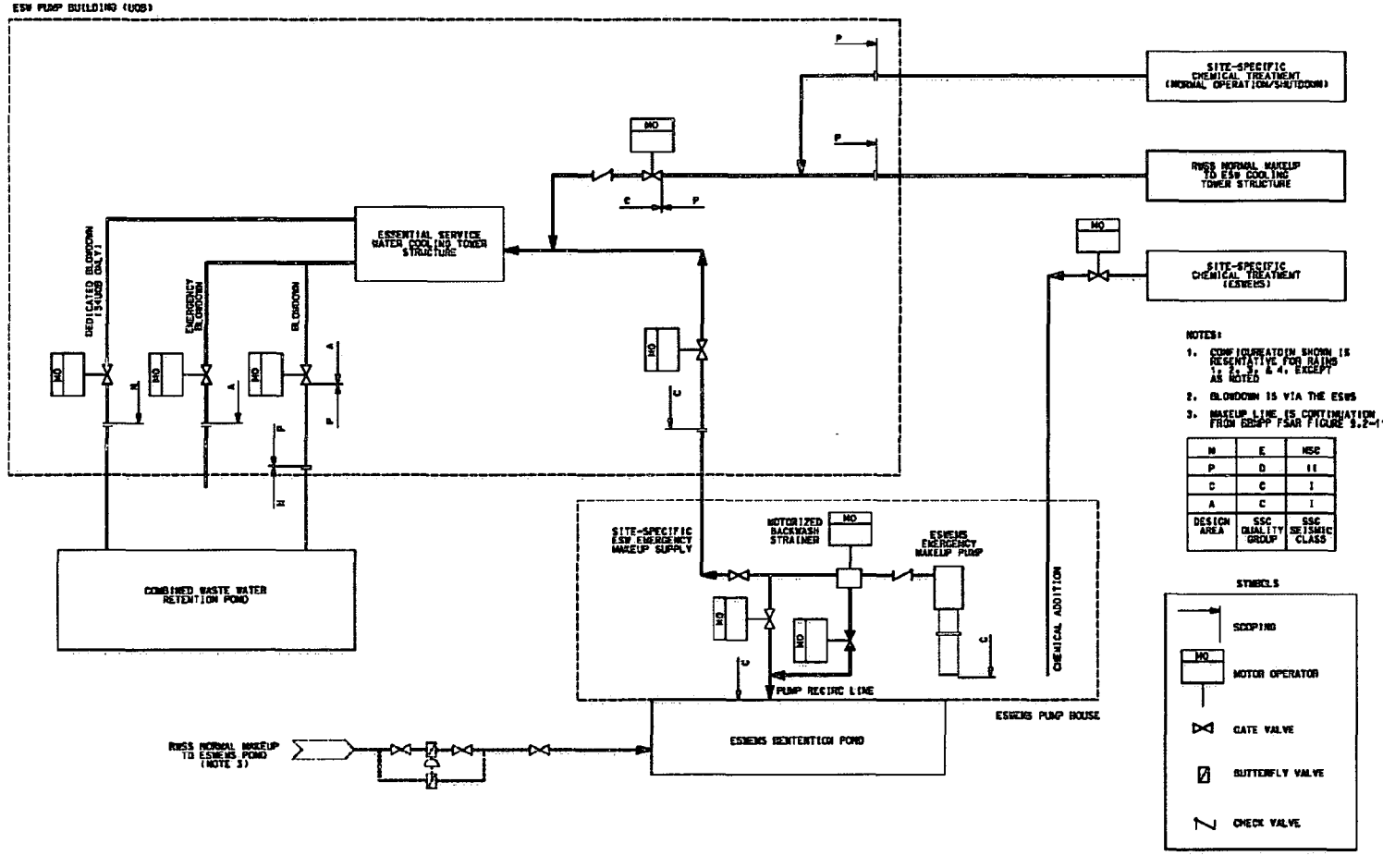


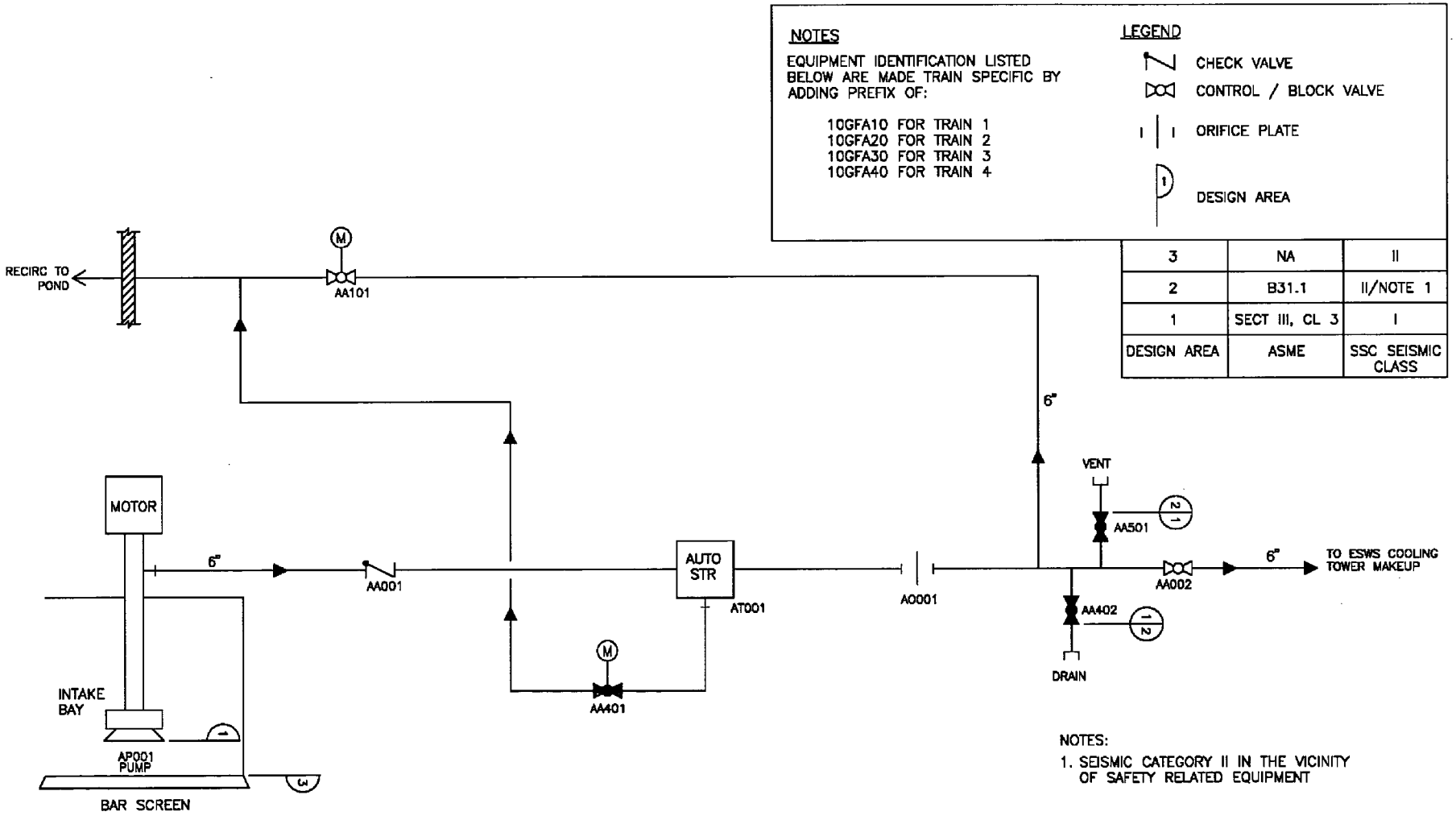
Figure 9.2-14
{Ultimate Heat Sink Systems}



N	E	NSC
P	D	II
C	C	I
A	C	I
DESIGN AREA	SSC QUALITY GROUP	SSC SEISMIC CLASS

Part 10 ITAACs

Figure 2.4-19b – {ESWEMS Mechanical Functional Arrangement}



Part 10, ITAACs

Table 2.4-20— {Essential Service Water Emergency Makeup System (ESWEMS) Component Mechanical Design}

Component Description	Component Tag Number	Component Location	ASME Code Section III	Function	Seismic Category
.....					
~~Piping Division 1~~		~~UQF~~	~~B31.1~~	~~Pressure Boundary~~	~~NSC~~
.....					
~~Piping Division 2~~		~~UQF~~	~~B31.1~~	~~Pressure Boundary~~	~~NSC~~
....					
~~Piping Division 3~~		~~UQF~~	~~B31.1~~	~~Pressure Boundary~~	~~NSC~~
.....					
~~Piping Division 4~~		~~UQF~~	~~B31.1~~	~~Pressure Boundary~~	~~NSC~~
.....					

Question 09.02.05-22

The staff determines that BBNPP FSAR Section 9.2.5 was missing information related to GDC Criterion 44, "Cooling Water" and RG 1.27. The staff reviewed the applicant's response related to heat tracing for ESWEMS in RAI Letter# 84 (RAI 3990) Question 09.02.05-7 and found that the additional information was needed.

