ENCLOSURE 2

MFN 06-509

Draft Presentation for Meeting Regarding GE Analytical Methods - Non-proprietary

Non-Proprietary Version

IMPORTANT NOTICE

This is a non-proprietary version of Enclosure 1 to MFN 06-509, which has the proprietary information removed. Portions of the enclosure that have been removed are indicated by an open and closed bracket as shown here [[ ]].

Draft for review – unverified – Non-proprietary Version

Technical Update

December 14, 2006

J.G.M. Andersen
J.S. Bowman
D.J. Kropaczek
B.R. Moore

imagination at work

Contents

Part I – Gamma scan validation

Part II – 10x10 fuel pressure drop data

Part III – LANCER-AETNA technical overview

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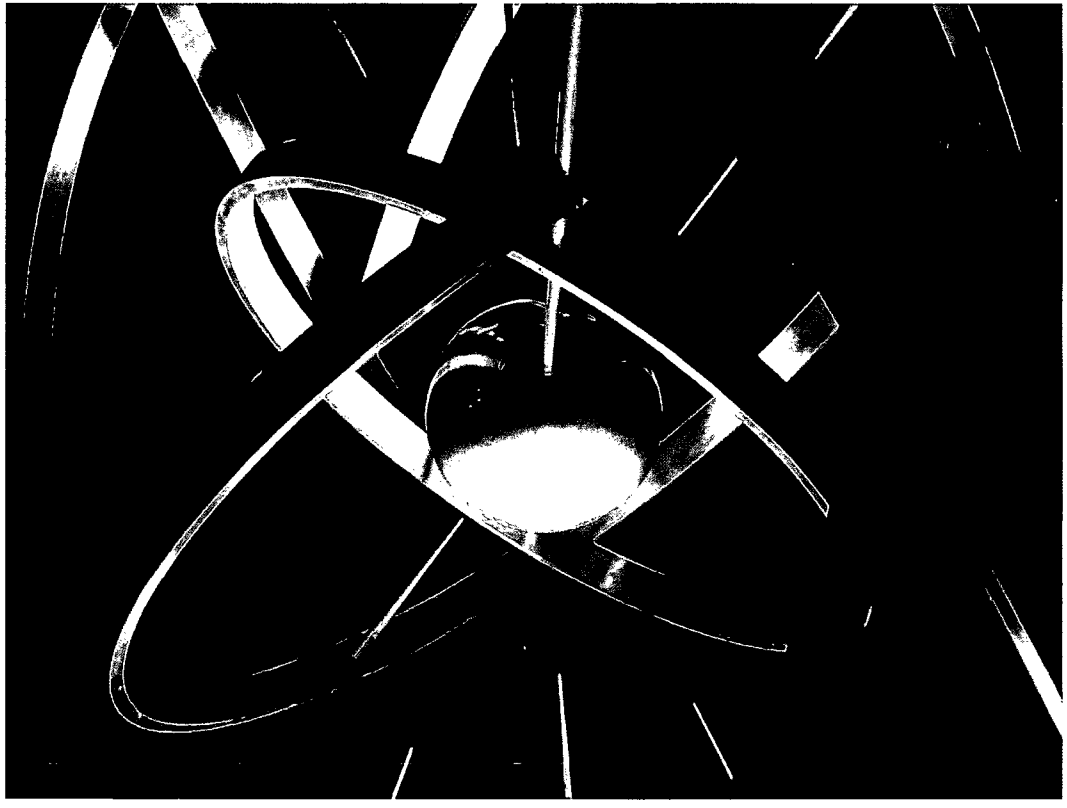
Gamma Scan Validation

NRC Presentation



imagination at work

Contents

Gamma Scan Purpose

Validate the application methodology

> Codes

> Processes

> Assumptions

> Confirmatory by nature

Cofrentes Cycle 13 (2002)

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[[GE12/GE14 Product Line Description

Power & Flow History for Cycle 13

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TIP Comparison Summary (PANAC11)

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EOC Core Average Axial TIP Agreement

PANAC11, 4 days prior to shutdown

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EOC TIP Agreement

PANAC11, 4 days prior to shutdown

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Power Measurements

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Preferred

$$_{56}Ba^{140} \xrightarrow[12.8\ d]{\beta^-} {}_{57}La^{140} \xrightarrow[40.2\ h,\ 1596\ keV]{\beta^-} {}_{58}Ce^{140}$$

