

# SIEMENS

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Document Control Desk  
ATTN: Chief, Planning, Program and Management Support Branch  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

## **EMF-2158(P) Revision 0, "Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4/MICROBURN-B2"**

- Ref.: 1. Letter, Stephen Dembek (NRC) to James F. Mallay (SPC), "Acceptance for Referencing of Licensing Topical Report EMF-2158(P) Revision 0, 'Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4/MICROBURN-B2' (TAC No. MA4592)," October 18, 1999.
- Ref.: 2. Letter, James F. Mallay (SPC) to Document Control Desk, "SER Conditions for CASMO-4/MICROBURN-B2," NRC:98:038, September 9, 1999.
- Ref.: 3. Letter, James F. Mallay (SPC) to Document Control Desk, "Request for Copies of Reports Referenced in EMF-2158(P) Revision 0, 'Siemens Power Corporation Methodology for Boiling Water Reactors: Evaluation and Validation of CASMO-4/MICROBURN-B2,'" NRC:99:016, April 28, 1999.

Siemens Power Corporation conducts a formal review of all new SERs to determine whether any of its restrictions need to be clarified. If clarifications are needed, they are incorporated into the approved version of the topical report. The initial review of the SER contained in Reference 1 confirmed that it corresponds to the proposed conditions in Reference 2. However, a more detailed evaluation revealed two instances where clarification appears necessary.

SPC requests the NRC's concurrence with the following points of clarification regarding Conclusions 1 and 5 in the Reference 2 SER. We will appreciate a reply by January 31, 2000 so that the approved version of the topical report can be distributed in a timely way.

### Conclusion 1

"The CASMO-4/MICROBURN-B2 code system shall be applied in a manner that predicted results are within the range of the validation criteria (Tables 2.1 and 2.2) and measurement uncertainties (Table 2.3) presented in EMF-2158(P)."

### Clarification 1

There are selectable constitutive models, which make up the thermal-hydraulic model of the MICROBURN-B2 code described in EMF-1833(P) Revision 2, "MICROBURN-B2: Steady State BWR Core Physics Method." The selected set that produced the validation results in Tables 2.1 and 2.2

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and the uncertainties in Table 2.3 was not the set previously used in CASMO-3G/MICROBURN-B or the codes which interface with CASMO-4/MICROBURN-B2. Updates to, selection of, and new constitutive models are allowed as long as the conditions of the SER for CASMO-4/MICROBURN-B2 are met. (Note: EMF-1833 was provided to the NRC for information by Reference 3.)

#### Clarification 2

As noted in Section 3.0 Statistical Aspects of CASMO-4/MICROBURN-B2 of the SER for EMF-2158(P) "The statistical aspects of CASMO-4 and MICROBURN-B2 consist of applying appropriate statistical techniques (Reference 2 [XN-NF-80-19(P)(A) Vol.1, Supplement 3 and Supplement 4, 'Advanced Nuclear Fuels Methodology for Boiling Water Reactors, Benchmark Results for the CASMO-3G/MICROBURN-B Calculation Methodology,' November 1990]) to the CASMO-4/MICROBURN-B2 code system data base." The statistical analysis procedure in this approved reference has been employed to determine the uncertainties in the measured power distribution of the CASMO-4/MICROBURN-B2 code system and the current CASMO-3G/MICROBURN-B code system.

However, for CASMO-3G/MICROBURN-B there was an SER condition "The currently approved TIP asymmetry uncertainty value of 6.0 percent should be used in determining the radial power uncertainty." (Note: "...currently approved..." referred to a core simulator methodology, XTGBWR, approved in 1983 in XN-NF-80-19(P)(A) Volume 1 and Supplements 1 and 2, "EXXON Nuclear Methodology for Boiling Water Reactors – Neutronic Methods for Design and Analyses," March 1983.) Using the approved statistical analysis procedure and the CASMO-3G/MICROBURN-B data base, and applying the TIP asymmetry uncertainty of 6.0 percent, the calculated radial power uncertainties are 4.09% for C-Lattice reactors and 4.32% for D-Lattice reactors.

The comparable uncertainty values for CASMO-4/MICROBURN-B2 are 2.90% for C-Lattice reactors and 4.10% for D-Lattice reactors. These uncertainties, though calculated using the same statistical analysis procedure, are smaller than the CASMO-3G/MICROBURN-B uncertainties because the TIP asymmetry uncertainties applied were those derived from the CASMO-4/MICROBURN-B2 data base and not the 6% value previously applied to CASMO-3G/MICROBURN-B.

The uncertainties listed in Table 2.3 in EMF-2158(P) will be used by SPC when the CASMO-4/MICROBURN-B2 code system is fully implemented for BWR licensing and core monitoring applications. If the CASMO-4/MICROBURN-B2 code system is changed, new uncertainties will be calculated and used in subsequent licensing and core monitoring applications.

#### Conclusion 5

"The CASMO-4/MICROBURN-B2 code system is approved as a replacement for the CASMO-3/MICROBURN-B code system used in NRC-approved SPC BWR licensing methodology and in SPC BWR core monitoring applications. Such replacements shall be evaluated to ensure that each affected methodology continues to comply with its SER restrictions and/or conditions."

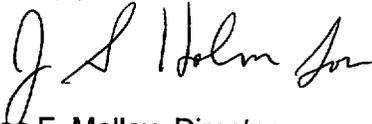
#### Clarification 1

The modifications, upgrades, and applications of the code system discussed in reference to Conclusion 1 must also satisfy the conditions of Conclusion 5.

In Conclusion 5 it is stated that the "...code system is approved as a replacement for the CASMO-3/MICROBURN-B code system..." It is recognized that MICROBURN-B2 cannot be executed without CASMO-4 input. Hence, the use of MICROBURN-B2 is part of a "code system." However, SPC routinely uses CASMO-3 to calculate numerous parameters such as fuel lattice kinetic parameters (e.g., Doppler, void and moderator reactivity coefficients, neutron lifetimes, and delayed neutron fractions), fuel actinide concentrations, and others. SPC intends to use CASMO-4 in a comparable manner.

If the above clarifications of the SER conclusions are found to be acceptable, SPC requests that the NRC concur. This letter of concurrence will be included in the approved version of the topical report.

Very truly yours,



James F. Mallay, Director  
Regulatory Affairs

/arn

cc: A. C. Attard  
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Project No. 702