Entergy

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Jerry C. Roberts
Director, Nuclear Safety
Assurance

RBG-46943

August 12, 2009

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

SUBJECT: Supplement to License Amendment Request (LAR) Changes to Technical Specification 5.6.5, "Core Operating Limits Report (COLR)"
River Bend Station, Unit 1
Docket No. 50-458
License No. NPF-47

REFERENCE
1. Letter RBG-46863 from Entergy to USNRC, License Amendment Request (LAR) Changes to Technical Specification 5.6.5, "Core Operating Limits Report (COLR)" dated November 20, 2008
2. Letter GNRO-2008/00053 from Entergy to USNRC, "Supplement to Amendment Request Changes to Technical Specification 5.6.5, "Core Operating Limits Report (COLR)" dated July 21, 2008.

Dear Sir or Madam:

On November 20, 2008, Entergy Operations, Inc. (Entergy) requested a license amendment for River Bend Station, Unit 1 (RBS), Reference 1. The change was to Technical Specification (TS) 5.6.5, "Core Operating Limits Report (COLR)" to add a reference to an analytical method that will be used to determine core operating limits. In that submittal a commitment was made to submit information regarding the impact of the fuel transition on the plant's safety analyses in a supplemental letter.

Attachment 1 is the additional information on the impact of the fuel transition on the plant's safety analyses. This information is similar to the corresponding request for Grand Gulf Nuclear Station (GGNS), Reference 2. This information completes the commitment made in the initial submittal. This response does not include new commitments.

A001
NRR

If you have any questions or require additional information, please contact David Lorfing at (225)-381-4157.

Sincerely,

Director, Nuclear Safety Assessment
River Bend Station - Unit 1

JCR/DNL/bmb
Attachments:

1. Additional Information On The Impact Of The Fuel Transition On The Plant's Safety Analyses

cc: Regional Administrator
U. S. Nuclear Regulatory Commission
Region IV
612 E. Lamar Blvd., Suite 400
Arlington, TX 76011-4125

NRC Senior Resident Inspector
P. O. Box 1050
St. Francisville, LA 70775

U. S. Nuclear Regulatory Commission
Attn: Mr. Alan B. Wang
MS O-7 D1
Washington, DC 20555-0001

Mr. Jeffrey P. Meyers
Louisiana Department of Environmental Quality
Office of Environmental Compliance
Attn. OEC - ERSD
P. O. Box 4312
Baton Rouge, LA 70821-4312

Attachment 1

RBG-46943

Additional Information On The Impact Of The Fuel Transition On The Plant's Safety Analyses

Commitment

Entergy will provide information regarding the impact of the fuel transition on the plant's safety analyses in a supplemental letter. Note the scope of this commitment was based upon a previous question for Grand Gulf Nuclear Station (GGNS) in Reference 2.

Previous NRC Question:

The application describes a transition from the current core with a full loading of ATRIUM-10 to a full loading of GE14 fuel. This transition will start with the upcoming refueling outage and continue over several refueling outages. Once the NRC staff approves the inclusion of the GEXL97 correlation into the TS, the licensee calculates the core operating limits listed in TS 5.6.5a and performs the plant accident analyses without further review by the NRC staff. Therefore, the staff requests that the licensee provide additional information to allow the staff to review the impact of the transition on the safety analyses.

Specifically, for loss-of-coolant accident (LOCA), anticipated transient without scam (ATWS), abnormal operation occurrence (AOO), American Society of Mechanical Engineers (ASME) Code overpressure, and stability analyses performed for the initial transition core:

a) state the approved methodology and/or the computer codes used and the reference (e.g. topical report) documenting the methodology/computer codes,
b) state if the analysis is in compliance with all applicable restrictions in the staff safety evaluation(s) approving the methodology, and
c) provide the quantitative results of the figure(s) of merit (FOM) compared against the acceptance criteria.

Below is an example of a format that would provide the set of information to the staff.

Analysis	Methodology / Code(s) Used	Staff Approval	Comply with all applicable restrictions and conditions	FOM	Result Valve vs. Acceptance Criterion
ATWS		Ref. xx	Y/N	Peak pressure PCT Peak pool temp Peak containment pres	
LOCA				PCT Local MWR Core wide MWR	
ASME Overpressure				Peak pressure	
Stability				Stability regions[1]	
AOO				OLMCPR[2]	

For the LOCA analysis, also provide a narrative showing that:
a) the limiting break location, break size, and single failure(s) were identified and used.
b) the limiting power/flow conditions and axial power shape were used.
c) the legacy fuel analysis (MAPLHGR) will continue to be applicable through the transition cycles.

