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Docket Nos. 50-315
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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Donald C. Cook Nuclear Plant Unit 1 and Unit 2
Response to Second Request for Additional Information Regarding the License Amendment Request to Adopt TSTF-490 and Implement Alternative Source Term

References:

1. Letter from J. P. Gebbie, Indiana Michigan Power Company (I&M), to U. S. Nuclear Regulatory Commission (NRC), "Donald C. Cook Nuclear Plant Units 1 and 2, License Amendment Request to Adopt TSTF-490, Revision 0, "Deletion of E Bar Definition and Revision to Reactor Coolant System Specific Activity Technical Specification" and Implement Full-Scope Alternative Source Term," dated November 14, 2014, Agencywide Documents Access and Management System (ADAMS) Accession No. ML14324A209.

2. Letter from J. P. Gebbie, I&M, to NRC, "Donald C. Cook, Unit 1 and Unit 2 - Supplemental Information for the License Amendment Request to Adopt TSTF-490, Revision 0, "Deletion of E Bar Definition and Revision to Reactor Coolant System Specific Activity Technical Specification" and Implement Full-Scope Alternative Source Term," dated February 12, 2015, ADAMS Accession No. ML15050A247.

3. E-mail capture from A. W. Dietrich, NRC, to T. L. Curtiss, I&M, "D.C. Cook Units 1 and 2 – SRXB RAI Concerning LAR to Adopt TSTF-490 and Implement Full-Scope AST (TAC NOS. MF5184 AND MF5185)," dated July 14, 2015, ADAMS Accession No. ML15195A698.

This letter provides Indiana Michigan Power Company's (I&M), licensee for Donald C. Cook Nuclear Plant (CNP) Units 1 and 2, response to the second Request for Additional Information (RAI) by the U. S. Nuclear Regulatory Commission (NRC) regarding a license amendment request (LAR) to adopt Technical Specification Task Force (TSTF)-490 and implement Alternative Source Term.

By Reference 1, as supplemented by Reference 2, I&M submitted a request to amend the Technical Specifications to CNP Units 1 and 2 Renewed Facility Operating Licenses DPR-58 and DPR-74. I&M proposes to adopt TSTF-490, Revision 0, and implement full scope alternative source term

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radiological analysis methodology. By Reference 3, the NRC transmitted an RAI regarding the LAR submitted by I&M in Reference 1.

Enclosure 1 to this letter provides an affirmation statement. Enclosure 2 to this letter provides I&M's response to the NRC's RAI in Reference 3. Copies of this letter and its enclosures are being transmitted to the Michigan Public Service Commission and Michigan Department of Environmental Quality, in accordance with the requirements of 10 CFR 50.91.

There are no new regulatory commitments made in this letter. Should you have any questions, please contact Mr. Michael K. Scarpello, Regulatory Affairs Manager, at (269) 466-2649.

Sincerely,

Joel P. Gebbie
Site Vice President

TLC/ams

Enclosures:

1. Affirmation
2. Response to the Second Request for Additional Information Regarding the License Amendment Request to Adopt TSTF-490 and Implement Full-Scope Alternate Source Term

c: A. W. Dietrich, NRC, Washington, D.C.
J. T. King – MPSC
MDEQ – RMD/RPS
NRC Resident Inspector
C. D. Pederson, NRC, Region III
A. J. Williamson, AEP Ft. Wayne, w/o enclosures

Enclosure 1 to AEP-NRC-2015-75

AFFIRMATION

I, Joel P. Gebbie, being duly sworn, state that I am Site Vice President of Indiana Michigan Power Company (I&M), that I am authorized to sign and file this request with the U. S. Nuclear Regulatory Commission on behalf of I&M, and that the statements made and the matters set forth herein pertaining to I&M are true and correct to the best of my knowledge, information, and belief.

Indiana Michigan Power Company

Joel P. Gebbie
Site Vice President

SWORN TO AND SUBSCRIBED BEFORE ME

THIS 24 DAY OF August, 2015

Notary Public

My Commission Expires 04-04-2018

DANIELLE BURGOYNE
Notary Public, State of Michigan
County of Berrien
My Commission Expires 04-04-2018
Acting in the County of Berrien

Enclosure 2 to AEP-NRC-2015-75

Response to the Second Request for Additional Information Regarding the License Amendment Request to Adopt TSTF-490 and Implement Full-Scope Alternate Source Term

By letter dated November 14, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14324A209), as supplemented by letter dated February 12, 2015 (ADAMS Accession No. ML15050A247), Indiana Michigan Power Company (I&M), the licensee for the Donald C. Cook Nuclear Plant (CNP), Units 1 and 2, submitted a license amendment request (LAR). The proposed amendment consists of adoption of Technical Specifications Task Force (TSTF)-490, Revision 0, and implementation of a full scope alternate source term radiological analysis methodology.

The U.S. Nuclear Regulatory Commission (NRC) staff in the Reactor Systems Branch (SRXB) of the Office of Nuclear Reactor Regulation is currently reviewing the submittal, as supplemented, and has determined that additional information is needed in order to complete the review. The text of the request for additional information (RAI) and I&M's response is provided below.

