
DTE Energy®



Meeting with NRC on RAI 10.04.07-1
Regarding Condensate & Feedwater
Supplemental Information

December 13, 2011



Attendees

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Agenda

- Background
- FSAR Chapter 10 Supplements and RAI
- ESBWR Design Features
- FSAR and DCD Comparison Section 10.4.7
- Conclusion



Background

NRC Request for Additional Information (RAI) 10.04.07-1:

In the applicant's August 5, 2011 supplemental response to RAI Question 12.02-7, the applicant proposed to make changes to FSAR Section 10.4.7, which currently incorporates by reference Section 10.4.7 of the ESBWR DCD with no departures or supplements. The proposed change would add, as supplemental information, the following statement: "The C&FS components can accommodate 100% feedwater flow to support a cascading feedwater configuration."

The staff has reviewed the relevant information in the ESBWR DCD. The staff found that the ESBWR DCD design and the BOP heat balance are based on the C&FS operating in a pumped forward configuration. The DCD does not directly identify a system configuration to route all feedwater flow through the CPS as stated in the RAI response, nor is it indicated in the DCD that pipe analysis (pipe hazards, transients, anticipated operational occurrences) was performed based on cascade operation with higher flows through the condensate system.

The staff requests for the applicant to clarify whether or not the proposed change to the FSAR constitutes a departure, and provide adequate justification supporting the conclusion. If the proposed change is a departure, then the applicant is requested to provide the following information in the Departures Report and the FSAR:

- 1. If it is determined that the change is a departure requiring NRC review and approval in accordance with 10 CFR 52.63 Item 5(b)(2), then provide appropriate justification and supporting information, or;*
- 2. If it is determined that NRC review and approval is not required for the change, then provide the bases for the determination that the departure does not require NRC review and approval in accordance with 10 CFR 52.63 Item 5(b)(2). In addition, the applicant should provide the basis and appropriate justification for its determination.*



Background

- NRC RAI 10.04.07-1 was issued following Detroit Edison's supplemental response to RAI 12.02-7.
- Detroit Edison added supplemental information in FSAR Chapter 10 to support FSAR Chapter 12 supplemental information which addresses reactor water iodine concentration assumptions for Appendix I offsite dose analysis for Fermi 3.
- These concentration assumptions address DCD source term changes incorporated into DCD Revision 7, based on NUREG-0016 and ANS 18.1 fuel performance.
 - DCD Rev 7 included updated source terms to reflect pumped forward design (previous revisions had assumed 100% feedwater flow through CPS).
 - Fermi 3 FSAR iodine concentration limits are established with 100% feedwater flow through CPS.



Background

Operation in a cascade configuration is not expected to be necessary to control reactor water iodine concentrations.

- FSAR includes operational flexibility, if necessary:
 - Cascade configuration is one means of controlling reactor water iodine concentrations.
 - Cascade configuration is included in the standard design.
 - Detailed design will address capacity for BOP condensate system and CPS to support 100% feedwater flow through full range of power operation without impacting safety.



Background

NRC SER for FSAR Chapter 12 discusses the following in regards to the Chapter 10 supplements

- ESBWR DCD describes nominal (not maximum) capabilities of the CPS and the condensate system components.
- Maximum component capabilities are established during detailed design.
- The staff found the approach for controlling reactor water iodine concentrations acceptable for demonstrating compliance with Appendix I.

FSAR Chapter 10 Supplements and RAI



- NRC RAI 10.04.07-1 focuses on EF3 SUP 10.4-2 (C&FS) and requests justification for including this information as supplemental vs. departure.
- Information added to FSAR Chapter 10 is as follows:
 - EF3 SUP 10.4-1 “The CPS condensate filters and demineralizers can accommodate 100% feedwater flow to support a cascading feedwater configuration”
 - EF3 SUP 10.4-2 “The C&FS components can accommodate 100% feedwater flow to support a cascading feedwater configuration”

