

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR REACTOR REGULATION  
WASHINGTON, D.C. 20555

April 6, 1995

NRC INFORMATION NOTICE 94-64, SUPPLEMENT 1: REACTIVITY INSERTION TRANSIENT  
AND ACCIDENT LIMITS FOR HIGH  
BURNUP FUEL

Addressees

All holders of operating licenses or construction permits for nuclear power reactors and all fuel fabrication licensees.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this supplemental information notice to provide addressees with additional information on high burnup fuel performance data acquired since the original notice and to discuss NRC and industry actions. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Background

In the original information notice, dated August 31, 1994, the NRC staff noted recent experimental data suggesting that high burnup fuel could be more prone to failure during design-basis transients and reactivity insertion accidents than previously thought. These data, on the relationship between fuel failure enthalpy and burnup for pressurized water reactor fuel rods tested in foreign experimental facilities, indicated that failure initiation enthalpy thresholds (measured in differential joules per gram) may be lower than those considered in the evaluation of currently approved fuel burnup limits. On October 26, 1994, the NRC staff presented additional technical information at the NRC 22nd Water Reactor Safety Information Meeting (WRSM).

Discussion

The data prompting the original information notice raised concerns about the adequacy of current fuel damage criteria for reactivity transients. The current fuel enthalpy limit criteria are (1) 1172 joules per gram (J/g) [280 calories per gram (cal/g)] (peak radially averaged), to ensure fuel coolability, and (2) for boiling water reactors, 711 J/g [170 cal/g], as the measure of fuel rod cladding failure (by boiling transition). The recent data, presented at the WRSM, indicate that fuel rod cladding failure might occur at enthalpy conditions of 126 J/g [30 cal/g] for high burnup fuel (i.e., fuel with more than 60 gigawatt-days per metric ton [GWD/t] uranium).

PDR I+R

Notice 94-064 950406

9503310049

updated on  
4/10/95

IDAR-11c

DF01  
11

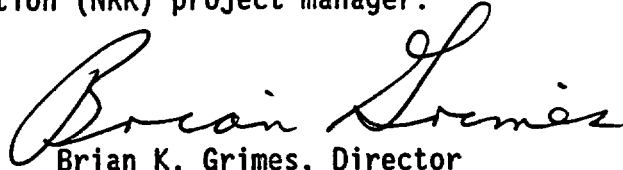
These data did not provide information on the enthalpy limits for fuel coolability. The NRC staff is closely following work to confirm the validity of the preliminary results by verifying the conditions of the experimental tests. The NRC is also reviewing data reduction, data interpretation, and the implications of the observed failure results at low enthalpy rise levels for the safety evaluation of light water reactor design-basis transients and accidents.

On October 27, 1994, the NRC staff held a public meeting with nuclear industry representatives, including fuel vendors and owners groups, to discuss the regulatory and safety issues regarding the new experimental data on RIAs with high burnup fuel. The purpose of the public meeting was to discuss the impact of the new information and planned NRC actions. Robert C. Jones, Chief, Reactor Systems Branch, issued a letter to the fuel vendors on November 14, 1994, that transmitted the WRSM papers and requested industry action (Accession No. 9411220131).\*

The NRC staff has contracted with three national laboratories to perform various safety analyses for high burnup fuel. It will then define best-estimate failure criteria, based on reactivity insertion data, and will consider changes to existing fuel failure criteria. Although, in view of the recent data, additional fuel failures could occur during design-basis events, fuel coolability is expected to be maintained. The staff has performed a preliminary assessment and concludes that no immediate concerns for public health and safety are raised.

The industry has performed an initial generic safety assessment of the preliminary data and concludes that there is no significant impact on the public health and safety. Their assessment and related information was provided to the staff in a letter of December 28, 1994, from the Nuclear Energy Institute (Accession No. 9503280347).\* The staff plans continuing interaction with the industry until final resolution of this issue.

This supplemental information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.