RAI-SRXB-1

The license amendment request (LAR) dated November 14, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14324A209) listed in Enclosure 12 the various new alternative source term (AST) input parameter values, including those based on reactor coolant system (RCS) performance, for offsite and control room (CR) habitability doses for each accident analysis. The supplement dated February 12, 2015 (ADAMS Accession No. ML15050A247) provided information about the thermal-hydraulic (TH) analyses that were applied as the basis for the values.

As stated in the supplement, "The current licensing basis (CLB) thermal hydraulic (TH) calculations were used to provide input to most of the new dose analyses, although some of those inputs are different from previous inputs that were derived from the same TH calculations." The supplement also stated that the majority of the input parameters originated from calculations performed for previous license amendments for Donald C. Cook Nuclear Plant Units 1 and 2, such as license amendment Nos. 271 and 252 for implementation of AST for CR habitability, and license amendment Nos. 256 and 239 to address steam generator tube rupture (SGTR) overfill. Other inputs were obtained from projects implemented under Title 10 of the Code of Federal Regulations (10 CFR), Section 50.59, from information obtained from actual plant post-trip data, and from simulator data representing a Unit 1 SGTR transient.

The supplement provided additional descriptions of the TH analysis for each accident considered in the AST analysis. The source documents for most of the accident analyses, such as the volume data provided by Westinghouse Electric Company during a steam generator replacement project, are not available for the NRC staff to verify the proper incorporation of the values as input parameters to the AST analysis. Thus, the NRC staff cannot verify the authenticity of the RCS input parameter values to their

source documentation, along with whether the sources, other than the previous license amendments, were reviewed and approved by the NRC.

a. *Provide information for all of the input parameter values provided in Enclosure 12 of the LAR connecting each value to its respective source documentation. Additionally, provide the source documentation that produced the input parameter values that were applied in each accident analysis. The source documentation can be submitted on the docket or made available for staff inspection via an audit. If placed on the docket and considered a proprietary document, submit a redacted version along with the proprietary version in accordance with 10 CFR 2.390.*

I&M's Response to RAI-SRXB-1:

The following information is being provided in response to RAI-SRXB-1 regarding the CNP LAR to adopt TSTF-490, Revision 0, and implement full-scope alternative source term (AST) (Reference 1). Information presented in the following tables corresponds to the information provided in Enclosure 12 of Reference 1 for the revised dose consequence analyses input parameters ("AST Value").

The source document for each new AST input value is also identified in the tables below. A list of all the source documents is provided after the tables in the "References" section. Any of the input parameter source documents that are not currently available on the NRC docket for CNP will be made available during the audit scheduled for September 2015. The tables below contain input values and source document information for the following accident scenarios:

Table 1 – Control Room Parameters

Table 2 - Loss of Coolant Accident (LOCA)

Table 3 - Fuel Handling Accident (FHA)

Table 4 - Main Steam Line Break (MSLB)

Table 5 - Steam Generator Tube Rupture (SGTR)

Table 6 - Locked Rotor Accident (LRA)

Table 7 - Control Rod Ejection (CRE)

Table 8 - Waste Gas Decay Tank (WGDT) Rupture

Table 9 - Volume Control Tank (VCT) Rupture

Table 1: Control Room Parameters		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
Control Room (CR) Volume	50,616 ft^3	Reference 30 This value is consistent with the CR habitability AST LAR approved via Reference 50 in 2002.
Normal Operation		
Filtered Make-up Flow Rate	0 cubic feet per minute (cfm)	No filtration during normal operation.
Filtered Recirculation Flow Rate	0 cfm	No filtration during normal operation.
Unfiltered Make-up Flow Rate	880 cfm	References 14, 15, and 31 The design makeup flow rate is given as 800 cfm in References 14 and 15. Reference 31 provides an expected operating range of between 720 cfm and 880 cfm. Use of a maximum make-up flow rate is conservative.
Unfiltered Inleakage	40 cfm	Reference 32 The value provided in Reference 32 of 40 cfm was confirmed to be conservative via gas tracer testing outlined in Reference 59.
Emergency Operation		
Recirculation Mode:		
Filtered Make-up Flow Rate	880 cfm	References 14, 15, and 31 The design makeup flow rate is given as 800 cfm in References 14 and 15. Reference 31 provides an expected operating range of between 720 cfm and 880 cfm. Use of a maximum make-up flow rate is conservative.
Filtered Recirculation Flow Rate	4520 cfm	Reference 6, Section 5.5.9 This value represents the total value of 5400 cfm from Reference 6 minus the 880 cfm listed above. The minimum recirculation flow rate reduces the radionuclide removal by the control room filters in the dose consequence analyses.
Unfiltered Make-up Flow Rate	0 cfm	Filtration activated during emergency operation.
Unfiltered Inleakage	40 cfm	Reference 32 The value provided in Reference 32 of 40 cfm was confirmed to be conservative via gas tracer testing outlined in Reference 59.
Filter Efficiencies		
Elemental	94.05%	Reference 1 (proposed change to Technical Specifications (TS)) and References 3 and 6 The maximum allowable methyl iodide penetration is 2.5% from Reference 1. This corresponds to a filter efficiency of 95% for elemental iodine and organic iodide per Reference 3. The HEPA filter efficiency is 99% for radioactive particulates per Reference 6. The filter efficiencies are adjusted to account for the HEPA removal efficiency requirement from Reference 6, Section 5.5.9 (1% adjustment for bypass).
Organic	94.05%	
Particulate	98.01%	
Occupancy		
0-24 hrs 1-4 days 4-30 days	1 0.6 0.4	Reference 2, Section 4.2.6
Breathing Rate	3.5 x 10-4 m^3/sec	Reference 2, Section 4.2.6

