December 17, 2002

MEMORANDUM TO: Samuel J. Collins, Director
Office of Nuclear Reactor Regulation

FROM: Ashok C. Thadani, Director ***Original signed by A. Thadani***
Office of Nuclear Regulatory Research

SUBJECT: RES PROPOSED RECOMMENDATION FOR RESOLVING GENERIC SAFETY ISSUE 189: "SUSCEPTIBILITY OF ICE CONDENSER AND MARK III CONTAINMENTS TO EARLY FAILURE FROM HYDROGEN COMBUSTION DURING A SEVERE ACCIDENT"

The Office of Nuclear Regulatory Research (RES) has completed the technical assessment for resolving the subject Generic Safety Issue (GSI) 189. By this memorandum, RES transmits its recommendation, and transfers lead of GSI-189 from RES to the Office of Nuclear Reactor Regulation (NRR), as described in Management Directive 6.4 (MD 6.4). GSI-189 was raised within the context of the on-going effort to risk-inform 10 CFR 50.44, "Standards for Combustible Gas Control System in Light-Water-Cooled Power Reactors." In SECY-00-0198, "Status Report on Study of Risk-Informed Changes to the Technical Requirements of 10 CFR Part 50 (Option 3) and Recommendations on Risk-Informed Changes to 10 CFR 50.44 (Combustible Gas Control)," the staff recommended that safety enhancements that have the potential to pass the backfit test be assessed for mandatory application through the generic issue program. The Commission has indicated in a SRM dated December 31, 2001, that the staff should work to expeditiously resolve GSI-189. Subsequently, in February 2002, GSI-189 passed the generic screening criteria and the technical assessment stage began. The following summarizes RES's proposed resolution of GSI-189. A summary of the technical assessment that supports the proposed resolution of this issue is attached.

This issue addresses the adequacy of combustible gas control during station blackout (SBO) conditions in PWR ice condenser and BWR Mark III containments. These systems consist of AC-powered igniters (distributed judiciously throughout the containment airspace) which are intended to initiate burning in relatively small volumes and at lean gas mixtures. For SBO events in which neither preferred AC nor backup AC power provided by the emergency diesel generators would be available, the igniters would not be functioning, and containment integrity could be challenged. RES considered the addition of a back-up diesel generator to power igniters, and a combination of igniters and air return fans, as well as the addition of passive recombiners (PARS). These mitigative fixes do not affect the frequency of postulated SBO events. Therefore, the enhancements under consideration do not avert any on-site costs associated with an accident, but does change the probability of early containment failure and its corresponding averted off-site costs. (Note that the NRC previously addressed the reduction of SBO frequency through the station blackout rule in 1988).

For this current analysis, initiating events, core damage frequencies (CDF), conditional containment failure (CCF) probabilities, and release categories were extracted from existing studies. RES's technical assessment focused on containment performance for ice condensers and Mark IIIs, by quantifying the reduction in the conditional containment failure probability associated with combustible gas control being available during SBO events. The reduction in CCF probability was converted to a dollar value based on the expected values for averting public exposure and offsite property damage associated with the availability of combustible gas control. These benefits were then compared to the overall cost for the implementation and maintenance of several alternative safety enhancements to determine if there is a potential cost beneficial back-fit.

To perform the technical assessment for GSI-189, RES obtained technical assistance from: (1) Brookhaven National Laboratory (BNL) to perform the benefits analysis; (2) Information Systems Laboratories (ISL) to perform the cost analysis and (3) Sandia National Laboratories (SNL) to perform targeted plant analysis. These three reports are packaged in ADAMS # ML022880554. RES staff has also worked closely with cognizant NRR staff throughout the development of this technical assessment.

The results of the cost benefit analysis suggest that there are large uncertainties, particularly on the benefit side with respect to the risk parameters (including phenomenological uncertainties) and plant-specific considerations. While mean values of the cost and benefit results show that the net benefit calculation can be either negative or positive, it is important to recognize: 1) there are significant uncertainties in the averted cost estimates, 2) the potential for large early releases in the absence of igniter function, and 3) the relatively low cost of providing alternate power sources. Thus it is a prudent course of action to pursue an enhancement to the igniter system. Moreover, the cost benefit analysis did not consider potential benefits due to averting some late containment failures and some subset of external initiated SBO events which are difficult to estimate but could provide added benefits. RES also considered qualitative benefits such as defense-in-depth, public confidence and regulatory coherence, and has determined that further regulatory action is justified.

RES has briefed the Advisory Committee on Reactor Safeguards (ACRS) on the GSI-189 technical assessment on June 6, 2002, and November 7, 2002, and the Thermal Hydraulic Phenomena and the Reliability and PRA Sub-committees on November 5, 2002. In a letter to the Commission dated November 13, 2002 (ADAMS # ML023230513), the ACRS stated that they agree with staff that further regulatory action by NRR is warranted for ice condensers and Mark IIIs. The ACRS recommended that the form of this action should be through the plant-specific severe accident management guidelines. Responding to this latest ACRS letter, RES worked with NRR to develop a draft letter from the EDO, which states that the staff will engage the affected stakeholders in developing additional information related to implementing various alternatives, including an option of using the severe accident management guidelines. Ultimately, the staff recommendation will be presented to the ACRS for review and comment before any action to complete resolution of GSI-189 goes to the Commission.

In summary, based on the technical assessment summarized in the attachment, with due consideration of uncertainties RES concludes that further action to provide back-up power to one train of igniters is warranted for both ice condenser and Mark III plants.

Attachment: As stated

cc: W. Travers, EDO
J. Larkins, ACRS

In summary, based on the technical assessment summarized in the attachment, with due consideration of uncertainties RES concludes that further action to provide back-up power to one train of igniters is warranted for both ice condenser and Mark III plants.

Attachment: As stated

cc: W. Travers, EDO
J. Larkins, ACRS

Distribution: SMSAB R/F DSARE R/F PNorian CTinkler JFlack
SFeld AMalliakos MDrouin ARubin MCunningham
HVanderMolen JStrosnider DSARE Action No.: 2002-03
RES Action No.: 2001270 GT/WITS: WITS 200100144
CPaperiello, DEDMRS WKane, DEDR PNorry, DEDM JCraig, AO
AMarkley, NRR SMagruder, NRR MLesar, ADM BShelton, CIO
MSchroll, SECY TClark CAder

C:\ORPCheckout\FileNET\ML023510161.wpd

*See previous concurrence

OAR in ADAMS? (Y or N) Y ADAMS ACCESSION NO.: ML023510161 TEMPLATE NO. RES-006
Publicly Available? (Y or N) Y DATE OF RELEASE TO PUBLIC 5 SENSITIVE? N
To receive a copy of this document, indicate in the box: "C" = Copy without enclosures **"E"** = Copy with enclosures **"N"** = No copy

OFFICE	SMSAB		C:SMSAB		D:DRAA		D:DSARE		D:RES	
NAME	ANotafrancesco:mb		JRosenthal		SNewberry		FEltawila		AThadani	
DATE	12/4/02*		12/4/02*		12/12/02*		12/13/02*		12/17/02*	