Alternate

$$_{40}Zr^{95} \xrightarrow[65.0\ d]{\beta^-} {}_{41}Nb^{95} \xrightarrow[35.1\ d,\ 765.8\ keV]{\beta^-} {}_{42}Mo^{95}$$

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- Ba^{140} inventory varies with power the last 60 days of operation
- The rapid decay of Ba/La^{140} requires measurements in 12 – 36 days after shutdown

Bundle/Nodal Power
Comparison Process

GS data time-corrected to shutdown

Perform 3D core tracking to time of shutdown

Integrate Ba^{140} concentrations

Normalize both measured & predicted Ba^{140}

Statistical comparison (vary subgrouping)

> Core – Region – Type – Bundle – Axial – Nodal

Results reported for PANAC11

Sample GE12 Comparison

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Sample Alternate Vendor Fuel Comparison

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Summary Predicted vs. Measured

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Error versus Exposure

[[

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Error versus Core Radial Position

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Methods Comparison Summary

PANAC11, Monitoring Basis

Last TIP Data		Gamma Scan Data	
Bundle RMS = [[	]]	Bundle RMS = [[	]]
Axial RMS = [[	]]	Axial RMS = [[	]]
Nodal RMS = [[	]]	Nodal RMS = [[	]]

Error versus Bundle Power

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Error versus Axial Position

[[

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Power Allocation (PAL) Uncertainty
Determination Process

Obtain bundle powers around TIP strings

[[ ]]

Compare measured PAL to predicted PAL

Statistical summary

Apply directly in SLMCPR process (σ_{PAL})

[[NEDE-32694P-A Gamma Scans

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New Methods Introduction

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Accumulated Uncertainty Rollup

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Rod Power

Comparison Process

GS data time-corrected to shutdown

Perform 3D core tracking to time of shutdown

Obtain power/void history from simulation

Lattice code reanalysis using power/void history

Integrate Ba^{140} concentrations

Normalize both measured & predicted Ba^{140}

Statistical comparison

Rod Power Validation

NEDC-32601P-A, Section 3.1.4

Total rod power is measured

Rod power comparison process (previous slide)

Compare total uncertainty to

[[ ]]

Confirms analytically derived σ is sufficient

Last Gamma Scan at Duane Arnold in 1984

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System Deployed at Fitzpatrick

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FitzPatrick Gamma Scan Statistics JLM420

Preliminary & Unverified

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FitzPatrick Gamma Scan Statistics JLM420

Preliminary & Unverified

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Conclusions

Cofrentes Bundle Gamma Scan (2002)

10x10 fuel, mixed core application

Power distribution uncertainties confirmed

Nodal power agreement excellent

TIPs and Gamma Scans programs in agreement

Verified Analysis

Preliminary Conclusions

Fitzpatrick Rod Gamma Scan (2006)

10x10 fuel – GE14 lead fuel

Measurement statistics improved over DA'88

Prediction on modern methods/fuel better

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Post-processing and verification in 2007

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10x10 Fuel Product ΔP Data

NRC Presentation

imagination at work

Full-Scale Tests [[

ATLAS and Stern Labs

> Critical power

> Pressure drop

GNF2 and GE14 tested

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GE14 and GNF2

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Test Data Summary

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GE14 ΔP [[

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GE14 ΔP

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GNF2 ΔP [[

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GNF2 ΔP

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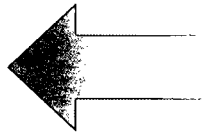
Method B Pressure Drop

ΔP friction

ΔP elevation  [[ ]]