Note 1: Stability regions = A figure showing the stability regions
Note 2: OLMCPR = operating limit minimum critical power ratio

Response
The response for each of the subject areas doesn't conveniently fit into a single table. The response is organized with the methods subjects first, followed by the River Bend results. The major subjects are organized in the same order as the table: ATWS, LOCA, ASME Overpressure, Stability, and AOOs (Including Off-Rated Limits). With respect to the requested COLR figures, the information supporting the COLR is included here. The requested figures will be provided with the normal COLR submittal.

ATWS

Methodology / Code(s) Used	Staff Approval	Comply with all applicable restrictions and conditions
ISCOR09	Note 1	Yes
PANAC11	NEDE–30130–P–A, Steady–State Nuclear Methods, April 1985. Note 2	Yes
ODYN09	NEDC-24154P-A, Qualification of the One-Dimensional Core Transient Model (ODYN) for Boiling Water Reactors (Supplement 1 - Volume 4), February 2000.	Yes
STEMP04	Note 3	N/A
TASC03	NEDC-32084P-A, TASC-03A, A Computer Program for Transient Analysis of a Single Channel, Revision 2, July 2002.	Yes

(1) The ISCOR code is not approved by name. However, the SER supporting approval of NEDE-24011-P Rev. 0 by the May 12, 1978 letter from D. G. Eisenhut (NRC) to R. Gridley (GE) finds the models and methods acceptable, and mentions the use of a digital computer code. The referenced digital computer code is ISCOR. The use of ISCOR to provide core thermal-hydraulic information in reactor internal pressure differences, Transient, ATWS, Stability, and LOCA applications is consistent with the approved models and methods

(2) The physics code PANACEA provides inputs to the transient code ODYN. The use of PANAC Version 11 in this application was initiated following approval of Amendment 26 of GESTAR II by letter from S.A. Richards (NRC) to G.A. Watford (GE), Subject: "Amendment 26 to GE Licensing Topical Report NEDE-24011-P-A, GESTAR II Implementing Improved GE Steady-State Methods", (TAC NO. MA6481), November 10, 1999.

(3) The STEMP code uses fundamental mass and energy conservation laws to calculate the suppression pool heatup. The use of STEMP was noted in NEDE-24222, "Assessment of BWR Mitigation of ATWS, Volume I & II (NUREG-0460 Alternate No. 3) December 1, 1979." The code has been used in ATWS applications since that time. There is no formal NRC review and approval of STEMP.

Parameter	Result	Acceptance Criteria
Peak Vessel Pressure (psig)	1497	≤1500
Peak Suppression Pool Temperature (°F)	182.4	≤185.0
Peak Containment Pressure (psig)	9.2	≤15.0
Peak Cladding Temperature (°F)	1405	≤2200
Peak Local Cladding Oxidation (%)	Insignificant(1)	≤17

(1) The calculated peak cladding temperature is less than 1600°F and therefore cladding oxidation is insignificant compared to the acceptance criteria and is not explicitly calculated.

LOCA

Methodology / Code(s) Used	Staff Approval	Comply with all applicable restrictions and conditions
ISCOR09	Note 1	Yes
LAMB08	NEDE-20566P-A, General Electric Analytical Model for Loss-of-Coolant Analysis in Accordance with 10CFR50 Appendix K, September 1986.	Yes
SAFER04/ GESTR08	NEDE-23785-1-PA Rev. 1, The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-of-Coolant Accident, Vol. 1, GESTR-LOCA – A Model for the Prediction of Fuel Rod Thermal Performance, October 1984. NEDE-23785-1-PA Rev. 1, The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-of-Coolant Accident, Vol. 2, SAFER – Long Term Inventory Model for BWR Loss-of-Coolant Analysis, October 1984. NEDE-23785-1-PA Rev. 1, The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-of-Coolant Accident, Vol. 3, SAFER/GESTR Application Methodology, October 1984. NEDE-23785P-A Rev. 1, The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-of-Coolant Accident, Vol. 3 Supplement 1, Additional Information for Upper Bound PCT Calculation, March 2002. Notes 2 and 3	Yes Note 4
TASC03	NEDC-32084P-A, TASC-03A, A Computer Program for Transient Analysis of a Single Channel, Revision 2, July 2002.	Yes

(1) The ISCOR code is not approved by name. However, the SER supporting approval of NEDE-24011-P Rev. 0 by the May 12, 1978 letter from D. G. Eisenhut (NRC) to R. Gridley (GE) finds the models and methods acceptable, and mentions the use of a digital computer code. The referenced digital computer code is ISCOR. The use of ISCOR to provide core thermal-hydraulic information in reactor internal pressure differences, Transient, ATWS, Stability, and LOCA applications is consistent with the approved models and methods.

