RAIO-0218-58646

February 13, 2018

Docket No. 52-048

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

SUBJECT: NuScale Power, LLC Response to NRC Request for Additional Information No. 300 (eRAI No. 9186) on the NuScale Design Certification Application

REFERENCE: U.S. Nuclear Regulatory Commission, "Request for Additional Information No. 300 (eRAI No. 9186)," dated December 15, 2017

The purpose of this letter is to provide the NuScale Power, LLC (NuScale) response to the referenced NRC Request for Additional Information (RAI).

The Enclosure to this letter contains NuScale's response to the following RAI Questions from NRC eRAI No. 9186:

- 02.03.01-6
- 02.03.01-7
- 02.03.01-8

This letter and the enclosed response make no new regulatory commitments and no revisions to any existing regulatory commitments.

If you have any questions on this response, please contact Marty Bryan at 541-452-7172 or at mbryan@nuscalepower.com.

Sincerely,

Zackary W. Rad
Director, Regulatory Affairs
NuScale Power, LLC

Distribution: Gregory Cranston, NRC, OWFN-8G9A
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Enclosure 1: NuScale Response to NRC Request for Additional Information eRAI No. 9186

Enclosure 1:

NuScale Response to NRC Request for Additional Information eRAI No. 9186

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Response to Request for Additional Information
Docket No. 52-048

eRAI No.: 9186
Date of RAI Issue: 12/15/2017

NRC Question No.: 02.03.01-6

Regulatory Background

10 CFR Part 50, Appendix A, General Design Criterion (GDC) 2, “Design bases for protection against natural phenomena”, states, in part, that “[s]tructures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena….without loss of capability to perform their safety functions” and that “[t]he design bases for these structures, systems, and components shall reflect….[a]ppropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated.”

In addition, 10 CFR 52.47(a)(1) requires a design certification applicant to provide site parameters postulated for its design and an analysis and evaluation of the design in terms of those site parameters.

Further, NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition" (SRP), Section 2.3.1, “Regional Climatology,” establishes criteria that the NRC staff uses to evaluate whether an applicant meets the NRC’s regulations. With respect to its review of the applicant’s postulated design-basis dry- and/or wet-bulb temperature site parameter values, the NRC staff considered, in part, Item 6(e) under Subsection I (Areas of Review) and SRP Acceptance Criterion (7) under Subsection II (Acceptance Criteria) regarding ambient temperature and atmospheric moisture statistics for use in establishing heat loads for the design of normal plant heat sink systems, post-accident containment heat removal systems, and plant heating, ventilating, and air conditioning systems.

Key Issue

This question is seeking clarification on the definitions of the summer and winter outdoor dry- and/or wet-bulb temperatures listed as site parameters in FSAR Tier 1, Table 5.0-1 and Tier 2, Table 2.0-1, including providing cross-references to those FSAR sections in which these postulated site parameters are used.

Information Requested

The NRC staff notes that the postulated design-basis summer and winter outdoor dry- and/or wet-bulb temperatures specified in FSAR Tier 1, Table 5.0-1, and Tier 2, Table 2.0-1 are the same numerical values listed in Table 1.2-6, “Envelope of ALWR Plant Site Design Parameters” of the Advanced Light Water Reactor Utility Requirements Document, Volume II – ALWR Evolutionary Plant, Chapter 1 (Overall Requirements), Revision 8, published by EPRI, March 1999. This indicates that there has been no change to the values of these “site design parameters” up through Revision 13 of the EPRI URD, which FSAR Tier 2, Section 2.3.1 cites as the basis for these postulated site parameter values. However, unlike FSAR Tier 1, Table 5.0-1 and Tier 2, Table 2.0-1, Revision 8 of the EPRI URD designates these dry- and wet-bulb values as “0% Exceedance Values (historical limit excluding peaks < 2 hours)”.

In order for future potential COL applicants referencing the NuScale SMR plant design certification to be able to consistently develop and compare their climate-related site characteristics with the corresponding site parameter values, the applicant should address the following issues related to the design-basis dry- and/or wet-bulb temperature site parameter values in FSAR Tier 1, Table 5.0-1 and Tier 2, Table 2.0-1 and in FSAR Tier 2, Section 2.3.1:

a. Confirm, for each of these site parameters, whether the postulated design-basis summer and winter outdoor dry- and/or wet-bulb temperatures represent 0 percent exceedance values relative to those specific seasons and, if so (considering the potential range of locations that the NuScale SMR plant design might be deployed in), what months define those seasons. If not, then please identify and explain what exceedance probability these site parameter values represent.
b. For each site parameter that represents a 0 percent exceedance value, confirm whether they also represent an absolute maximum or minimum value or, as in the EPRI URD, are based on historical limits excluding peaks less than 2 hours (or some other duration).
c. Define what the coincident wet-bulb temperature value represents (e.g., the overall maximum wet-bulb temperature that is coincident with the indicated dry-bulb temperature, the mean of the wet-bulb temperatures coincident with the indicated dry-bulb temperature, an estimated wet-bulb temperature value assumed to be coincident with the indicated dry-bulb temperature).
d. Consistent with SRP Section 2.3.1, Subsection I (Areas of Review), Item (6), last paragraph, which calls for “[a]ll references to FSAR (Final Safety Analysis Report) sections in which these conditions are used” to be identified by an applicant, please provide cross-references to those FSAR sections in which these postulated site parameters are used.
e. Annotate FSAR Tier 1, Table 5.0-1 and Tier 2, Table 2.0-1 to clarify these postulated site parameter values as indicated above, and/or revise FSAR Tier 2, Section 2.3.1 and related discussions under Tier 2, Section 9.4 to further explain what these values represent.

NuScale Response:

a) Tier 1 Table 5.0-1, Tier 2 Table 2.0-1, and Tier 2 Section 2.3.1 are revised, as shown in the attached markup, to list the zero, one, and five percent exceedance dry-and/or wet-bulb values assumed for the NuScale standard design. Percent exceedance values are

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based on data from all calendar days. The terms "summer" and "winter" have been removed, as shown in the attached markup, to prevent the misleading implication that the percent exceedances could be based on data from summer or winter days only.

b) Site parameters that represent a zero percent exceedance value are based on historical limits excluding peaks less than 2 hours of duration. Tier 1 Table 5.0-1 and Tier 2 Table 2.0-1 are revised, as shown in the attached markup, to provide clarification.

c) The coincident wet-bulb temperature value represents the mean of the collected wet bulb temperatures that occurred coincident with the indicated dry-bulb temperature. Tier 2 Section 2.3.1 is revised, as shown in the attached markup, to provide clarification.

d) Cross references are provided in Tier 2 Table 2.0-1, as shown in the attached markup.

e) Various FSAR sections are revised, as shown in the attached markup, to further explain what these postulated site parameter values represent.