ΔP local losses

ΔP acceleration

+ ΔP expansion/contraction

ΔP total

Comparison to Findlay-Dix

Preliminary & Unverified

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Comparison to Findlay-Dix

Preliminary & Unverified

Conclusions

- GE14 & GNF2 tests – geometry represents [[current fuel designs

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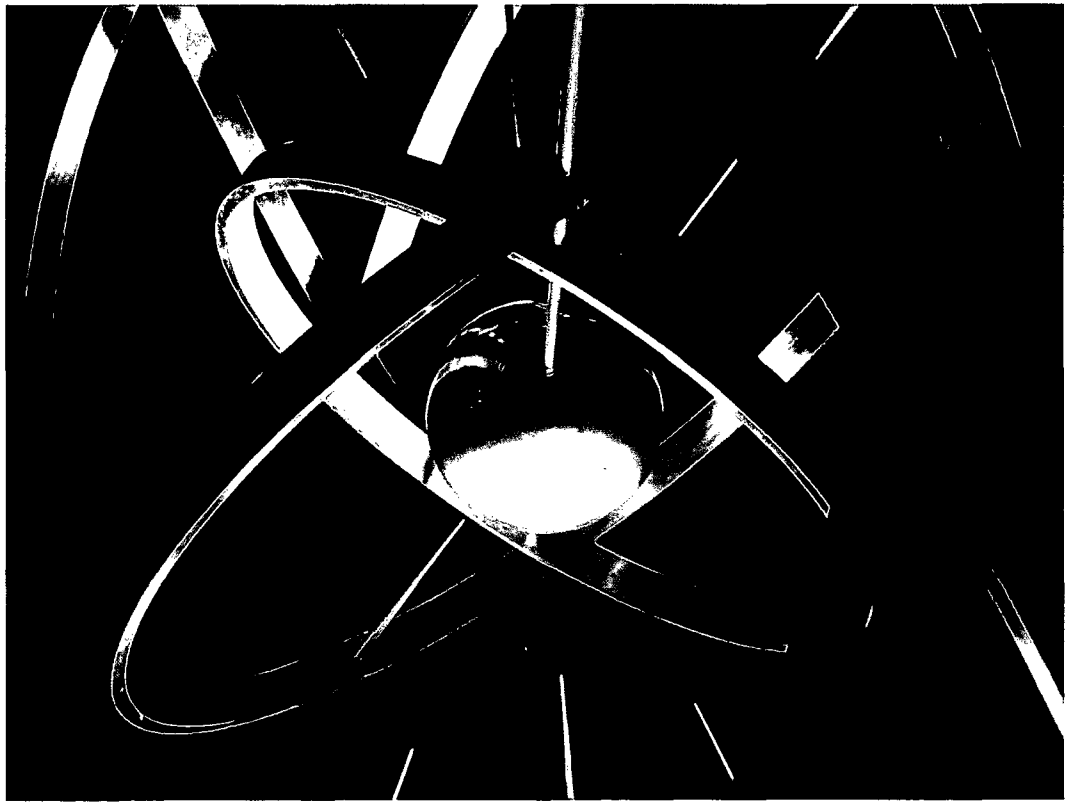
Advanced Methods

NRC Presentation



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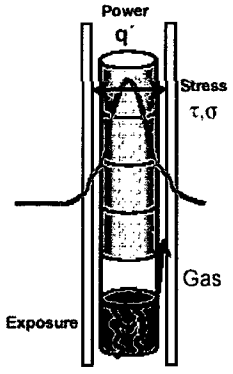
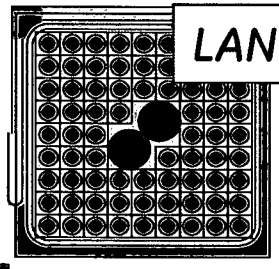
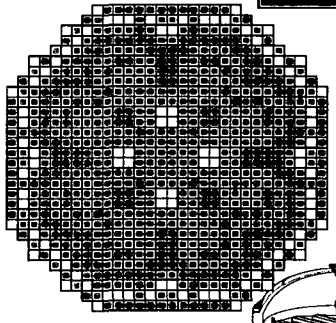
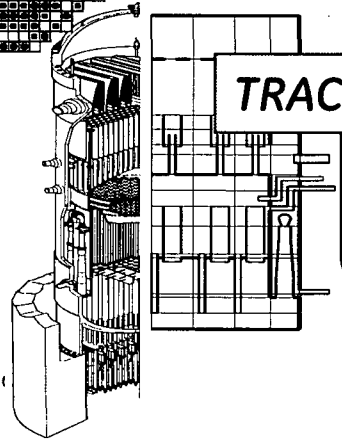
New Methods Analysis Platforms









PRIME

Fuel rod thermal-mechanical

Mechanical behavior of fuel rod.

(Replaces GSTRM)

LANCER

2-D Lattice Physics

Nuclear Behavior of Fuel Rods Within Bundle.