(2) Letter, J.F. Klapproth (GE) to USNRC, "Transmittal of GE Proprietary Report NEDC-32950P 'Compilation of Improvements to GENE's SAFER ECCS-LOCA Evaluation Model," dated January 2000 by letter dated January 27, 2000.

(3) Letter, S.A. Richards (NRC) to J.F. Klapproth (GE), "General Electric Nuclear Energy Topical Reports NEDC-32950P and NEDC-32084P Acceptability Review," May 24, 2000.

(4) The ECCS-LOCA evaluations are in compliance with the one SER restriction upon the SAFER/GESTR-LOCA methodology. This SER restriction is described within NEDE-23785-1-PA Rev. 1, The GESTR-LOCA and SAFER Models for the Evaluation of the Loss-of-Coolant Accident, Vol. 3, SAFER/GESTR Application Methodology. October 1984, as "...NRC will require a demonstration that the PCT value calculated by the licensing method always exceeds the upper-bound value". All ECCS-LOCA evaluations explicitly calculate both the licensing PCT and the upper bound PCT, and all evaluations report a licensing PCT which exceeds the upper bound PCT.

Parameter	ATRIUM-10 Result	GE14 Result	Acceptance Criteria
Licensing Basis PCT	≤ 1810 °F	≤ 1660 °F	≤ 2200 °F
Maximum Local Oxidation	≤ 3%	≤ 1%	≤ 17%
Core Wide Metal-Water Reaction	≤ 0.1%	≤ 0.1%	≤ 1.0%
Coolable Geometry	Items 1 AND 2	Items 1 AND 2	Satisfied by: PCT ≤ 2200 °F AND Maximum Local Oxidation ≤ 17%
Core Long Term Cooling	Satisfied by: EITHER Core reflooded above TAF OR Core reflooded to the elevation of jet pump suction and 1 core spray system in operation	Satisfied by: EITHER Core reflooded above TAF OR Core reflooded to the elevation of jet pump suction and 1 core spray system in operation	Core temperature acceptably low AND Long-term decay heat removed

LOCA Specific NRC Question (a)
For the LOCA analysis, also provide a narrative showing that the limiting break location, break size, and single failure(s) were identified and used.

Response
The ECCS-LOCA evaluations evaluate all potentially limiting single failures including:

- HPCS emergency diesel generator
- LPCS emergency diesel generator
- LPCI emergency diesel generator

- Single ADS valve out-of-service

The ECCS-LOCA evaluations identify the HPCS emergency diesel generator as the limiting single failure.

The limiting break location is not a function of fuel type, and the ECCS-LOCA evaluations utilize prior SAFER/GESTR-LOCA evaluations to identify the limiting break location as the recirculation suction line break.

The ECCS-LOCA evaluations examine break sizes ranging from a double-ended guillotine break of the recirculation suction line to small breaks for which no core heatup is predicted. The break sizes are selected to satisfy the Appendix K requirement for the use of the Moody Slip Flow Model with a discharge coefficient of 1.0, 0.8, and 0.6. Additional break sizes are evaluated to fully characterize the PCT versus break size response and to ensure that the limiting break size is identified.

The GE14 limiting large break is identified as the double-ended guillotine break of the recirculation suction line and the limiting small break is identified as a 0.05 ft^2 break of the recirculation suction line. The 0.05 ft^2 break is identified as the overall most limiting break.

The ATRIUM-10 limiting large break is identified as the double-ended guillotine break of the recirculation suction line and the limiting small break is identified as a 0.05 ft^2 break of the recirculation suction line. The large break is identified as the overall most limiting break.

LOCA Specific NRC Question (b)

For the LOCA analysis, also provide a narrative showing that the limiting power/flow conditions and axial power shape were used.