Brian K. Grimes, Director  
Division of Project Support  
Office of Nuclear Reactor Regulation

Technical contacts: L. E. Phillips, NRR  
(301) 415-3232

S. Wu, NRR  
(301) 415-3284

Attachments:

1. List of Recently Issued NRC Information Notices
2. List of Recently Issued NMSS Information Notices

*Attachments filed in Jacket*

LIST OF RECENTLY ISSUED  
 NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
95-18, Supp. 1	Potential Pressure-Locking of Safety-Related Power-Operated Gate Valves	03/31/95	All holders of OLs or CPs for nuclear power reactors.
95-20	Failures in Rosemount Pressure Transmitters due to Hydrogen Permeation into the Sensor Cell	03/22/95	All holders of OLs or CPs for nuclear power reactors.
95-19	Failure of Reactor Trip Breaker to Open Because of Cutoff Switch Material Lodged in the Trip Latch Mechanism	03/22/95	All holders of OLs or CPs for nuclear power reactors.
95-18	Potential Pressure-Locking of Safety-Related Power-Operated Gate Valves	03/15/95	All holders of OLs or CPs for nuclear power reactors.
95-17	Reactor Vessel Top Guide and Core Plate Cracking	03/10/95	All holders of OLs or CPs for boiling water reactors.
95-16	Vibration Caused by Increased Recirculation Flow in a Boiling Water Reactor	03/09/95	All holders of OLs or CPs for boiling water reactors.
95-15	Inadequate Logic Testing of Safety-Related Circuits	03/07/95	All holders of OLs or CPs for nuclear power reactors.
95-14	Susceptibility of Containment Sump Recirculation Gate Valves to Pressure Locking	02/28/95	All holders of OLs or CPs for nuclear power reactors.
95-13	Potential for Data Collection Equipment to Affect Protection System Performance	02/24/95	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License  
 CP = Construction Permit

LIST OF RECENTLY ISSUED  
NMSS INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
95-07	Radiopharmaceutical Vial Breakage during Preparation	01/27/95	All U.S. Nuclear Regulatory Commission medical licensees authorized to use byproduct material for diagnostic procedures.
95-01	DOT Safety Advisory: High Pressure Aluminum Seamless and Aluminum Composite Hoop-Wrapped Cylinders	01/04/95	All U.S. Nuclear Regulatory Commission licensees.
94-89	Equipment Failures at Irradiator Facilities	12/28/94	All U.S. Nuclear Regulatory Commission irradiator licensees.
89-25, Rev. 1	Unauthorized Transfer of Ownership or Control of Licensed Activities	12/07/94	All fuel cycle and material licensees.
94-81	Accuracy of Bioassay and Environmental Sampling Results	11/25/94	All U.S. Nuclear Regulatory Commission licensees.
93-60, Supp. 1	Reporting Fuel Cycle and Materials Events to the NRC Operations Center	10/20/94	All 10 CFR Part 70 fuel cycle licensees.
94-74	Facility Management Responsibilities for Purchased or Contracted Services for Radiation Therapy Programs	10/13/94	All U.S. Nuclear Regulatory Commission Medical Licensees.
94-73	Clarification of Criticality Reporting Criteria	10/12/94	All fuel fabrication facilities.

This supplemental information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

orig /s/'d by BKGrimes

Brian K. Grimes, Director  
 Division of Project Support  
 Office of Nuclear Reactor Regulation

Technical contacts: L. E. Phillips, NRR  
 (301) 415-3232

S. Wu, NRR  
 (301) 415-3284

Attachments:

1. List of Recently Issued NRC Information Notices
2. List of Recently Issued NMSS Information Notices

DOCUMENT NAME: 9464SP1.IN

\*See previous concurrence

*OECB/DOPS	*Tech Ed	*SRXB/DSSA	*SRXB/DSSA	*C:SRXB/DSSA	*D:/DSSA
CVHodge	MFMejac	SWu	LEPhillips	RCJones	GMHolahan
02/01/95	02/01/95	02/01/95	02/03/95	02/03/95	02/20/95
*IMOB/NMSS	*D:FCSS/NMSS	*OECB/DOPS	*C:OECB/DOPS	D:DOPS/NRR	
KMRamsey	RFBurnett	RLDennig	AEChaffee	BKGrimes	
03/09/95	03/09/95	02/22/95	03/29/95	03/3/95	

OFFICIAL RECORD COPY

This supplemental information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRC) project manager.

