Pressure Temperature Limits Report
Topical

CEOG Task 1174

Presentation to

US Nuclear Regulatory Commission

by John Ghergurovich

Project Leader

CEOG PTLR Topical

- Introductions
  - Utility Sponsors
    - OPPD, Kevin Holthaus
    - APS, Jeff Brown
  - CE Engineering Services
    - John Ghergurovich, Project Leader
    - Anatoly Ostrov, LTOP Technical Expert
    - Phil Richardson, Licensing
    - Frank Ferraraccio, Task Leader, LTOP
    - Steve Byrne, Task Leader, Materials
    - Howard Jones, Task Leader, Fluence

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- Agenda
  - Background Review
  - Outline of Changes since Rev. 3
    - Changes by Section
  - Technical Summary
  - Schedule & Budget
  - Discussion/Q&A

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- Background
  - Rev 0-2: Developed 1991-98
    - Originally developed prior to GL 96-03
    - Format issues
  - Rev 3: May 1999
    - Structured into GL 96-03 Format
      - Not enough detail, interpretation issues
      - Developed comment matrix
        - limit to 1989 ASME Code Year
  - Rev 4: Internal draft only
  - Rev 5: June/July 2000
    - Incorporated All NRC Comments
    - Updated to 1995-6 ASME Code Year

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- Changes since Rev. 3
  - Identity Change
    - "Westinghouse Nuclear Services" refers to a business unit in the Company.
    - "CE Nuclear Power LLC" refers to the organization located in Windsor, CT.
    - "CE NSSS" refers to the historical plant design in the field.

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- Changes since Rev. 3 (Continued)
  - Discuss changes by section
    - All sections were reviewed
      - Most significant changes in:
        - » Section 3: Low Temperature Overpressure Protection Requirements
        - » Section 5: Application of Fracture Mechanics in Constructing P-T Curves
      - Globally
        - » Use of more prescriptive language, such as "shall" and "must" instead of "should"

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- Section 1: Neutron Fluence Calculational Methods
  - Review Results:
    - Fluence Calculation section of PTLR (Section 1.3) based on DG-1053 available in the Spring of 1999
      - No changes are required to accommodate DG-1053 dated September 1999
      - Industry comments on DG-1053 dated September 1999 provided by NEI in May 2000
      - NRC revising DG-1053 to address industry comments
        - » CEOG does not anticipate the need for changes to the PTLR for the Final RG-1053

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- Section 2: Reactor Vessel Material Surveillance Program
  - Review Results:
    - No change in methodology
    - Introduced additional references:
      - CE NPSD-1119, Rev 1, "Updated Analysis for CE Fabricated Reactor Vessel Welds Best Estimate Copper and Nickel Content", CEOG Task 1054

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Section 3: Low Temperature Overpressure Protection Requirements

- Review Results:
  - Inclusion of only the current CE Nuclear Power LLC methodology for CE NSSS designs
  - More focused P-T limit basis for LTOP setpoints and requirements:
    - Appendix G to Section XI of the ASME Code 1995 Edition, now includes the provision for plants with LTOP systems, or
    - Code Case N-640, with prior NRC approval

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- Section 3: Low Temperature Overpressure Protection Requirements
  - Review Results (Continued):
    - Strict compliance with GL 96-03:
      - Only P-T limits and LTOP setpoints can be removed from TS;
      - Analyses cannot credit operating restrictions if they are not in TS
    - More detailed description of methodology of mass addition transient analysis, both water-solid and with steam volume
    - More detailed description of methodology of energy addition transient analysis, both water-solid and with steam volume, with inclusion of mathematical derivations (Attachment D)

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- Section 3: Low Temperature Overpressure Protection Requirements
  - Review Results (Continued):
    - Inclusion of a new section on the effect of minimum pressure on RCP shaft seal integrity (Section 3.4.1.1)
    - In addition to the above, other NRC comments on Rev. 3, dated July 13, 1999, are addressed

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- Section 4: Method for Calculating Beltline Material Adjusted Reference Temperature (ART)
  - Review Results:
    - No changes necessary from Rev. 3