Specifically, described in the BBNPP FSAR;

- The safety classification and seismic classification of the heat tracing associated with the ESWEMS.
- The associated main control room alarms associated with low temperature conditions of the ESWEMS piping system or loss of heat tracing.

Response

The safety classification of the heat trace is safety-related since the piping is safety-related. The heat trace is also seismically classified as Class I.

A list of ESWEMS alarms is provided in the BBNPP FSAR Table 9.2-1. The ESWEMS has high temperature, Pond Level Low and Pond Level Low-Low alarms. Since heat tracing is required to maintain the unburied portions of the pipe operable, a heat trace alarm will be added to Table 9.2-1.

COLA Impact

The BBNPP FSAR will be revised as follows:

9.2.5.2.3 {Essential Service Water Emergency Makeup System

Heat tracing will be used as necessary for freeze protection of ESWEMS piping to ensure its availability during low temperature conditions. This heat tracing supports the ESWEMS safety-related function, therefore, the heat tracing is safety-related and seismic Class I. Annunciation for the ESWEMS heat tracing is described in Table 9.2-1.

Table 9.2-1— {ESWEMS Alarms}

Alarm Description	Equipment and/or Process Conditions for Alarm
....	.....
ESWEMS Heat Trace Failure	Loss of continuity

Question 09.02.05-23

Follow-up to RAI Letter# 84 (3990) Question 09.02.05-6

The staff found that the a detailed NPSH discussion was not added by the applicant's response in FSAR Section 9.2.5 for NPSH requirements for the emergency makeup water pumps for the ESWEMS pumps.

Specifically, the applicant should address in the COL FSAR:

- Given the decreasing water levels in the ESWEMS retention pond and at the maximum design cooling water temperature for the duration of a 30 day accident, describe the ESWEMS pump NPSH available versus the NPSH required before makeup is available at the end of the 30 days.

- Given the decreasing water levels in the ESWEMS retention pond for the duration of a 30 day accident, describe if vortex formation related to the pumps has any negative consequences before makeup is available at the end of the 30 days of the DBA.

Response

Bullet 1: The suction of the ESWEMS pumps are located in wells that are lower than the bottom of the ESWEMS retention pond to ensure the pumps do not have issues with Net Positive Suction Head (NPSH) or vortexing. These wells are not counted in the volume of the ESWEMS retention pond for a 30 day accident. The available NPSH of the ESWEMS pump at maximum design cooling water temperature at the pump suction with zero static head is 32 feet. With static head from the pump wells, the available NPSH for the ESWEMS pumps after a 30 day accident is 39 feet. The ESWEMS pumps specification requires a pump that requires less than 32 feet NPSH at suction. Therefore the ESWEMS pumps will have adequate NPSH after a 30 day accident.

Bullet 2: There is no risk of pump suction vortexing. The ESWEMS pump suctions are in wells that are lower than the bottom of the ESWEMS retention pond. At the end of a 30 day accident there remains approximately 7 feet of water above the pump suction based on the elevations given in figure 9.2-5, not counting extra margin in the retention pond. The intake design and height of the pump inlet from the bottom of the intake are based on the recommendations of ANSI/HI 9.8-1998 to minimize the likelihood of vortex formation.

COLA Impact

The BBNPP FSAR will be revised as follows:

9.2.5.3.2 Piping, Valves and Fittings

ESWEMS Pumps

There are four vertical turbine pumps, each rated at 400 gpm (approximately 1,515 l/min) minimum, with a minimum developed head of 100 feet. Each pump is driven by an electric motor, and is equipped with intake screens to protect the pump suctions from debris and a discharge check valve. They are designed to ASME Section III, Class 3 requirements, and constructed of materials compatible with the ESWS makeup water.

The ESWEMS pumps require less than 32 feet NPSH. The required ESWEMS pump NPSH is based on the temperature conditions of the retention pond after a 30 day accident and with zero static head. The pump NPSH does not take into account any margin in the retention pond, or the fact that the pumps have their suction point in wells approximately 7 feet below the credited bottom of the retention pond. This 7 feet of static head margin ensures there is adequate NPSH for the ESWEMS pumps throughout a 30 day accident and that vortexing at the pump suction is not a concern.

The system pressure loss calculation includes 20% margin to account for aging and fouling and a 5 psi drop across the automatic strainer. The 400 gpm capacity of the ESWEMS pumps results in 29% margin over the required flow rate of 310 gpm.

The minimum allowable head of the ESWEMS pump provides 107% margin over the 48 ft required head of the system, which includes the 20% aging and fouling factor.