Impact on DCA:

FSAR Tier 1 Table 5.0-1 and Tier 2 Sections 2.0, 2.3, 3.8, 9.2, 9.4, 10.4, and 20.1 have been revised as described in the response above and as shown in the markup provided in this response.

RAI 02.03.01-2, RAI 02.03.01-7, RAI 03.07.02-24S1, RAI 03.08.05-1, RAI 03.08.05-8

Table 5.0-1: Site Design Parameters

Site Characteristic/Parameter	NuScale Design Parameter
Nearby Industrial, Transportation, and Military Facilities	
External hazards on plant structures, systems, and components (SSC) (e.g., explosions, fires, release of toxic chemicals and flammable clouds, pressure effects) on plant SSC	No external hazards
Aircraft hazards on plant SSC	No aircraft hazards
Meteorology	
Maximum precipitation rate	19.4 in. per hour 6.3 in. for a 5-minute period
Normal roof snow load	50 psf
Extreme roof snow load	75 psf
100-year return period 3-second wind gust speed	145 mph (Exposure Category C) with an importance factor of 1.15 for Reactor Building, Control Building, and Radioactive Waste Building
Design Basis Tornado maximum ~~horizontal~~ wind speed ~~maximum~~ translational speed maximum rotational speed ~~maximum~~ radius of maximum rotational speed ~~maximum~~ pressure ~~differential~~drop ~~maximum~~ rate of pressure drop	 230 mph 46 mph 184 mph 150 ft 1.2 psi 0.5 psi/sec
Tornado missile spectra	Table 2 of Regulatory Guide 1.76, Revision 1, Region 1.
Maximum wind speed design basis hurricane	290 mph
Hurricane missile spectra	Tables 1 and 2 of Regulatory Guide1.221, Revision 0.
~~Summer~~Zero percent exceedance value (historical limit excluding peaks <2 hours) maximum outdoor design dry bulb temperature	115°F
~~Winter~~Zero percent exceedance value (historical limit excluding peaks <2 hours) minimum outdoor design dry-bulb temperature	-40°F
~~Summer outdoor wet bulb temperature~~ ~~coincident~~ ~~non-coincident~~	 ~~80°F~~ ~~81°F~~
Accident release χ/Q values at security owner controlled area fence 0-2 hr 2-8 hr 8-24 hr 24-96 hr 96-720 hr	 ~~5.72~~6.22E-04 s/m^3 ~~4.85~~5.27E-04 s/m^3 ~~2.14~~2.41E-04 s/m^3 ~~2.15~~2.51E-04 s/m^3 ~~1.95~~2.46E-04 s/m^3
Accident release χ/Q values at main control room/ technical support center door and heating ventilation and air conditioning intake (approximately 112 feet from source) 0-2 hr 2-8 hr 8-24 hr 1-4 day 4-30 day	Door / Heating Ventilation and Air Conditioning Intake 6.50E-03 s/m^3 / 6.50E-03 s/m^3 5.34E-03 s/m^3 / 5.34E-03 s/m^3 2.32E-03 s/m^3 / 2.32E-03 s/m^3 2.37E-03 s/m^3 / 2.37E-03 s/m^3 2.14E-03 s/m^3 / 2.14E-03 s/m^3

RAI 02.03.01-2, RAI 02.03.01-7, RAI 03.07.02-24S1, RAI 03.08.05-1, RAI 03.08.05-8

Table 2.0-1: Site Design Parameters

Site Characteristic / Parameter	NuScale Design Parameter	References to Parameter
Geography and Demography (Section 2.1)		
Minimum exclusion area boundary	~~Security owner controlled area fence~~400 feet from the closest release point	Sections 2.1 and 2.3.4
Minimum outer boundary of low population zone	~~Security owner controlled area fence~~400 feet from the closest release point	Sections 2.1 and 2.3.4
Nearby Industrial, Transportation, and Military Facilities (Section 2.2)		
External hazards on plant systems, structures, and components (SSC) (e.g., explosions, fires, release of toxic chemicals and flammable clouds, pressure effects) on plant SSC	No external hazards	Section 2.2
Aircraft hazards on plant SSC	No design basis aircraft hazards	Sections 2.2 and 3.5.1.6
Meteorology (Section 2.3)		
Maximum precipitation rate	19.4 inches per hour 6.3 inches for a 5 minute period	Section 3.4.2.2
Normal roof snow load	50 psf	Sections 3.4.2.2, 3.8.4.3.11, and 3.8.4.8
Extreme roof snow load	75 psf	Sections 3.4.2.2, 3.8.4.3.12, and 3.8.4.8
100-year return period 3-second wind gust speed	145 mph (exposure Category C) with an importance factor of 1.15 for Reactor Building, Control Building and Radioactive Waste Building	Sections 3.3.1.1, 3.8.4.3.13, and 3.8.4.8
Design basis tornado maximum ~~horizontal~~ wind speed ~~maximum~~ translational speed maximum rotational speed ~~maximum~~ radius of maximum rotational speed ~~maximum~~ pressure ~~differential~~drop ~~maximum~~ rate of pressure drop	 230 mph 46 mph 184 mph 150 ft 1.2 psi 0.5 psi/sec	Sections 3.1.1.2, 3.3.2.1, 3.8.4.3.14, and 3.8.4.8
Tornado missile spectra	Table 2 of Regulatory Guide 1.76, Revision 1, Region 1	Section 3.5.1.4
Maximum wind speed design basis hurricane	290 mph	Sections 3.3.2.1, 3.8.4.3.14, and 3.8.4.8
Hurricane missile spectra	Tables 1 and 2 of Regulatory Guide 1.221, Revision 0	Section 3.5.1.4
~~Summer outdoor design dry bulb temperature~~	~~115°F~~	
~~Winter outdoor design dry bulb temperature~~	~~-40°F~~	
~~Summer outdoor wet bulb temperature~~ ~~coincident~~ ~~non-coincident~~	 ~~80°F~~ ~~81°F~~	

