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RS-05-111

10 CFR 50.90

August 19, 2005

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

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Additional Information Supporting the Request for License Amendment Related to Application of Alternative Source Term

References:

1. Letter from Michael J. Pacilio (AmerGen Energy Company, LLC) to U. S. NRC, "Request for License Amendment Related to Application of Alternative Source Term," dated April 3, 2003
2. Letter from Keith R. Jury (AmerGen Energy Company, LLC) to U. S. NRC, "Additional Information Supporting the Request for License Amendment Related to Application of the Alternative Source Term," dated December 23, 2003
3. Letter from Keith R. Jury (AmerGen Energy Company, LLC) to U. S. NRC, "Additional Information Supporting the Request for License Amendment Related to Application of Alternative Source Term," dated December 9, 2004
4. Letter from Keith R. Jury (AmerGen Energy Company, LLC) to U. S. NRC, "Additional Information Supporting the Request for License Amendment Related to Application of Alternative Source Term," dated December 17, 2004
5. Letter from Keith R. Jury (AmerGen Energy Company, LLC) to U. S. NRC, "Additional Information Supporting the Request for License Amendment Related to Application of the Alternative Source Term," dated March 30, 2005
6. Letter from Kahtan N. Jabbour (U. S. NRC) to Christopher M. Crane (AmerGen Energy Company, LLC), "Clinton Power Station, Unit 1 – Request for Additional Information Re: Application of Alternative Source Term Methodology (TAC No. MB8365)," dated July 26, 2005

A001

In Reference 1, AmerGen Energy Company, LLC (AmerGen) submitted a request for a change to Appendix A, Technical Specifications (TS), of Facility Operating License No. NPF-62 for Clinton Power Station (CPS). Specifically, the proposed change is requested to support application of an alternative source term (AST) methodology, in accordance with 10 CFR 50.67, "Accident source term," with the exception that Technical Information Document (TID) 14844, "Calculation of Distance Factors for Power and Test Reactor Sites," will continue to be used as the radiation dose basis for equipment qualification. AmerGen provided additional information in References 2, 3, 4, and 5 to support the NRC's review of the proposed change.

In Reference 6, the NRC requested additional information that is needed to complete review of the proposed change. These requests were concerned with the AmerGen use of the deposition methodology from AEB-98-03, "Assessment of Radiological Consequences for the Perry Pilot Plant Application Using the Revised (NUREG-1465) Source Term." The NRC believes this methodology was nonconservative. Therefore, to resolve the NRC concern with the deposition methodology, AmerGen has revised the Loss of Coolant Accident (LOCA) analysis. Attachment 1 to this letter provides the requested information. In addition, the Main Steam Line Break accident analysis has been revised to provide additional margin and to address cesium releases. Copies of the revised calculations are provided on the enclosed CD-ROM.

AmerGen has developed a set of tables documenting the changes in parameters and methods used in each version of the supporting calculations. These tables are provided as Attachment 2. A summary of the revised analysis results is also included in Attachment 2. The tables provided in Attachment 2 to this letter supersede Tables 1 through 14 provided in Attachment 2 to Reference 1.

A number of assumptions in the analyses were revised to support the LOCA reanalysis. As a result of these changes, it is necessary to revise two of the proposed TS changes identified in Reference 1. The proposed main steam isolation valve leakage has been revised to assume a total leakage of 200 standard cubic feet per hour (scfh) as opposed to the originally proposed total leakage of 250 scfh. In addition, AmerGen has decided to withdraw the proposed changes to TS Section 5.5.7, "Ventilation Filter Testing Program (VFTP)," paragraph c. These changes would have revised the allowed methyl iodide penetration value for the laboratory testing of the ESF ventilation systems filters. The revised markups reflecting the change to the total MSIV leakage is provided in Attachment 3. The retyped TS page is provided in Attachment 4. The markup of the associated Bases page is provided in Attachment 5 for information only. These pages will supersede the pages provided in Reference 1.

There are no regulatory commitments contained in this letter.

AmerGen has reviewed the information supporting a finding of no significant hazards consideration that was previously provided to the NRC in Reference 1. The supplemental information provided in this submittal does not affect the bases for concluding that the proposed license amendment does not involve a significant hazards consideration.

If you have any questions concerning this letter, please contact Mr. Timothy A. Byam at (630) 657-2804.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 19th day of August 2005.

Respectfully,

Keith R. Jury

Keith R. Jury
Director – Licensing and Regulatory Affairs

Attachments:
1. Response to Request for Additional Information
2. Clinton Power Station (CPS) Plant Parameters Tables
3. Markup of Proposed Technical Specifications Page
4. Retyped Technical Specifications Page
5. Markup of Proposed Technical Specification Bases Page

Enclosure: CD-ROM Containing Calculation C-020, Revision 3 and Calculation C-023, Revision 1

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Clinton Power Station
Illinois Emergency Management Agency – Division of Nuclear Safety

NRC Request 1

Clinton's use of the main steam line aerosol deposition methodology from AEB-98-03, "Assessment of Radiological Consequences for the Perry Pilot Plant Application Using the Revised (NUREG-1465) Source Term," appears to be non-conservative. Please address the following concerns:

a. AEB-98-03 modeling assumed 2 removal nodes in each of the unbroken steam lines, with each segment well-mixed. The broken steam line was modeled as one segment (removal node). Clinton extrapolates use of the AEB-98-03 methodology by modeling main steam line deposition in 3 nodes, using the same 50^{th} percentile deposition rate value (deposition velocity) in each node. The staff thinks that this use overestimates the deposition in the later nodes. The model currently used by Clinton assumes the same rate of deposition in each node which is ultimately based on a particle size distribution that has not undergone any change through deposition in upstream nodes. In other words, the removal of the larger, more quickly and easily deposited aerosols would change the size distribution of aerosols in the piping in later piping segments. These later piping segments would be expected to have a higher concentration of smaller aerosols that would be less likely to be deposited, and the deposition velocity in these segments (modeled as removal nodes) should be reduced to reflect this change. Please discuss whether your aerosol deposition model accounts for or otherwise addresses this change in the aerosol size distribution due to deposition in upstream piping.

b. The calculated aerosol removal rate increases over time (as indicated in the licensee's spreadsheet calculation of equivalent aerosol filter efficiency in Appendix A of the March 30, 2005 submittal), where the staff would expect the removal rate to decrease over time because most of the easily deposited aerosols have already been deposited in previous time periods. Please discuss whether your aerosol deposition model accounts for or otherwise addresses this change in the aerosol size distribution over time due to deposition.

c. Half of the pipe circumference was multiplied by the pipe segment length to estimate the aerosol settling area. This formulation appears to include essentially vertical sections of pipe in the settling area, and thus may be non-conservative. Please discuss the effect of including vertical sections, if any, in the estimated aerosol settling area and the resultant effect on aerosol removal.

Response to Request 1

1.a The aerosol deposition model now accounts for or otherwise addresses the change in the aerosol size distribution due to deposition in upstream piping. The detailed description of the aerosol deposition treatment can be found in calculation C-020 Revision 3, section 5.4.6.

1.b AmerGen believes that the conservatisms in the LOCA calculation bound the effects of changes in the deposition rate during the first 24 hours. However, AmerGen has reevaluated the assumption of aerosol deposition and has decided to no longer take any credit for deposition after 24 hours. Calculation C-020 Revision 3, section 5.4.6 includes further details on the aerosol size distribution over time due to deposition.

1.c AmerGen has revised the LOCA analysis such that the conservative approach of the projected area of the horizontal pipe (i.e., Length x Diameter) is now used as the settling area as discussed in calculation C-020 Revision 3, section 5.4.6.

NRC Request 2

Please address these further considerations with respect to the modeling of main steam line deposition:

a. What is the effect of the decay heat from deposited material in the main steam piping with respect to iodine re-evolution?

b. The report on which the elemental iodine deposition rate was based ("MSIV Leakage Iodine Transport Analysis," J.E. Cline, August 20, 1990) also includes resuspension and conversion. Have you considered the effect of resuspension and conversion on the elemental iodine deposition rate?

c. Does the pipe wall temperature used in elemental iodine deposition modeling account for the decay heat of the deposited material in the pipe? How would this additional source of heat affect the deposition assumed?

Response to Request 2

2.a The effect of the decay heat from deposited material in the main steam piping with respect to iodine re-evolution has been evaluated. The decay heat added to the piping is calculated to be less than 80 watts and has no significant effect on re-evolution. The description of this evaluation can be found in calculation C-020 Revision 3, Attachment H.