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- Section 5: Application of Fracture Mechanics in Constructing P-T Curves
  - Review Results:
    - No methodology changes
    - Code Year ASME 1995 Edition through 1996 Addenda
    - Code Case N-640 (only via NRC approval)

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- Section 6: Method for Addressing 10CFR50 Minimum Temperature Requirements in the P-T Curves
  - Review Results:
    - No changes necessary from Rev. 3

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- Section 7: Application of Surveillance Capsule Data to the Calculation of Adjusted Reference Temperature
  - Review Results:
    - No changes necessary from Rev. 3

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- Technical Summary
  - Addressed all NRC concerns noted in comment matrix
  - Updated to latest approved ASME Code Year

Anticipate favorable and timely outcome

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- Schedule & Budget
  - Utility Schedule Needs
    - OPPD: Expiration of PT Limits estimated Spring 2001
    - APS: Ongoing task to update technical specifications
  - NRC Review Fees
    - Budgeted $12,600 (approximately 100 labor hrs.)

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Discussion/Q&A

Chapter A-Introduction	
Comments	**Final Response**
On page 6, the first paragraph of the page states that once the pressure temperature limits report (PTLR) has been incorporated into the plant's technical specifications, any changes made in a PTLR would be controlled by the requirements of 10 CFR 50.59 and that the changes would no longer require a license amendment submittal to become effective. We have informed CE and OPPD that a plant could make changes in the PTLR through the design change (10 CFR 50.59) process if the changes in the P-T limits or LTOP setpoints were calculated using the approved methodology. However, the PTLR process requires a licensee to submit a new administrative section that refers to the specific version of the methodology that has been approved by the staff for generating P-T limit curves and LTOP system setpoints. The staff has previously emphasized that if a licensee was proposing a change to the approved methodology, the licensee would have to submit a license amendment request; this is consistent with the staff's position on page 2 of Generic Letter 96-03. Changes to the approved methodologies for the P-T limit curves and for the LTOP settings cannot be accomplished through the 10 CFR 50.59 process. The paragraph needs to be reworded to reflect this.	Agree with comment. Changes to approved methodologies for PT Limits and LTOP settings cannot be accomplished through the 10CFR 50.59 process. This section will be modified accordingly. Additionally, the sample plant specific PTLR and sample Tech Spec markup (Appendix A and B of the topical report) will be modified accordingly. OPPD, NRC, and ABB CENP agreed that there is no advantage to including methodologies beyond that currently used for the entire CE fleet, since anytime the utility changes methodology a license amendment would be needed.
Chapter 1.0-Neutron Fluence Calculation Methods (pages 13-26)	
The fluence calculation proposed in Section 1.0 of this report does not constitute a "Methodology" but it is acceptable for plant specific applications. The staff assumes that Section 1.4.1 does not include calculational adjustments based on plant specific data. The value of 1.15×10^{19} n/cm^2 is cited from Ref. 1 but the value of 1.501×10^{19} n/cm^2 is recommended. Neither of the above values is acceptable. The 1.15×10^{19} n/cm^2 has been derived using plant specific data adjustments which is in violation of the method proposed in CE NPSD-683 Rev. 3. The 1.501×10^{19} n/cm^2 value was derived using ENDF/B-IV based cross sections which is not conservative particularly for a thermal shield plant. On the other hand low leakage loading strategies have been applied for several Ft. Calhoun cycles which is conservative. However, the submittal does not quantify these effects to justify why the recommended value is conservative. OPPD, Fort Calhoun PTLR Submittal. Refs. (1) LIC-98-0009 dated January 30, 1998, Attachment 3, and (2) LIC-99-0045 dated May 26, 1999, Attachment C, Section 2.1.	This section defines the requirements for the fluence calculation and by itself does not constitute a methodology. The requirements are consistent with Draft Reg Guide 1053. Section 1.4.1 and 1.4.2 do describe how plant specific data should be used (i.e., to validate calculations are within expected tolerances). The 1.15×10^{19} n/cm^2 number doesn't appear in the ABB CENP topical report. This plant specific number will be addressed by OPPD.
Chapter 2.0-Reactor Vessel Surveillance Program (pages 27-28)	