Response

The potentially limiting power and flow conditions are evaluated, including the rated power/flow point and the point on the MELLLA rod line with highest power and lowest flow. Calculations are performed at these power/flow points using both nominal and Appendix K conditions. The rated power/flow point is identified as the limiting power and flow condition for GE14 and the MELLLA power/flow point is identified as the limiting power and flow condition for ATRIUM-10.

Single loop operation is investigated and shown to be bounded by two loop operation. Likewise, feedwater temperature reduction is also examined and shown to be bounded by LOCA at rated feedwater temperature. Increased core flow is also dispositioned as bounded by LOCA at rated core flow.

Both mid-peaked and top-peaked axial power shapes are evaluated by the ECCS-LOCA evaluations. The limiting axial power shape is identified as mid-peaked for large breaks and the limiting axial power shape for small breaks is identified as top-peaked.

LOCA Specific NRC Question (c)

For the LOCA analysis, also provide a narrative showing that the legacy fuel analysis (MAPLHGR) will continue to be applicable through the transition cycles.

Response

The legacy fuel MAPLHGRs are not applied to the transition cycles because a new SAFER/GESTR-LOCA evaluation is performed for the legacy fuel and new MAPLHGRs are generated. This legacy fuel SAFER/GESTR-LOCA evaluation satisfies all 10 CFR 50.46 licensing requirements, the one SER restriction, and generates MAPLHGR limits which are applicable to the transition cycles.

ASME Overpressure

Methodology / Code(s) Used	Staff Approval	Comply with all applicable restrictions and conditions
PANAC11	NEDE–30130–P–A, Steady–State Nuclear Methods, April 1985, Note 1	Yes
ODYN09	NEDC-24154P-A, Qualification of the One-Dimensional Core Transient Model (ODYN) for Boiling Water Reactors (Supplement 1 – Volume 4), Revision 1, February 2000.	Yes

(1) The physics code PANACEA provides inputs to the transient code ODYN. The use of PANAC Version 11 in this application was initiated following approval of Amendment 26 of GESTAR II by letter from S.A. Richards (NRC) to G.A. Watford (GE), Subject: "Amendment 26 to GE Licensing Topical Report NEDE-24011-P-A, GESTAR II Implementing Improved GE Steady-State Methods", (TAC NO. MA6481), November 10, 1999.

Event	Steam Line Pressure (psig)	Dome Pressure (psig)	Vessel Pressure (psig)	TS Dome Pressure Limit (1) (psig)	ASME Vessel Limit (2) (psig)
MSIV Closure (Flux Scram) - ICF (HBB)	1306	1313	1348	1325	1375
MSIV Closure (Flux Scram) - MEOD (HBB)	1301	1308	1333	1325	1375

(1) Technical Specification 2.1.2 Reactor Coolant System Pressure SL

(2) GESTAR II, Revision 16, Section S.3 Vessel Pressure ASME Code Compliance Model

Stability

Methodology / Code(s) Used	Staff Approval	Comply with all applicable restrictions and conditions
ISCOR09	Note 1	Yes
PANAC11	NEDE–30130–P–A, Steady–State Nuclear Methods, April 1985.	Yes
ODYSY05	NEDE-33213P-A, ODYSY Application for Stability Licensing Calculations Including Option I-D and II Long Term Solutions, April 2009. NEDO-32339-A, Reactor Stability Long-Term Solution: Enhanced Option I-A, Revision 1, April 1998. NEDO-32339-A Supplement 3, Reactor Stability Long-Term Solution: Enhanced Option I-A, Flow Mapping Methodology, Revision 1, April 1998. NEDO-32339-A Supplement 4, Reactor Stability Long-Term Solution: Enhanced Option I-A, Generic Technical Specifications, Revision 1, April 1998. NEDC-32339P-A Supplement 1, Reactor Stability Long-Term Solution: Enhanced Option I-A, ODYSY Application to E1A, December 1996. NEDC-32339P-A Supplement 2, Reactor Stability Long-Term Solution: Enhanced Option I-A, Solution Design, Revision 1, April 1998.	Yes

(1) The ISCOR code is not approved by name. However, the SER supporting approval of NEDE-24011-P Rev. 0 by the May 12, 1978 letter from D. G. Eisenhut (NRC) to R. Gridley (GE) finds the models and methods acceptable, and mentions the use of a digital computer code. The referenced digital computer code is ISCOR. The use of ISCOR to provide core thermal-hydraulic information in reactor internal pressure differences, Transient, ATWS, Stability, and LOCA applications is consistent with the approved models and methods.