2.b The effect of resuspension of elemental iodine and the associated conversion to organic iodine is now considered. The description of this treatment can be found in calculation C-020, Revision 3 in Section 5.4.6.2.

2.c The effect of the decay heat from deposited material in the main steam piping with respect to iodine deposition has been evaluated. The decay heat added to the piping is calculated to be less than 80 watts and has no significant effect on deposition or pipe wall temperature. The description of this treatment can be found in calculation C-020, Revision 3 in Attachment H.

NRC Request 3

By licensee letter (RS-03-239), dated December 23, 2003, in response to NRC staff's Question 9, it was stated that the LOCA analysis would no longer credit a 50 percent reduction in the feedwater isolation valve (FWIV) leak rate after 24 hours. The correction would be noted in Table 4, "Key LOCA Analysis Inputs and Assumptions" when a revised analysis would be subsequently submitted. The revised analysis was submitted by licensee letter (RS-05-033), dated March 30, 2005. In revised Table 4, the 50 percent reduction in FWIV leak rate after 24 hours does not appear to have changed. Is this assumption used in the revised LOCA analysis?

Response to Request 3

The LOCA analysis was previously revised as indicated. However, due to an oversight the notation in Table 4 regarding the 50% reduction in FWIV leak rate after 24 hours was not changed. The correct value for this parameter is reflected in the parameter table provided in Attachment 2. These parameter tables supersede Tables 1 through 14 provided in Attachment 2 to the original amendment request (Reference 1).

NRC Request 4

The staff understands how the new filter penetrations requested in the submittal were developed. However, the staff requests that the licensee provide technical data and information to show that the filter, if they were tested and used in the degraded state, would provide satisfactory performance for the entire surveillance period and be sufficiently capable of mitigating an event if it were needed. The staff has reasonable assurance that filters tested in accordance with the criteria set forth in Regulatory Guide (RG) 1.52 Revision 2 or Revision 3, which incorporated a safety factor of 2 or greater, would provide adequate performance to protect public health and safety. A number of studies and data have been developed which confirm adequate performance at the conditions specified in the RG. For penetrations that exceed the values listed in the RG, the staff has no data upon which to base degraded filter performance and thus requires this information to assess the impact on safety.

Response to Request 4

AmerGen has reevaluated the proposed changes to the filter penetrations and has decided to withdraw the request to revise these values. Therefore, AmerGen will continue to evaluate CPS filter performance against the currently existing filter penetration values specified in TS Section 5.5.7, "Ventilation Filter Testing Program (VFTP)," paragraph c.

References

1. Letter from Michael J. Pacilio (AmerGen Energy Company, LLC) to U. S. NRC, "Request for License Amendment Related to Application of Alternative Source Term," dated April 3, 2003

ATTACHMENT 2

Clinton Power Station (CPS) Plant Parameters Tables

Clinton Power Station (CPS) Plant Parameters Tables

(Includes Changes Made Since April 3, 2003 Submittal)

Table 1: Clinton General Parameters and Methods Applicable to Design Basis Accidents

General AST Analysis Parameter or Method	Currently Licensed Value or Method	Value or Method Submitted in April 3, 2003 AST Application	Final Supplemented Value or Method Used in Current AST Analysis	Justification for Change
Core Power Level	3543 MWth (current) 100% power is 3473 MWth, 102% power with RG 1.49 instrument uncertainty allowance is 3543 MWth.	3543 MWth (current) 100% power is 3473 MWth, 102% power with RG 1.49 instrument uncertainty allowance is 3543 MWth.	3543 MWth (current) 100% power is 3473 MWth, 102% power with RG 1.49 instrument uncertainty allowance is 3543 MWth.	No changes
Core Source Terms	TID-14844	**ORIGEN2-based inventory Includes the 60 isotopes in the standard RADTRAD library**	ORIGEN2-based inventory Includes the 60 isotopes in the standard RADTRAD library	Changed from currently licensed for AST No change since 04/03/03 submittal. TID-14844 continues to be used for Equipment Qualification purposes.
Dose Conversion Factors for Thyroid Inhalation, Whole Body, and TEDE Dose	Thyroid – ICRP 30 Whole Body – RG 1.109 TEDE – N/A	**Federal Guidance Reports 11 & 12 (RADTRAD input file) (TEDE only)**	Federal Guidance Reports 11 & 12 (RADTRAD input file) (TEDE only)	Changed from currently licensed for AST No change since 04/03/03 submittal
Personnel Dose Inputs Onsite Breathing Rate Offsite Breathing Rate 0 – 8 hours: 8 – 24 hours: 1 – 30 days: CR Occupancy Factors 0 – 1 day: 1 – 4 days: 4 – 30 days:	 3.47E-04 m^3/sec 3.47E-04 m^3/sec 1.75E-04 m^3/sec 2.32E-04 m^3/sec 1.0 0.6 0.4	 3.47E-04 m^3/sec 3.47E-04 m^3/sec 1.75E-04 m^3/sec 2.32E-04 m^3/sec 1.0 0.6 0.4	 3.47E-04 m^3/sec 3.47E-04 m^3/sec 1.75E-04 m^3/sec 2.32E-04 m^3/sec 1.0 0.6 0.4	No Changes
Distance to EAB	975 meters	975 meters	975 meters	No Changes
EAB Dispersion Factors 0 – 2 hr	N/A – New X/Qs needed for AST	 **2.46E-04 (sec/m^3)**	 2.46E-04 (sec/m^3)	Changed from currently licensed for AST (PAVAN used) No change since 04/03/03 submittal

Table 1: Clinton General Parameters and Methods Applicable to Design Basis Accidents

General AST Analysis Parameter or Method	Currently Licensed Value or Method	Value or Method Submitted in April 3, 2003 AST Application	Final Supplemented Value or Method Used in Current AST Analysis	Justification for Change
Distance to LPZ	4018 meters	4018 meters	4018 meters	No Changes
LPZ Dispersion Factors 0 – 8 hr 8 – 24 hr 1 – 4 day 4 – 30 day	N/A – New X/Qs needed for AST	 **(sec/m^3)** **2.48E-05** **1.65E-05** **6.81E-06** **1.91E-06**	 (sec/m^3) 2.48E-05 1.65E-05 6.81E-06 1.91E-06	Changed from currently licensed for AST (PAVAN used) No change since 04/03/03 submittal
CR Filtered Intake: Dispersion Factors 0 – 2 hr 2 – 8 hr 8 – 24 hr 1 – 4 day 4 – 30 day	N/A – New X/Qs needed for AST	 **(sec/m^3)** **2.36E-04** **1.77E-04** **7.33E-05** **5.33E-05** **4.48E-05**	 (sec/m^3) 2.36E-04 1.77E-04 7.33E-05 5.33E-05 4.48E-05	Changed from currently licensed for AST (ARCON96 used) No change since 04/03/03 submittal
CR Unfiltered Intake: Dispersion Factors 0 – 2 hr 2 – 8 hr 8 – 24 hr 1 – 4 day 4 – 30 day	New X/Qs calculated for AST	 **(sec/m^3)** **1.54E-03** **1.09E-03** **4.67E-04** **3.21E-04** **2.64E-04**	 (sec/m^3) 1.54E-03 1.09E-03 4.67E-04 3.21E-04 2.64E-04	Changed from currently licensed for AST (ARCON96 used) No changes since 04/03/03 submittal
Filtered Intake Rate – Hi-Rad Mode	3,000 cfm + 10% = 3300 cfm	3,000 cfm + 10% = 3300 cfm	**3,000 cfm - 10% = 2700 cfm Sensitivity analysis indicates the -10% uncertainty is bounding**	Supported by design basis analysis
CR Filtered in-leakage	650 cfm	650 cfm	650 cfm	No Change to TS 3.7.3.5
Control Room Filtered and Unfiltered Inleakage Control Margin Exchange Basis	N/A – New for AST	**Allowed Unfiltered Inleakage [cfm] = 786.4 - 0.2868 * (measured Filtered Inleakage) and with 5% Instrument Uncertainty** **Allowed Unfiltered**	**Conservative Unfiltered Inleakage Allowance (cfm)** **= ($I_{DF} - I_{TS+}$) * 0.32** **where:** **I_{DF} = Analyzed filtered inleakage (1100 cfm)** **I_{TS+} = Technical Specification**	Supplement dated March 30, 2005 (question #12), and further supplemented by this table. The 0.32 value corresponds to the penetration associated with the accident analysis assumption of a 70% charcoal adsorber efficiency

