UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 9, 1996

MEMORANDUM TO: Chairman Jackson
Commissioner Rogers
Commissioner Dicus

FROM: James M. Taylor
Executive Director for Operations

SUBJECT: USE OF NUREG-1465 SOURCE TERM AT OPERATING REACTORS

This memorandum responds to the Commission's request during the staff's briefing on June 12, 1996, concerning the Final Rule on Reactor Siting Criteria, to seek Commission guidance on the staff's activities involving implementation of the revised severe accident source term at operating reactors. In previous memoranda dated September 6, 1994, and July 21, 1995, the staff informed the Commission of its plans for evaluating the application of the revised source term to operating reactors, including interaction with the public and industry. The staff proposed a number of intermediate milestones for this effort and committed to keep the Commission informed of the status of this activity.

During the past year, the staff has proceeded with its plans and has actively pursued identification of issues related to implementation of the revised source term at operating reactors. The industry remains interested in using the revised accident source term to perform design-basis accident (DBA) dose evaluations in support of plant, technical specification, and procedure modifications at a number of operating nuclear power plants. The results of a collaborative project between the Nuclear Energy Institute (NEI) and the Electric Power Research Institute (EPRI) were submitted in November 1995 to the NRC in EPRI Technical Report TR-105909, "Generic Framework for Application of Revised Accident Source Term to Operating Plants." This report is intended to give power reactor licensees a framework for consistent implementation of the revised source term described in NUREG-1465. As such, it prescribes industry's preferred approach for implementing the revised source term at operating plants. Licensees are also preparing six pilot plant applications to demonstrate how the methodologies contained in TR-105909 will be applied on a site-specific basis. A copy of TR-105909 is attached for your information.

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ATTACHMENT 2

The potential types of plant changes desired by industry are categorized in four groups: (1) isolation valve actuation timing, (2) mitigation system actuation timing, (3) allowable leak rate changes, and (4) filtration unit simplification. Methodologies are proposed in TR-105909 for applying the revised source term in both limited-scope applications (Groups 1 and 2) and broad-scope applications (Groups 3 and 4), both of which incorporate an approach for evaluating the margin of safety of proposed plant changes. The report also contains five appendices that provide additional technical detail to support the general concepts described in the main section. The appendices include a comparison of the TID-14844 source term to the revised source term, examples of timing-only and chemical form-only applications, and supporting technical information on release and removal parameters. The staff has neither accepted nor rejected these industry positions.

As described in TR-105909, the industry's approach for applying the revised source term to operating plants rests on four fundamental principles. The first principle states that it is acceptable for operating plants to continue using the current source term contained in Technical Information Document (TID) 14844, "Calculation of Distance Factors for Power and Test Reactors." The second principle states that "essentially complete" implementation of NUREG-1465 as a substitute for the TID-14844 source term is acceptable if an adequate margin of safety is maintained. The third principle asserts that selective implementation of some, but not all, aspects of the revised source term is acceptable if the technical justification is adequate. The last principle is that dose calculations using the limits in 10 CFR Part 100 and existing licensing-basis methods are acceptable for revised source term applications.

An important consideration raised by the staff during its ongoing review of TR-105909 is that licensees need to use an integrated approach when considering changes that result from the application of the revised source term at operating plants. An integrated approach means that licensee applications would contain an evaluation of the overall impact on the plant when applying the revised source term at operating reactors. The staff is developing a technical position on what constitutes an integrated approach for reviewing licensee applications of the revised source term and plans to apply the technical position when reviewing pilot plant applications. The technical position will also address whether removal of existing accident-mitigation systems or safety equipment based solely on the application of the revised source term should be included in this program.

Since receiving TR-105909, the staff met with representatives from NEI and some licensees in January 1996, to discuss NRC's initial review of the report. The staff met again with representatives of NEI and some licensees in February 1996 to gain a better understanding of how industry intends to apply the report on a plant-specific basis. The first two pilot plant applications were submitted in December 1995, and April 1996. The staff met with a third licensee in May 1996, to discuss that licensee's plans for submitting its pilot plant application. The three remaining pilot plant applications are expected by December 1996. All six pilot plant applications will likely cover the range of features of the revised source term desired by the industry. However, NEI is gathering industry estimates of the total number and spectrum of applications of the revised source term that may be submitted for NRC review.