Question 09.02.05-24

The staff determines that BBNPP FSAR Section 9.2.5 was missing information related to GDC Criterion 44, "Cooling Water" and RG 1.27.

BBNPP FSAR Section 9.2.1.3.5, "Piping, Valves, and Fittings," state that the ESWS piping, valves and fittings are made of carbon steel. This is compatible with the water chemistry in the ESWS tower basin. Buried piping is coated and wrapped and provided with appropriate cathodic protection. The Cathodic Protection (CP) system for underground pipe is described in Section 8.3.1.1.15.

BBNPP FSAR Section 9.2.5 does not specifically describe if the emergency makeup water system (ESWEMS) is buried and has cathodic protection.

Specifically, the applicant should add this information to the BBNPP FSAR related to Section 9.2.5 related to any site specific buried UHS support piping which should be cathodic protected.

Response

Sections of the ESWEMS piping are buried and will have cathodic protection. The FSAR will be revised to address the buried piping and the cathodic protection being supplied.

COLA Impact

The BBNPP FSAR will be revised as follows;

9.2.5.3.2 Piping, Valves and Fittings

ESWEMS Piping

Portions of the ESWEMS piping are buried. Buried piping is coated and wrapped and provided with appropriate cathodic protection. The Cathodic Protection (CP) system for underground pipe is described in Section 8.3.1.1.15.

9.2.5.5 Safety Evaluation

- Has seismically qualified and installed (buried) piping runs from the ESWEMS pumphouse to the individual ESWS cooling tower basins. Buried piping is coated, wrapped and provided with appropriate cathodic protection,

Question 09.02.05-25

10 CFR Part 50, Appendix A, GDC 2, "Design Bases for Protection Against Natural Phenomena," states that structures, systems, and components (SSCs) important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions.

Regulatory Guide (RG) 1.27, "Ultimate Heat Sink for Nuclear Power Plants," states that the sink safety functions may be provided by natural or manmade features. More than one water source may be involved in the sink complex in performing these functions under different conditions. Because of the importance of the sink to safety, these functions should be ensured during and following the most severe natural phenomena postulated for the site (e.g., the Safe Shutdown Earthquake, design basis tornado, hurricane, flood, or drought).

COL FSAR Subsection 9.2.5.3.2 states that the Essential Service Water Emergency Makeup System (ESWEMS) consists of a retention pond, 700ft x 400 ft. Approximately 76.6 acre-ft of water is maintained below the normal operational water level of 17 ft (5 m), elevation 695ft (212m) NAVD 88. The minimum required level 12ft (4 m), elevation 689.5 ft (210.2 m) NAVD 88, maintains a volume of approximately 50.3 acre-ft. The ESWEMS Retention Pond was sized for the design basis LOCA in accordance with NRC RG 1.27 (NRC, 1976) assuming the ESWEMS does not start up until 72 hours post-accident with two Emergency Service Water System trains running.

The total inventory loss from the ESWEMS retention pond during the 30 day period under the most limiting meteorological conditions (maximum evaporation conditions) was conservatively calculated to be 46.4 acre-ft. The worst case environmental conditions are based on 30 years of historical meteorological data for the area as required by RG 1.27. The day of lowest average relative humidity is combined with the highest average monthly insolation and the 1 % exceedance extreme annual wind speed to create a synthetic day for single day worst-case pond evaporation. This synthetic day is then repeated for 30 consecutive days to create a conservative 30-day period. This inventory loss consists of the following calculated losses and design allowances: (1) 34.2 acre-ft for cooling tower evaporation; (2) 9.8 acre-ft for loss to an ice cover; (3) 2.4 acre-ft for pond seepage. The total water remaining after 30 days is 3.9 acre-ft. All of the remaining water is usable, which provides a margin greater than 8% of the total volume requirement.

COL FSAR Subsection 2.3.1.2.2.1 states that in the period from January 1, 1950, through August 31, 2007 (NOAA, 2008d), eight tornadoes were reported in Columbia County, Pennsylvania. as presented in COL FSAR Table 2.3-3. This corresponds to an annual average of about 0.14 tornadoes per year. The magnitude of the tornadoes ranged from F0 to F2, as designated by the National Weather Service. The width of the paths of the eight tornadoes in Columbia County was estimated to range from 10 to 75 yards (9 to 69 m).

COL FSAR Subsection 2.3.1.2.2.14 states that using the methodology and values in Table 1 from RG 1.76 (NRC, 2007b), the design-basis tornado characteristics for BBNPP are presented in Table 2.3-20. The maximum tornado wind speed is 230 mph (1 03 mps), the pressure drop is 1.2 psi (83 mb), and the rate of pressure drop is 0.5 psi/s (37 mb/s).

