

November 4, 1996

Document Control Desk

Attn: Chief, Planning, Program and Management Support Branch

U.S. Nuclear Regulatory Commission

Washington, D.C. 20555

Overheads for November 4, 1996 NRC Meeting

Attached are the overheads presented by Siemens Power Corporation in the November 4, 1996 meeting with NRC. The purpose of this meeting was to provide an overview of submitted methodology and supporting documentation of Realistic PWR Large Break LOCA Code. Some of the information presented on the overheads is proprietary to SPC. The overheads with the proprietary information are marked as proprietary. In accordance with the requirements of 10 CFR 2.790(b), an affidavit is attached to support the withholding of this information from public disclosure.

Egan Wang

Generic Issues and Environmental Projects Branch

Division of Reactor Program management

Nuclear Reactor Regulations

U.S. NRC

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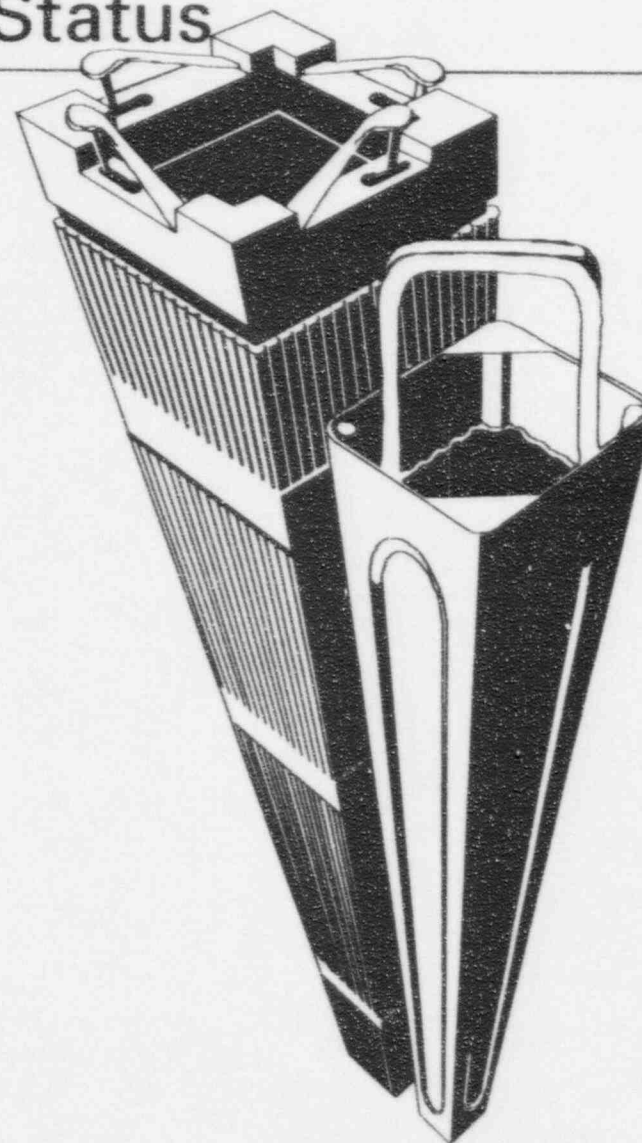
# Overview of Realistic PWR Large Break LOCA Methodology and NRC Review Status

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Presented by:

H. D. Curet and S. E. Jensen

Siemens Power Corporation - Nuclear Division



## Introduction

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- Purpose - Overview of submitted methodology and supporting documentation
- Objective - Demonstrate sufficient methodology documentation to justify reinitiating the review

## Key Events

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- RODEX3, April 1991 submittal approved in February 1996
- Realistic PWR LBLOCA Code and Methodology submitted October 1992 and December 1992, respectively
- Westinghouse "BE Model" submitted August 1992
- SPC Uncertainties Analyses submitted July 1993
- ITS discontinued review of SPC Methodology in September 1994
- SPC anticipated NRR and contractor to reinitiate review in June 1996
- Westinghouse "BE Model" approved June 1996
- Received copy of ITS close out report September 1996
- Lessons learned from Westinghouse review August 1992 to June 1996 to be applied to future "BE Model" reviews
- Meeting with NRR on November 1996 to discuss lessons learned to be applied to SPC Realistic Model

## Background

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- In 1988 USNRC revised the LOCA Emergency Core Cooling System Rule to allow realistic LOCA evaluation models in place of prescribed conservative models
  - Uncertainties in realistic evaluation models to be quantified
  - High probability that 10 CFR 50.46 criteria are not exceeded including uncertainties
- Basis for rule change is extensive research performed after 1975 rule as documented in "Compendium of ECCS Research"
- NRC issued Regulatory Guide 1.157 providing guidance for best estimate LOCA analysis
- NRC developed code scaling, applicability, and uncertainty (CSAU) evaluation methodology

## Status of Realistic LOCA Submittal

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- Realistic LOCA submittal consists of 14 topical reports which have been submitted for NRC review as follows:
  - ANF-90-145(P), Vols. 1&2, RODEX3 Fuel Rod Model, submitted April 1991
  - EMF-92-139(P), Vol. 3, Assessments, submitted September 1992
  - EMF-92-139(P), Vol. 2, S-RELAP5 Code, submitted October 1992
  - EMF-92-139(P), Vol. 1, Methodology Description, submitted December 1992
  - EMF-92-139(P), Vol. 3, Supplements 1-7, Assessment Calculation, submitted July 1993
  - EMF-92-139(P), Vol. 4, Uncertainties, submitted July 1993
  - EMF-92-139(P), Vol. 5, 4-Loop PWR Uncertainties, Submitted September 1995
- Final planned methodology report submitted July 1993