Table 2: LOCA Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
Containment Purge		
Iodine Chemical Form	95% aerosol, 4.85% elemental, 0.15% organic	Reference 2
Containment Volume	1,066,352 ft^3	Reference 28 This value represents the sum of the upper containment (sprayed/unsprayed), lower containment (sprayed/unsprayed), lower containment fan room (sprayed), ice condenser (unsprayed), and lower containment dead-ended (unsprayed) volumes.
Containment Purge Flow Rate	36,300 cfm	References 16, 17, and 19 Increased by 10% for conservatism from the source document value.
Containment Purge Isolation Time	15 seconds	Reference 8 (U1), Table 14.3.1-8 References 16, 17, and 41 Reference 6, Table 3.3.6-1, Item #4 Representative safety injection signal of approximately 5 seconds from Reference 8 increased to 10 seconds for conservatism. The containment purge isolation valves are fully closed within 5 seconds of receipt of a safety injection signal for a total isolation time of 15 seconds.
Containment Purge Filtration	0%	References 16, 17, and 18 The referenced documents show that the purge exhaust fans discharge to the plant vent without filtration.
Removal by Wall Deposition	None	Not credited.
Removal by Sprays	None	Not credited.
Containment Leakage		
Iodine Chemical Form	95% aerosol, 4.85% elemental, 0.15% organic	Reference 2
Containment Sump pH	>7.0	Reference 27 An analysis has been performed (Reference 27) to include strong acid generation due to radiation effects.
Compartment Volumes (max) Upper Containment (Sprayed) Lower Compartment (Sprayed) Fan Rooms (Sprayed) Upper Containment (Unsprayed) Ice Condenser (Unsprayed) Lower Containment (Unsprayed) Dead-End (Unsprayed)	 621,968 ft^3 103,770 ft^3 48,913 ft^3 122,600 ft^3 105,577 ft^3 66,188 ft^3 18,663 ft^3	Reference 28, Tables 5.2.5.1 & 5.4.4.1 The values represent a 2% increase for conservatism.

Table 2: LOCA Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
Containment Ventilation Start Time	300 seconds	Reference 43 This value represents a conservative input assumption which will support future plant activities. Delaying the ventilation start time is conservative for the purposes of dose consequence analyses. This value is consistent with the input utilized in the CNP normal operating pressure / normal operating temperature (NOP/NOT) submittal (see Enclosure 8 of Reference 57).
Containment Ventilation Flow Rate Fan Rooms to Lower Containment (Unsprayed) Fan Rooms to Lower Containment (Sprayed) Lower Containment (Unsprayed) to Dead – End Dead-End to Fan Rooms Lower Containment (Unsprayed) to Fan Rooms Lower Containment (Unsprayed) to Ice Condenser Lower Containment (Sprayed) to Ice Condenser Ice Condenser to Upper Containment (Sprayed) Ice Condenser to Upper Containment (Unsprayed) Upper Containment (Sprayed) to Fan Rooms Upper Containment (Unsprayed) to Fan Rooms Lower Containment – Sprayed to/from Unsprayed Upper Containment – Sprayed to/from Unsprayed	 14,580.5 cfm 22,859.5 cfm 90 cfm 90 cfm 1,350 cfm 13,140.5 cfm 22,859.5 cfm 30,072.3 cfm 5,927.7 cfm 30,072.3 cfm 5,927.7 cfm 2206.3 cfm (spray induced circulation) 4086.7 cfm (spray induced circulation)	References 16, 17, and 20 Values taken from the Reference 16 and 17 drawings were conservatively decreased by 10% and then modified in Reference 20 to ratio flows to the appropriate compartments within the model.
Sprayed/Unsprayed Volume Induced Mixing Flow Rate	2 Turnovers of Unsprayed Compartment/hour	Reference 2, Appendix A, Section 3.3