Table 1: Clinton General Parameters and Methods Applicable to Design Basis Accidents				
General AST Analysis Parameter or Method	**Currently Licensed Value or Method**	**Value or Method Submitted in April 3, 2003 AST Application**	**Final Supplemented Value or Method Used in Current AST Analysis**	**Justification for Change**
		Inleakage [cfm] = 747 - 0.273 * (measured Filtered Inleakage)	**3.7.3.5 limit of 650 cfm or less based on measured filtered inleakage.**	for the control room recirculation filter, combined with the TS 5.5.7.b in-place testing penetration allowance of 2%. Independent RADTRAD analyses have shown that this relationship is conservative over the range of applicability. The design basis accident analyses are run with the assumption of a filtered inleakage of 1100 cfm and no unfiltered inleakage. Filtered inleakage is now controlled to less than 650 cfm (which includes instrument uncertainty). The most recent tracer gas test showed filtered inleakage well within the TS 3.7.3.5 limit and there was no apparent unfiltered inleakage.
Unfiltered Intake Rate – Hi-Rad Mode	10 cfm	**600 cfm**	**144 cfm with maximum allowable filtered inleakage of 650 cfm. See Margin Exchange Formulation above**	Includes 10 cfm for ingress/egress. Equivalency formula provided in March 30, 2005 supplement and as modified in this supplement as supported by design basis analysis.
CR Intake Filter Efficiency	99% for all Iodines	**97% for all Iodines**	**99% for all Iodines**	Changed back to currently licensed value. Based on this change, proposed revision to TS 5.5.7c has been withdrawn.
CR Filtered Recirc Rate	61,000 cfm - 10% = 54,900 cfm	61,000 cfm - 10% = 54,900 cfm	61,000 cfm - 10% = 54,900 cfm	No Changes
CR Recirc Filter Efficiency	70% for all Iodines (currently licensed value)	70% for all Iodines (currently licensed value)	**68% for all Iodines (reduced by 2% for bypass)**	Accounts for 2% filter bypass (TS 5.5.7)

Table 1: Clinton General Parameters and Methods Applicable to Design Basis Accidents				
General AST Analysis Parameter or Method	**Currently Licensed Value or Method**	**Value or Method Submitted in April 3, 2003 AST Application**	**Final Supplemented Value or Method Used in Current AST Analysis**	**Justification for Change**
Control Room Volume	324,000 cu. ft. (includes TSC)	324,000 cu. ft. (includes TSC)	324,000 cu. ft. (includes TSC)	No Changes (TSC volume included for conservatism)
Control Room Filtered Intake and Recirculation Air Filtration Initiation Time (manual)	20 minutes During this period of no filtration and no CR pressurization, an inleakage of 1500 cfm is assumed, which is 1/2 of assumed filter makeup value required for CR pressurization.	**20 minutes During this period of no filtration and no CR pressurization, an inleakage of 1650 cfm is assumed, which is 1/2 of assumed filter makeup value used for CR pressurization.**	20 minutes During this period of no filtration and no CR pressurization, an inleakage of 1650 cfm is assumed, which is 1/2 of assumed filter makeup value used for CR pressurization.	Added 10% for uncertainty. The outside air intake isolation will occur automatically at time T = 0, with LOOP and/or single failure. This is assured by dual isolation dampers in series (to account for single failure), which fail close on loss of power and hi-rad signal. In case of a single failure of one of the emergency power sources, it is possible that manual action would be required to start one of the HVAC trains in emergency mode (i.e., the control room envelope could be unpressurized, with 0 cfm outside air intake for the first 20 minutes). 1650 cfm is used for unfiltered inleakage that might occur during the possible unpressurized condition with none of the HVAC trains operating for the first 20 minutes.

Table 2: Clinton Parameters and Methods Applicable to LOCA				
LOCA AST Analysis Parameter or Method	**Currently Licensed Value or Method**	**Value or Method Submitted in April 3, 2003 AST Application**	**Final Supplemented Value or Method Used in Current AST Analysis**	**Justification for Change**
Primary Containment Mixing	Instantaneous mixing in combined drywell and wetwell volume	**The analysis supporting the submittal used a drywell bypass leakage rate of 3,000 cfm for the first two hours, followed by an assumption of well-mixed drywell-containment conditions thereafter.**	The analysis supporting the submittal used a drywell bypass leakage rate of 3,000 cfm for the first two hours, followed by an assumption of well-mixed drywell-containment conditions thereafter.	RG 1.183 No Changes since 04/03/03 submittal
Primary Containment Leakage to Secondary Containment	Leak Rate: 0.92^*L_a = 0.598%/day from 0 to 188 seconds (Unfiltered during drawdown period) 0.92^*L_a = 0.598%/day from 188 seconds to 30 days (SGTS filtered)	Leak Rate: 0.92^*L_a = 0.598%/day from 0 **to 10 min** (Unfiltered during drawdown period) **0.92^*L_a = 0.598%/day from 10 min to 24 hrs (SGTS filtered)** **= 0.299%/day from 1 to 30 days (SGTS filtered)**	Leak Rate: 0.92^*L_a = 0.598%/day from 0 to 10 min (Unfiltered during drawdown period) 0.92^*L_a = 0.598%/day from 10 min to 24 hrs (SGTS filtered) **= 0.380%/day from 1 to 30 days** (SGTS filtered)	No Change during drawdown period. However, drawdown period changed from 188 seconds to 10 minutes as supported by analysis. No Change (10 min to 24 hours) Reduction to 50% permitted by RG 1.183 after 24 hours if justified by analysis. Further changes required (reduced to 63.6%) after re-evaluation per this supplement.
ECCS Leakage into Secondary Containment Leak Rate	No ECCS Leakage	**5 gpm (2 times the maximum allowable admin limit)**	5 gpm (2 times the maximum allowable admin limit)	Design basis analysis
Fraction Flashed	N/A	**1.36%**	**10%**	RG 1.183, Design basis analysis
Filtered by SGTS	N/A	**Yes – after drawdown**	Yes – after drawdown	No Change since 04/03/03

Table 2: Clinton Parameters and Methods Applicable to LOCA

LOCA AST Analysis Parameter or Method	Currently Licensed Value or Method	Value or Method Submitted in April 3, 2003 AST Application	Final Supplemented Value or Method Used in Current AST Analysis	Justification for Change
				submittal
Purge Penetrations 101 and 102 Leakage to the Environment	Leak Rate (for each of two penetrations): 0.01^*L_a = 0.0065%/day from 0 to 30 days (Included as part of the 0.08^*L_a value)	**Leak Rate (for each of two penetrations): 0.02^*L_a = 0.013%/day from 0 to 1 day = 0.0065%/day from 1 to 30 days**	Leak Rate (for each of two penetrations): 0.02^*L_a = 0.013%/day from 0 to 1 day **= 0.00827%/day from 1 to 30 days**	Design basis analysis per 04/03/03 submittal Reduction by a 0.636 factor based on square root of ratio of containment post-LOCA pressure at 1 day to 9 psig test pressure. This leakage to be counted against the total L_a, but not part of 0.08^*L_a limit.
Primary Containment Leak Rate (SGTS Filtered and Secondary Containment Bypass)	0.65% per day	**0.65% per day for first 24 hours (L_a); 0.325% per day thereafter**	0.65% per day for first 24 hours (L_a); **0.413% per day thereafter**	No Change (0-24 hours) Changed for AST to 50% after 24 hours per the 04/03/03 submittal. Re-evaluation determined reduction by a 0.636 factor based on square root of ratio of containment post-LOCA pressure at 1 day to 9 psig test pressure.
Total MSIV Leak Rate Limits Post-24 hours analytical values	112 scfh total in four lines	**250 scfh total for four lines 100 scfh for any one line 125 scfh total**	**200 scfh total for four lines 100 scfh for any one line 127 scfh total, 63.6 scfh for any one line**	Supported by design basis analysis calculation C-020 Changed for AST to 50% after 24 hours per the 04/03/03 submittal. Re-evaluation determined reduction by a 0.636 factor based on square root of ratio of containment post-LOCA pressure at 1 day to 9 psig test pressure.