(Replaces TGBLA)

AETNA

3-D Core Simulation

Nuclear + Thermal-Hydraulic Behavior of Bundles in Core

(Replaces PANAC)

TRACG

Coupled Core and BOP Simulation

Best Estimate Analysis of Operational Transients

(Replaces ODYN, TASC, SAFER, CORCL)

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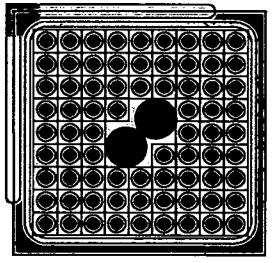
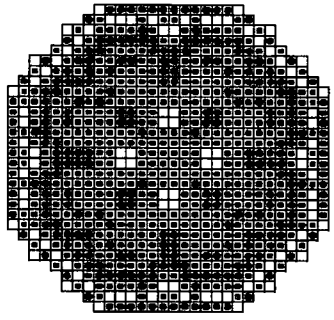
LANCER / AETNA





Lattice Physics (LANCER) ***3-D Simulator (AETNA)***

BWR core analysis tools for steady-state applications

- Nodal power limits – e.g. LHGR, MAPLHGR
- Reactivity based limits – e.g. SDM
- Exposure Limits – e.g. NEXRAT (Peak pellet exposure)
- Critical power limits – e.g. OLMCPR, SLMCPR

LANCER

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LANCER Calculational Scheme

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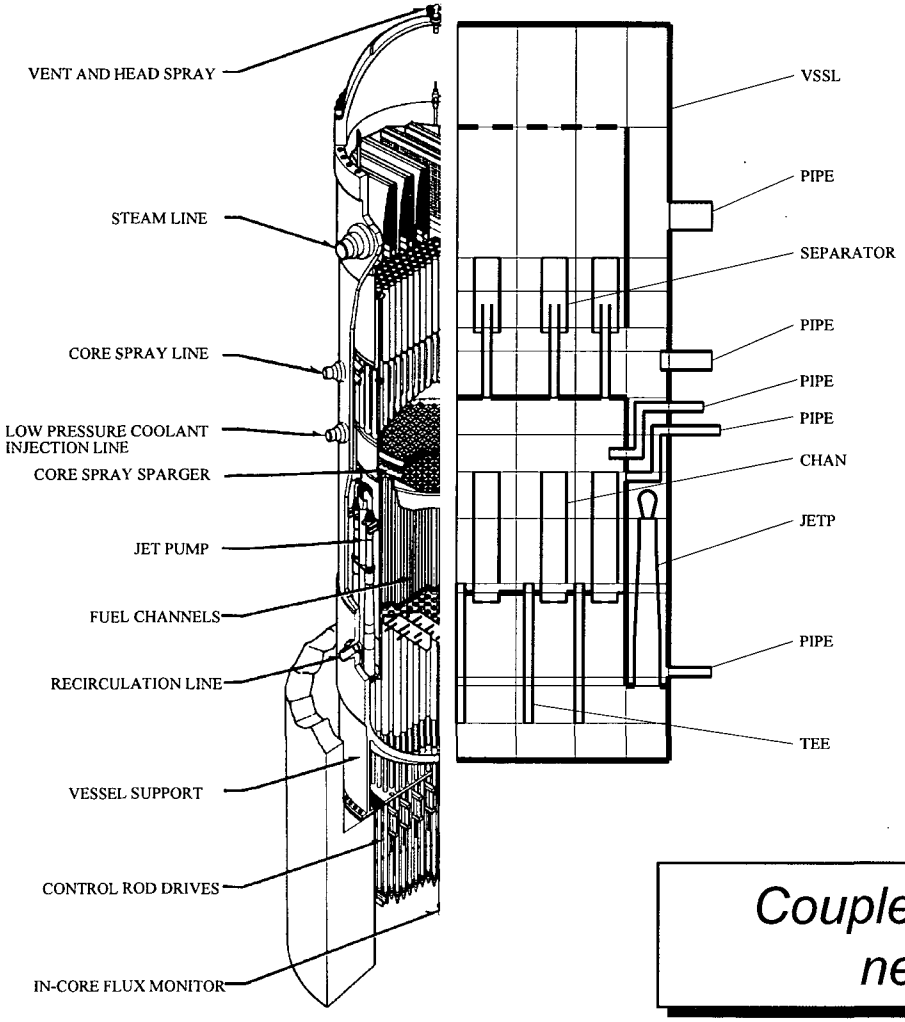
[[AETNA Features