COL FSAR Subsection 2.4.8.1 states that the ESWEMS Retention Pond design must ensure that the capability to perform their safety-related function is maintained during the most severe credible natural phenomena in combination with normal operations, anticipated operational occurrences, or accident condition.

Nuclear plants that have been directly affected by tornadoes include Davis-Besse, June 24, 1998; Surry, April 16, 2011 (event number 46761); and Browns Ferry, April 27, 2011, (event number 46793). The tornado events at Surry and Davis-Besse were associated with direct hits in the switchyards.

As such, the applicant should address the following items in the COL FSAR related to tornadoes and their potential negative effects on the UHS design and operation (or, if appropriate, explain why such consideration is not relevant):

1. Describe whether a tornado direct hit of the ESWEMS retention pond was considered in terms of the amount of water inventory (margin) that may be lost and describe if a 30-day water supply remains to support post accident UHS. The Staff notes that such consideration appears to have been given in Subsection 9.2.7.3 of the Updated Final Safety Analysis Report for the adjacent Susquehanna Steam Electric Station.

2. Describe whether a tornado direct hit of the ESWEMS retention pond could cause any negative effects on running the ESWEMS pumps (such as loss of net positive suction head or pump vortexing) or other SSCs important to safety.

Response:

1. A tornado direct hit impact on the ESWEMS Retention Pond does not need to be considered when determining retention pond inventory. National Oceanic and Atmospheric Administration (NOAA) Technical Memorandum NWS SR-147, "The Tornado: An Engineering Perspective", February 1993, provides information on tornado impacts on bodies of water. Of note is Section IX.D, Water Removal from Ponds, which demonstrates that a tornado vortex is not small enough nor the pressure low enough to effect significant water removal from the "sucking" process. Even a tornado with an extreme pressure difference of 3 psi would only raise the water 6 feet in the eye of the tornado. Winds and wave action do result in spray that is most commonly observed being sucked up in the tornado. The paper also provides examples where tornados have passed over bodies of water (lakes and swimming pools) where there was no observable difference in water level. The ESWEMS Retention Pond dimensions are 400 ft x 700 ft, which is bounded by the examples cited in the NOAA report.

   The minimum pond volume is based on a volume of water lost to ice, approximately 9.8 acre-ft versus the lesser volume of water lost to evaporation at 4.6 acre-ft. A tornado would be expected to occur at a same time as evaporation losses from the pond, not during a worst case cold spell resulting in maximum ice formation. There is a margin of 5.2 acre-ft between the evaporation losses and the icing losses that can account for the spray action water losses during a tornado. With the quick tornado transit times, losing water only due to spray action to a tornado, and the margin available in the UHS pond during evaporation, the impact of a tornado on retention pond levels is insignificant and bounded.

2. A worst case scenario would have a tornado pass over the ESWEMS pumps wells at the end of a 30 day accident. The pump wells are 7 feet lower than the credited retention pond volume. The pump wells hold approximately 7 feet of water over the pump suctions, and part of the wells are located inside the ESWEMS Pump House. As discussed in the response above, an extreme pressure drop caused by a tornado would be around 3 psi. This would cause the water level at the tornado core (eye) to rise 6 feet. Since the tornado is smaller than the pump wells a tornado would not be able to

uncover the suction of the pumps. Since the ESWEMS pumps are sized to be under 32 feet NPSH and the available NPSH with no static head at the suction is 32 feet NPSH, the pumps will have acceptable static head at all times.

A tornado would pass over the pump wells quickly. While the change in water level may result in vortexing of a pump, the transient would be quick and the vortexing would end once water level restabilized after the tornado has passed.

COLA Impact

The BBNPP FSAR will be revised as follows:

9.2.5.3.2 Piping, Valves, and Fittings

ESWEMS Retention Pond

A tornado direct hit impact on the ESWEMS Retention Pond does not need to be considered in determining retention pond inventory. National Oceanic and Atmospheric Administration (NOAA) Technical Memorandum NWS SR-147, "The Tornado: An Engineering Perspective", February 1993 (NOAA, 1993), provides information on tornado impacts on bodies of water. Of note is Section IX.D, Water Removal from Ponds, which demonstrates that a tornado vortex is not small enough nor the pressure low enough to effect significant water removal from the "sucking" process. Even a tornado with an extreme pressure difference of 3 psi would only raise the water 6 feet in the eye of the tornado. Winds and wave action do result in spray that is most commonly observed being sucked up in the tornado. The paper also provides examples where tornados have passed over bodies of water (lakes and swimming pools) where there was no observable difference in water level. With quick tornado transit times and only losing water to wave and wind action that produces spray, the amount of water lost due to a direct tornado strike on the retention pond can be considered insignificant and is not included in retention pond volume calculations. The ESWEMS Retention Pond dimensions are 400 ft x 700 ft, which is bounded by the examples cited in the NOAA report.