Table 2: Clinton Parameters and Methods Applicable to LOCA				
LOCA AST Analysis Parameter or Method	**Currently Licensed Value or Method**	**Value or Method Submitted in April 3, 2003 AST Application**	**Final Supplemented Value or Method Used in Current AST Analysis**	**Justification for Change**
FWIV leak rate: Air (Containment atmosphere): Water (ECCS): Flashing Fraction:	Each of two penetrations 17.2 cfm from t = 0 to 1 hour 3 gpm from t = 0 to 30 days 1.36%	**Each of Two Penetrations** **10.98 cfm from 21.15 minutes to 1 hour** **2 gpm from 1 hour to 24 hours, 1 gpm after 24 hours** **1.36%**	**Total for two penetrations** **10.98 cfm for 1 hour (before FWIV LCS fills the lines)** **2 gpm (constant) from 0 to 30 days** **10%**	Changed per Supplement dated December 23, 2003 Question #1 (Page 6 of 11)
Primary Containment Bypassing Secondary Containment	8.0% L_a for duration of accident	**8.0% L_a for first day** **4.0% L_a after first day**	8.0% L_a for first day **5.09% L_a after first day**	No Change since 04/03/03 submittal Reduction by a 0.636 factor based on square root of ratio of containment post-LOCA pressure at 1 day to 9 psig test pressure.
Aerosol Natural Deposition Coefficients Used in the Containment	50% instantaneous plateout (RG 1.3)	**Credit is taken for natural deposition of aerosols based on equations for the Power's model in NUREG/CR 6189 and built into RADTRAD as natural deposition time dependent lambdas.** **No credit is assumed for natural deposition of elemental or organic iodine**	Credit is taken for natural deposition of aerosols based on equations for the Power's model in NUREG/CR 6189 and built into RADTRAD as natural deposition time dependent lambdas. No credit is assumed for natural deposition of elemental or organic iodine	No change since 04/03/03 submittal.
Suppression pool scrubbing	Factor of 10 for elemental and particulate	**Not credited**	Not credited	No change since 04/03/03 submittal.
Deposition/Plate-out (where credited)	None	***Calculated for horizontal segments only using RADTRAD Brockmann-Bixler model.***	**AEB 98-03 well-mixed flow is now assumed instead of plug flow.**	Supplement dated March 30, 2005 and as modified in this supplement. Refer to design analysis for details (see attached Tables 6, 7, and 8

Table 2: Clinton Parameters and Methods Applicable to LOCA

LOCA AST Analysis Parameter or Method	Currently Licensed Value or Method	Value or Method Submitted in April 3, 2003 AST Application	Final Supplemented Value or Method Used in Current AST Analysis	Justification for Change
		Aerosol settling in horizontal lines only; elemental deposition in all credited lines.	**Aerosol settling in horizontal lines only; elemental deposition in all credited lines.**	for AEB 98-03 Parameters for MSIV, FWIV, Purge lines, respectively).
Main Steam Line and Condenser Holdup Credit for MSIV Leakage	Two-hour holdup in main steam line. 100% of MSIV leakage filtered by SGTS.	**No credit is taken for holdup and plate-out downstream of seismically qualified main steam piping or in the condenser since these components have not been evaluated for seismic ruggedness.**	No credit is taken for holdup and plate-out downstream of seismically qualified main steam piping or in the condenser since these components have not been evaluated for seismic ruggedness.	No change since 04/03/03 submittal.
Releases to Containment	Instantaneous release	**No Core Activity Release for first 2 minutes. Release Fractions and Timing per RG 1.183**	No Core Activity Release for first 2 minutes. Release Fractions and Timing per RG 1.183	No change since 04/03/03 submittal.
SGTS flow rate	4000 cfm + 10% = 4400 cfm	4000 cfm + 10% = 4400 cfm	4000 cfm + 10% = 4400 cfm	No Change
Containment Mixing	Not credited	Not credited	Not credited	No Change
Natural Deposition in Containment	50% instantaneous plateout (RG 1.3)	**Powers' algorithm built into RADTRAD**	Powers' Algorithm built into RADTRAD	No change since 04/03/03 submittal.
Containment Spray Removal Mechanism	Not credited	Not credited	Not credited	No Change
Containment Volumes				
Drywell	241,699 cu. ft.	241,699 cu. ft.	241,699 cu. ft.	No Change
Containment	1,512,341 cu. ft.	1,512,341 cu. ft.	1,512,341 cu. ft.	No Change
Primary Containment Total (where applicable)	1.754E+06 cu. ft.	1.754E+06 cu. ft.	1.754E+06 cu. ft.	No Change
Minimum Suppression Pool volume	146,400 ft^3	146,400 ft^3	146,400 ft^3	No Change
LOCA Break Location Assumed	Recirc suction line (largest pipe causes the quickest	Recirc suction line (largest pipe causes the quickest loss	**A main steam line is now assumed to break just before**	Supplement dated March 30, 2005 Response to Question #1, Page 8

Table 2: Clinton Parameters and Methods Applicable to LOCA

LOCA AST Analysis Parameter or Method	Currently Licensed Value or Method	Value or Method Submitted in April 3, 2003 AST Application	Final Supplemented Value or Method Used in Current AST Analysis	Justification for Change
	loss of reactor coolant)	of reactor coolant)	**the inboard MSIV to minimize deposition credit.**	of 11
MSIV Leakage Rate Distribution	112 scfh total for all four steam lines	**100 scfh for two shortest lines and 50 scfh for the third, totaling 250 scfh total allowable leakage**	**100 scfh for two shortest lines totaling 200 scfh total allowable leakage**	Design analysis
Fraction of Containment Leakage that Bypasses SGTS	100% for first 188 seconds, 8% for 188 seconds to 30 days	**100% for first 10 minutes, 8% 10 minutes to 30 days**	100% for first 10 minutes, 8% 10 minutes to 30 days	No change since 04/03/03 submittal.
Secondary Containment Drawdown Time	188 seconds	**10 minutes (+ 2 minutes during gap release phase)**	10 minutes (+ 2 minutes during gap release phase)	Supported by design basis analysis
SGTS Iodine Efficiency	99%	**97%**	**99%**	Changed back to currently licensed value. Based on this change, proposed revision to TS 5.5.7c has been withdrawn.

Table 3: Clinton Parameters and Methods Applicable to Suppression Pool pH Transient Analysis				
Suppression Pool pH Transient AST Analysis Parameter or Method	**Currently Licensed Value or Method**	**Value or Method Submitted in April 3, 2003 AST Application**	**Final Supplemented Value or Method Used in Current AST Analysis**	**Justification for Change**
Hydriodic acid addition	N/A – Not required for TID-14844	**5% of core iodine inventory, released at a constant rate over the release accident**	5% of core iodine inventory, released at a constant rate over the release accident	No change since 04/03/03 submittal.
Nitric Acid production from irradiation of water and air during accident	N/A – Not required for TID-14844	**As per Grand Gulf 12/22/00 letter to NRC**	As per Grand Gulf 12/22/00 letter to NRC	No change since 04/03/03 submittal.
Hydrochloric Acid addition by radiolysis of exposed chloride-bearing materials inside containment during accident (addition by pyrolysis will not be considered as temperatures near 572 F are required)	N/A – Not required for TID-14844	**As per Grand Gulf 12/22/00 letter to NRC, with AST-based containment post-LOCA activities**	As per Grand Gulf 12/22/00 letter to NRC, with AST-based containment post-LOCA activities	No change since 04/03/03 submittal.
Cesium Hydroxide addition from release of cesium	N/A – Not required for TID-14844	**5% of core cesium inventory, released at a constant rate over the release accident**	5% of core cesium inventory, released at a constant rate over the release accident	No change since 04/03/03 submittal.
SBLCS credit	N/A – Not required for TID-14844	**Credited for pH control Full sodium pentaborate injection into suppression pool within several hours of accident initiation and pool is well mixed**	Credited for pH control Full sodium pentaborate injection into suppression pool within several hours of accident initiation and pool is well mixed	Design analysis No change since 04/03/03 submittal
Minimum weight of sodium pentaborate in Liquid Control Tank	N/A – Not required for TID-14844	**Limiting value = 4246 lb. for both current and extended power uprate conditions (with enrichment to 30 atom % B^{10}). Corresponding molecular weights of $Na_2B_{10}O_{16}$ $10H_2O$ are**	Limiting value = 4246 lb. for both current and extended power uprate conditions (with enrichment to 30 atom % B^{10}). Corresponding molecular weights of $Na_2B_{10}O_{16}$ $10H_2O$ are 590.30 g/mole with natural boron (19.78 atom % B^{10}) and	No change since 04/03/03 submittal.