The staff is completing its review of TR-105909 and is preparing a Commission paper and decision letter concerning the staff's preferred generic implementation approach. The staff plans to present the draft Commission paper and decision letter to the NRR Executive Team, brief the Committee to Review Generic Requirements and the Advisory Committee on Reactor Safeguards, and then send the Commission paper and decision letter to the Commission by November 1, 1996, (Staff Requirements Memorandum M960612, dated July 2, 1996). The staff does not plan to begin a formal review of the pilot plant applications until the review of TR-15909 is completed and Commission guidance has been sought concerning the staff's preferred approach for implementing the revised source term at operating reactors, which will include proposed resolutions to certain technical and policy issues.

Following the Commission briefing on the Final Rule on Reactor Siting Criteria, the Commission cautioned the staff about considering exemptions if rule changes are necessary to allow use of the revised source term at operating reactors on a generic basis (SRM M960612). The staff is in the process of ascertaining whether rule changes are necessary and will address this issue in the Commission paper due November 1, 1996. In a memorandum dated July 10, 1996, the staff informed the Commission that the staff's schedule for developing the regulatory guidance for implementation of the revised source term has been affected, in part, by related regulatory activities.

It should be noted the staff determined that it would not require operating plants to use the revised source term (SECY-94-300, "Proposed Issuance of Final NUREG-1465, 'Accident Source Terms for Light-Water Nuclear Power Plants'," dated December 15, 1994). However, any licensees wanting to implement the revised source term on a voluntary basis would need to ensure that safety margin is not sacrificed for economic gain.

Due to limited NRR staff resources, regulatory activities designed to improve or maintain the safety of operating reactors will be assigned a higher priority than reviews of the six pilot plant applications regarding the revised source term.

Attachment: As stated

cc: SECY
OGC
OCA
OPA

Subject: Meeting to Discuss the Application of the NUREG-1465 Revised Source Terms (RST) to Containment Isolation Valve Closure Times for GGNS

Date: August 29 - 30, 1996

Location: GGNS, ESC Conference Room 2

Participants:

NRC Technical	GGNS
Jay Lee	Sheri Mahoney
Barry Zalcman	Mike Withrow
Jack Donohew	Greg Broadbent
	Robert Fuller
	Deepak Rao
	Marvin Morris (Omega Technical Services)

Major Agenda Items:

Introductions

History of Grand Gulf's involvement with the RST, including participation in industry groups

Overview of RST application (containment isolation valve closure times)

Overview of accident analysis software and results of reanalysis

Considerations other than radiological consequences that should be evaluated when implementing the RST

Use of 10 CFR 50.59 guidelines to revise licensing basis to implement RST and subsequent use of revised licensing basis to justify future plant changes

Future NUREG on rebaselining BWRs and PWRs

Breakouts: plant tour, detailed discussions on various aspects of implementing the RST

Potential future changes (control room standby fresh air system elimination)

ATTACHMENT 3

GRAND GULF INITIAL NUREG-1465 APPLICATION

The initial GGNS application of NUREG-1465 is a simple change to the timing of the activity release and containment isolation. Release fractions, chemical form, and other model assumptions remain unchanged from the current GGNS LOCA dose analysis.

ANALYSIS

Consistent with NUREG-1465, the activity release is divided into three phases: the blowdown phase, the gap release phase, and the in-vessel release phase. A bounding value for the duration of the blowdown phase was evaluated for BWRs by the BWROG and determined to be 121 seconds. Reactor coolant source terms are assumed released into the drywell during this phase. The gap release and in-vessel release phases are modeled consistent with the guidance in NUREG-1465 and EPRI TR-105909.