The chapter states on the bottom of page 28 that a proposed modification to the surveillance capsule withdrawal schedule can be evaluated under the provisions of the 10 CFR 50.59 process if the withdrawal (removal) schedules are not specified in the Technical Specifications. Part 50, Appendix H, Section III.B.1 of 10 CFR states that the design of the surveillance capsule programs and withdrawal schedules must meet the requirements of the Edition of ASTM Standard Procedure E-185 which is current on the issue date of the ASME Code to which the reactor vessel was purchased. Section III.B.1 of the Appendix also states that later editions of ASTM E-185 may be used through the 1982 edition of the Standard Procedure. The staff position is that a licensee can use the 10 CFR 50.59 process to amend a previously approved surveillance capsule withdrawal schedule, only if the withdrawal schedule was not located in the plant's Technical Specifications, and if the proposed changes were consistent with the licensee's ASTM E-185 procedure of record, or with one of the more recent editions of the Standard Procedure listed in the rule (e.g., ASTM Standard Procedures E185-73, E185-79, or E185-82). Otherwise, pursuant to 10 CFR Part 50, Appendix H, Section III.B.3., such proposed changes would have to be submitted for review and approval of the staff. As stated on page 28 of the report, if the surveillance capsule withdrawal schedule is located in the Technical Specifications, any proposed changes to the schedule would require a license amendment request submittal (pursuant to 10 CFR 50.90 submittal). The report needs to be revised to reflect these requirements and the restrictions on using the 10 CFR 50.59 process for changes to the withdrawal schedule.	The report will be revised to reflect the stated requirements.
Chapter 4-Method for Calculating Beltline Material Adjusted Reference Temperature (ART) No Issues	
Chapter 5-Application Of Fracture Mechanics In Constructing P-T Curves	
The middle paragraph on page 53, the report is redundant in that it repeats the option of using either Code Case N514 or the 1996 Edition of Appendix G to Section XI of the Code as the basis for establishing the LTOP pressure setpoints. These options were already discussed in Section 3.0 of the report and do not need repeating. The staff's issues with the discussion of these methodologies have been described previously in items D.21 and D.22 to this list of staff concerns. To avoid confusion, the middle paragraph on page 53 needs to be deleted.	All references to anything beyond the 1989 version of the ASME code will be removed. Since Code Case N514 has been used and approved for some CE plants, this methodology will be discussed. ABB CENP disagrees that the middle paragraph is redundant. The topical report is organized into LTOP Issues-Chapter 3 and P-T Curves-Chapter 5. The middle paragraph is describing P-T limits in Chapter 5 may be retained after the removal of the reference to the 1996 version of the ASME Code.
The top of page 54 discusses the acceptable methodologies for generating both the P-T limits and the LTOP setpoints and is basically a repetition of the discussion on pages 30 and 31 of the report. Again, the discussion is ambiguous because it implies that any combination of methodologies for the P-T limits and the LTOP setpoints can be used in conjunction with one another. Pursuant to the requirements of 10 CFR 50.55a, 10 CFR Part 50, Appendix G, and Appendix G of the ASME Code, there are restrictions on which methodologies listed for the P-T limits can be used in conjunction with the methodologies listed for the LTOP setpoints.	All references to anything beyond the 1989 version of the ASME code will be removed. The acceptable methodologies for P-T limits will be clear and any references to acceptable methods for LTOP setpoints will also be clear.