Table 2: LOCA Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
Containment Spray Start Time	300 seconds	Reference 43 This value represents a conservative input assumption which will support future plant activities. Delaying the spray start time is conservative for the purposes of dose consequence analyses. This value is consistent with the input utilized in the CNP NOP/NOT submittal (see Enclosure 8 of Reference 57).
Containment Spray Stop Time	0.319-0.426 hours and after 24 hours	References 10, 11, and 20 The spray interruption corresponds to pump suction realignment. The values utilized in the analyses bound the source documentation value of a 5 minute interruption.
Containment Spray Flow Rate Upper Containment Lower Containment Fan Rooms	 1466 gallons per minute (gpm) 660 gpm 201 gpm	References 29 and 42 Minimum spray flow rates conservatively minimize the removal coefficients.
Containment Spray Drop Fall Height Upper Containment Lower Containment Fan Rooms	 58.6 feet (ft) 28.5 ft 20.1 ft	Reference 28 The spray drop fall height is used in the calculation of the aerosol iodine removal coefficient.
Containment Spray Mean Drop Diameter Upper Containment Lower Containment Fan Rooms	 609 microns 671 microns 671 microns	Reference 29 This parameter is used in the calculation of the elemental iodine spray removal coefficient.
Elemental Iodine Spray Removal Coefficient	20 hr-1, with a total decontamination factor of 200	Reference 4, Section III.4.C.i
Time that Total Elemental decontamination factor reaches 200	2 hours	Reference 20 Output of RADTRAD computer run.
Aerosol Spray Removal Coefficient Upper Containment Lower Containment Fan Rooms	 5.06 hour-1 6.65 hour-1 3.03 hour-1	Reference 20 The coefficients are calculated using the volumes provided above.
Time that Total Aerosol DF reaches 50	2.32 hours	Reference 20 Output of RADTRAD computer run.

Table 2: LOCA Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
Organic Iodine Spray Removal	None	Reference 4 Reference 4 states that it is conservative to assume that organic iodides are not removed by either spray or wall deposition.
Natural Deposition	Elemental, Organic Iodine – None	Not credited.
	Aerosols - 0.1 hr-1 in unsprayed regions only	Reference 5
Containment Leakage Rate 0 to 24 hours 24 hours to 30 days	 0.18 %/day 0.09 %/day	Reference 1 (proposed change to TS)
Containment Leakage Filtration	0%	Not credited.
Engineered Safety Feature (ESF) Leakage to the Auxiliary Building		
Iodine Chemical Form	0% aerosol, 97% elemental, 3% organic	Reference 2, Appendix A, Section 5.6
Containment Sump Volume	50,955 ft^3	Reference 29 This value represents the minimum sump volume at the time of switchover to recirculation, which conservatively maximizes the radionuclide concentration for the ESF leakage outside of containment.
Emergency Core Cooling System Recirculation Start Time	1388.4 seconds	Reference 47 A minimum switchover time increases the amount of ESF leakage outside containment.
ESF Leakage Flow Rate	0.2 gpm (two times the allowable value)	Reference 12 Per Reference 2, Appendix A, Section 5.2, this value represents double the allowable value of 0.1 gpm from the CNP Leakage Monitoring Program.
ESF Leakage Flashing Fraction	10%	Reference 2
Auxiliary Building Ventilation Filtration	0%	Not credited.
ESF Leakage to the Refueling Water Storage Tank (Not Explicitly Modeled in Current Licensing Basis)		

Table 3: FHA Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
Iodine Chemical Form	0% aerosol, 99.85% elemental, 0.15% organic	Reference 2, Appendix B, Section 2
Number of Fuel Assemblies Damaged	1	Reference 2
Percentage of Fuel Rods Failed	100%	Reference 8, Section 14.2.1.4
No. of rods exceeding 6.3 kilowatts per foot (kw/ft) above 54 GWD/MTU	150	Reference 19 Assumed value to provide margin for future core designs (conservative assumption).
High burnup multiplier applied to gap fractions	2	Reference 56 The high burnup adjustment involves doubling the gap inventory of all of the rods in the affected assembly. Since all of the rods in the dropped assembly are assumed to fail, the entire source term for this event is increased by a factor of two.
Water Level Above Damaged Fuel	23 feet	Reference 6, Sections 3.7.14 and 3.9.6
Pool Decontamination Factors	Elemental - 285 Organic - 1.0	References 2 and 58
Delay Before Fuel Movement	120 hours	Reference 7 TRO 8.9.2 states that the reactor shall be subcritical for at least 120 hours prior to the movement of irradiated fuel assemblies.
Containment Release Filtration	0%	Not credited.
Fuel Handling Area Exhaust Ventilation Filtration	Aerosol - 98.01% Elemental - 89.1% Organic - 89.1%	References 3 and 6 The maximum allowable methyl iodide penetration is 5% from Reference 6. This corresponds to a filter efficiency of 90% for elemental iodine and organic iodide per Reference 3. The HEPA filter efficiency is 99% for radioactive particulates per Reference 6. The filter efficiencies are adjusted to account for the HEPA removal efficiency requirement from Section 5.5.9 (1% adjustment for bypass).

Table 4: MSLB Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
Maximum Pre-Accident Iodine Spike Concentration	60 µCi/gm Dose Equivalent I-131	Reference 6, Section 3.4.16
Concurrent Iodine Spike Appearance Rate	500x Equilibrium	Reference 2
Initial Steam Generator Iodine Source Term	0.1 µCi/gm Dose Equivalent I-131	Reference 6, Section 3.7.17
Iodine Chemical Form	0% aerosol, 97% elemental, 3% organic	Reference 2, Appendix E, Section 4
Percentage of Fuel Rods Failed	0%	References 38 and 39 Sufficient DNB margin exists to prevent fuel failures for this event.