Decay Ratios Resulting from ODYSY Analysis for River Bend Cycle 16

		Cycle 16	
Case	**State**	**Core Decay Ratio**	**Channel Decay Ratio**
RVM1	B	0.350	0.009
RVM2	A'	0.559	0.202
RVM3	B'	0.654	0.069
RVM4	FRE H1	0.517	0.113
RVM5	FRE H0	0.467	0.014
RVM6	A' LOFH	0.789	0.291
RVM7	B' LOFH	0.774	0.319

See Figure 2 for comparison of the result values to the Acceptance Criteria.

Figure 1. River Bend Station Region Boundaries (Normal Trip Reference)

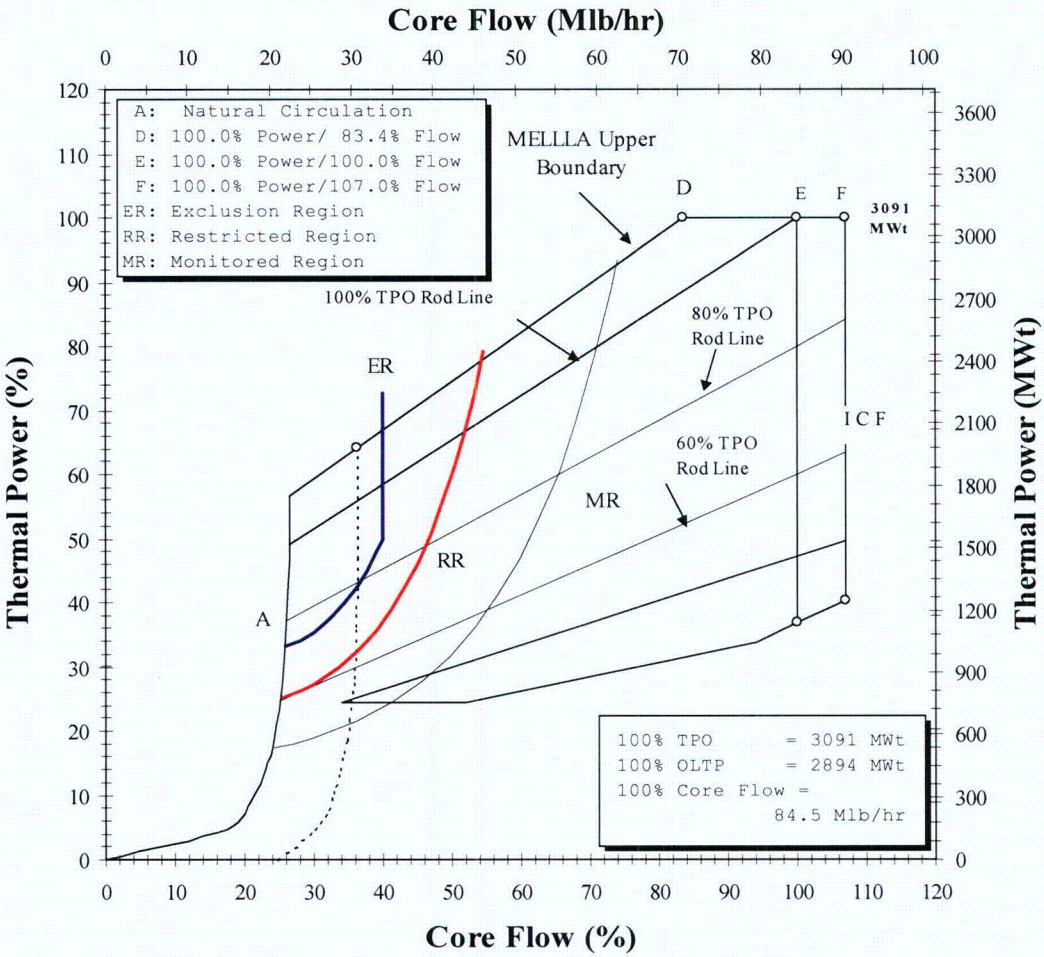
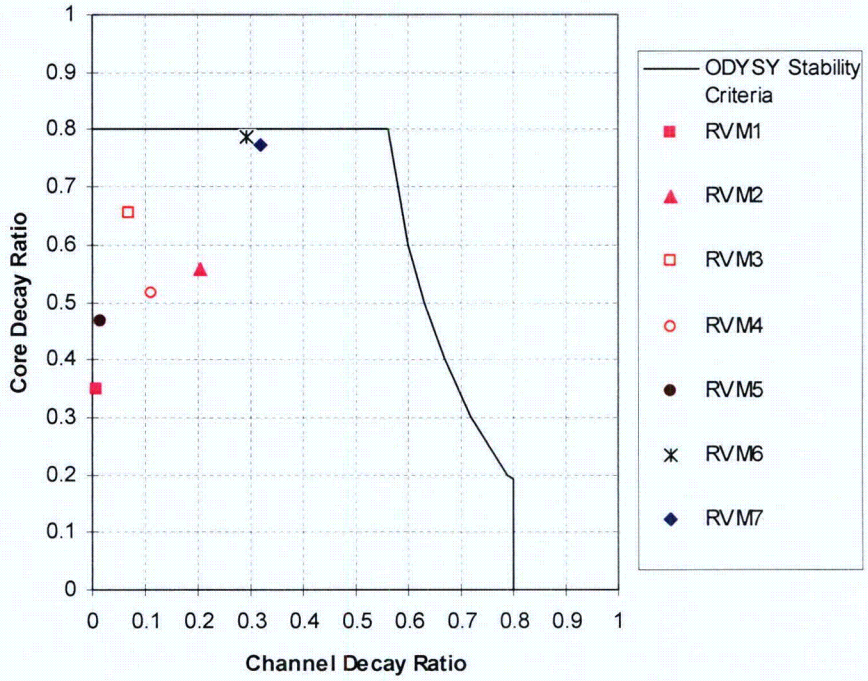