Page 73 lists a series of equations to be used in the calculations of the allowable pressure data that will be used in the generation of the P-T limit curves. The page states that the M_t factors used in the calculations may be determined from either Figure G-2214-1 of the 1996 Edition of Appendix G to Section XI or from Figure G-2214-2 of one of the Pre-1996 Editions of Appendix G to Section XI. Page 73 also states the M_m factors used in the calculations may be determined from either Figure G-2214-1 of the 1996 Edition of Appendix G to Section XI or from the corresponding M_m formula in the 1996 Edition of the Appendix. At this point, the staff has only approved Editions of the ASME Code through the 1989 Edition of the Code (pursuant to 10 CFR 50.55a). Any reference to Figure G-2214-1 should be to the 1989 or Pre-1989 Editions of Appendix G to Section XI. Furthermore, pursuant to 10 CFR Part 50, Appendix G, a licensee will need to apply for an exemption to use the 1996 Edition of Appendix G for the determination or calculation of the M_m and M_t coefficient values if the 1996 Edition yields higher values of the coefficients than would use of Figure G-2214-1 from one of the approved editions of the Appendix (e.g., the 1989 Edition or Pre-1989 Editions of Appendix G to Section XI).	All ABB CENP plants use P-T limits consistent with the 1989 version of the ASME Code and 10 CFR50 App. G. ~~ABB CENP desired to provide flexibility to plants if the NRC approves versions of the ASME Code beyond 1989.~~ ~~For restrictions on approved methodology see the middle paragraph of page 54.~~ ~~Also see response to comment in Chapter A Introduction for clarification.~~ All references to anything beyond the 1989 version of the ASME code will be removed.
Figures 5.7 through 5.11 provide examples of typical composite P-T limit heatup, cooldown, and hydrostatic testing P-T limit curves for CE designed nuclear plants. At pressures greater than 20% of the preservice hydrostatic test pressure, a vertical line is drawn in the figures that is based on the lowest service temperature criteria (given in Section 6.3 of the report). The lowest service temperature criteria is relative to the limiting RT_{NDT} value of the ferritic low alloy steel piping, pump, and valve materials in the primary coolant pressure boundary (e.g., set at RT_{NDT} +100 F). However, the lowest service temperature criteria may be non-conservative relative to the minimum temperature requirements for the vessel when the RCS is pressurized to greater than 20% of the preservice hydrostatic test pressure (PHTP). It is critical to point out that the vertical lines for pressures greater than 20% of the PHTP should be based on the criteria that yield the more conservative results. This issue should also be clarified in the P-T limit figures in the sample PTLR (Appendix A to the report).	ABB CENP will clarify figures 5.7-5.11 to show that for any temperatures, the RCS pressures is based on the criteria that yields the lowest pressure, depending on plant operational mode (i.e., heatup, cooldown, hydro, SDC, or core critical). This will be added as a footnote. Also, Figures 5.7-5.9 will be clarified so that the temperature lines don't extend beyond the bolt-up temperature or beyond the vertical line representing the lowest service temperature. This same changes will be made to the appropriate figures in Appendix A.
Chapter 6-Method For Addressing 10 CFR 50 Minimum Temperature Requirements in the P-T Limit Curves	
The section only lists the minimum temperature requirements for operation with the core critical when the reactor coolant system (RCS) pressure is ≤ 20% of the preservice hydrostatic test pressure (PHTP), and when the RCS pressure is > 20% of the PHTP. The section does not mention the minimum temperature requirements for inservice hydrostatic/leak rate testing conditions both at ≤ 20% and > 20% of the PHTP, and during normal operations at ≤ 20% and > 20% of the PHTP when the core is not critical. All of the minimum temperature requirements should be stated and should basically be the same as those mentioned on pages 59-60 of the report.	The ABB CENP approach was to focus on the core critical minimum temperature requirements, since this bounds when the core is not critical. All the minimum temperature requirements will be stated here.
Chapter 7.0-Application of Surveillance Capsule Data to the Calculation of Adjusted Reference Temperature	