A tornado will also not impact NPSH of the ESWEMS pumps. The pump suctions are located in wells approximately 7 feet lower than the bottom of the retention ponds. A tornado is unable to impact NPSH enough to cause issues with the ESWEMS pumps. A tornado might be able to change water levels enough to induce vortexing, but this condition would be very short-lived and only occur while the tornado is directly over the pump wells. As soon as the tornado passes, any potential vortexing would cease.

9.2.5.8 References

.....

ASME 2004b. Code for Operation and Maintenance of Nuclear Power Plants, ASME OM Code, The American Society of Mechanical Engineers, 2004 edition.

NOAA 1993. Technical Memorandum NWS SR-147, "The Tornado: An Engineering Perspective", National Oceanic and Atmospheric Administration (NOAA), February 1993.

Question 09.02.05-26

RG. 1.27, "Ultimate Heat Sink for Nuclear Power Plants", states that the ultimate heat sink, as a complex, should be shown to be highly reliable by showing that certain conditions are satisfied. Such conditions would include: (1) the river cannot be diverted or blocked sufficiently to affect the availability of water at the connecting conduits; (2) no serious transportation accidents have occurred or can be reasonably expected; and (3) the dam was designed to appropriately conservative requirements, has functioned properly over its lifetime, and (based on projection of the best available data) will function properly for the lifetime of the nuclear power units it serves.

Based on the staff's review of various site plans, for example Figures 1.1-2 and 2.4.5, it appears the Essential Service Water Emergency Makeup System (ESWEMS) maybe adjacent to service roads.

Describe in the COL FSAR the necessary controls or design features that are in place to ensure the UHS and ESWEMS remains reliable for up to 30 days post design basis accident. The concern is the UHS becoming contaminated by a transportation accident (for example trucks transporting chemicals, oils, or diesel fuel oils (etc.) into the site via access roads) and the UHS becoming unavailable to satisfy the guidance in RG. 1.27.

Response

The ESWEMS Retention Pond has embankments (see FSAR Figures 3E-9, 3E-10 and 3E-11) that help prevent spills and other effluents from entering the pond. The embankments transition from the natural terrain to a flat grade about 10-15 feet wide, then rises at a 2 to 1 slope up approximately 5 feet. At the top of the embankment is a flat grade about 10 feet wide that then transitions to a 3 to 1 slope into the retention pond. The ten (10) foot wide embankment top is not used as any sort of transportation pathway. On the north and west sides of the retention pond the adjacent terrain is higher than the embankment, but due to the steep natural terrain and the design of the embankment any spills or accidents would end up between the terrain and the top of the embankment. Therefore, any spilled contents would drain away from the retention pond.

COLA Impact

The BBNPP FSAR will be revised as follows:

9.2.5.3.2 Piping, Valves and Fittings

ESWEMS Retention Pond

The ESWEMS Retention Pond has embankments (Figures 3E-9, 3E-10 and 3E-11) that help prevent spills and other effluents from entering the pond. The embankment is not used as a transportation path. On the north and west sides of the retention pond the adjacent terrain is higher than the embankment. Due to the steep natural terrain and the design of the embankment any spills or accidents would end up between the terrain and the top of the embankment. Therefore, any spilled contents would drain away from the retention pond.

Question 09.02.05-30

Follow-up to RAI Letter# 84 (RAI 3990) Question 09.02.05-2 (part 3).

The applicant responded to RAI Letter# 84 on May 3, 2010 stating that the two non safety-related instruments on Figure 9.2-3 are correctly classified as nonsafety-related. BBNPP FSAR Table 3.2-1 will be revised to clarify the safety-related ESWEMS instruments and controls and add non safety-related instruments and controls as shown below.

The staff notes that this response is that the ESWEMS retention pond water level and water temperature instrumentation are nonsafety-related. However, Technical Specifications (TS) 3. 7.19 states that the ESWEMS retention pond water level and water temperature have surveillance requirements (SR). It is unclear if the nonsafety related instruments are to be utilized to completed these SR.