Figure 2. River Bend Decay Ratios vs. ODYSY Stability Criteria



AOOs Including Off-Rated Limits

Methodology / Code(s) Used	Staff Approval	Comply with all applicable restrictions and conditions
ISCOR09	Note 1	Yes
PANAC11	NEDE–30130–P–A, Steady–State Nuclear Methods, April 1985, Note 2	Yes
ODYN09	NEDC-24154P-A, Qualification of the One-Dimensional Core Transient Model (ODYN) for Boiling Water Reactors (Supplement 1 – Volume 4), Revision 1, February 2000.	Yes
TASC03	NEDC-32084P-A, TASC-03A, A Computer Program for Transient Analysis of a Single Channel, Revision 2, July 2002.	Yes

(1) The ISCOR code is not approved by name. However, the SER supporting approval of NEDE-24011-P Rev. 0 by the May 12, 1978 letter from D. G. Eisenhut (NRC) to R. Gridley (GE) finds the models and methods acceptable, and mentions the use of a digital computer code. The referenced digital computer code is ISCOR. The use of ISCOR to provide core thermal-hydraulic information in reactor internal pressure differences, Transient, ATWS, Stability, and LOCA applications is consistent with the approved models and methods

(2) The physics code PANACEA provides inputs to the transient code ODYN. The use of PANAC Version 11 in this application was initiated following approval of Amendment 26 of GESTAR II by letter from S.A. Richards (NRC) to G.A. Watford (GE), Subject: "Amendment 26 to GE Licensing Topical Report NEDE-24011-P-A, GESTAR II Implementing Improved GE Steady-State Methods", (TAC NO. MA6481), November 10, 1999.

Limiting Pressurization Events OLMCPR Summary Table

Application Condition / Exposure Range*	Option A GE14	Option A ATRIUM-10
Equipment in Service		
BOC to MOC	1.27	1.28
MOC to EOC	1.31	1.31
RPTOOS		
BOC to MOC	1.33	1.34
MOC to EOC	1.36	1.35
PROOS		
BOC to MOC	1.27	1.28
MOC to EOC	1.31	1.31

TBVOOS		
BOC to MOC	1.30	1.31
MOC to EOC	1.34	1.34
TBVOOS & RPTOOS		
BOC to MOC	1.36	1.37
MOC to EOC	1.38	1.39
PROOS & TBVOOS		
BOC to MOC	1.30	1.31
MOC to EOC	1.34	1.34
PROOS & TBVOOS & RPTOOS		
BOC to MOC	1.36	1.37
MOC to EOC	1.38	1.39

* Each application condition covers the entire range of licensed flow and feedwater temperature.