On page 96 it is stated that a licensee using the methodology may apply the surveillance data from a sister plant that has an equivalent material (e.g., equivalent heat number) in the surveillance program for the sister plant's reactor vessel. Pursuant to the requirements of 10 CFR Part 50, Appendix H, "Reactor Vessel Material Surveillance Program Requirements," the staff position is that a licensee may only use the data from a sister plant if the surveillance program and data has been approved by the staff as complying with the requirements for Integrated Surveillance Programs that are Section III.3.C. to 10 CFR Part 50, Appendix H. If a licensee has not been approved to use integrated surveillance data the rules require that the licensee submit a request to use the integrated data. According to the rule, such requests will be evaluated by the Director of the Office of Nuclear Reactor Regulation on a case-by-case.	ABB CENP will revise this section to state that when sister plant data is used...the licensee needs to explain and justify that indeed the data is truly sister plant data. Also it will be stated that the use of sister plant data needs to be reviewed and approved by the NRC... and that this does not necessarily mean that an application for an Integrated Surveillance Program needs to be made.
Chapter 8-Summary of Results	
No Issues	
Chapter 9-References	
Reference 10 needs to be revised to remove the reference to the 1996 Edition of Appendix A to Section XI of the ASME Code since the report does not refer to this methodology as being acceptable for either the establishment of the LTOP system setpoints or for generation of the P-T limit curves.	All references to anything beyond the 1989 version of the ASME code will be removed.
Appendix A to the Report	
Section 2.3 of the Appendix (page A-6) states that the acceptability criterion for the LTOP system is that the "peak transient pressure does not exceed 110% of the applicable Appendix G pressure limit. Section 2.3 of the Appendix does not state that a licensee cannot apply for an exemption to set the LTOP setpoints at 110% of the peak Appendix G pressure (e.g., an exemption to use either the 1996 Edition of Appendix G to Section XI or Code Case N-514 for the LTOP pressure setpoint) if the applicant is requesting an exemption to use Code Case N-640 as the basis for calculating the K_{IR} values used in the Appendix G P-T limit calculations. The report needs to correct this omission.	The report will be modified to remove the reference to Code case N-640 and references to anything beyond the 1989 version of the ASME Code. This will clarify this section.
Section 2.6 of the Appendix (page A-12) should clarify that the lowest service temperature line in Figures 4-1 and 4-2 of the Appendix should be generated from the acceptance criterion that yields the more conservative value: (1) the minimum temperature requirement for normal operations with the core not critical and the RCS pressure greater than 20% of the preservice hydrostatic test pressure (PHTP), or (2) the lowest service temperature requirement for the ASME Code Class 1 piping, pump and valves.	The requested clarification will be made. Specifically, the lowest service temperature definition will be added to section 2.6 and a statement will be added to clarify that the allowed RCS pressure at a given temperature is based on the criteria that yields the lowest pressure, depending on plant operational mode (i.e., heatup, cooldown, hydro, SDC, or core critical).
Appendix B to the Report	

Appendix B provides an example of the proposed technical specifications for a typical PTLR license amendment request from a CEOG member utility. However, the sample proposed technical specifications do not contain an administrative controls technical specification page which governs the PTLR program. This is not consistent with the criteria in GL 96-03 and needs to be corrected.	The Standard Technical Specifications-Combustion Engineering Plants, NUREG-1432, Vol 1, Rev. 1, April 1995 will be marked up as another example of the modified technical specifications and included in appendix B. This will be added to the existing markups of the "older" technical specifications. The additional markup will specify that the NRC staff approval document needs to be inserted in the Administrative Controls Section.
In accordance with Generic Letter 96-03, the PTLR process requires that any changes made to a previously approved NRC methodology be submitted by the licensee to the NRC for approval. This is true for any changes to a methodology. Changes to the curves, etc., using an approved methodology do not have to be reviewed by the NRC.	This restriction and allowances will be clear in both the "older" technical specification markups and the Standard Technical Specifications-Combustion Engineering Plants markups.