Table 3: Clinton Parameters and Methods Applicable to Suppression Pool pH Transient Analysis

Suppression Pool pH Transient AST Analysis Parameter or Method	Currently Licensed Value or Method	Value or Method Submitted in April 3, 2003 AST Application	Final Supplemented Value or Method Used in Current AST Analysis	Justification for Change
		590.30 g/mole with natural boron (19.78 atom % B^{10}) and 589.28 g/mole with 30% B^{10} enrichment.	589.28 g/mole with 30% B^{10} enrichment.	
Iodine Re-evolution from Containment Liquids (none if pH maintained above 7)	N/A – Not required for TID-14844	None. Suppression pool pH stays at 7 or above during entire accident.	None. Suppression pool pH stays at 7 or above during entire accident.	Supported by design analysis No change since 04/03/03 submittal

Table 4: Clinton Parameters and Methods Applicable to CRDA				
CRDA AST Analysis Parameter or Method	**Currently Licensed Value or Method**	**Value or Method Submitted in April 3, 2003 AST Application**	**Final Supplemented Value or Method Used in Current AST Analysis**	**Justification for Change**
Damaged Fuel Releases to Reactor Coolant Fraction of failed fuel that melts Fuel Bundles in Core Fuel peaking factor	1200fuel rods failed - (GE 10x10 fuel) 1% (Conservative rounding of value used in NEDE-31152P, Rev. 7) 624 1.7	1200fuel rods failed - (GE 10x10 fuel) 1% (Conservative rounding of value used in NEDE-31152P, Rev. 7) 624 1.7	1200fuel rods failed - (GE 10x10 fuel) 1% (Conservative rounding of value used in NEDE-31152P, Rev. 7) 624 1.7	No Change No Change No Change No Change
Radioactivity transport pathway	Carryover with steam to condenser prior to MSIV closure and leakage from condenser to the environment	Carryover with steam to condenser prior to MSIV closure and leakage from condenser to the environment	Carryover with steam to condenser prior to MSIV closure and leakage from condenser to the environment	No Change
Fuel released activity carried to condenser before MSIV complete closure	Noble Gases 100% Iodines 10% Remaining radionuclides 1%	Noble Gases 100% Iodines 10% Remaining radionuclides 1%	Noble Gases 100% Iodines 10% Remaining radionuclides 1%	No Change
Activity in condenser release to environment	Noble Gases 100% Iodines 10% Remaining radionuclides 1%, with released Iodine species as follows: 97% elemental and 3% organic	Noble Gases 100% Iodines 10% Remaining radionuclides 1%, with released Iodine species as follows: 97% elemental and 3% organic	Noble Gases 100% Iodines 10% Remaining radionuclides 1%, with released Iodine species as follows: 97% elemental and 3% organic	No Change
Airborne condenser activity leakrate to environment	1% per day for 24 hours, then 0 (or at the most limiting flow rate of turbine or condenser flow paths such as unisolated mechanical vacuum pumps, with credit	1% per day for 24 hours, then 0 (or at the most limiting flow rate of turbine or condenser flow paths such as unisolated mechanical vacuum pumps, with credit	1% per day for 24 hours, then 0 (or at the most limiting flow rate of turbine or condenser flow paths such as unisolated mechanical vacuum pumps, with credit for available filters,	No Change

Table 4: Clinton Parameters and Methods Applicable to CRDA

CRDA AST Analysis Parameter or Method	Currently Licensed Value or Method	Value or Method Submitted in April 3, 2003 AST Application	Final Supplemented Value or Method Used in Current AST Analysis	Justification for Change
	for available filters, or unprocessed air ejectors).	for available filters, or unprocessed air ejectors).	or unprocessed air ejectors).	
Credit for activity decay during condenser residence	Yes	Yes	Yes	No Change
Credit for activity decay after release to environment	No	No	No	No Change
Credit for accident termination features	Yes, isolation of Mechanical Vacuum Pumps on MSLRM high-high rad signal.	Yes, isolation of Mechanical Vacuum Pumps on MSLRM high-high rad signal.	Yes, isolation of Mechanical Vacuum Pumps on MSLRM high-high rad signal.	No Change
Credit for Holdup in Turbine Building	No	No	No	No Change
Condenser Volume	175,000 cu. ft.	175,000 cu. ft.	175,000 cu. ft.	No Change

Table 5: Clinton Parameters and Methods Applicable to the Main Steam Line Break (MSLB) Accident

MSLB AST Analysis Parameter or Method	Currently Licensed Value or Method	Value or Method Submitted in April 3, 2003 AST Application	Final Supplemented Value or Method Used in Current AST Analysis	Justification for Change
Discharged Mass	96,250 lb (53,750 lb liquid and 42,500 lb steam)	96,250 lb (53,750 lb liquid and 42,500 lb steam)	**140,000 lb liquid (no steam) (40% flashing)**	This change ensures that the discharged mass is maximized (conservative application of SRP 15.6.4, Paragraph III.2.a). The value of 140,000 lb liquid is only used for control room and offsite dose analysis. The values for coolant released listed in the current license basis remain the basis for no fuel damage.
MSIV closure time	5.5 seconds	5.5 seconds	5.5 seconds	No Change
Analyzed Cases and Activity Releases	Two cases analyzed, one without and one with postulated iodine spike, using TS reactor coolant activity limits and reactor coolant iodine and noble gas activity concentrations.	Two cases analyzed, one without and one with postulated iodine spike, using TS reactor coolant activity limits and reactor coolant iodine and noble gas activity concentrations.	**Two cases analyzed, one without and one with postulated iodine spike, using TS reactor coolant activity limits and reactor coolant iodine and noble gas activity concentrations.** **Cesium activity is now considered in addition to iodine and noble gas.**	NRC RAI question directed at Dresden & Quad Cities received June 29, 2005 required the addition of cesium activity to be considered in the dose consequence analysis.
Dispersion Factors for MSLB				Supported by design basis analysis
Control Room:	Not calculated	N/A – Hemispherical cloud model	N/A – Hemispherical cloud model	No change since 04/03/03 submittal
EAB:	1.8E-04	3.68E-04	3.68E-04	RG 1.5
LPZ:	4.2E-05	1.02E-04	1.02E-04	RG 1.5

Table 6: Clinton AEB 98-03 Parameters and Methods Used for MSIV Leakage Analysis

AEB 98-03 Parameters and Methods Used for MSIV Leakage Analysis	Final Supplemented Value or Method Used in Current AST Analysis	Justification
Leakage Distribution	50% in MS Line A (Shortest Unbroken line) 50% in MS Line B (Shortest line when inboard piping assumed broken and unavailable)	Leakage limits are 200 scfh Total, and 100 scfh for any one line. Maximizing flow through shorter lines minimizes piping deposition credit. Lines selected for minimization of effective filter efficiencies.
Nodalization for AEB-98-03; Single Active Failure Assumptions	Two-node treatment is used for each steam line in which flow occurs. The first node is from the reactor vessel to the inboard MSIV. The second node is from the inboard MSIV to the Auxiliary Building / Turbine Building wall. Steam line piping is seismically supported through this wall with consideration of SSE loads. This serves to protect the secondary containment gas control boundary. The Outboard MSIV is assumed to fail on both steam lines in which flow is assumed.	Outboard MSIV failure is selected since this maximizes the volume of piping in which the fluid is depressurized. This in turn minimizes deposition and this treatment is used for all steam lines. Although the CPS design basis line break associated with the non-mechanistic R.G. 1.183 source terms is a recirc line break, a steam line break is assumed in order to ensure conservative treatment of deposition. That is assumed to result in the unavailability for deposition of inboard piping on the broken steam line. The inboard node for the broken steam line is not credited. For conservatism and for consistency with AEB-98-03, only two nodes are used in any one steam line. Therefore, penetration piping and seismically qualified piping downstream of the outboard MSIV are treated as a single node.
Well-mixed modeling for aerosol gravitational settling and elemental iodine deposition.	The formulations for effective filter efficiencies in piping segments that are used in the CPS AST application are from AEB-98-03, Appendix A "Use of Plug-Flow and Well-Mixed Models for Fission Product Deposition in the Main Steam Line for the Perry Assessment"	For conservatism, a well-mixed model is used for both inboard and outboard piping nodes. The AEB-98-03 Appendix A formulas are for a well-mixed treatment of a piping segment or node and are presented for use with gravitational settling of aerosols. This formulation would also be applicable for elemental iodine removal when the appropriate deposition velocities and deposition areas are used.
Aerosol Settling Velocities	Settling Velocities used for gravitational settling use a 20-group probability distribution based on the AEB-98-03 recommended distribution parameters.	NRC's AEB-98-03, indicates *"The staff believes that, at this time, a well-mixed model is more appropriate than a plug flow model for settling in the main steam line. However complete mixing may not occur along the entire length of the pipe and, in some pipe segments, plug flow may exist. Given the conservatism associated with using a well-mixed model for the entire length of the pipe and a number of additional conservatisms inherent in the piping depositions analysis, use of a 10th percentile settling velocity with a well-mixed model is not appropriate. Additional conservatisms include additional deposition by thermophoresis,*