$MCPR_p$ Limits for GE14 and Atrium-10

			Below P_{bypass}				Above P_{bypass}							
App. Cond.	**Exp.**	**Fuel**	**23.8% P * F ≤ 50.0%**	**23.8% P * F > 50.0%**	**40% P * F ≤ 50.0%**	**40% P * F > 50.0%**	**40% P ***	**50% P ***	**70% P ***	**70% P ***	**85% P**	**85% P**	**90% P**	**100% P**
1	EOC	G1446	2.13	2.44	1.90	2.04	1.63	1.63	-	1.50	-	-	1.35	1.31
		ATR10	2.08	2.34	1.86	1.97	1.60	1.60	-	1.48	-	-	1.35	1.31
	MOC	G1446	2.11	2.44	1.88	2.04	1.56	1.55	1.44	1.41	-	-	1.30	1.27
		ATR10	2.05	2.34	1.83	1.97	1.56	1.53	1.44	1.40	-	-	1.31	1.28
2	EOC	G1446	2.13	2.44	1.90	2.04	1.63	1.63	-	1.50	-	-	1.39	1.36
		ATR10	2.08	2.34	1.86	1.97	1.60	1.60	-	1.48	-	-	1.39	1.35
	MOC	G1446	2.11	2.44	1.88	2.04	1.56	1.55	1.44	1.42	-	-	1.36	1.33
		ATR10	2.05	2.34	1.83	1.97	1.56	1.53	1.44	1.43	-	-	1.37	1.34
3	EOC	G1446	2.13	2.44	1.90	2.04	2.04	1.95	-	1.75	1.66	1.39	1.35	1.31
		ATR10	2.08	2.34	1.86	1.97	1.97	1.88	-	1.70	1.61	1.38	1.35	1.31
	MOC	G1446	2.11	2.44	1.88	2.04	2.04	1.93	-	1.74	1.65	1.33	1.30	1.27
		ATR10	2.05	2.34	1.83	1.97	1.97	1.87	-	1.69	1.60	1.33	1.31	1.28
4	EOC	G1446	2.13	2.44	1.90	2.04	1.63	1.63	-	1.52	-	-	1.38	1.34
		ATR10	2.08	2.34	1.86	1.97	1.60	1.60	-	1.50	-	-	1.38	1.34
	MOC	G1446	2.11	2.44	1.88	2.04	1.56	1.55	-	1.44	-	-	1.33	1.30
		ATR10	2.05	2.34	1.83	1.97	1.56	1.53	-	1.44	-	-	1.35	1.31
5	EOC	G1446	2.13	2.44	1.90	2.04	1.63	1.63	-	1.52	-	-	1.42	1.38
		ATR10	2.08	2.34	1.86	1.97	1.60	1.60	-	1.50	-	-	1.43	1.39
	MOC	G1446	2.11	2.44	1.88	2.04	1.58	1.55	-	1.46	-	-	1.40	1.36
		ATR10	2.05	2.34	1.83	1.97	1.59	1.54	-	1.47	-	-	1.41	1.37

			Below P_{bypass}				Above P_{bypass}							
App. Cond	**Exp.**	**Fuel**	**23.8% P * F ≤ 50.0%**	**23.8% P * F > 50.0%**	**40% P * F ≤ 50.0%**	**40% P * F > 50.0%**	**40% P ***	**50% P ***	**70% P ***	**70% P ***	**85% P**	**85% P**	**90% P**	**100% P**
6	EOC	G1446	2.13	2.44	1.90	2.04	2.04	1.95	-	1.75	1.66	1.42	1.38	1.34
		ATR10	2.08	2.34	1.86	1.97	1.97	1.88	-	1.70	1.61	1.41	1.38	1.34
	MOC	G1446	2.11	2.44	1.88	2.04	2.04	1.93	-	1.74	1.65	1.36	1.33	1.30
		ATR10	2.05	2.34	1.83	1.97	1.97	1.87	-	1.69	1.60	1.37	1.35	1.31
7	EOC	G1446	2.13	2.44	1.90	2.04	2.04	1.95	-	1.75	1.66	1.45	1.42	1.38
		ATR10	2.08	2.34	1.86	1.97	1.97	1.88	-	1.70	1.61	1.45	1.43	1.39
	MOC	G1446	2.11	2.44	1.88	2.04	2.04	1.93	-	1.74	1.65	1.42	1.40	1.36
		ATR10	2.05	2.34	1.83	1.97	1.97	1.87	-	1.69	1.60	1.43	1.41	1.37

Application Conditions:

1. Equipment in Service
2. RPTOOS
3. PROOS
4. TBVOOS
5. TBVOOS & RPTOOS
6. PROOS & TBVOOS
7. PROOS & TBVOOS & RPTOOS

* While operating in SLO, a 0.02 adder must be applied to all $MCPR_p$ limits. In addition, the SLO operating limit MCPR must remain above 1.44 for GE14 and 1.40 for Atrium-10.