TRACG



BWR system analysis tool with AETNA simulator

- ✓AOO
- ✓Stability
- ✓ESBWR (AOO, ATWS, LOCA, Stability)
- > ATWS
- > LOCA
- > RDA

Coupled simulator provides 3-D neutron kinetics solution

New Methods Introduction Timeline

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Scope – LANCER Methods LTR

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Scope – LANCER Qualification LTR

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Scope – AETNA Methods LTR

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Scope – AETNA Qualification LTR

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[[Scope – LANCER/AETNA Applications SE

LANCER02 Benchmark Suite

ENDF/B-VII Library Validation

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All Eigenvalues from Test Suite

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All Pin-by-Pin Fission Rate RMS's from Test Suite

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Example of Fission Rate Error

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ΔDoppler Coefficient

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0% Void Depletion (Monteburn Comparison)

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70% Void Depletion (Monteburn comparison)

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Summary

New steady state nuclear methods

> State of the art

> Qualified against data

Structured documentation

> Method – theoretical basis, models, equations, etc.

> Qualification – demonstrated over a broad range for the entire fleet

> Application – clearly defined and supported by qualification

Proposed review schedule follows documentation structure

ENCLOSURE 3

MFN 06-509

Affidavit

General Electric Company

AFFIDAVIT

I, George B. Stramback, state as follows:

(1) I am Manager, Regulatory Services, General Electric Company ("GE") and have been delegated the function of reviewing the information described in paragraph (2) which is sought to be withheld, and have been authorized to apply for its withholding.

(2) The information sought to be withheld is contained in Enclosure 1 to GE letter MFN 06-509, Robert E. Brown to U.S Nuclear Regulatory Commission, *Draft Presentation for Meeting Regarding GE Analytical Methods*, dated December 8, 2006. The Enclosure 1 (*Draft Presentation for Meeting Regarding GE Analytical Methods*) proprietary information is delineated by a double underline inside double square brackets. Figures and large equation objects are identified with double square brackets before and after the object. In each case, the sidebars and the superscript notation[{3}] refers to Paragraph (3) of this affidavit, which provides the basis for the proprietary determination.

(3) In making this application for withholding of proprietary information of which it is the owner, GE relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4), and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10 CFR 9.17(a)(4), and 2.390(a)(4) for "trade secrets" (Exemption 4). The material for which exemption from disclosure is here sought also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by General Electric's competitors without license from General Electric constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product;

c. Information which reveals aspects of past, present, or future General Electric customer-funded development plans and programs, resulting in potential products to General Electric;

d. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs (4)a., and (4)b, above.

(5) To address 10 CFR 2.390 (b) (4), the information sought to be withheld is being submitted to NRC in confidence. The information is of a sort customarily held in confidence by GE, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by GE, no public disclosure has been made, and it is not available in public sources. All disclosures to third parties including any required transmittals to NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within GE is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his delegate), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside GE are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information identified in paragraph (2), above, is classified as proprietary because it contains data and conclusions regarding GE Methods, pertaining to NEDC-33137P, *Applicability of GE Methods to Expanded Operating Domains*, which supports evaluations of the safety-significant changes necessary to demonstrate the regulatory acceptability for the expanded power/flow operating domains, including Extended Power Uprates, Constant Pressure Power Uprates, and the MELLLA+ domain, for a GE BWR, utilizing analytical models and methods, including computer codes, which GE has developed, obtained NRC approval of, and applied to perform evaluations of transient and accident events in the GE Boiling Water Reactor ("BWR"). The development and approval of these system,

component, and thermal hydraulic models and computer codes was achieved at a significant cost to GE, on the order of several million dollars.

The development of the evaluation process along with the interpretation and application of the analytical results is derived from the extensive experience database that constitutes a major GE asset.

(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to GE's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of GE's comprehensive BWR safety and technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology and includes development of the expertise to determine and apply the appropriate evaluation process. In addition, the technology base includes the value derived from providing analyses done with NRC-approved methods.

The research, development, engineering, analytical and NRC review costs comprise a substantial investment of time and money by GE.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

GE's competitive advantage will be lost if its competitors are able to use the results of the GE experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to GE would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive GE of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

I declare under penalty of perjury that the foregoing affidavit and the matters stated therein are true and correct to the best of my knowledge, information, and belief.

Executed on this 8th day of December 2006.

George B. Stramback

George B. Stramback
General Electric Company