Table 2.0-1: Site Design Parameters (Continued)

Site Characteristic / Parameter	NuScale Design Parameter	References to Parameter
Routine release χ/Q and D/Q values ~~at site boundary and locations of interest~~associated with the bounding offsite dose location		
undepleted/no decay	5.43E-05 ~~m/s~~^{3}s/m^3	Table 11.3-6
undepleted/2.26-day decay	5.43E-05 ~~m/s~~^{3}s/m^3	
depleted/8.00-day decay	5.43E-05 ~~m/s~~^{3}s/m^3	
D/Q	5.43E-07 1/m^2	
Zero percent exceedance values (historical limit excluding peaks <2 hours)		Sections 3.8.4.3.8, 3.8.4.8, 20.1.1.4, and 20.1.1.5 and Table 9.4.1-1
Maximum outdoor design dry bulb temperature	115°F	
Minimum outdoor design dry bulb temperature	-40°F	
Maximum coincident wet bulb temperature	80°F	
Maximum non-coincident wet bulb temperature	81°F	
One percent exceedance values		Section 9.2.7.2.1 and Tables 9.2.7-1, 9.4.2-1, 9.4.3-1, and 10.4.9
Maximum outdoor design dry bulb temperature	100°F	
Minimum outdoor design dry bulb temperature	-10°F	
Maximum coincident wet bulb temperature	77°F	
Maximum non-coincident wet bulb temperature	80°F	
Five percent exceedance values		Table 9.4.4-1
Maximum outdoor design dry bulb temperature	95°F	
Minimum outdoor design dry bulb temperature	-5°F	
Maximum coincident wet bulb temperature	77°F	
Hydrologic Engineering (Section 2.4)		
Maximum flood elevation probable maximum flood and coincident wind wave and other effects on max flood level	1 foot below the baseline plant elevation	Sections 2.4.2 and 3.4.2.1 and Table 3.8.5-9
Maximum elevation of groundwater	2 feet below the baseline plant elevation	Sections 2.4.12, 3.4.2.1, 3.8.4.3.22.1, and 3.8.4.8 and Table 3.8.5-9
~~Site grading~~	~~Site is properly graded and has adequate drainage to prevent localized flooding~~	
Geology, Seismology, and Geotechnical Engineering (Section 2.5)		
Ground motion response spectra /safe shutdown earthquake	See Figures 3.7.1-1 and 3.7.1-2 for horizontal and vertical certified seismic design response spectra (CSDRS) for all Seismic Category I SSC. See Figures 3.7.1-3 and 3.7.1-4 for horizontal and vertical high frequency certified seismic design response spectra (CSDRS-HF) for Reactor Building and Control Building.	Sections 3.7.1.1, 3.8.4.3.16, and 3.8.4.8
Fault displacement potential	No fault displacement potential	Section 2.5.3

2.3 Meteorology

RAI 02.03.01-7

The NuScale Power Plant is designed using meteorological parameters ~~selected to envelope conditions at most~~that are representative of a reasonable number of potential plant site locations in the United States. These parameters are discussed below and presented in Table 2.0-1.

COL Item 2.3-1: A COL applicant that references the NuScale Power Plant design certification will describe the site-specific meteorological characteristics for Section 2.3.1 through Section 2.3.5, as applicable.

2.3.1 Regional Climatology

The design maximum precipitation rate is 19.4 inches per hour and 6.3 inches for a 5 minute period. These values come from NWS HMR #52 (Reference 2.3-1) and address the majority of locations in the United States.

The design normal roof snow load is 50 psf. For the extreme roof snow load, a value of 150 percent of the normal roof snow load, or 75 psf was selected.

The design basis severe wind is a 3-second gust at 33 ft above ground for exposure category C. The wind speed (W) is 145 mph. The wind speed is increased by an importance factor of 1.15 for the design of the site independent structures. These design parameters are based upon ASCE/SEI 7-05 (Reference 2.3-4).

The parameters provided in Table 2.0-1 for the design basis tornado and tornado missiles are the most severe tornado parameters postulated for the continental United States as identified in RG 1.76, Rev. 1. Similarly, the parameters for the design basis hurricane and hurricane missiles are the most severe parameters postulated in RG 1.221, Rev 0.

RAI 02.03.01-7

The design basis dry-bulb and wet bulb temperatures are based on the EPRI Utility Requirements Document (Reference 2.3-2). ~~The maximum and minimum dry bulb temperatures are 115 degrees F and -40 degrees F respectively, and the coincident and non-coincident wet bulb temperatures are 80 and 81 degrees F respectively.~~Pertinent zero-, one-, and five-percent exceedance values assumed in the design are provided in Table 2.0-1. The coincident wet-bulb temperature value represents the mean of the collected wet bulb temperatures that occurred coincident with the indicated dry-bulb temperature.

Regional climatology is site-specific and is addressed by the COL applicant as part of the response to COL Item 2.3-1.

2.3.2 Local Meteorology

Local meteorology is site-specific and is addressed by the COL applicant as part of the response to COL Item 2.3-1.

3.8.4.3.8 Operating Thermal Loads (T_o)

Thermal loads are caused by a temperature variation through the concrete wall between the interior temperature and the external environmental temperature. In addition, in the RXB, a thermal gradient could occur in the five foot thick walls surrounding the reactor pool. Section 1.3 of ACI 349.1R (Reference 3.8.4-7) states that thermal gradients should be considered in the design of reinforcement for normal conditions to control concrete cracking. However, a thermal gradient less than approximately 100° F need not be analyzed because such gradients will not cause significant stress in the reinforcement or strength deterioration.

RAI 02.03.01-7

As shown in Table 2.0-1, the external temperature design parameters for the NuScale standard structures are zero percent exceedance dry bulb values of -40°F and +115°F. The external soil temperature is assumed to be 21°F in the winter and 40°F in the summer.

The RXB has a design internal air temperature range of 70°F to 130°F, and a design pool temperature range of 40°F to 120°F. These temperatures are used to determine the stresses and displacements.

The CRB has a maximum temperature differential of 110°F, based on an external temperature of -40°F and an internal temperature of 70°F. This gradient has been determined not to affect the design stresses in the building. T_0 is not a load for the CRB.

3.8.4.3.9 Accident Thermal Loads (T_a)

The maximum post accident temperature in the RXB is assumed to be 212°F. This temperature is used in conjunction with the external temperature to determine the stresses and displacements.