Chapter 3.0 - Low Temperature Overpressure Protection

Comments	Final Response
The staff has identified a number of issues that need to be addressed regarding the generic topical report. Most of these issues are relatively simple, however, a number of significant issues remain. The significant issues are: the continued ambiguity regarding the appropriate references that can be used to develop the P-T limits and the LTOP P-T limits, the lack of a model for calculating the energy addition transient, ambiguity regarding how a steam bubble in the pressurizer will be credited in the analysis, ambiguity regarding how operating restrictions can be credited in the analysis and vague statements regarding what assumptions need to be included in the analysis. A list of all the concerns is provided below.	Addressed individually in Comments.
1. The discussion in Section 3.0 regarding the development of the P-T limits and LTOP limits is very general, confusing and could be misleading. Statements implying that a 1.1 relaxation factor can be applied to references 10 or 11 must be removed. The topical should state clearly that there are only two acceptable methods for generating P-T limits: (1) Appendix G to Section XI of the 1986 ASME code, or (2) ASME Code Case N-640, if an exemption is granted by the NRC. Additionally, the topical should state clearly that there are only three acceptable methods for generating the LTOP P-T limits: (1) Appendix G to Section XI of the 1986 ASME code, (2) 110% of Appendix G to Section XI of the 1986 ASME code, if an exemption is granted from the NRC, or (3) ASME Code Case N-640, if an exemption is granted from the NRC. Although the topical can be interpreted a number of ways, the above is how the staff have interpreted the discussion. If this is not the case, state clearly what else would be acceptable under this topical and why.	Agreed Clear As agreed with the NRC, no other methodologies beyond those currently used for CEOG plants will be described. Code Case N-640 text will be removed. The two kinds of P-T limits that are used as a basis for LTOP setpoints and limitations at the CEOG plants are 1) App. G P-T limits based upon methodology through the 1989 ASME B&PV Code and 2) LTOP P-T limits based upon Code Case N-514. ABB CENP defines P-T limits associated with Code case N-514 (which effectively increase the App. G limits by 10%) as LTOP P-T limits, to distinguish them from the Appendix G P-T limits. The Code case can only be used if prior NRC exemption is obtained.
2. The general methodology is based on the presumption that an adequate LTOP system can be designed a number of ways by varying the assumptions. The methodology implements this strategy by allowing a number of plant parameters to be controlled in the PTLR, rather than in the TS. Although this concept could be appealing it goes well beyond the process described in Generic Letter 96-03. Additionally, generic TS changes and reductions in TS content are being discussed with the	Clear Agreed. The only values that will be removed from the Tech Specs are PT Limits and LTOP setpoints (e.g., PZR level requirement will not be removed)

Owners Groups. As a result, it is not appropriate to move these controls to the PTLR.	
3. The statement on page 38 of the topical, that operating restrictions that reduce the severity or eliminate a transient "shall be placed in the TS" is misleading. The analyses need to be based on the TS. The topical should state that if there are no TS controlling the restriction, then the restriction cannot be credited in the analysis or put in the PTLR. For example, for plants without a TS on the charging pumps, pressurizer level in modes 4, 5 and 6, or reactor coolant pumps in operation, the topical should state that these restrictions cannot be credited in the analysis or put in the PTLR.	Clear While the NRC position is true, the report statement stands. As the analysis work is performed, any limitations need to be in the TS for control. The report will be made clear that the analysis/methodology cannot credit operating restrictions if they are not in the technical specifications.
4. Please clarify how a pressurizer steam volume is used as an additional qualifier in the overpressure analyses? The discussion implies that it be used in lieu of a requirement on the relief valves rather than in conjunction with the relief valves for both the mass addition and energy addition transient? The steam bubble in conjunction with operator action should be considered additional defense-in-depth or margin when performing the water-solid calculations. For example, it is prudent to assure there is a steam bubble prior to starting a RCP to prevent the relief valves from being challenged, however, the overpressure analysis should generally consider water-solid conditions. If an individual plant needs this credit as a result of having only one relief valve or the plant's design basis already credits the steam bubble, this can be credited, however, generic approval is not appropriate.	A transient can be limited by initial PZR level and press plus dT to avoid pressurization to setpoint. The detailed methodology for the energy and mass addition transient will be described. The text will clarify that the relief valve will remain operable within the LTOP region even when credit is taken for a steam bubble.
5. The topical should indicate that pressurizer level uncertainties need to be considered in the analysis and indicate which standard should be used for determining the uncertainties.	Clear The uncertainty shall be determined using guidance contained in Reg. Guide 1.105 and ISA Standard S67.04-1982, which has been approved by the NRC.
6. On page 36, with respect to the mass addition transient, the topical states the limiting event is the simultaneous operation of two HPSI and three charging pumps or the combination of the maximum flowrate permitted by TS. The plant specific discussion of two HPSI or three charging pumps should be removed or used as an example. The maximum flowrate permitted by TS should be the only criteria.	Clear Text will be revised to address "maximum combination"
7. To reduce confusion please define "conservative margin" when evaluating pump performance (page 45).	Clear The HPSI pump inputs shall be maximized by addition of 3 to 10% of nominal values. The charging pump input shall be the maximum flow rate measured at the plant.
8. The methodology needs to require that the core flood tank pressure be verified to determine if they need to be isolated.	Clear..the following text will be added. The requirements for the alignment of the Safety Injection Tanks (SIT) to the RCS while in the LTOP temperature range shall be evaluated to ensure that the SITs are isolated and ths do not constitute an