Table 4: MSLB Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
Reactor Coolant System (RCS) Mass	466,141.5 pounds-mass (lbm)	References 23 and 44 The Reference 44 information was provided by Westinghouse Electric Company (WEC) during replacement of the CNP Unit 1 steam generators (SG(s)). The modification document for the SG replacement is identified in Reference 51. Section 4.1 of Reference 52 provides further information on calculation of this value.
SG Secondary Liquid Mass	97,515.7 lbm/SG 161,000 lbm/SG	Reference 34 The SG secondary liquid mass values are obtained from the steam release calculation documented in Reference 34. This calculation was performed for CNP as part of the CR habitability AST LAR approved via Reference 50 in 2002. Section 4.3 of Reference 52 provides further information on these values.
Intact SG Steam Release	0 - 2 hours: 456,000 lbm 2 - 8 hours: 1,186,000 lbm 8 - 24 hours: 1,347,000 lbm	Reference 34 The intact SG steam release values are obtained from the steam release calculation documented in Reference 34. This calculation was performed for CNP as part of the CR habitability AST LAR approved via Reference 50 in 2002.
Primary-Secondary Leak Rate	0.25 gpm to each SG	Reference 1 (proposed change to TS)
Density Used for Leakage Volume-to-Mass Conversion	62.3 lbm/ft^3	References 2, 13, and 19 RG 1.183, Appendix E, Section 5.2 requires that the density used in converting volumetric leak rates to mass leak rates be consistent with the surveillance tests and facility instrumentation used to show compliance with leak rate technical specifications. Per Reference 13 the required fluid conditions for reported RCS leakage by the reactor coolant leak rate monitoring program is 70°F. At atmospheric pressure, the corresponding fluid density is 62.30 lbm/ft^3.
Duration of Intact SG Tube Uncovery After Reactor Trip	40 minutes	References 19 and 42 This value was derived from simulator data representing a Unit 1 post-SGTR transient with applicable operator actions. CNP's simulator is certified to Reference 53. From the simulator data it was shown that the intact SGs return to their initial levels at approximately 20 minutes following a reactor trip. A tube recovery time of 40 minutes is utilized to bound both units.

Table 4: MSLB Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
Tube Leakage Flashing Fraction During Uncovery	0-60 seconds: 16% 60- 300 seconds: 6% 300-1200 seconds: 5% 1200 seconds-40 min: 4%	References 19 and 42 Reference 24 This information is derived from plant simulator data and actual plant post-trip data. A discussion of how these values were derived is provided in Section 4.6 of Reference 52.
Time to Cool RCS to 212F	24 hours	Reference 46 This is an assumed value with the Reference 46 calculation providing confidence in the assumption. The Reference 46 calculation performed to support CNP's ultimate heat sink (UHS) program, which utilizes conservative assumptions including UHS temperature of 90.1°F, shows that a temperature of 212°F is reached at approximately 24 hours.
Intact SG Iodine Partition Coefficient	Unflashed Leakage - 100 Flashed Leakage - 0	Reference 2, Appendix E, Section 5.5.4
Intact SG Moisture Carryover Fraction	0.2% (Particulate Partition Coefficient = 500)	Reference 49, Section 8.2.1, Unit 1 Reference 45, Unit 2 SG moisture carryover fractions for Unit 1 and Unit 2 conservatively increased to 0.2% for use in the analysis to bound both units.

Table 5: SGTR Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
Maximum Pre-Accident Iodine Spike Concentration	60 µCi/gm Dose Equivalent I-131	Reference 6, Section 3.4.16
Concurrent Iodine Spike Appearance Rate	335x Equilibrium	Reference 2
Initial SG Iodine Source Term	0.1 µCi/gm Dose Equivalent I-131	Reference 6, Section 3.7.17
Iodine Chemical Form	0% aerosol, 97% elemental, 3% organic	Reference 2
Percentage of Fuel Rods Failed	0%	References 38 and 39 Sufficient DNB margin exists to prevent fuel failures for this event.
RCS Mass	466,141.5 lbm	References 24 and 44 The Reference 44 information was provided by WEC during replacement of the CNP Unit 1 SGs. The modification document for the SG replacement is identified in Reference 51. Section 4.1 of Reference 52 provides further information on calculation of this value.