The CRB does not have any high energy or high temperature piping. T_a is not a load for the CRB.

3.8.4.3.10 Rain Load (R)

RAI 02.03.01-3

The flat portion of the roof of the RXB does not have a parapet or any means to retain water. The CRB roof is sloped and the parapet has scuppers to disperse rainwater. An additional drainage pipe limits the average water depth on the CRB roof to a maximum of 4 inches. Therefore a rain load is assumed bounded by the snow load and extreme snow load.

3.8.4.3.11 Snow Loads (S)

RAI 02.03.01-2, RAI 02.03.01-3

RAI 02.03.01-7

Table 9.2.7-1: Site Cooling Water System Equipment Design Data

Description	Technical Data
Site Cooling Water Pumps	
Quantity	3
Type	Vertical wet pit type
Flow rate (max).	24,000 GPM each (50% capacity)
Motor brake horsepower	1500 HP
Cooling Tower - Three Cells (Two Cell Tower plus Spare Cell)	
Type	Mechanical draft, induced
Flow maximum (GPM) over 2 cells	48,000 (design flow plus margin)
Number of cells	3 (2 active)
Fan motor (horsepower)	300 each, three fans required.
~~Design ambient~~One percent exceedance non-coincident wet bulb temperature	80 °F
Cold water temperature	90 °F
Travelling Screens with Motors with Trash Rakes	
Flow (GPM)	24,000 each maximum (design flow plus margin)

RAI 02.03.01-7

Table 9.4.1-1: CRVS Outdoor Air Design Conditions

Parameter	Temperature
~~Summer~~Maximum outdoor design dry bulb temperature	115°F
~~Summer~~Maximum ~~outdoor~~ coincident wet bulb temperature ~~(coincident)~~	80°F
~~Summer outdoor~~Maximum non-coincident wet bulb temperature ~~(non-coincident)~~	81°F
~~Winter~~Minimum outdoor design dry bulb temperature	-40°F
*Table 9.4.1-1 temperatures are zero percent exceedance values	

RAI 02.03.01-7

Table 9.4.2-1: Outside Air Temperature Range for Reactor Building Ventilation System

Parameter	Temperature
~~Summer~~Maximum outdoor design dry bulb temperature	100°F
~~Summer outdoor~~Maximum coincident design wet bulb temperature	77°F
~~Winter~~Minimum outdoor design dry bulb temperature	-10°F
*Table 9.4.2-1 temperatures are one percent exceedance values	

RAI 02.03.01-7

Table 9.4.3-1: Outside Air Design Temperature for the Radioactive Waste Building HVAC System

Parameter	Temperature
~~Summer~~Maximum outdoor design dry bulb temperature	100°F
~~Summer outdoor~~Maximum coincident design wet bulb temperature	77°F
~~Winter~~Minimum outdoor design dry bulb temperature	-10°F
*Table 9.4.3-1 temperatures are one percent exceedance values	

RAI 02.03.01-7

Table 9.4.4-1: Turbine Building HVAC System Outdoor Air Design Conditions

Parameter	Temperature
~~Summer~~Maximum Outdoor Design Dry Bulb Temperature	95°F
~~Summer Outdoor~~Maximum coincident Design Wet Bulb Temperature	77°F
~~Winter~~Minimum Design Dry Bulb Temperature	-5°F
*Table 9.4.4-1 temperatures are five percent exceedance values	

RAI 02.03.01-7

Table 10.4-9: Circulating Water System Design Parameters

Circulating Water Pumps, per six NPMs	
Number	3 pumps per loop
Capacity	[[76353 gpm]] / 33% capacity
Type	Vertical, wet pit
Motor horsepower (nameplate)	[[1750 hp]]
Limitations	3 pumps are sufficient when assuming loss of a single pump
Traveling Screens	
Type	Continuously moving
Number	1 per pump
Cooling Tower	
Cells per tower	[[14]]
Type	Mechanical draft, induced
~~W~~One percent exceedance value maximum non-coincident wet bulb temperature	[[80°F]]
Range	[[20°F]]
Approach	[[10°F]]
Flow, each CWS loop	[[228,000 gpm]]
Construction code	ACI 318 standards
Testing standard	Cooling tower performance standard ASME PTC 23
Cooling Tower Makeup and Blowdown	
Rate	[[5320 gpm per loop]]
Cycles of concentration	[[5]]
Chemical Treatment	
Materials	[[biocide (typically sodium hypochlorite), algaecide, pH adjuster, corrosion inhibitor, scale inhibitor, and dispersant.]]
Piping, including the expansion joints, butterfly valves, condenser water boxes, and tube bundles.	
Size	[[9-foot diameter]]
Material	Prestressed concrete lined pipe (underground); carbon steel pipe (above ground).
Code	ASME B31.1 (above ground)

20.1.1.4 Snow, Ice, and Extreme Cold

RAI 02.03.01-7

The snow and ice design criteria are identified in Section 3.8.4. The zero percent exceedance minimum outdoor design dry bulb temperature (i.e., extreme cold) ~~design temperature~~ is identified in Table 2.0-1.

COL Item 20.1-4: A COL applicant that references the NuScale Power Plant design certification will determine if snow, ice and extreme cold temperature hazards are applicable at the site location. If snow, ice and extreme cold hazards are applicable, the COL applicant will ensure equipment and structures credited for FLEX strategies are designed to be available following a site-specific snow, ice or extreme cold temperature hazard.

20.1.1.5 High Temperatures

RAI 02.03.01-7

The zero percent exceedance maximum outdoor design dry bulb temperature (i.e. high temperature) ~~design temperature~~ is identified in Table 2.0-1.

COL Item 20.1-5: A COL applicant that references the NuScale Power Plant design certification will determine if extreme high temperature hazard is applicable at the site location. If extreme high temperature hazard is applicable, the COL applicant will ensure equipment and structures credited for FLEX strategies are designed to be available following a site-specific extreme high temperature hazard.

20.1.2 Extended Loss of AC Power and Loss of Ultimate Heat Sink Design Assessment

This section discusses the inherent coping capability of the NuScale Power Plant design to maintain the key safety functions following an ELAP and an LUHS event. The key safety functions are maintaining core cooling, containment and spent fuel pool cooling.

20.1.2.1 Definitions

An ELAP event is defined as a loss of all alternating current (AC) electric power to the essential and nonessential switchgear buses except for those fed by qualified DC batteries through inverters.