Specifically the applicant should address in the FSAR:

- Describe the instruments to be utilized for TS SR 3.7.19.7, verification of the water temperature in the ESWEMS retention pond.
- Describe the instruments to be utilized for TS SR 3.7.19.8, verification of the water level in the ESWEMS retention pond.
- Describe if nonsafety related instruments can be utilized to perform these two TS SR stated above. Typically, nonsafety related instruments do not meet stringent criterion (calibrated to Bureau of National Standards (BNS)) and cannot be used or credited for the completion of TS SRs.

Response

Based on the fact that these instruments will be used by operators to ensure the retention pond is operable, the temperature and level instrumentation (CL001 and CT002) will be safety-related. These instruments will be used to complete the Technical Specification Surveillance requirements. FSAR figure 9.2-3, FSAR Table 3.2-1, and FSAR section 9.2.5 will be revised to specify that these instruments are safety-related and they are used to satisfy Technical Specification Surveillance Requirements.

COLA Impact

The BBNPP FSAR will be revised as follows:

9.2.5.3.2 Piping, Valves and Fittings

ESWEMS Instruments and Alarms

ESWEMS instrumentation indications as shown in Figure 9.2-3 are available locally and in the main control room. A list of ESWEMS alarms is provided in Table 9.2-1.

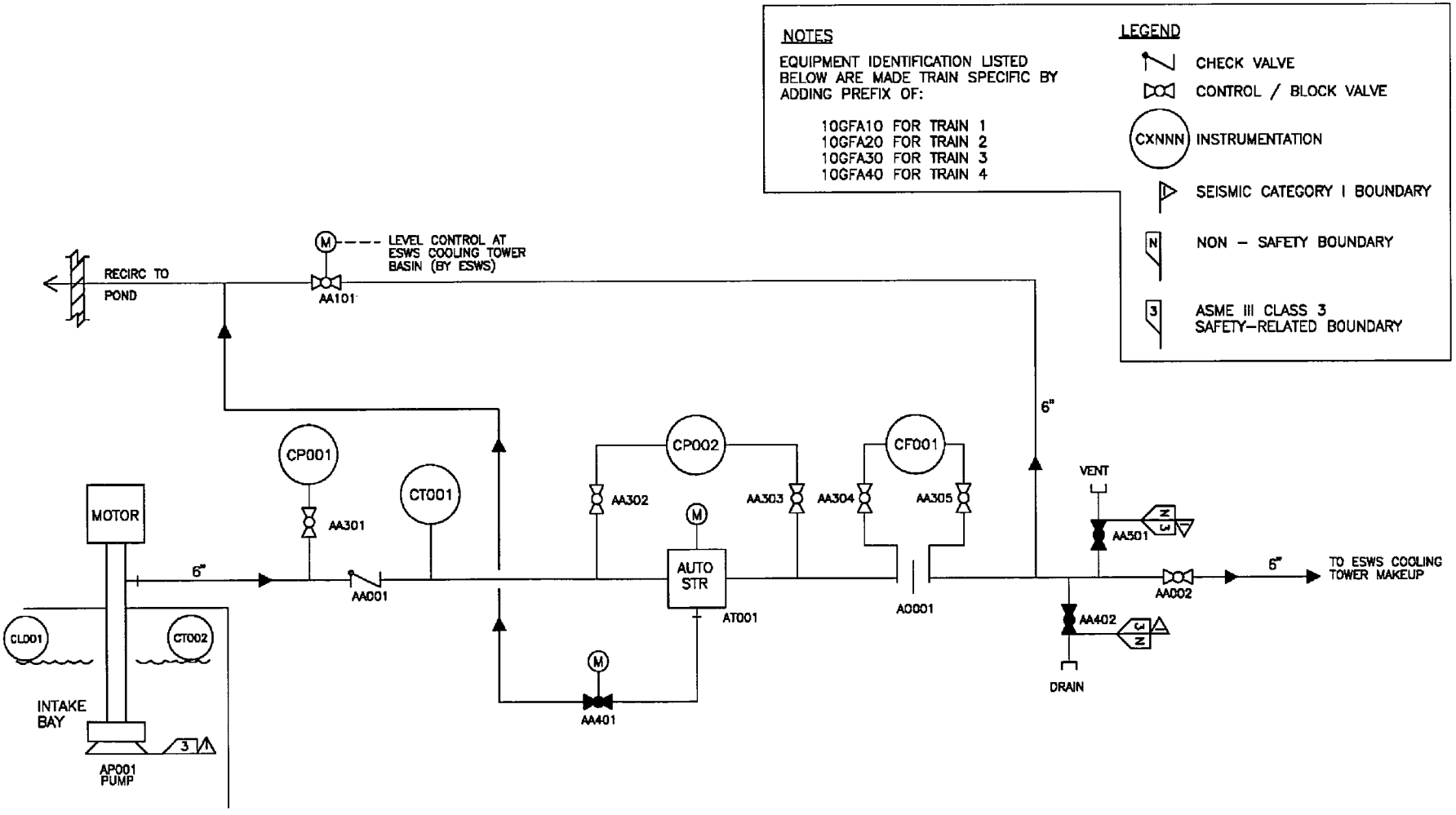
Instruments CL001 and CT002 as seen on Figure 9.2-3 are used by the control room to ensure retention pond temperature and level meet Technical Specification Requirements. These instruments are not directly used to run the ESWEMS pumps or control the system.