	additional mass additiona source
9. Pages 38 and 39 discuss the assumptions for the analysis, however, it includes a number of statements, "unless a less restrictive approach is justified." These statements should be removed. It is not clear who needs to justify the alternative approach, the NRC, the licensee, or the vendor. Does changing these assumptions mean the methodology is not being followed? If these assumptions are not considered part of the methodology, why are they not?	Clear Qualifier can be removed and the assumptions that are outlined are part of the ABB CENP methodology.
10. With regard to the "typically used" assumptions on page 44, please describe why these are not considered important and part of the methodology. Additionally, how is the steam generator heat transfer surface area for the energy addition transient determined.	Phrase - statement will be removed. The SG HT area is based on the maximum active tube surface area with no plugged tubes. We are not currently crediting any tube plugging.
11. For the operating and discharge characteristics of the SDC relief valves, please include the statement that the ASME standards and/or manufacturers recommendations, "whichever is more conservative," should be used. Additionally, the inlet pressure drop should also be included for these valves (if not included in the discharge characteristics).	Clear. Limitation will be added.
12. With regard to the pressure difference between the pressurizer and the limiting weld accounted for in the P-T limits and setpoints, the topical should state that maximum number of RCPs and RHR pumps, permitted by TS, should be accounted for in the P-T limits unless there is a TS restriction on RCP operation in modes 4, 5, and 6.	Clear. The following text will be added. A pressure correction factor is a pressure differential between the reference location in the reactor vessel beltline and the PZR pressure instrument tap. It includes, in part, a flow induced pressure drop between the reactor vessel inlet nozzle and the surge line nozzle in the hot leg. The pressure drop depends on the reactor vessel flow rate, which is a function of the number of operating RCPs. The maximum number of RCPs allowed by procedures to operate within a temperature range shall be accounted for in determining the pressure drop.
13. With regard to operator action, within "10 minutes of the start." Please clarify that if credit for operator action given it should be assumed 10 minutes after being alerted to the problem, not 10 minutes from the start of the event.	Clear; but need to research current basis for 10 minutes. Basis is NRC approval but have to review context and thence this will be clarified.
14. On page 42 the report states that a pressure vs setpoint function can be generated. Please describe how this is developed and how it will be used.	Clear. The following text will be added. The function could be developed such as a result of an energy addition transient analysis performed for a number of setpoints. The curve would allow the determination of an optiomal PORV setpoint that yields the peak pressure below the applicable P-T limit.

15. The energy addition evaluation method or analytical model for this event is not provided. A description of this model needs to be provided or the topical needs to state that a separate NRC approved model is needed and will be referenced in the TS administrative controls section to apply this PTLR methodology.	Text describes model features. CEOG does not intend to submit a separate topical on the model. The current ABB model has been Quality Assured and used in various plant specific submittals to the NRC. ABB CENP will add the mathematical details of this methodology to make it clear.
16. The ABB CENP method of equilibrium pressure method appears to be an acceptable model for water solid conditions. However, it is not clear how this model will be applied when credit is given for a pressurizer steam volume. Please describe how these time-dependent calculations are performed.	Clear. The following text will be added to clarify steam space statements. The equilibrium pressure is the greatest peak pressure that could be reached during this transient if it is higher than the maximum pressure at the opening. No time factor and operator action is involved, except for accounting for the additional inputs during 10 minutes, or less if justified. As a result, this equilibrium pressure applies to both water-solid and steam volume initial conditions in the PZR. A PZR steam volume is only credited in establishing pressurization rate prior to relief valve opening, which is then used in the calculation of the pressure accumulation. The latter is added to the nominal setpoint to determine the maximum opening pressure (see section 3.3.3). Depending on the assumed PORV opening time, a significant reduction in the maximum opening pressure on liquid can be realized, as pressuriztion rate is much lower than on water.
17. There should be a sample set of marked-up TS pages for the CE Standard TS. The marked up TS pages provided does not include an Administrative Controls section. The marked up pages need an Administrative controls section referencing the approved topical. The marked-up TS should also include TS on all restrictions credited in the report.	TS markup are presented as an example. The marked up standard TS, including an administrative section will be added.
18. Temperature uncertainties are discussed in a number of places, however, temperature uncertainties do not seem to be considered in all applications. To clarify, please state what standard will be used to quantify the temperature uncertainties and state that the uncertainties will be applied in all cases where temperature plays a role (i.e., enable temperature, P-T limits/LTOP P-T limits or setpoints, and all cases where temperature related operating restrictions are applied).	Clear. The uncertainty shall be determined using guidance contained in Reg. Guide 1.105 and ISA Standard S67.04-1982, which has been approved by the NRC. Also, temperature uncertainties are included in all cases where temperature related operating restrictions are applied.