Instead of assuming the immediate isolation of containment, complete containment isolation is modeled as occurring at 2 minutes. As discussed above, only reactor coolant source terms are released during this period. During this 2-minute period, the containment is assumed to be completely unisolated and source terms entering the containment from the drywell are released directly to the environment.

BENEFITS

Grand Gulf has implemented the Improved Technical Specifications. The analytical closure requirements on stroke times for the GGNS containment isolation valves are now located in the Technical Requirements Manual. EOI intends to revise these closure requirements for isolation valves whose analytical closure requirements are set by the LOCA scenario. These valves will continue to be monitored by the GGNS IST program which tracks their performance and identifies trends indicative of potential degradation.

This application will provide benefits in several areas.

1. Valve Performance Improvements
   With a longer stroke time, the actuator can be re-geared to increase torque in lieu of complete actuator replacement. Also, thrust margins can be improved by reducing inertia overshoot without modifying the valve.

2. Operations Improvements
   If a valve fails to meet the TRM stroke time requirements during surveillance testing, the valve is declared inoperable. Operations must then evaluate the affected system which may then result in an LCO. Since these failures are also reportable conditions, a Licensee Event Report is also generated. Increasing the stroke times for these valves would decrease the frequency of these events.

3. System Performance Improvements
   The longer stroke times minimize the potential for water hammer.

Potential Applications of the Revised Accident Source Terms (NUREG-1465)

In general, a potential application involves any plant requirements associated with the accident source term timing, iodine chemical form, gap fraction, fuel release fraction, and containment fission product removal mechanisms. BWRs and PWRs share in many of the same applications (depending on specific design features). Examples of potential applications are described in Table 1.

The pilot applications for GGNS were selected based on the relative importance for improving safety and operational burdens such as cost and personnel dose. These applications were also selected based on their synergistic effects on the analysis results and a cross-section of the RST methods (so as to support development of the framework document). The pilot applications for GGNS are as follows:

1. Elimination of the automatic isolation function of select primary and secondary containment penetrations
2. Relaxation of the general automatic containment isolation valve closure times
3. Elimination of the control room standby fresh air system.

The identification of applications is based on individual plant needs and scoping calculations assessing the relative sensitivities of these needs to the various aspects of the accident source terms. Following the completion of these pilot applications, GGNS would pursue additional issues such as the relaxation of containment ILRT and valve LLRT limits, relaxation of SGTS initiation times, and the reduction of ESF D/G electrical loads. A preliminary list of potential applications for the other Entergy plants is provided below.

ANO Units 1 and 2:

1. Downgrading of the containment purge, fuel handling building, and containment penetration room filters
2. Relaxation of the general automatic containment isolation valve closure times
3. Elimination of the containment spray NaOH addition system.

RBS:

1. General increase in accident dose margins
2. Relaxation of the general automatic containment isolation valve closure times
3. Relaxation of requirements for the PVLCS.

Waterford III:

1. Downgrading of the shield building ventilation charcoal adsorbers
2. Relaxation of the general automatic containment isolation valve closure times
3. Reduction of ESF D/G loadings
4. Relaxation of containment ILRT and valve LLRT limits
5. General increase in accident dose margins.

Table 1
Potential Applications of Revised Accident Source Terms

Application	NUREG-1465 Source Term Feature				
	Timing	Iodine Chemical Form	Gap Release Fractions	Fuel Release Fractions	Removal Mecha-nisms
Equip. or Function Elimination					
ESF charcoal beds		X			X
Fuel pool ESF filters		X	X		
Short-term HVAC isolation	X		X		
Equip. Safety Class Downgrade					
ESF charcoal beds		X			X
Fuel pool ESF filters		X	X		
Change in EQ Requirements					
• Lower early dose					
Isolation valves & dampers	X		X		
Electrical operators	X		X		
• Lower dose at upper locations					
Fan-coolers		X		X	X
Instrumentation		X		X	X
• Higher long-term dose from sump/recirc. fluid					
Pumps		X		X	X
Instrumentation		X		X	X
Improved Equipment Reliability					
Slower valve closures	X		X		
Delayed actuations	X		X		
Delayed chemical addition	X	X	X		
Delayed diesel loading	X		X		
Reduced Inservice Testing					
Charcoal beds		X			X
ILRT frequency	X	X	X	X	X
Reduced Maintenance Impact					
Reduce painting restrictions		X			X
Lower risk of inad. spray	X		X		
Reduce valve rework (La)	X	X	X	X	X
Reduce HVAC repairs	X		X		
Improved Reload Fuel Design					
Higher enrichment/fewer assemblies			X		
Improved EOPs					
Longer response times	X				
Increased plant accessibility	X		X		