NEI 12-06 (Reference 20.1-6) defines an LUHS as the loss of motive force for UHS flow, i.e., service water or circulating water pumps, with no prospect for recovery. The LUHS event assumes the water inventory in the UHS remains available following the event, and the piping connecting the UHS to plant systems, which are qualified to survive the applicable external hazards, remains intact.

NEI 12-06 defines the following three phases for developing FLEX strategies (Reference 20.1-6):

Response to Request for Additional Information
Docket No. 52-048

eRAI No.: 9186
Date of RAI Issue: 12/15/2017

NRC Question No.: 02.03.01-7

Regulatory Background

10 CFR Part 50, Appendix A, General Design Criterion (GDC) 2, “Design bases for protection against natural phenomena”, states, in part, that “[s]tructures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena….without loss of capability to perform their safety functions” and that “[t]he design bases for these structures, systems, and components shall reflect….[a]ppropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated.”

In addition, 10 CFR 52.47(a)(1) requires a design certification (DC) applicant to provide site parameters postulated for its design and an analysis and evaluation of the design in terms of those site parameters.

NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition" (SRP), Section 2.3.1, “Regional Climatology,” establishes criteria that the NRC staff uses to evaluate whether an applicant meets the NRC’s regulations. With respect to its review of the applicant’s postulated design- basis dry- and/or wet-bulb temperature site parameter values, the NRC staff considered, in part, Item 6(e) under Subsection I (Areas of Review) and SRP Acceptance Criterion (7) under Subsection II (Acceptance Criteria) regarding ambient temperature and atmospheric moisture statistics for use in establishing heat loads for the design of normal plant heat sink systems, post-accident containment heat removal systems, and plant heating, ventilating, and air conditioning systems.

Further, SRP Section 2.3.1, Subsection IV (Evaluation Findings), Item 4(b), in part, calls for the NRC staff to reach a conclusion that “[t]he postulated site parameters are representative of a reasonable number of sites that have been or may be considered for a COL application.”

Key Issue

This question is seeking justification for the summer outdoor design non-coincident and coincident wet-bulb temperatures listed as site parameters in FSAR Tier 1, Table 5.0-1 and Tier 2, Table 2.0-1. The chosen values are non-conservatively low in many geographical areas of

the contiguous U.S., which may require COL applicants referencing the NuScale DCD for those locations to seek a departure from the DC rule.

Background Information

The NRC staff notes that the postulated design-basis summer and winter outdoor dry- and/or wet-bulb temperatures specified in FSAR Tier 1, Table 5.0-1, and Tier 2, Table 2.0-1 are the same numerical values listed in Table 1.2-6, “Envelope of ALWR Plant Site Design Parameters” of the Advanced Light Water Reactor Utility Requirements Document, Volume II – ALWR Evolutionary Plant, Chapter 1 (Overall Requirements), Revision 8, published by EPRI, March 1999. This indicates that there has been no change to the values of these “site design parameters” up through Revision 13 of the EPRI URD, which FSAR Tier 2, Section 2.3.1 cites as the basis for these postulated site parameter values.

In order for the NRC staff to reach the conclusion called for in SRP Section 2.3.1, Subsection IV (Evaluation Findings), Item 4(b), regarding these postulated site parameters, the applicant should address the following issues:

The postulated summer outdoor non-coincident wet-bulb temperature listed in FSAR Tier 1, Table 5.0-1 and Tier 2, Table 2.0-1, and in Tier 2, Table 9.4.1-1 is 81 degrees (deg) F. The NRC staff notes that several of the previously reviewed DC applications for other new reactor designs initially referenced the EPRI URD for the same design ambient temperature site parameters, and in many cases subsequently revised several of these site parameter values, including the non-coincident wet-bulb temperature. The staff further notes that almost all of the Combined License (COL) and Early Site Permit (ESP) applications that it has reviewed identify a non-coincident wet-bulb temperature greater than the corresponding site parameter value listed in FSAR Tier 1, Table 5.0-1 and Tier 2, Table 2.0-1. The table below summarizes many of these values (ESP applications are designated, all other entries are COL applications):

Site / Application	NCWB (deg F)
Bellefont	83.5
Callaway	81
Comanche Peak	86
Fermi	86.0
Grand Gulf	81
Levy County	85.5
Nine Mile Point	82.3
North Anna	88
PSEG ESP	86.2
River Bend	85.2
Shearon Harris	83.5
South Texas	88.3

Turkey Point	87.4
Victoria ESP	86.1
V.C. Summer	87.3
Vogtle	83.9
William States Lee	85

Note: NCWB = Non-Coincident Wet-Bulb Temperature

The geographical area covered by these site locations is diverse not only in latitude and longitude, but in topographic setting (i.e., coastal and interior) as well. Further, the NRC staff notes, based on data compiled by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE) in its “Weather Data Viewer” (Version 3.0) that numerous locations throughout the contiguous 48 United States report maximum wet-bulb temperatures greater than the non-coincident wet-bulb temperature postulated for the NuScale SMR power plant design.

Requested Information

Therefore, given the preceding and with the NRC staff’s current understanding that the DC application does not appear to identify or explain the statistical bases for the postulated design-basis summer and winter outdoor dry- and/or wet-bulb temperatures, including the non-coincident wet-bulb temperature, the applicant should either:

1. update the DC application by justifying and clarifying the statement in FSAR Tier 2, Section 2.0, “Site Characteristics and Site Parameters” which reads “[t]he NuScale Power Plant design assumes site parameters that envelope conditions at most expected potential plant site locations in the United States”, and elsewhere in the FSAR (if applicable), or
2. appropriately revise as necessary the postulated non-coincident wet-bulb temperature (81 deg F) and/or the postulated coincident wet-bulb temperature (80 deg F), such that the NRC staff can reach its conclusion as stated in the SRP Section 2.3.1, Subsection IV (Evaluation Findings), Item 4(b) that “[t]he postulated site parameters are representative of a reasonable number of sites that have been or may be considered for a COL application.”

NuScale Response:

Various FSAR sections are revised, as shown in the attached markup, to use language more similar to SRP Section 2.3.1 Subsection IV Item 3. For example, Tier 2 Section 2.0 is revised from "The NuScale Power Plant design assumes site parameters that envelope conditions at most expected potential plant site locations in the United States" to "The NuScale Power Plant design assumes site parameters that are representative of a reasonable number of potential plant site locations in the United States."