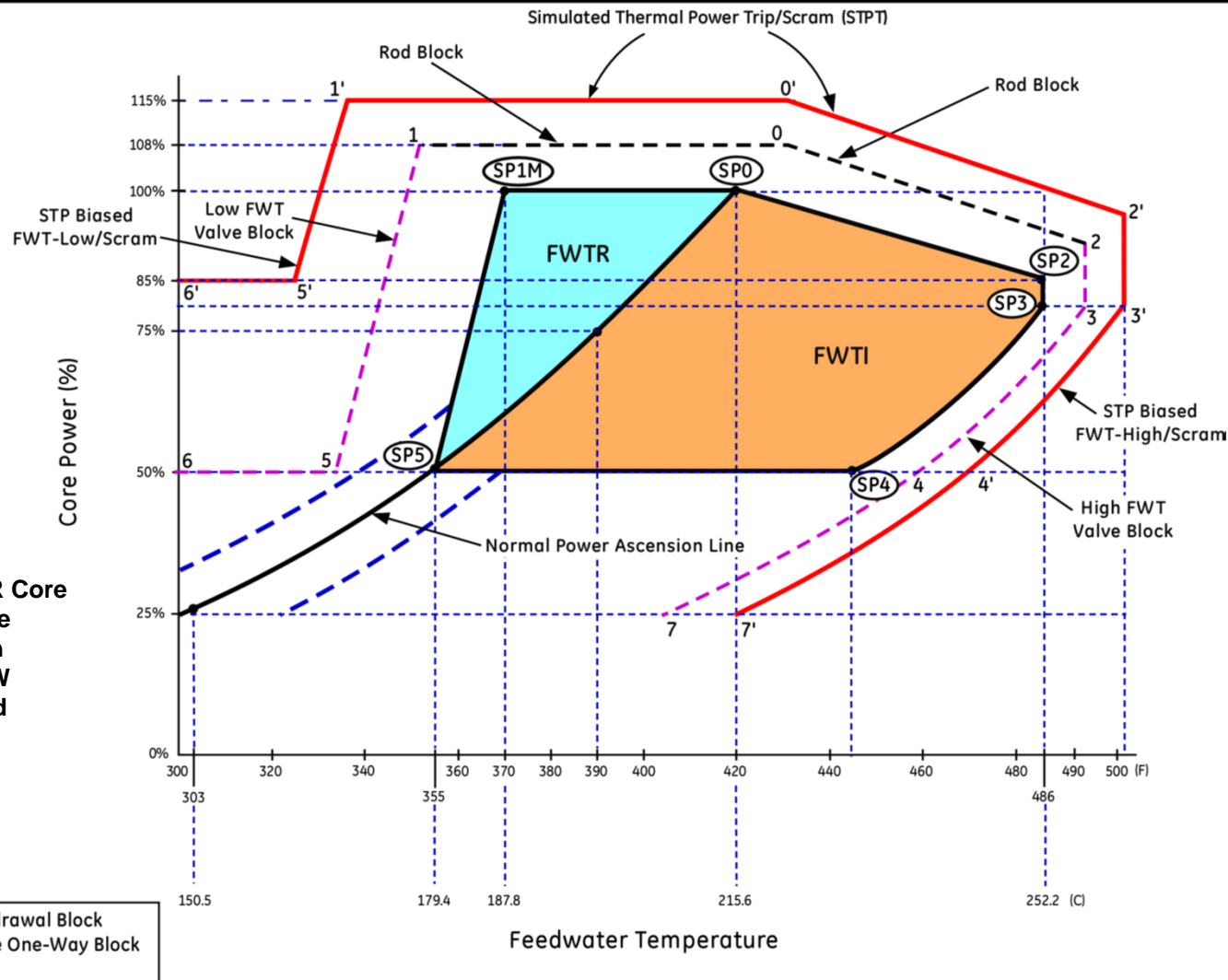
FSAR Chapter 10 Supplements and RAI



- RG1.206 defines a departure as a deviation from design information in a standard design certification rule.
- FSAR Chapter 10 information specifies supplemental detailed BOP system design capabilities for Fermi 3. The supplements do not deviate from the DCD standard design but provide more detailed site-specific design information to ensure sufficient capacity is available for cascade operation.
- The following slides show DCD design information for (1) operating in the cascade configuration within the feedwater operating domain and (2) the system components available to align heater drains to the condenser.