Table 3.2-1 {Classification Summary for Site-Specific SSCs}

KKS System or Component Code (Note 5)	SSC Description	Safety Classification (Note 1)	Quality Group Classification	Seismic Category (Note 2)	10 CFR 50 Appendix B Program (Note 4)	Location (Note 3)	Comment/ Commercial Code
GFA	**ESWEMS System**						
30GFA10/20/30/40 CL001-100	ESWEMS Retention Pond Level Indication	S	N/A	I	Yes	UQF	ASME III /IEEE
30GFA10/20/30/40 CT002-100	ESWEMS Retention Pond Temperature Indication	S	N/A	I	Yes	UQF	ASME III /IEEE

Figure 9.2-3

Figure 9.2–3 – {ESWEMS Schematic}



Question 09.02.05-31

The staff determines that BBNPP FSAR Section 9.2.5 was missing information related to GDC Criterion 44, "Cooling Water" and RG 1.27.

FSAR Section 9.2.5.4.2, "Abnormal Operating Conditions," does not have any detailed description related to the normal or abnormal conditions power conditions, for example response to loss of off-site power (LOOP), and power supplies to components important to safety.

Response:

The COLA will be revised to specify the safety class of the electrical service and the impact of Loss of Offsite Power (LOOP) conditions. The only accident scenarios found relevant were accident conditions where the retention pond would be needed and a LOOP accident.

COLA Impact:

The BBNPP FSAR will be revised as follows:

9.2.5.4.1 Normal Operating Conditions

{The normal ESWS makeup is supplied by the RWSS from the Susquehanna River. The RWSS provides filtered water from the media filter beds located in the Water Treatment Building to each of the ESWS cooling tower basins. The two operating ESWS divisions have the normal makeup MOVs open, while the two standby divisions' normal makeup MOVs are closed.

Blowdown from each train is aligned to the Combined Waste Water Retention Pond, with flow rate controlled by manual adjustment of the safety-related motor operated blowdown isolation valve.

The ESWEMS for each division is in standby, with the ESWEMS isolation MOV at the ESWS cooling tower basin closed. The recirculation line's MOV is also closed. The ESWS normal makeup MOVs, blowdown isolation MOVs and ESWEMS isolation MOVs are in the certified design scope and are discussed herein for additional clarity.

During normal operating conditions the ESWEMS pumps, MOVs and all associated ESWEMS safety-related components are powered by safety-related power supplies.

Periodic surveillance testing is conducted to demonstrate ESWEMS operability.}

9.2.5.4.2 Abnormal Operating Conditions

Plant Accident Conditions

{On receipt of an accident signal, the normal ESWS Makeup Water System isolation MOVs that are open will close; those that are closed will remain closed. In addition, the ESWS cooling tower blowdown isolation valves will close. None of these safety-related valves can be opened until the accident signal is cleared. For the first 72 hours after a DBA, the ESWS relies on the cooling tower basin inventory to make up for system losses due to evaporation. Subsequent action is manually initiated from the main control room or locally, based on operators' judgment resulting from prevailing conditions and indications. This includes initiating the ESWEMS makeup flow to two of the four ESWS cooling tower basins. The safety-related recirculation

isolation MOVs operate in conjunction with the ESWEMS isolation MOVs to allow the ESWEMS pumps to operate within their optimum range by modulating the flow of water back to the ESWEMS Retention Pond, based on control inputs from the ESWS Cooling Tower basin water level control systems. The ESWS normal makeup MOVs, blowdown isolation MOVs, ESWEMS isolation MOVs and ESWS cooling tower basin level control systems are in the certified design scope and are discussed herein for additional clarity.}

Loss of Offsite Power

In the event of loss of offsite power (LOOP), ESWEMS will continue to operate as needed. There are four divisions of Emergency Power Supply System (EPSS) distribution equipment for the ESWEMS. The EPSS distribution equipment for the ESWEMS is located in the Seismic Category ESWEMS Pump House. Each division is functionally independent and physically separated from the other divisions. Each division of EPSS powers one train of ESWEMS.}