Table 5: SGTR Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
SG Secondary Liquid Mass	97,515.7 lbm/SG 161,000 lbm/SG	Reference 34 The SG secondary liquid mass values are obtained from the steam release calculation documented in Reference 34. This calculation was performed for CNP as part of the CR habitability AST LAR approved via Reference 50 in 2002. Section 4.3 of Reference 52 provides further information on these values.
Intact SG Steam Release	0 - 30 min: 198,515 lbm 30 min - 2 hours: 314,432 lbm 2 - 8 hours: 1,367,475 lbm 8 - 24 hours: 1,347,000 lbm	Reference 35 The intact SG steam release values are obtained from the SGTR thrust (TH) calculation documented in Reference 35. This calculation was performed for CNP as part of the CR habitability AST LAR approved via Reference 50 in 2002. Section 5.2.1 of Reference 52 provides further information on these values.
Ruptured SG Steam Release	0-30 min. - 66,171lbm	Reference 35 The ruptured SG steam release values are obtained from the SGTR TH calculation documented in Reference 35. This calculation was performed for CNP as part of the CR habitability AST LAR approved via Reference 50 in 2002. Section 5.2.2 of Reference 52 provides further information on these values.
Pre-Trip Total Steam Flow Rate Through Condenser	17,153,800 lbm/hr	References 8 and 40
Time of Reactor Trip	101 seconds	Reference 33 This value was taken from a supporting calculation, Reference 33, to address SGTR overfill (Reference 55). Section 5.2.4 of Reference 52 provides further information about this value.
Primary-Secondary Leak Rate	0.25 gpm to each steam generator	Reference 1 (proposed change to TS)
Density Used for Leakage Volume-to-Mass Conversion	62.3 lbm/ft^3	Reference 2 Reference 13 RG 1.183, Appendix E, Section 5.2 requires that the density used in converting volumetric leak rates to mass leak rates be consistent with the surveillance tests and facility instrumentation used to show compliance with leak rate technical specifications. Per Reference 13 the required fluid conditions for reported RCS leakage by the reactor coolant leak rate monitoring program is 70°F. At atmospheric pressure, the corresponding fluid density is 62.30 lbm/ft^3.

Table 5: SGTR Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
Ruptured Tube Break Flow	146,704 lbm	Reference 35 The ruptured tube break flow value was obtained from the SGTR TH calculation documented in Reference 35. This calculation was performed for CNP as part of the CR habitability AST LAR approved via Reference 50 in 2002. Section 5.2.5 of Reference 52 provides further information on this value.
Duration of Ruptured Tube Break Flow	30 minutes	Reference 35 This value is taken from the SGTR TH calculation documented in Reference 35. This calculation was performed for CNP as part of the CR habitability AST LAR approved via Reference 50 in 2002.
Break Flow Flashing Fraction	Pre-Trip: 16% Post Trip: 0-60 seconds: 16% 60-300 seconds: 6% 300-1200 seconds: 5% 1200 seconds-30 min: 4%	References 19 and 42 Reference 24 This information is derived from plant simulator data and actual plant post-trip data. A discussion of how these values were derived is provided in Section 4.6 of Reference 52.
Duration of Intact SG Tube Uncovery After Reactor Trip	40 minutes	References 19 and 42 This value was derived from simulator data representing a Unit 1 post-SGTR transient with applicable operator actions. CNP's simulator is certified to Reference 53. From the simulator data it was shown that the intact SGs return to their initial levels at approximately 20 minutes following a reactor trip. A tube recovery time of 40 minutes is utilized to bound both units.
Tube Leakage Flashing Fraction During Uncovery	0-60 seconds: 16% 60- 300 seconds: 6% 300-1200 seconds: 5% 1200 seconds-40 min: 4%	References 19and 42 Reference 24 This information is derived from plant simulator data and actual plant post-trip data. A discussion of how these values were derived is provided in Section 4.6 of Reference 52.
Time to Cool RCS to 212°F	24 hours	Reference 46 This is an assumed value with the Reference 46 calculation providing confidence in the assumption. The Reference 46 calculation performed to support CNP's UHS program, which utilizes conservative assumptions including an UHS temperature of 90.1°F, shows that a temperature of 212°F is reached at approximately 24 hours.
SG Iodine Partition Coefficient	Unflashed Leakage - 100 Flashed Leakage - 0	Reference 2, Appendix E, Section 5.5.4
Condenser Partition Coefficient	100	Reference 35, Section 6.3.4

Table 5: SGTR Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
Intact SG Moisture Carryover Fraction	0.2% (Particulate Partition Coefficient = 500)	Reference 49, Section 8.2.1, Unit 1 Reference 45, Unit 2 SG moisture carryover fractions for Unit 1 and Unit 2 conservatively increased to 0.2% for use in the analysis to bound both units.

Table 6: LRA Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
Fuel Rod Gap Fractions	I-131 - 0.08 Kr-85 - 0.10 Other Noble Gases - 0.05 Other Halogens - 0.05 Alkali Metals - 0.12	Reference 2
Percentage of Fuel Rods Failed	11%	Reference 8 (U2), Section 14.1.6.2.2.8
Fuel Rod Peaking Factor	1.65	References 9 and 54 This value was conservatively chosen to bound both units.
No. of rods exceeding 6.3 kw/ft above 54 GWD/MTU	150 rods in two assemblies	Reference 19 Assumed value to provide margin for future core designs (conservative assumption).
High burnup multiplier applied to gap fractions	1.0104	Reference 22 This value is calculated using the high burnup core fraction (2 assemblies/193 assemblies = 0.0104) and doubling the gap fractions for this portion of the core.
Initial SG Iodine Source Term	0.1 µCi/gm Dose Equivalent I-131	Reference 6, Section 3.7.17
Iodine Chemical Form	0% aerosol, 97% elemental, 3% organic	Reference 2
RCS Mass	466,141.5 lbm	References 22 and 44 The Reference 44 information was provided by WEC during replacement of CNP Unit 1 SGs. The modification document for the SG replacement is identified in Reference 51. Section 4.1 of Reference 52 provides further information on calculation of this value.