## General Methodology

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- Select codes based on capabilities
- Specify LBLOCA scenario, identify, and rank phenomena (PIRT)
- Establish assessment matrix
- Define system and experiment nodalization
- Perform assessments, determine accuracy and bias, and effects of scale
- Perform NPP calculation
- Determine uncertainty and biases
- Total uncertainty to calculate LBLOCA scenario in specific NPP

## Codes for Realistic LOCA

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- RODEX3 - Fuel rod thermal mechanical response
- S-RELAP5 - System thermal hydraulic response (steady & transient)
- ICECON - Containment backpressure
- GSUAM - Generic statistical uncertainties analysis methodology



## Benchmarks (cont'd)

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- SPC assessments of S-RELAP5 against integral test experiments:
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  - [ ]
  - [ ]
  - [ ]
  - [ ]
  - [ ]
- Assessments selected to encompass entire range of LBLOCA blowdown, refill, and reflood phenomena from facilities of varying scale
- Example calculations of Westinghouse 3-loop and 4-loop PWRs are provided

## Uncertainties Methodology

### Methodology:

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## Uncertainties Methodology

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### Parameters treated deterministically

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- [ ]
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# Uncertainties Methodology

Parameters included in experimental design

[ ]

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## Uncertainties Methodology

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# Uncertainties Methodology

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## Additional uncertainties

- Plant uncertainties

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## Uncertainties Methodology

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Uncertainties combined using GSUAM ([ ] trials)

Monte Carlo PCT Calculation Results  
3-Loop Westinghouse PWR

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## Uncertainties Methodology

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Uncertainties combined using GSUAM ([ ] trials)

Monte Carlo PCT Calculation Results  
4-Loop Westinghouse PWR

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## Summary and Conclusions

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- SPC developed Realistic PWR LBLOCA evaluation model following CSAU stepwise approach
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- Code applicability and scaling effects evaluated by numerous assessments against experimental data
- Methodology uncertainties were identified, quantified, and combined using GSUAM
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- [ ]
- Methodology submitted to NRC for review

## Summary

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- SPC submitted PWR Realistic LBLOCA Methodology to update technology

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## AFFIDAVIT

STATE OF WASHINGTON    )  
                              ) ss  
COUNTY OF BENTON     )

I, H. D. Curet, being duly sworn, hereby say and depose:

1. I am the Manager, Product Licensing, for Siemens Power Corporation ("SPC"), and as such I am authorized to execute this Affidavit.

2. I am familiar with SPC's detailed document control system and policies which govern the protection and control of information.

3. I am familiar with the Siemens Power Corporation information in the viewgraphs presented to the NRC on November 4, 1996 entitled "Overview of Realistic PWR Large Break LOCA Methodology and NRC Review Status," referred to as "Document." Information contained in this Document has been classified by SPC as proprietary in accordance with the control system and policies established by SPC for the control and protection of information.

4. The Document contains information of a proprietary and confidential nature and is of the type customarily held in confidence by SPC and not made available to the public. Based on my experience, I am aware that other companies regard information of the kind contained in the Document as proprietary and confidential.

5. The Document has been made available to the U.S. Nuclear Regulatory Commission in confidence, with the request that the information contained in the Document will not be disclosed or divulged.

6. The Document contains information which is vital to a competitive advantage of SPC and would be helpful to competitors of SPC when competing with SPC.

7. The information contained in the Document is considered to be proprietary by SPC because it reveals certain distinguishing aspects of SPC licensing methodology which secure competitive advantage to SPC for fuel design optimization and marketability, and includes information utilized by SPC in its business which affords SPC an opportunity to obtain a competitive advantage over its competitors who do not or may not know or use the information contained in the Document.

8. The disclosure of the proprietary information contained in the Document to a competitor would permit the competitor to reduce its expenditure of money and manpower and to improve its competitive position by giving it valuable insights into SPC licensing methodology and would result in substantial harm to the competitive position of SPC.

9. The Document contains proprietary information which is held in confidence by SPC and is not available in public sources.

10. In accordance with SPC's policies governing the protection and control of information, proprietary information contained in the Document has been made available, on a limited basis, to others outside SPC only as required and under suitable agreement providing for nondisclosure and limited use of the information.

11. SPC policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

12. Information in this Document provides insight into SPC licensing methodology developed by SPC. SPC has invested significant resources in developing the methodology as well as the strategy for this application. Assuming a competitor had available the same background data and incentives as SPC, the competitor might, at a minimum, develop the information for the same expenditure of manpower and money as SPC.

THAT the statements made hereinabove are, to the best of my knowledge,  
information, and belief, truthful and complete.

FURTHER AFFIANT SAYETH NOT.

*[Signature]*

SUBSCRIBED before me this 1<sup>st</sup>  
day of November, 1996.

*Sue M. Galpin*

Sue M. Galpin  
NOTARY PUBLIC, STATE OF WASHINGTON  
MY COMMISSION EXPIRES: 2/27/00