In the past (e.g. May 1997 U.S. ABWR design certification) the NRC has certified the identical

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dry and wet bulb temperature values that NuScale is proposing in its DC application.

There is no single wet bulb temperature that could be postulated which would prevent all future COL applicants from departing from the standard design. Lower postulated wet bulb temperatures used in a DC application would lead to some potential COL applicants in harsher environments departing from the standard design in order to assure year round operation at full capacity. Higher postulated wet bulb temperatures used in a DC application would lead to some potential COL applicants in milder environments departing from the standard design to save money on the operation of oversized cooling systems that are not necessary for their typical meteorological conditions. Regardless, it is a business decision rather than a safety issue because NuScale's heating ventilation and air conditioning systems and cooling towers are not safety related (as shown in Tier 2 Table 3.2-1).

The postulated wet bulb temperatures in the NuScale DC application are representative of a reasonable number of potential sites and are in alignment with the past precedence of other DC applications. Increasing these postulated wet bulb temperatures would potentially increase the number of COL applicants that would seek to depart from the standard design for economic reasons and increase the magnitude of the design change they would seek to implement. NuScale is not changing the postulated wet bulb temperatures used for the standard design.

Impact on DCA:

FSAR Tier 2 Sections 2.0, 2.3, 2.5, and 3.3 have been revised as described in the response above and as shown in the markup provided in this response.

CHAPTER 2 SITE CHARACTERISTICS AND SITE PARAMETERS

2.0 Site Characteristics and Site Parameters

RAI 02.03.01-7

The NuScale Power Plant design assumes site parameters that ~~envelope conditions at most expected~~are representative of a reasonable number of potential plant site locations in the United States. A summary of these parameters is provided in Table 2.0-1.

COL Item 2.0-1: A COL applicant that references the NuScale Power Plant design certification will demonstrate that site-specific characteristics are bounded by the design parameters specified in Table 2.0-1. If site-specific values are not bounded by the values in Table 2.0-1, the COL applicant will demonstrate the acceptability of the site-specific values in the appropriate sections of its combined license application.

2.3 Meteorology

RAI 02.03.01-7

The NuScale Power Plant is designed using meteorological parameters ~~selected to envelope conditions at most~~that are representative of a reasonable number of potential plant site locations in the United States. These parameters are discussed below and presented in Table 2.0-1.

COL Item 2.3-1: A COL applicant that references the NuScale Power Plant design certification will describe the site-specific meteorological characteristics for Section 2.3.1 through Section 2.3.5, as applicable.

2.3.1 Regional Climatology

The design maximum precipitation rate is 19.4 inches per hour and 6.3 inches for a 5 minute period. These values come from NWS HMR #52 (Reference 2.3-1) and address the majority of locations in the United States.

The design normal roof snow load is 50 psf. For the extreme roof snow load, a value of 150 percent of the normal roof snow load, or 75 psf was selected.

The design basis severe wind is a 3-second gust at 33 ft above ground for exposure category C. The wind speed (W) is 145 mph. The wind speed is increased by an importance factor of 1.15 for the design of the site independent structures. These design parameters are based upon ASCE/SEI 7-05 (Reference 2.3-4).

The parameters provided in Table 2.0-1 for the design basis tornado and tornado missiles are the most severe tornado parameters postulated for the continental United States as identified in RG 1.76, Rev. 1. Similarly, the parameters for the design basis hurricane and hurricane missiles are the most severe parameters postulated in RG 1.221, Rev 0.

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The design basis dry-bulb and wet bulb temperatures are based on the EPRI Utility Requirements Document (Reference 2.3-2). ~~The maximum and minimum dry bulb temperatures are 115 degrees F and -40 degrees F respectively, and the coincident and non-coincident wet bulb temperatures are 80 and 81 degrees F respectively.~~Pertinent zero-, one-, and five-percent exceedance values assumed in the design are provided in Table 2.0-1. The coincident wet-bulb temperature value represents the mean of the collected wet bulb temperatures that occurred coincident with the indicated dry-bulb temperature.

Regional climatology is site-specific and is addressed by the COL applicant as part of the response to COL Item 2.3-1.

2.3.2 Local Meteorology

Local meteorology is site-specific and is addressed by the COL applicant as part of the response to COL Item 2.3-1.

2.5 Geology, Seismology, and Geotechnical Engineering

RAI 02.03.01-7

The NuScale Power Plant is designed using geologic, seismologic, and geotechnical engineering parameters ~~selected to envelope conditions expected at a broad range of United States nuclear power plant sites~~that are representative of a reasonable number of potential plant site locations in the United States. These parameters are presented in Table 2.0-1.

COL Item 2.5-1: A COL applicant that references the NuScale Power Plant design certification will describe the site-specific geology, seismology, and geotechnical characteristics for Section 2.5.1 through Section 2.5.5, below.

2.5.1 Basic Geologic and Seismic Information

Basic regional and site geologic and seismic information is site-specific and addressed by the COL applicant as part of the response to COL Item 2.5-1.

2.5.2 Vibratory Ground Motion

There are two design basis earthquakes for the evaluation of structures that are included in the certified design: the certified seismic design response spectra (CSDRS) and the certified seismic design response spectra - high frequency (CSDRS-HF). These spectra were developed by reviewing earthquake design data from the U.S. nuclear industry and are intended to bound most of the central and eastern U.S. as well as sites in less seismically active portions of the western U.S.

The CSDRS and CSDRS-HF are discussed in Section 3.7.1. The CSDRS is shown in Figure 3.7.1-1 and Figure 3.7.1-2. The CSDRS-HF is shown in Figure 3.7.1-3 and Figure 3.7.1-4. The CSDRS and CSDRS-HF are key design parameters.

Local vibratory ground motion, including development of a safe shutdown earthquake is site-specific and addressed by the COL applicant as part of the response to COL Item 2.5-1.

2.5.3 Surface Faulting

The design analysis assumes that there is no fault displacement potential under the plant structures. This assumption is a key design parameter.

Detailed surface and subsurface geological, seismological, and geophysical information, including surface faulting, is site-specific and addressed by the COL applicant as part of the response to COL Item 2.5-1.

2.5.4 Stability of Subsurface Materials and Foundations

The design analysis assumes the following parameters:

- The minimum shear wave velocity is 1000 fps. Competent material is generally considered to be in situ material having a minimum shear wave velocity of 1,000 fps.