Table 6: LRA Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
SG Secondary Liquid Mass	97,515.7 lbm/SG 161,000 lbm/SG	Reference 34 The SG secondary liquid mass values are obtained from the steam release calculation documented in Reference 34. This calculation was performed for CNP as part of the CR habitability AST LAR approved via Reference 50 in 2002. Section 4.3 of Reference 52 provides further information on these values.
Primary-Secondary Leak Rate	0.25 gpm to each SG	Reference 1 (proposed change to TS)
Density Used for Leakage Volume-to-Mass Conversion	62.3 lbm/ft^3	References 2, 13, and 19 RG 1.183, Appendix E, Section 5.2 requires that the density used in converting volumetric leak rates to mass leak rates be consistent with the surveillance tests and facility instrumentation used to show compliance with leak rate TS. Per Reference 13 the required fluid conditions for reported RCS leakage by the reactor coolant leak rate monitoring program is 70°F. At atmospheric pressure, the corresponding fluid density is 62.30 lbm/ft^3.
Secondary Steam Release	0 - 2 hours: 460,000 lbm 2 - 8 hours: 1,256,000 lbm 8 - 24 hours: 1,347,000 lbm	Reference 34 The secondary steam release values are obtained from the steam release calculation documented in Reference 34. This calculation was performed for CNP as part of the CR habitability AST LAR approved via Reference 50 in 2002.
Time to Cool RCS to 212°F	24 hours	Reference 46 This is an assumed value with the Reference 46 calculation providing confidence in the assumption. The Reference 46 calculation performed to support CNP's UHS program, which utilizes conservative assumptions including a UHS temperature of 90.1°F, shows that a temperature of 212°F is reached at approximately 24 hours.

Table 6: LRA Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
Duration of SG Tube Uncovery Following Reactor Trip	40 minutes	References 19 and 42 This value was derived from simulator data representing a Unit 1 post-SGTR transient with applicable operator actions. CNP's simulator is certified to Reference 53. From the simulator data it was shown that the intact SGs return to their initial levels at approximately 20 minutes following a reactor trip. A tube recovery time of 40 minutes is utilized to bound both units.
Intact Tube Leakage Flashing Fraction During Uncovery	0-60 seconds: 16% 60- 300 seconds: 6% 300-1200 seconds: 5% 1200 seconds-40 min: 4%	References 19 and 42 Reference 24 This information is derived from plant simulator data and actual plant post-trip data. A discussion of how these values were derived is provided in Section 4.6 of Reference 52.
SG Iodine Partition Coefficient	Unflashed Leakage - 100 Flashed Leakage - 0	Reference 2
SG Moisture Carryover Fraction	0.2% (Particulate Partition Coefficient = 500)	Reference 49, Section 8.2.1, Unit 1 Reference 45, Unit 2 SG moisture carryover fractions for Unit 1 and Unit 2 conservatively increased to 0.2% for use in the analysis to bound both units.

Table 7: CRE Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
Fuel Rod Gap Fractions	Noble Gases - 0.10 Other Halogens - 0.10 Alkali Metals - 0.12	Reference 2
Percentage of Fuel Rods Failed	10%	References 36 and 37
Percentage of Fuel That Experiences Melting	0.25%	References 36 and 37 Reference 2
No. of rods exceeding 6.3 kw/ft above 54 GWD/MTU	150 rods in two assemblies	Reference 19 Assumed value to provide margin for future core designs (conservative assumption).
High burnup multiplier applied to gap fractions	1.0104	Reference 25 This value is calculated using the high burnup core fraction (2 assemblies/193 assemblies = 0.0104) and doubling the gap fractions for this portion of the core.
Fuel Rod Peaking Factor	1.65	References 9 and 54 This value was conservatively chosen to bound both units.
Initial SG Iodine Source Term	0.1 µCi/gm Dose Equivalent I-131	Reference 6, Section 3.7.17

Table 7: CRE Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
Iodine Chemical Form - Secondary Release	0% aerosol, 97% elemental, 3% organic	Reference 2
Iodine Chemical Form - Containment Release	95% aerosol, 4.85% elemental, 0.15% organic	Reference 2
Containment Volume	1,066,352 ft^3	Reference 28 This value represents the sum of the upper containment (sprayed/unsprayed), lower containment (sprayed/unsprayed), lower containment fan room (sprayed), ice condenser (unsprayed), and lower containment dead-ended (unsprayed) volumes.
Containment Leakage Rate 0 to 24 hours 24 hours to 30 days	 0.18 %/day 0.09 %/day	Reference 1 (proposed change to TS)
Containment Leakage Filtration	0%	Not credited.
Natural Deposition in Containment	Element Iodine - None	Not credited.
	Aerosols - 0.1 hr-1 after 24 hours	Reference 5
Iodine/Particulate Removal by Containment Sprays	None	Not credited.
RCS Mass	466,141.5 lbm	References 25 and 44 The Reference 44 information was provided by WEC during replacement of the CNP Unit 1 SGs. The modification document for the SG replacement is identified in Reference 51. Section 4.1 of Reference 52 provides further information on calculation of this value.
SG Secondary Liquid Mass	97,515.7 lbm/SG 161,000 lbm/SG	Reference 34 The SG secondary liquid mass values are obtained from the steam release calculation documented in Reference 34. This calculation was performed for CNP as part of the CR habitability AST LAR approved via Reference 50 in 2002. Section 4.3 of Reference 52 provides further information on these values.
Primary-Secondary Leak Rate	0.25 gpm to each SG	Reference 1 (proposed change to TS)
Density Used for Leakage Volume-to-Mass Conversion	62.3 lbm/ft^3	References 2, 13, and 19 RG 1.183, Appendix E, Section 5.2 requires that the density used in converting volumetric leak rates to mass leak rates be consistent with the surveillance tests and facility instrumentation used to show compliance with