Considerations for Implementing
Revised Accident Source Terms (NUREG 1465)
At GGNS

1. **General Implementation Philosophy:** Radiological dose analysis is a complex and specialized area of NRC safety regulation that is rapidly evolving. This evolution is occurring at both the technical and regulatory levels. This situation dictates that interpretations of regulatory requirements must be consistent and well-coordinated between the industry and the NRC. Unique plant-specific positions necessary for establishing a basis for implementation decisions must not constitute "minimum compliance" but should be prudent and conservative in protecting appropriate safety margins. In the absence of explicit regulatory guidance on specific technical issues, industry-wide positions may be necessary to ensure consistency and avoid enforcement actions.

2. **Implementation Program:** The GGNS program for implementing the revised accident source terms needs to maintain a strong safety culture by:
   - evaluating applicable design margins and maintaining a balanced approach for all important considerations in decisions;
   - evaluating analytical results (total doses) to determine that the safety margins (*i.e.*, relative to existing Part 100 limits) are being appropriately met;
   - using the IPE and additional PRA evaluations to identify and prioritize those applications that have important safety benefits;
   - using the CBLA evaluation process to identify and prioritize those applications that have cost and normal operating personnel dose benefits.

3. **Key Assumptions:**
   - For design basis purposes, the accident progression ends after the early in-vessel release phase.
   - All applications that do not require prior NRC approval (*e.g.*, by T/S change, USQ, etc.) will be conducted in accordance with the plant-specific processes (*i.e.*, 10CFR50.59).
   - All applications that do require prior NRC approval will be conducted in accordance with the NEI guidance document and accepted practices as established by NRC precedences.
   - The NUREG can be applied to any dose event (*e.g.*, fuel handling accident).

4. **Safety Benefit Applications:**
   - Develop a better understanding of available margins for improved accident management guidelines.
   - Eliminate the automatic isolation (on LOCA) and certain fail closed (*e.g.*, loss of instrument air but not LOP) design functions for secondary containment penetrations that do not communicate directly with the secondary containment

atmosphere (*e.g.*, IAS, PSW, TBCW). These penetrations would be remote manually isolated from the control room.

- minate the automatic isolation (on LOCA but not certain line break events) .l certain fail closed design functions for primary containment penetrations that do not communicate directly with the reactor, drywell, or process fluids with severe accident source terms.
- Increase the sequencing times for certain safety related electrical loads on the ESF D/Gs so as to reduce bus degraded voltage problems (*i.e.*, delay the actuation times for functions such as SGTS).
- Eliminate the EQ requirements for components with only a radiation harsh environment so as to take advantage of technological improvements in the design of the components (*i.e.*, use new and more reliable components that cannot be supplied as EQ equipment).
- Better characterize the liquid line release pathways (may be more important in limiting releases than currently designed).

5. **Cost and Station Dose Benefit Applications:**
   - Increase the general containment isolation times to decrease valve maintenance requirements.
   - Increase the ILRT and various LLRT limits to provide additional testing margin and reduce valve maintenance requirements.
   - Eliminate the control room standby fresh air system to reduce surveillance and maintenance requirements.
   - Eliminate or further reduce the need for secondary containment during outages (via the fuel handling accident analysis).
   - Eliminate or reduce the charcoal adsorber requirements for SGTS.