Table 6: Clinton AEB 98-03 Parameters and Methods Used for MSIV Leakage Analysis

AEB 98-03 Parameters and Methods Used for MSIV Leakage Analysis	Final Supplemented Value or Method Used in Current AST Analysis	Justification
		diffusiophoresis, and flow irregularities; addition deposition as a result of hygroscopicity and possible plugging of the leaking MSIV by aerosols. Given the conservatism of the well-mixed assumption, we believe it is acceptable then to utilize median values (as compared to more conservative values) for deposition parameters. CPS is somewhat different than Perry in that piping downstream from the outboard MSIV to the Auxiliary Building / Turbine Building wall is credited. The NRC staff has questioned whether crediting the same settling velocities throughout the piping system, and treatment of the downstream piping as a third node was adequately conservative. In response, CPS: 1. Has combined penetration piping and downstream piping into a single outboard node; 2. Uses a 20 group probability distribution on settling velocities with settling efficiencies determined for each group and a net weighted average efficiency used, a process that is significantly more conservative than use of a median settling velocity; 3. Takes no credit is taken for aerosol settling after 24 hours. Other phenomena, such as effects of depletion over time of more easily settled particle sizes are considered to be adequately addressed by the above conservatisms and the significant residual conservatism mentioned in the original AEB-98-03 conclusions quoted above.
Elemental Iodine Removal Parameters	Elemental iodine deposition velocities, resuspension rates, and fixation rates are taken from RG 1.183, Appendix A, Reference A-9.	Elemental Iodine deposition is analyzed using the well-mixed model of AEB-98-03, Appendix A, where settling velocities and deposition velocities are treated as analogous properties. The impacts of resuspension from deposited elemental iodine have been evaluated where all re-evolved iodine is treated as organic iodine and instantly released. The dose impacts are minimal.
Actual Inboard Piping Volumes and Surface Areas	For Aerosol Settling LINE — Vol (ft^3) — Area(ft^2) MS A — 86 — 58.23 MS B — 116 — 78.32 (Line B assumed broken and not credited) For Elemental Iodine Deposition LINE — Vol (ft^3) — Area(ft^2) MS A — 157 — 334 MS B — 187 — 397	For Aerosols - only includes horizontal piping. Settling area is projected horizontal surface area of horizontal piping only. For Elemental iodine - includes total piping area and volume.

Table 6: Clinton AEB 98-03 Parameters and Methods Used for MSIV Leakage Analysis

AEB 98-03 Parameters and Methods Used for MSIV Leakage Analysis	Final Supplemented Value or Method Used in Current AST Analysis	Justification
	(Line B assumed broken and not credited)	
Outboard Piping Volumes and Surface Areas	For Aerosol Settling LINE — Vol (ft^3) — Area(ft^2) MS A — 268 — 180.68 MS B — 268 — 180.68 For Elemental Iodine Deposition LINE — Vol (ft^3) — Area(ft^2) MS A — 268 — 568 MS B — 268 — 568	For Aerosols - only includes horizontal piping. Settling area is projected horizontal surface area of horizontal piping only. For Elemental iodine - includes total piping area and volume.
Associated Containment Leak Rate	Leak Rate (cfh) = Leak Rate Acceptance Criterion (scfh) * $[14.7/(P_a+14.7)]*(233+460)/(68+460)$ where P_a - 9 psig and 233 °F is peak drywell temperature at 2 minute, per USAR Figure 6.2-3. Leak Rates LINE — (scfh) — (cfh) — (cfm) MS A — 100 — 81.41 — 1.357 MS B — 100 — 81.41 — 1.357	CPS MSIVs are tested at the P_a of 9 psig. Leak Rates are determined per standard 10CFR50 Appendix J practice for all PCIVs.
Fluid Temperature for deposition velocity and flow rate assessments	550 °F from 0 to 24 hours 410 °F from 24 to 96 hours 200 °F from 96 to 720 hours	The deposition velocities, resuspension rates and fixation rates are temperature dependent. Outboard flow rates are also temperature dependent. Credit for temperature reductions in the current CPS AST LOCA analysis are very limited and conservative. The full normal operating pipe wall temperature is used for the first 24 hours. The value applicable at 24 hours is used from then until 96 hours, and the 96-hour value is used from then until 720 hours. The generic BWR cooldown curve has been found applicable to CPS, and the impact of decay heat from deposited radioactivity on steam piping has been found to be negligible.
Inboard Piping Node Flow Rate	LINES — Flow Rate (cfm) MS A — 1.357 MS B — N/A broken	Values are as determined from Containment Leak Rate.
Outboard Piping Node Flow Rate	LINES — Flow Rate (cfm) 0-24 hours MS A — 3.188	Values are conservatively expanded based on outside pressure with Fluid Temperatures at conservative pipe wall temperatures for the accident duration, compared with standard conditions at 68 °F. Therefore, inboard flow rates are multiplied by:

Table 6: Clinton AEB 98-03 Parameters and Methods Used for MSIV Leakage Analysis

AEB 98-03 Parameters and Methods Used for MSIV Leakage Analysis	Final Supplemented Value or Method Used in Current AST Analysis	Justification
	MS B 3.188 24-96 hours MS A 1.747 MS B 1.747 96-720 hours MS A 1.325 MS B 1.325	100 scfh * 1 hr / 60 min * (550+460)/(68+460) = 3.188 cfm for 0-24 hours 100 scfh * 1 hr / 60 min * (410+460)/(68+460) = 1.747 cfm for 24 to 96 hours 100 scfh * 1 hr / 60 min * (200+460)/(68+460) = 1.325 cfm for 96 to 720hours
Leak Rate and flow rates after 24 hours	Leak Rates and flow rates are assumed to be reduced to 63.6% of initial values after 24 hours. No further reductions are taken between 24 and 720 hours.	MSIV leakage is assumed to be reduced to a conservative 63.6% of the technical specification value at 24 hours, based on the following square root leakage rate correlation with containment pressure, MSIV leakage testing performed at the CPS P_a of 9 psig, and CPS-USAR Figure 6.2-6a indicating a containment pressure of approximately 18.33 psia (3.63 psig) is reached at 24 hours for minimum ECCS in operation: $(3.63 / 9)^{0.5} = 0.636$
Seismic Design of Credited Piping	Credited MS piping is that piping which has been designed to withstand a design basis SSE.	Piping and components from the reactor vessel to the outside of the shutoff valve in the steam tunnel are Seismic Category 1 and safety related due to their functions. Downstream piping through the wall between the Auxiliary Building and the Turbine Building (secondary containment boundary wall) is also seismically analyzed to assure secondary containment gas control boundary integrity. Therefore, all of this piping is available for aerosol gravitational settling or elemental iodine deposition.

Table 7: Clinton Parameters for FWIV Piping Deposition

<table>
<tr><th>Parameters for FWIV Piping Deposition</th><th>Final Supplemented Value or Method Used in Current AST Analysis</th><th>Justification</th></tr>
<tr><td>Feedwater Leakage Control Mode (FWLC) function, and Leakage Distribution</td><td>The function of the FWLC mode of RHR is to create a water seal at the outboard feedwater isolation check valves and gate valves within one hour following a DBA LOCA and maintain the seal for a 30 day period. (USAR Sec. 5.4.7.1.1.6)</td><td>Leakage limits are 10.98 cfm of containment air prior to fill, and its equivalent of 2 gpm of water leakage after fill. Maximizing all flow through one of the lines minimizes piping deposition credit during the one-hour fill period. After fill the 2 gpm is treated as ECCS leakage outside of containment.</td></tr>
<tr><td>Nodalization for AEB-98-03 well mixed modeling; Single Active Failure Assumptions</td><td>Two-node treatment is used for the air leakage through the feedwater line where flow is postulated. The first node is from the reactor vessel to the inboard FWIV. The second node is from the inboard FWIV to the secondary containment boundary wall.
The Outboard FWIV is assumed to fail.</td><td>Outboard FWIV failure is selected since this maximizes the volume of piping in which the fluid is depressurized. This in turn minimizes deposition.