Table 7: CRE Inputs and Assumptions		
Input/Assumption	**New AST Value**	**Reference and/or Additional Comments**
		leak rate TS. Per Reference 13 the required fluid conditions for reported RCS leakage by the reactor coolant leak rate monitoring program is 70°F. At atmospheric pressure, the corresponding fluid density is 62.30 lbm/ft^3.
Secondary Steam Release	0 - 2 hours: 460,000 lbm 2 - 8 hours: 1,256,000 lbm 8 - 24 hours: 1,347,000 lbm	Reference 34 The secondary steam release values are obtained from the steam release calculation documented in Reference 34. This calculation was performed for CNP as part of the CR habitability AST LAR approved via Reference 50 in 2002. Section 5.4 of Reference 52 provides further information on these values.
Time to Cool RCS to 212°F	24 hours	Reference 46 This is an assumed value with the Reference 46 calculation providing confidence in the assumption. The Reference 46 calculation performed to support CNP's UHS program, which utilizes conservative assumptions including a UHS temperature of 90.1°F, shows that a temperature of 212°F is reached at approximately 24 hours.
Duration of SG Tube Uncovery Following Reactor Trip	40 minutes	References 19 and 42 This value was derived from simulator data representing a Unit 1 post-SGTR transient with applicable operator actions. CNP's simulator is certified to Reference 53. From the simulator data it was shown that the intact SGs return to their initial levels at approximately 20 minutes following a reactor trip. A tube recovery time of 40 minutes is utilized to bound both units.
Tube Leakage Flashing Fraction During Uncovery	0-60 seconds: 16% 60- 300 seconds: 6% 300-1200 seconds: 5% 1200 seconds-40 min: 4%	References 19and 42 Reference 24 This information is derived from plant simulator data and actual plant post-trip data. A discussion of how these values were derived is provided in Section 4.6 of Reference 52.
SG Iodine Partition Coefficient	Unflashed Leakage - 100 Flashed Leakage - 0	Reference 2, Appendix E, Section 5.5.4
SG Moisture Carryover Fraction	0.2% (Particulate Partition Coefficient = 500)	Reference 49, Section 8.2.1, Unit 1 Reference 45, Unit 2 SG moisture carryover fractions for Unit 1 and Unit 2 conservatively increased to 0.2% for use in the analysis to bound both units.

Table 8: WGDT Inputs and Assumptions		
Input/Assumption	**New Analytical Value**	**Reference and/or Additional Comments**
RCS Mass	275,460,950 gm	References 21 and 44 The Reference 44 information was provided by WEC during replacement of the CNP Unit 1 SGs. The modification document for the SG replacement is identified in Reference 51. Section 4.2 of Reference 52 provides further information on calculation of this value.
Tank Volume	500 ft^3	Reference 21 Arbitrarily chosen volume modeled such that 100% of the tank volume is released instantaneously.
Tank Release Rate	1,000,000 cfm	Reference 21 Conservatively high flow rate is used to model the complete and instantaneous release of all of the activity in the WGDT.

Table 9: VCT Inputs and Assumptions		
Input/Assumption	**New Analytical Value**	**Reference and/or Additional Comments**
RCS Mass	275,460,950 gm	References 26 and 44 The Reference 44 information was provided by WEC during replacement of the CNP Unit 1 SG. The modification document for the SG replacement is identified in Reference 51. Section 4.2 of Reference 52 provides further information on calculation of this value.
Tank Volume Liquid Volume	267 ft^3	Reference 48
Tank Volume Vapor Volume	500 ft^3	Reference 26 Arbitrarily chosen volume modeled such that 100% of the tank volume is released instantaneously.
VCT Release Rate	1,000,000 cfm	Reference 26 Conservatively high flow rate is used to model the complete and instantaneous release of all of the activity in the VCT.
Letdown Flow Rate	132 gpm	References 8 and 19 This value is increased by 10% from the source documentation for conservatism.
Letdown Isolation Time	15 minutes	Reference 8, Section 14.2.3.1

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24. Calculation RWA-1313-011, Rev. 0, "Cook Nuclear Plant Steam Generator Tube Rupture AST Radiological Analysis," July 2014.

25. Calculation RWA-1313-012, Rev. 0, "Cook Nuclear Plant Control Rod Ejection AST Radiological Analysis," July 2014.

26. Calculation RWA-1313-013, Rev. 0, "Cook Nuclear Plant VCT Radiological Analysis as Part of AST Methodology Implementation," July 2014.

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