19. For the development of the enable temperature in Section 3.4.3, how is the temperature different between the water temperature and the 1/4 or 3/4 t location calculated? Also, to clarify, an exemption is not required when the Code Case N-514 is applied only to the enable temperature, however, NRC approval is needed.	The water surface temperature is the boundary temperature which enables the calculation of the 1/4t and 3/4t metal temperatures, via finite element thermal analysis.
20. Please indicate in the topical that when establishing the bolt-up temperature, the P-T limits/LTOP P-T limits and setpoints that have been generated must encompass the RCS temperature associated the established bolt-up temperature (i.e., the P-T limits and LTOP protection bound operation with the head bolted).	NRC to elaborate. The topical will state that P-T curves are developed and applied down to the bolt-up temperature.
21. On pages 30 and 31, the report lists and discusses what are acceptable methodologies for generating the P-T limits LTOP system setpoints. The discussion is ambiguous because it implies that any combination of methodologies for the P-T limits and the LTOP setpoints can be used in conjunction with one another. Pursuant to the requirements of 10 CFR Part 50, Appendix G, there are restrictions on which methodologies listed for the P-T limits can be used in conjunction with the methodologies listed for the LTOP setpoints.	As agreed with the NRC, no other methodologies beyond those currently used for CEOG plants will be described. The two kinds of P-T limits that are used as a basis for LTOP setpoints and limitations at the CEOG plants are 1) App. G P-T limits based upon methodology through the 1989 ASME B&PV Code and 2) LTOP P-T limits based upon Code Case N-514. ABB CENP defines P-T limits associated with Code case N-514 (which effectively increase the App. G limits by 10%) as LTOP P-T limits, to distinguish them from the Appendix G P-T limits. The Code case can only be used if prior NRC exemption is obtained.
22. The middle paragraph of page 32 discusses how the LTOP system setpoints are established from the P-T limits. The staff considers the wording in the paragraph on page 32 to be ambiguous, in that a licensee may interpret the wording to mean that the P-T limit pressure values satisfying equation (1) of the 1996 Appendix G may be relaxed by 110% and then again by 110% to establish the LTOP system pressure setpoints. On this page, and throughout the report, the term "LTOP P-T limits" creates confusion with references to Appendix G P-T limits (e.g., P-T limits generated from the stress intensity equation in Appendix G). The 1996 edition of Appendix G does not allow the pressure values that are established from the stress intensity equation in the Appendix to be multiplied by a value of 1.1. Paragraph G-2215 of the Appendix states that "LTOP systems shall limit the maximum pressure of the vessel to 110% of the pressure determined to satisfy equation (1) of Appendix G (e.g., the stress intensity equation for generating the P-T limits). We recommend the following: (1) throughout the report, replace the term "LTOP P-T limits" with a terminology that avoids confusion with the Appendix G P-T limits; and (2) reword the final two sentences of the paragraph to state: "The latter requirement, which was first introduced by Reference 11, effectively increases the Appendix G P-T limits by 10% to arrive at the LTOP setpoint values. As indicated in Section 3.1.1, an exemption must be obtained from the NRC to use either Reference 10 or 11 as the basis for establishing the LTOP setpoints."	Clear. Suggested text will be considered. Reference to Reference 10 and 11 will be removed and what remains for text will be based on approved ABB CENP methodology.