A feedwater line break is not postulated because of the short duration of assumed containment air leakage through feedwater lines compared to the full-accident duration of the main steam line break.</td></tr>
<tr><td>Actual Inboard Piping Volumes and Surface Areas</td><td>For Aerosol Settling
LINE Vol (ft^3) Area(ft^2)
FW A 57 64.56

For Elemental Iodine Deposition
LINE Vol (ft^3) Area(ft^2)
FW A 83 316</td><td>For Aerosols - only includes horizontal piping. Settling area is projected horizontal surface area of horizontal piping only.

For Elemental iodine - includes total piping area and volume.</td></tr>
<tr><td>Outboard Piping Volumes and Surface Areas</td><td>For Aerosol Settling
LINE Vol (ft^3) Area(ft^2)
FW A 182 157.82

For Elemental Iodine Deposition
LINE Vol (ft^3) Area(ft^2)
FW A 182 496</td><td>For Aerosols - only includes horizontal piping. Settling area is projected horizontal surface area of horizontal piping only.

For Elemental iodine - includes total piping area and volume.</td></tr>
<tr><td>Seismic Design of Credited Piping</td><td>Credited piping is seismically designed from the reactor vessel through the containment and auxiliary building. No turbine building piping is credited.</td><td>Piping and components from the reactor vessel to the outside of the outboard gate valves (1B21-F065A/B) in the steam tunnel are Seismic Category 1 and safety related due to their functions. Downstream piping through the wall between the Auxiliary Building and the Turbine Building is also seismically analyzed to assure secondary containment gas control boundary integrity. Therefore, all of this piping is available for aerosol gravitational settling or elemental iodine deposition.</td></tr>
</table>

Table 7: Clinton Parameters for FWIV Piping Deposition		
Parameters for FWIV Piping Deposition	**Final Supplemented Value or Method Used in Current AST Analysis**	**Justification**
Associated Containment Leak Rate	LINE (cfm) FW A 10.98	CPS FWIVs are tested with water at 1.1 times the P_a of 9 psig. Air Leak Rates are determined per calculated correlation to a 2gpm liquid leak rate.
Fluid Temperature for deposition velocity and flow rate assessment	420 °F	The normal operation feed water temperature is used for the short air leakage period.
Inboard Piping Node Flow Rate	LINES Flow Rate (cfm) FW A 10.98	Values are as determined from Containment Leak Rate
Outboard Piping Node Flow Rate	LINES Flow Rate (cfm) FW A 29.50	Values are conservatively expanded based on outside pressure with containment at P_a and Fluid Temperature at 420 °F for the accident duration, compared with standard conditions at 68 °F. Therefore, inboard flow rates are multiplied by: $(14.7+9)/(14.7) * (420+460)/(68+460) = 2.687$
Leak Rate and flow rates after 24 hours	No reductions in FWLC system related leak rates are credited.	Leak rates are controlled by RHR system pressures rather than containment pressures, and are, therefore, not assumed to be reduced with time.

Table 8: Clinton Parameters for Purge Piping Deposition

Parameters for Purge Piping Deposition	Final Supplemented Value or Method Used in Current AST Analysis	Justification
Leakage Distribution	100% through Purge Penetration 101 100% through Purge Penetration 102	Leakage limit is, 2% L_a, per purge line.
Nodalization for AEB-98-03 well mixed modeling; Single Active Failure Assumptions	A one-node treatment is used for the air leakage through the purge lines. The node is conservatively assumed to be from containment to the outboard isolation valve.	This treatment also conservatively ignores the impact of piping within secondary containment to the intake and exhaust points. If that piping should (seismically) fail then this releases would be SGTS filtered. These two 2% portions of L_a will continue to be accounted for in the 92% of containment leakage that is SGTS filtered, as well as being treated as a separate bypass pathway with aerosol settling and elemental iodine deposition credit. In effect the same activity is released through two pathways.
Piping Volumes and Surface Areas	For Aerosol Settling LINE — Vol (ft^3) — Area(ft^2) Purge Pene. 101 — 373 — 165.04 Purge Pene. 102 — 330 — 146.07 For Elemental Iodine Deposition LINE — Vol (ft^3) — Area(ft^2) Purge Pene. 101 — 373 — 518.00 Purge Pene. 102 — 349 — 486.00	For Aerosols – only includes horizontal piping. Settling area is projected horizontal surface area of horizontal piping only. For Elemental iodine - includes total piping area and volume.
Seismic Design of Credited Piping	Credited piping is seismically designed from the reactor vessel through the containment and auxiliary building. No turbine building piping is credited.	Credited piping and components are Seismic Category 1 and safety related due to their functions.
Associated Containment Leak Rate	*= (Total Primary Containment Volume) * 0.02 * L_a % / day / 1440 min/day* *= 1.754E+06 ft^3 * 0.02 * 0.0065 / 1440 = 0 .1583 cfm* LINES — Flow Rate (cfm) Purge Pene. 101 — 0.1583 Purge Pene. 102 — 0.1583	CPS isolation valves are tested at a P_a of 9 psig.
Piping Node Flow Rate	LINES — Flow Rate (cfm) Purge Pene. 101 — 0.3351	To correct for upstream pressure conditions, 0.16 scfm is multiplied by: $((14.7\ psia+9\ psig)/14.7\ psia)*(233^{\circ}F + 460^{\circ}R)/(68^{\circ}F + 460^{\circ}R)$

Table 8: Clinton Parameters for Purge Piping Deposition		
Parameters for Purge Piping Deposition	**Final Supplemented Value or Method Used in Current AST Analysis**	**Justification**
	Purge Pene. 102 0.3351	Therefore the flowrate becomes 0.3351 cfm.
Fluid Temperature for flow rate assessment	233 °F	Based on peak drywell temperature (per USAR Figure 6.2-3) at the 2 minute time of post-LOCA gap release.
Leak Rate and flow rates after 24 hours	Leak Rates and flow rates are assumed to be reduced to 63.6% after 24 hours.	*Purge leakage is assumed to be reduced to a conservative 63.6% of the technical* specification value at 24 hours, based on the following square root leakage rate correlation with containment pressure, Purge leakage testing performed at the CPS P_a of 9 psig, and CPS-USAR Figure 6.2-6a indicating a containment pressure of approximately 18.33 psia (3.63 psig) is reached at 24 hours for minimum ECCS in operation: $(3.63 / 9)^{0.5} = 0.636$

Table 9: Clinton Tech Spec Changes Since 04/03/03 Submittal (Affected Pages)				
Tech Spec Changes (Affected Pages)	**Tech Spec Changes Submitted in April 3, 2003 AST Application**	**Final Supplemented Tech Spec Changes for Current Submittal**	**Justification for Change**	**Comments**
1.0-2		No Changes since 04/03/03		
3.1-20		No Changes since 04/03/03		
3.3-59		No Changes since 04/03/03		
3.6-19	3.6.1.3.9 Verify leakage rate through each MSIV leakage path is ≤ 100 scfh when tested at ≥ P_a and the combined leakage rate for all MSIV leakage paths is ≤ 250 scfh when tested at ≥ P_a.	3.6.1.3.9 Verify leakage rate through each MSIV leakage path is ≤ 100 scfh when tested at ≥ P_a and the combined leakage rate for all MSIV leakage paths is ≤ **200** scfh when tested at ≥ P_a.	Supported by design basis analysis.	Changes resulted from recalculation based on RAIs and 07/14/05 Exelon meeting with NRC.
3.6-19a		No Changes since 04/03/03		
3.6-26		No Changes since 04/03/03		
3.6-27		No Changes since 04/03/03		
5.0-12	ESF Ventilation System Penetration values changed to: SGTS: 1.5% CRV M/U: 1.5% CRV Recirc: 15%	**ESF Ventilation System Penetration values changed back to original values:** **SGTS: 0.175%** **CRV M/U: 0.175%** **CRV Recirc: 6%**	Change being withdrawn consistent with the discussion in the 7/14/05 Exelon/NRC meeting and RG 1.52, Rev.2.	Supported by design basis analysis.
Table of Contents, Page iv		No Changes since 04/03/03		
Table of Contents, Page v		No Changes since 04/03/03		
B 3.1-38		No Changes since 04/03/03		
B 3.1-39		No Changes since 04/03/03		
B 3.1-40		No Changes since 04/03/03		
B 3.1-43a		No Changes since 04/03/03		
B 3.3-157		No Changes since 04/03/03		
B 3.6-25		No Changes since 04/03/03		
B 3.6-27	**Combined MSIV leakage for all four lines changed**	**Combined MSIV leakage for all four lines changed**	Supported by design basis analysis.	