LHGRFAC$_p$ Limits for GE14 and Atrium-10

			Below P_{bypass}				Above P_{bypass}					
App. Cond.	**Exp.**	**Fuel**	**23.8% P F ≤ 50.0%**	**23.8% P F > 50.0%**	**40% P F ≤ 50.0%**	**40% P F > 50.0%**	**40% P**	**50% P**	**70% P**	**85% P**	**85% P**	**100% P**
1, 2, 4, 5	EOC	G1446	0.749	0.647	0.854	0.742	1.000	-	-	-	-	1.000
		ATR10	0.781	0.628	0.890	0.733	1.000	-	-	-	-	1.000
	MOC	G1446	0.861	0.651	0.959	0.785	1.000	-	-	-	-	1.000
		ATR10	0.810	0.707	0.900	0.777	1.000	-	-	-	-	1.000
3, 6, 7	EOC	G1446	0.749	0.647	0.854	0.742	0.742	0.797	0.875	0.924	1.000	1.000
		ATR10	0.781	0.628	0.890	0.733	0.733	0.789	0.876	0.930	1.000	1.000
	MOC	G1446	0.861	0.651	0.959	0.785	0.785	0.838	0.914	0.960	1.000	1.000
		ATR10	0.810	0.707	0.900	0.777	0.777	0.808	0.879	0.930	1.000	1.000

Application Conditions:

1. Equipment in Service
2. RPTOOS
3. PROOS
4. TBVOOS
5. TBVOOS & RPTOOS
6. PROOS & TBVOOS
7. PROOS & TBVOOS & RPTOOS

Loop Manual TBV In-Service $MCPR_f$ Limits for GE14 and Atrium-10
(Application Conditions 1, 2 and 3)

20% F *	30% F *	50% F *	110% F *
1.26	1.26	1.19	1.19

Loop Manual TBVOOS $MCPR_f$ Limits for GE14 and Atrium-10
(Application Conditions 4, 5, 6 and 7)

20% F *	30% F *	50% F *	110% F *
1.38	1.38	1.31	1.31

Application Conditions:

1. Equipment in Service
2. RPTOOS
3. PROOS
4. TBVOOS
5. TBVOOS & RPTOOS
6. PROOS & TBVOOS
7. PROOS & TBVOOS & RPTOOS

* While operating in SLO, a 0.02 adder must be applied to all $MCPR_f$ limits. In addition, the SLO operating limit MCPR must remain above 1.44 for GE14 and 1.40 for Atrium-10.

Loop Automatic TBV In-Service $MCPR_f$ Limits for GE14 and Atrium-10

(Application Conditions 1, 2 and 3)

20% F *	30% F *	75% F *	110% F *
1.34	1.34	1.19	1.19

Loop Automatic TBVOOS $MCPR_f$ Limits for GE14 and Atrium-10
(Application Conditions 4, 5, 6 and 7)

20% F *	30% F *	75% F *	110% F *
1.46	1.46	1.31	1.31

Application Conditions:

1. Equipment in Service
2. RPTOOS
3. PROOS
4. TBVOOS
5. TBVOOS & RPTOOS
6. PROOS & TBVOOS
7. PROOS & TBVOOS & RPTOOS

* While operating in SLO, a 0.02 adder must be applied to all $MCPR_f$ limits. In addition, the SLO operating limit MCPR must remain above 1.44 for GE14 and 1.40 for Atrium-10.

Loop Manual $LHGRFAC_f$ Limits for GE14 and Atrium-10
(All Application Conditions)

20% F	47.3% F	76.6% F	110% F
0.700	0.700	1.000	1.000

Loop Automatic $LHGRFAC_f$ Limits for GE14 and Atrium-10
(All Application Conditions)

20% F	39.2% F	83.1% F	110% F
0.550	0.550	1.000	1.000

Application Conditions:

1. Equipment in Service
2. RPTOOS
3. PROOS
4. TBVOOS
5. TBVOOS & RPTOOS
6. PROOS & TBVOOS
7. PROOS & TBVOOS & RPTOOS