3.3 Wind and Tornado Loadings

The design includes three structures that are evaluated for wind and tornado loadings: the Seismic Category I Reactor Building (RXB) and Control Building (CRB) [the CRB is Seismic Category II above elevation 120' and in the areas below 120' defined in Section 1.2.2.2] and the Seismic Category II Radioactive Waste Building (RWB). The RXB, CRB and RWB are enclosed structures. This section describes the design approach for severe and extreme wind loads on these structures. Section 3.8.4 discusses the design of the Seismic Category I Structures.

The Seismic Category II RWB is also classified as RW-IIa (High Hazard) in accordance with Regulatory Guide (RG) 1.143, Rev. 2, "Design Guidance For Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants." The RWB is designed using the same wind, tornado and hurricane loads as specified for as the Seismic Category I structures. This meets or exceeds the wind load specified in Table 2 of RG 1.143, Rev. 2. This regulatory guide directs the use of ASCE 7-95 for wind loads. However, ASCE 7-05 (Reference 3.3-1) is used for wind loads in this design. Similarly, the tornado missiles from RG 1.76, Rev.1, "Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants," are used rather than the tornado missiles identified in Table 2 of RG 1.143, Rev. 2.

In addition, other structures, systems, and components that have the potential to interact with the Seismic Category I buildings are evaluated to demonstrate they do not adversely affect the RXB or Seismic Category I portions of the CRB. This is described in Section 3.3.3.

RAI 02.03.01-7

The design complies with General Design Criteria 2 and 4 in that structures, systems, and components are designed to withstand the most severe effects of natural phenomena wind, hurricane, and tornadoes without loss of the capability to perform their safety functions. This is achieved by establishing design parameters that ~~envelope conditions at most~~are representative of a reasonable number of potential plant site locations in the United States. Design parameters for severe wind loads are provided in Section 3.3.1.1 and design parameters for extreme wind loads are provided in Section 3.3.2.1.

The RWB has been evaluated for severe and extreme wind loads using the methodology in Section 3.3.1.2 and Section 3.3.2.2 and can withstand the severe and extreme winds.

3.3.1 Severe Wind Loadings

3.3.1.1 Design Parameters for Severe Wind

The design basis severe wind is a 3-second gust at 33 feet above ground for exposure category C. The wind speed (V_w) is 145 mph. The wind speed is increased by an importance factor of 1.15 for the design of the RXB, CRB, and RWB. These design parameters are based upon ASCE/SEI 7-05.

3.3.1.2 Determination of Severe Wind Forces

The maximum velocity pressure (q_z) based on the applicable maximum wind speed (V_w) is calculated in conformance with ASCE/SEI 7-05 (Reference 3.3-1), Equation 6-15, as follows:

Response to Request for Additional Information
Docket No. 52-048

eRAI No.: 9186
Date of RAI Issue: 12/15/2017

NRC Question No.: 02.03.01-8

Regulatory Background

10 CFR Part 50, Appendix A, General Design Criterion (GDC) 2, “Design bases for protection against natural phenomena”, states, in part, that “[s]tructures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena….without loss of capability to perform their safety functions” and that “[t]he design bases for these structures, systems, and components shall reflect….[a]ppropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated.”

In addition, 10 CFR 52.47(a)(1) requires a design certification (DC) applicant to provide site parameters postulated for its design and an analysis and evaluation of the design in terms of those site parameters.

Further, NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition" (SRP), Section 2.3.1, “Regional Climatology,” establishes criteria that the NRC staff uses to evaluate whether an applicant meets the NRC’s regulations. With respect to its review of the applicant’s postulated design-basis dry- and/or wet-bulb temperature site parameter values, the NRC staff considered, in part, Item 6(e) under Subsection I (Areas of Review) and SRP Acceptance Criterion (7) under Subsection II (Acceptance Criteria) regarding ambient temperature and atmospheric moisture statistics for use in establishing heat loads for the design of normal plant heat sink systems, post-accident containment heat removal systems, and plant heating, ventilating, and air conditioning systems.

Key Issue

This question is seeking justification regarding whether the “design-basis” summer and winter outdoor dry- and/or wet-bulb temperatures listed in FSAR Tier 2, Section 9.4 for the Reactor Building, Spent Fuel Pool Area, Radwaste Building, and Turbine Building ventilation systems should also be listed as site parameters in either FSAR Tier 1, Table 5.0-1 or FSAR Tier 2, Table 2.0-1, or both, and, if so, clarification of the definitions of these additional site parameter values, including providing cross-references to those FSAR sections in which these postulated site parameters are used.

Background Information

The NRC staff notes that other “design-basis” summer and winter outdoor dry- and/or wet-bulb temperatures are identified under FSAR Tier 2, Section 9.4, “Air Conditioning, Heating, Cooling, and Ventilation Systems”, but that they are not specified as postulated site parameters in FSAR Tier 1, Table 5.0-1, as part of the certified design, or in FSAR Tier 2, Table 2.0-1. These include:

- summer outdoor design dry- and wet-bulb temperatures of 100 deg F and 77 deg F, respectively, and a winter outdoor design dry-bulb temperature of -10 deg F, as listed in FSAR Tier 2, Table 9.4.2-1, “Outside Air Temperature Range for Reactor Building Ventilation System”, referenced from Tier 2, Subsection 9.4.2.1, “Design Bases”, under Tier 2, Section 9.4.2, “Reactor Building and Spent Fuel Pool Area Ventilation System”;
- summer outdoor design dry- and wet-bulb temperatures of 100 deg F and 77 deg F, respectively, and a winter outdoor design dry-bulb temperature of -10 deg F, as listed in FSAR Tier 2, Table 9.4.3-1, “Outside Air Design Temperature for the Radioactive Waste Building HVAC System”, referenced from Tier 2, Subsection 9.4.3.1, “Design Bases”, under Tier 2, Section 9.4.3, “Radioactive Waste Building Ventilation”; and
- summer outdoor design dry- and wet-bulb temperatures of 95 deg F and 77 deg F, respectively, and a winter design dry-bulb temperature of -5 deg F, as listed in FSAR Tier 2, Table 9.4.4-1, “Turbine Building HVAC System Outdoor Air Design Conditions”, referenced from Tier 2, Subsection 9.4.4.2, “System Description”, under Tier 2, Section 9.4.4, “Turbine Building Ventilation System”.