Table 9: Clinton Tech Spec Changes Since 04/03/03 Submittal (Affected Pages)				
Tech Spec Changes (Affected Pages)	**Tech Spec Changes Submitted in April 3, 2003 AST Application**	**Final Supplemented Tech Spec Changes for Current Submittal**	**Justification for Change**	**Comments**
	to 250 scfh, 100 scfh max any one line	**to 200 scfh, 100 scfh max any one line**	(TS 3.6.1.9)	
B 3.6-28a		No Changes since 04/03/03		
B 3.6-44		No Changes since 04/03/03		
B 3.6-45		No Changes since 04/03/03		
B 3.6-46		No Changes since 04/03/03		
B 3.6-47		No Changes since 04/03/03		
B 3.6-88		No Changes since 04/03/03		
B 3.7-16	**<u>INSERT F</u>** **This testing ensures that the inleakage through the negative pressure portion of the Control Room Ventilation System remains within the design basis accident analysis basis. This inleakage would be filtered by the Control Room Ventilation System recirculation filters. An additional allowance of 600 cfm of unfiltered inleakage is also considered in the design basis accident analysis.**	**<u>INSERT F</u>** **This testing ensures that the inleakage through the negative pressure portion of the Control Room Ventilation System remains within the design basis accident analysis basis. This inleakage would be filtered by the Control Room Ventilation System recirculation filters. An additional allowance of 144 cfm of unfiltered inleakage (assuming the maximum allowed filtered inleakage of 650 cfm) is also considered in the design basis accident analysis. Filtered and unfiltered inleakages can be interchanged based on the equivalency formula provided in the design basis analysis.**	**Supported by design basis analysis**	

Table 10: Summary of Clinton LOCA Dose Re-Analysis			
EAB (rem TEDE)	**LPZ (rem TEDE)**	**Control Room (DBA Case) (rem TEDE)**	**Dose Contributor**
2.853	1.029	0.944	Filtered Primary Containment Leakage (unfiltered for 10 minutes, SGTS filtered thereafter) *[92% of L_A]*
4.976	0.990	0.501	PC Leakage bypassing Secondary Containment, with no piping deposition credit *[8% of L_A]*
4.764	1.478	0.814	MSIV Leakage, without LCS but with piping deposition credit. *[200 scfh total all MS lines, 100 scfh max/line]*
2.655	3.351	1.609	FWIV LCS Leakage of ECCS Water (unfiltered) *[2.0 gpm]*
1.646	0.166	0.081	FWIV Air Leakage before fill with ECCS Water by LCS (unfiltered) *[10.98 cfm, analogous to 2.0 gpm]*
0.039	0.066	0.033	Primary Containment Leakage through purge penetrations 101 and 102, with piping deposition credit *[2% of L_a per penetration]*
0.174	0.196	0.136	ECCS Leakage in Secondary Containment (unfiltered for 10 minutes, SGTS filtered thereafter) *[5 gpm]*
N/A	N/A	0.585	Gamma Shine to Control Room
17.11	7.28	4.70	Total Calculated Value
25	25	5	Dose Limit

Table 11: Summary of Clinton MSLB Dose Re-Analysis			
EAB (rem TEDE)	**LPZ (rem TEDE)**	**Control Room (DBA Case) (rem TEDE)**	**Analyzed Case**
2.47E-02	6.88E-03	8.31E-02	Case 1: Normal Equilibrium of 0.2 μCi
4.90E-01	1.36E-01	1.66E+00	Case 2: Iodine Spike of 4.0 μCi
Case 1: 2.5 Case 2: 25	Case 1: 2.5 Case 2: 25	Case 1: 5 Case 2: 5	Dose Limits

Table 12: Summary of Clinton CRDA Dose Analysis (Unchanged by this Supplement)			
EAB (rem TEDE)	**LPZ (rem TEDE)**	**Control Room (DBA Case) (rem TEDE)**	**Analyzed Case**
4.1E-02	1.6E-02	4.3E-01	Case 1: Based on 1% of condenser free volume leakage per day
6.4E-01	1.5E-01	2.5E-01	Case 2: Based on steam jet air ejector activity release
6.3	6.3	5	Dose Limits

ATTACHMENT 3
Markup of Proposed Technical Specifications Page

CLINTON POWER STATION

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<u>Markup of Proposed Technical Specifications Page</u>

3.6-19

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.1.3.8	-----NOTE----- Only required to be met in MODES 1, 2, and 3. ----- Verify the combined leakage rate for all secondary containment bypass leakage paths is ≤ 0.08 L_a when pressurized to ≥ P_a.	In accordance with the Primary Containment Leakage Rate Testing Program
SR 3.6.1.3.9	-----NOTE----- Only required to be met in MODES 1, 2, and 3. ----- ~~Verify total leakage rate through all four main steam lines is ≤ 112 scfh when tested at ≥ P_a.~~ Verify the leakage rate through each MSIV leakage path is ≤ 100 scfh when tested at ≥ Pa and the combined leakage rate for all MSIV leakage paths is ≤ 200 scfh when tested at ≥ Pa.	In accordance with the Primary Containment Leakage Rate Testing Program
SR 3.6.1.3.10	-----NOTE----- Only required to be met in MODES 1, 2, and 3. ----- Verify combined leakage rate through hydrostatically tested lines that penetrated the primary containment is within limits.	In accordance with the Primary Containment Leakage Rate Testing Program

(continued)

ATTACHMENT 4
Retyped Technical Specifications Page

CLINTON POWER STATION

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<u>Retyped Technical Specifications Page</u>

3.6-19

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.1.3.8	------------------NOTE------------------ Only required to be met in MODES 1, 2, and 3. -- Verify the combined leakage rate for all secondary containment bypass leakage paths is ≤ 0.08 L_a when pressurized to ≥ P_a.	In accordance with the Primary Containment Leakage Rate Testing Program
SR 3.6.1.3.9	------------------NOTE------------------ Only required to be met in MODES 1, 2, and 3. -- Verify the leakage rate through each MSIV leakage path is ≤ 100 scfh when tested at ≥ P_a and the combined leakage rate for all MSIV leakage paths is ≤ 200 scfh when tested at ≥ P_a.	In accordance with the Primary Containment Leakage Rate Testing Program
SR 3.6.1.3.10	------------------NOTE------------------ Only required to be met in MODES 1, 2, and 3. -- Verify combined leakage rate through hydrostatically tested lines that penetrated the primary containment is within limits.	In accordance with the Primary Containment Leakage Rate Testing Program

(continued)

ATTACHMENT 5
Markup of Proposed Technical Specification Bases Page

Markup of Proposed Technical Specification Bases Page
(Provided for Information Only)

B 3.6-27

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.1.3.8 (continued)

leakage through the isolation device. If both isolation valves in the penetration are closed, the actual leakage rate is the lesser leakage rate of the two valves. This method of quantifying maximum pathway leakage is only to be used for this SR.

The Frequency is consistent with the Primary Containment Leakage Rate Testing Program. This SR simply imposes additional acceptance criteria. Secondary containment bypass leakage is considered part of L_a.

A Note is added to this SR which states that these valves are only required to meet this leakage limit in MODES 1, 2 and 3. In the other conditions, the Reactor Coolant System is not pressurized and specific primary containment leakage limits are not required.

With regard to leakage rate values obtained pursuant to this SR, as read from plant indication instrumentation, the specified limit is considered to be a nominal value and therefore does not require compensation for instrument indication uncertainties (Ref. 9).

SR 3.6.1.3.9

The analyses in References 1, 2, and 3 are based on leakage that is less than the specified leakage rate. Combined leakage through all four main steamlines must be ≤ ~~112~~ 200 scfh when tested at P_a (9.0 psig). In addition, the leakage rate through any single main steam line must be ≤ 100 scfh when tested at Pa. The MSIV leakage rate must be verified to be in accordance with the assumptions of References 1, 2, and 3. A Note is added to this SR which states that these valves are only required to meet this leakage limit in MODES 1, 2, and 3. In the other conditions, the Reactor Coolant System is not pressurized and primary containment leakage limits are not required. The Frequency is required by the Primary Containment Leakage Rate Testing Program.

(continued)