ESBWR Design Features



ESBWR Design Features



26A6642BF Rev. 09

ESBWR

Design Control Document/Tier 2

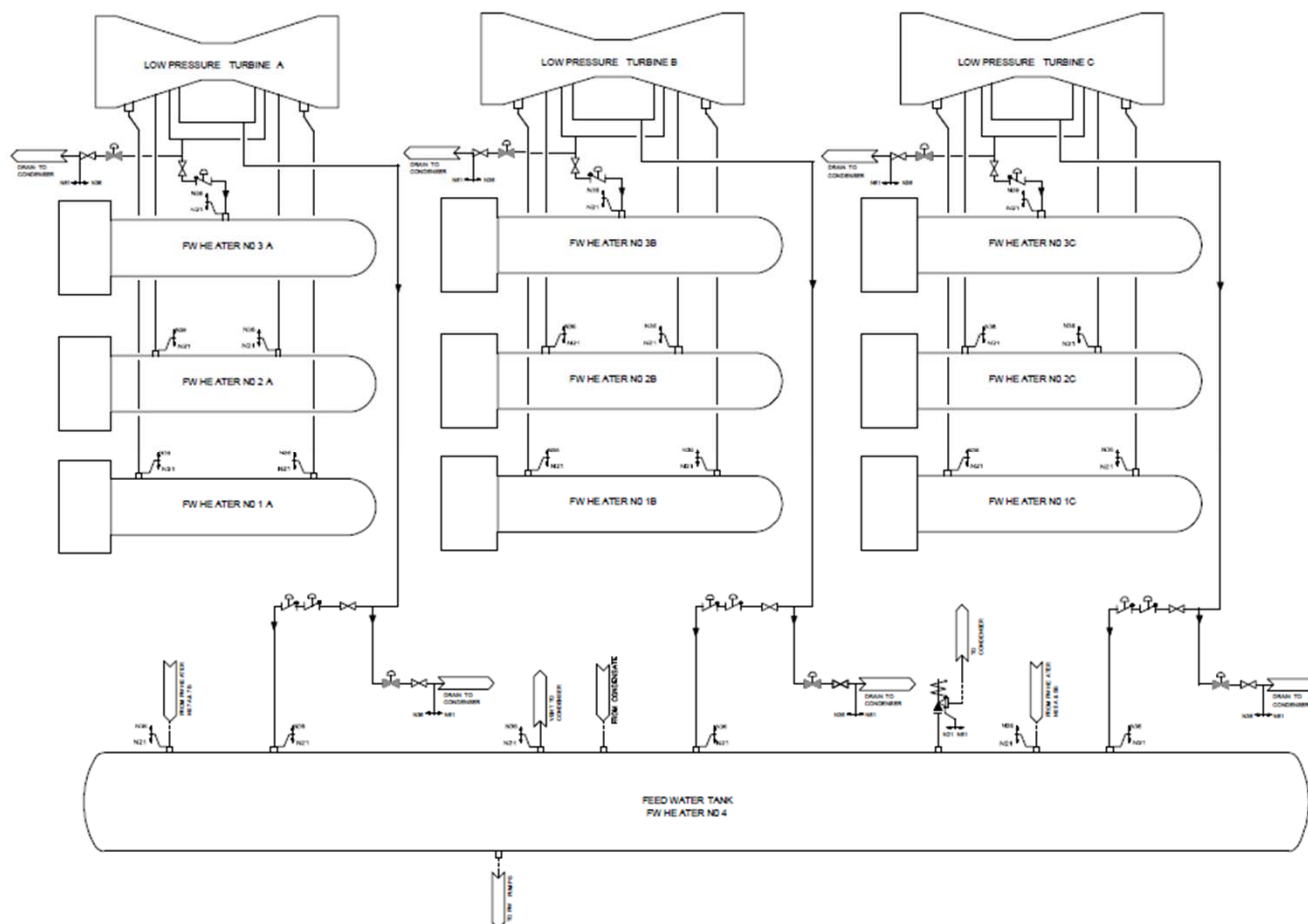


Figure 10.4-6a. Low Pressure Extraction Steam System

ESBWR Design Features



ESBWR

26A6642BF Rev. 09

Design Control Document/Tier 2

TYPICAL FOR EACH HIGH PRESSURE FEEDWATER HEATER TRAIN

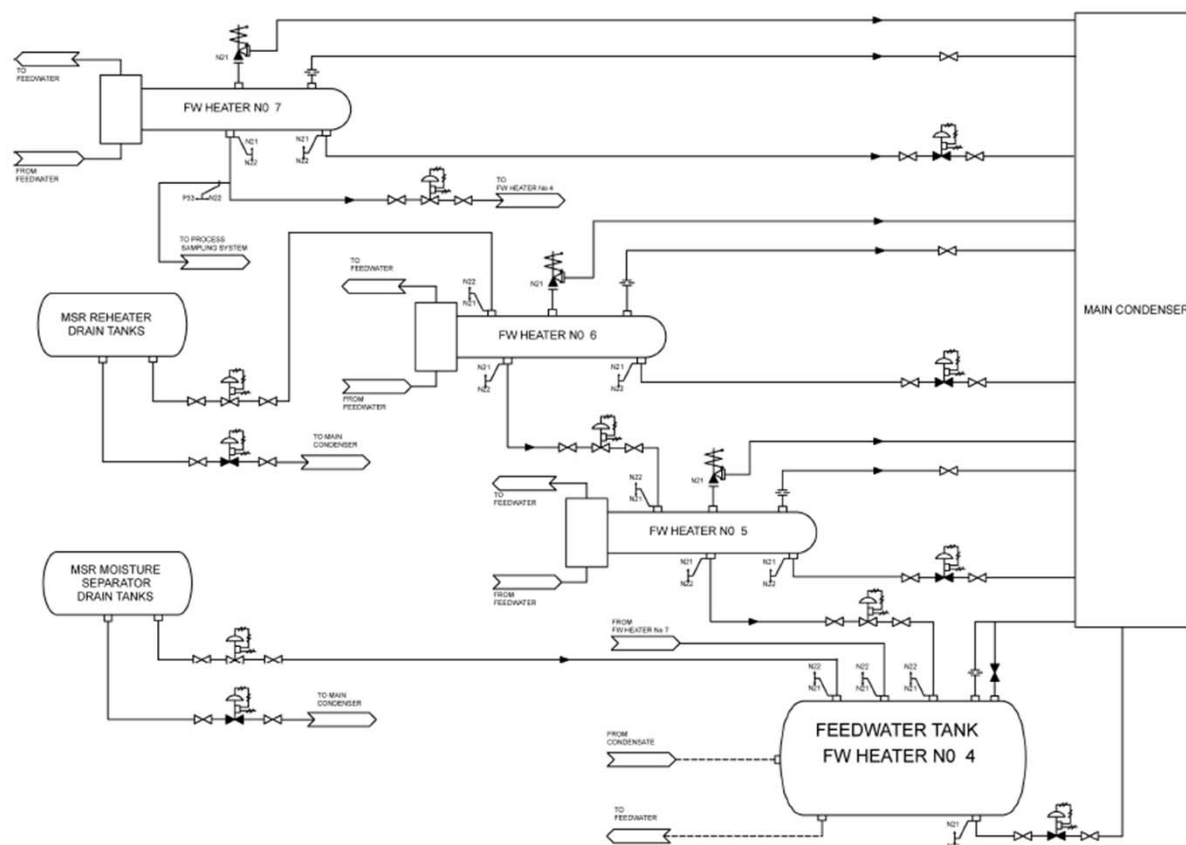
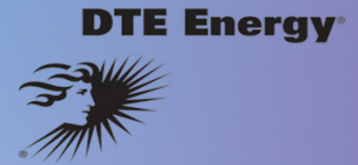


Figure 10.4-7b. High Pressure Drain and Vent System

FSAR and DCD Comparison Section 10.4.7



- Detroit Edition reviewed the FSAR and DCD against guidance in NRC SRP Section 10.4.7 (C&FS), specifically to address the RAI concerns.
- The review indicates that there is no departure from the design basis for the systems and there are no impacts on safety.

FSAR and DCD Comparison Section

10.4.7



- SRP Section 10.4.7 (C&FS) describes the “specific areas of review” for a BWR as:
 - C&FS characteristics with regard to capability to supply adequate feedwater under normal operation and shutdown.
 - C&FS interfaces are acceptable with regard to functional design requirements and seismic design classification.
 - Detection of major system leaks that could affect functional performance of safety-related equipment.