The NRC staff further notes that the “design-basis” summer and winter outdoor dry- and/or wet-bulb temperatures listed above are the same numerical values listed in Table 1.2-6, “Envelope of ALWR Plant Site Design Parameters” of the Advanced Light Water Reactor Utility Requirements Document, Volume II – ALWR Evolutionary Plant, Chapter 1 (Overall Requirements), Revision 8, published by EPRI, March 1999. This suggests that there has been no change to the values of these “site design parameters” up through Revision 13 of the EPRI URD. In addition, Revision 8 of the EPRI URD refers to the dry- and/or wet-bulb temperature values in the first two bulleted items above as “1% Exceedance Values” and the dry- and/or wet-bulb temperature values in the last bulleted item above as “5% Exceedance Values”. The wet-bulb temperatures in the bulleted items above are designated as “coincident wet bulb” temperatures in Revision 8 of the EPRI URD.

The referenced EPRI URD also identifies non-coincident wet-bulb temperature values of 80 deg F and 79 deg F for the 1% and 5% Exceedance Values, respectively. FSAR Tier 2, Section 9.4 does not appear to include any such values.

Information Requested

FSAR Tier 2, Section 1.2.1, “Principal Site Characteristics”, identifies the following structures as being included in the NuScale certified design (i.e., the Reactor Building (RXB), the Control Building (CRB), and the Radioactive Waste Building (RWB)). The applicant should address the following issues:

(a) Confirm whether the “design-basis” summer and winter outdoor dry- and/or wet-bulb temperatures listed in the first two bulleted items above that are related to the “Reactor Building and Spent Fuel Pool Area Ventilation System” and to the “Radioactive Waste Building Ventilation” system should be identified as postulated site parameters in FSAR Tier 2, Table 2.0-1 or FSAR Tier 1, Table 5.0-1 as well. The NRC staff notes possible challenges to the listed wet-bulb temperature value similar to those discussed in RAI Question 02.03.01-7.

If these “design-basis” summer and winter outdoor dry- and/or wet-bulb temperatures are added to FSAR Tier 2, Table 2.0-1 and/or Tier 1, Table 5.0-1 as postulated site parameters:

1. Update the necessary text and any associated current or new table(s).
2. Confirm, for each of these site parameters, whether the postulated design-basis summer and winter outdoor dry- and/or wet-bulb temperatures represent a specific percent exceedance value relative to those specific seasons and, if so, specify the exceedance value. Also, considering the potential range of locations that the NuScale SMR plant design might be deployed in, indicate what months define those seasons. Otherwise, please explain the basis for these site parameter values.
3. Confirm whether the listed wet-bulb temperature value represents a coincident or non-coincident value and annotate accordingly.
4. If the listed wet-bulb temperature is a value coincident with the indicated dry-bulb temperature, define what the coincident wet-bulb temperature represents (e.g., the overall maximum wet-bulb temperature that is coincident with the indicated dry-bulb temperature, the mean of the wet-bulb temperatures coincident with the indicated dry-bulb temperature, an estimated wet-bulb temperature value assumed to be coincident with the indicated dry-bulb temperature) so that COL applicants referencing the NuScale SMR plant design certification can consistently develop and compare their climate-related site characteristics with the corresponding site parameter values.
5. Consistent with SRP Section 2.3.1, Subsection I (Areas of Review), Item (6), last paragraph, which calls for “[a]ll references to FSAR (Final Safety Analysis Report) sections in which these conditions are used” to be identified by an applicant, please provide cross-references to those FSAR sections in which these postulated site parameters are used.

(b) Confirm whether the “design-basis” summer and winter outdoor dry- and/or wet-bulb temperatures listed in the last bulleted item above that are related to the “Turbine Building Ventilation System” should be identified as postulated site parameters in FSAR Tier 2, Table 2.0-1. The NRC staff notes possible challenges to the listed wet-bulb temperature value similar to those discussed in RAI Question 02.03.01-7.

If these “design-basis” summer and winter outdoor dry- and/or wet-bulb temperatures are added to FSAR Tier 2, Table 2.0-1 as postulated site parameters, then the Applicant should address the same issues identified in Question 02.03.01-8, Items (a)(1) to (a)(5).

(c) FSAR Tier 2, Table 9.2.7-1, “Site Cooling Water System Equipment Design Data”, as

referenced from Tier 2, Subsection 9.2.7.2.1, “General Description”, under Tier 2, Section 9.2.7, “Site Cooling Water System” lists a design ambient wet-bulb temperature of 80 deg F. The applicant should confirm whether this value represents the postulated coincident wet-bulb temperature listed in FSAR Tier 1, Table 5.0-1 and Tier 2, Table 2.0-1 and update the necessary text and the associated table accordingly.

NuScale Response:

a) See response to RAI 9186 Question 02.03.01-6. Note that FSAR Tier 2 Section 9.4 does not include the cited EPRI URD non-coincident wet bulb temperature values of 80°F and 79°F for the one percent and five percent exceedance values respectively because only the coincident wet bulb temperature is pertinent to determining the air's enthalpy for HVAC design. Further, note that the non-coincident wet bulb five percent exceedance value of 79°F is not included in the FSAR because it is not used in any design analysis associated with the DC application.

b) See response to RAI 9186 Question 02.03.01-6.

c) FSAR Tier 2 Table 9.2.7-1 is revised, according to the attached markup, to clarify that the 80°F wet bulb value is a non-coincident one percent exceedance value.

Impact on DCA:

FSAR Table 9.2.7-1 has been revised as described in the response above and as shown in the markup provided in this response.

RAI 02.03.01-7

Table 9.2.7-1: Site Cooling Water System Equipment Design Data

Description	Technical Data
Site Cooling Water Pumps	
Quantity	3
Type	Vertical wet pit type
Flow rate (max).	24,000 GPM each (50% capacity)
Motor brake horsepower	1500 HP
Cooling Tower - Three Cells (Two Cell Tower plus Spare Cell)	
Type	Mechanical draft, induced
Flow maximum (GPM) over 2 cells	48,000 (design flow plus margin)
Number of cells	3 (2 active)
Fan motor (horsepower)	300 each, three fans required.
~~Design ambient~~One percent exceedance non-coincident wet bulb temperature	80 °F
Cold water temperature	90 °F
Travelling Screens with Motors with Trash Rakes	
Flow (GPM)	24,000 each maximum (design flow plus margin)