FSAR and DCD Comparison Section

10.4.7 – System Capabilities



C&FS capability to supply adequate feedwater to reactor is unaffected.

- Detroit Edison will operate Fermi 3 as described in the DCD for normal operating conditions using pumped forward heater configuration.
 - Chapter 10 supplemental information has no impact on the DCD description of ESBWR normal operation as condensate system and CPS will meet minimum system requirements in pump forward heater drains configuration.
 - BOP heat balances in DCD are unaffected by added capacity in condensate system and CPS.
- As shown on figures above, the ESBWR design includes system components that can align the system in a cascade configuration.
 - Cascade configuration is addressed in DCD for power maneuvers during system startup, plant startup and shutdown, and power changes.
 - Cascade configuration does not impact safety-related functions or components.
- Nominal BOP heat balance is provided for normal operational configuration.

FSAR and DCD Comparison Section 10.4.7– Interfaces and Functional Design Requirements



Interfaces and functional design requirements are maintained when operating in cascade configuration

- DCD defines no safety functions in design bases for C&FS:

10.4.7 Condensate and Feedwater System

The Condensate and Feedwater System (C&FS) receives condensate from the condenser hotwell(s), supplies condensate to the condensate purification system, and delivers high purity feedwater (FW) to the reactor, at the required flow rate, pressure and temperature.

10.4.7.1 Design Bases

10.4.7.1.1 Safety Design Bases

The C&FS does not perform, ensure or support any safety-related function, and thus, has no safety design basis.

- Non-safety power generation design bases functions described in DCD Section 10.4.7.1.2 will be maintained in detailed design.

FSAR and DCD Comparison Section 10.4.7– Interfaces and Functional Design Requirements



Reactor safety is unaffected by operation in cascade configuration.

- Adequate feedwater flow will be maintained.
- Feedwater heaters will be operating and feedwater temperature will be maintained within feedwater temperature operating domain.

System safety-related interfaces are unaffected by operation in cascade configuration.

- No safety-related components are affected.
- Seismic design classification of components at seismic interface is unaffected.

Detailed design will ensure the DCD criteria are maintained.

FSAR and DCD Comparison Section 10.4.7– Impact on Safety-Related Equipment



Detection of system leaks is unaffected.

- C&FS pressure retaining components will be designed and constructed to codes and standards as specified in DCD Sections 3.2 and 10.4.7.2.2.
- C&FS is designed to minimize leakage with welded construction utilized where practicable.

Cascading operation will be addressed in detailed design in accordance with DCD system functional requirements in DCD Section 10.4.7.2.

- C&FS will have sufficient capacity and control stability to accommodate normally anticipated step and ramp changes in reactor power.
- FW flow will be controlled and regulated automatically by ESBWR control systems.

Detailed design must ensure that safety analyses results are unaffected.

FSAR and DCD Comparison Section

10.4.7 – Conclusions



Adherence to DCD criteria will be maintained through detailed design for ensuring capacity of BOP condensate system and CPS.

- Design functions described in DCD will be maintained through detailed design.

Safety-related systems and functions will be maintained when operating in cascade configuration.

- C&FS will function to supply adequate feedwater to reactor during operation and shutdown.
- Seismic interface is unaffected by cascading operation.
- Reactor operation is unaffected.



Conclusion

- Cascading Capability currently exists within the DCD.
- By adding information to Fermi 3 FSAR, Section 10.4.7, detail design will ensure sufficient capacity to operate in a cascading configuration.
- Design bases of the C&FS are not changed.
- Supplemental information does not change DCD C&FS design information.
- Reactor Safety Analyses remain bounding when operating within the feedwater temperature operating domain.
- Fermi 3 Supplemental Information ensures that detailed design will verify capability consistent with Chapter 12 assumptions.



Acronyms

BOP – balance of plant

C&FS – condensate and feedwater system

COL – Combined License

CPS – condensate purification system

DCD – Design Control Document

DCR – Design Certification Rule

FSAR – Final Safety Analysis Report

GEH – GE Hitachi Nuclear Energy

ITAAC – inspection, testing, analyses, and acceptance criteria

RG – Regulatory Guide

SRP – Standard Review Plan