Brian K. Grimes, Director  
 Division of Project Support  
 Office of Nuclear Reactor Regulation

Technical Contacts: L. E. Phillips, NRR (301) 415-3232      S. Wu, NRR (301) 415-3284

Attachments:

1. List of Recently Issued NRC Information Notices
2. List of Recently Issued NMSS Information Notices

\*\*A copy of this document is available for inspection and copying at the NRC Public Document Room, 2120 L St., NW, Washington, DC 20037.

DOCUMENT NAME: S:\DOPS\_SEC\HIBUSUP1.INF

\*See previous concurrence

*OECB/DOPS	*Tech Ed	*SRXB/DSSA	*SRXB/DSSA	*C:SRXB/DSSA	*D:/DSSA
CVHodge	MFMejac	SWu	LEPhillips	RCJones	GMHolahan
02/01/95	02/01/95	02/01/95	02/03/95	02/03/95	02/20/95

*IMOB/NMSS	*D:FCSS/NMSS	*OECB/DOPS	*C:OECB/DOPS	D:DOPS/NRR
KMRamsey	RFBurnett	RLDennig	AEChaffee	BKGrimes
03/09/95	03/09/95	02/22/95	03/29/95	03/ /95

OFFICIAL RECORD COPY

*MEM*

This supplemental information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate NRC project manager.

Brian K. Grimes, Director  
 Division of Operating Reactor Support  
 Office of Nuclear Reactor Regulation

Technical Contacts: L. E. Phillips, NRR  
 (301) 415-3232

S. Wu, NRR  
 (301) 415-3284

Attachments:

1. List of Recently Issued NRC Information Notices
2. List of Recently Issued NMSS Information Notices

\*\*A copy of this document is available for inspection and copying at the NRC Public Document Room, 2120 L St, NW, Washington DC 20037.

\*See previous concurrence

*OECB/DOPS	*Tech Ed	*SRXB/DSSA	*SRXB/DSSA	*C:SRXB/DSSA	*D:/DSSA
CVHodge	MFMejac	SWu	LEPhillips	RCJones	GMHolahan
02/01/95	02/01/95	02/01/95	02/03/95	02/03/95	02/20/95

*IMOB/NMSS	*D:FCSS/NMSS	*OECB/DOPS	C:OECB/DOPS	D:DOPS/NRR
KMRamsey	RFBurnett	RLDennig	AEPaffee <i>KB</i>	BKGrimes
03/09/95	03/09/95	02/22/95	03/29/95	03/ /95

Document: hibusupl.inf

1000  
31



provided to the staff in a letter of December 28, 1994, from the Nuclear Energy Institute.\*\* The staff plans continuing interaction with the industry until final resolution of this issue.

This supplemental information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate NRC project manager.

Brian K. Grimes, Director  
Division of Operating Reactor Support  
Office of Nuclear Reactor Regulation

Technical Contacts: L. E. Phillips, NRR  
(301) 415-3232

S. Wu, NRR  
(301) 415-3284

Attachments:

1. List of Recently Issued NRC Information Notices
2. List of Recently Issued NMSS Information Notices

\*\*A copy of this document is available for inspection and copying at the NRC Public Document Room, 2120 L St, NW, Washington DC 20037.

\*See previous concurrence

*OECB/DOPS	*Tech Ed	*SRXB/DSSA	*SRXB/DSSA	*C:SRXB/DSSA	*D:/DSSA
CVHodge	MFMejac	SWu	LEPhillips	RCJones	GMHolahan
02/01/95	02/01/95	02/01/95	02/03/95	02/03/95	02/20/95

*IMOB/NMSS	*D:FCSS/NMSS	*OECB/DOPS	C:OECB/DOPS	D:DOPS/NRR
KMRamsey	RFBurnett	RLDennig	AEChaffee	BKGrimes
03/09/95	03/09/95	02/22/95	03/ /95	03/ /95

Document: hibusupl.inf

provided to the staff in a letter of December 28, 1994, from the Nuclear Energy Institute.\*\* The staff plans continuing interaction with the industry until final resolution of this issue.

This supplemental information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate NRC project manager.

Brian K. Grimes, Director  
Division of Operating Reactor Support  
Office of Nuclear Reactor Regulation

Technical Contacts: L. E. Phillips, NRR  
(301) 415-3232

S. Wu, NRR  
(301) 415-3284

Attachments:

1. List of Recently Issued NRC Information Notices
2. List of Recently Issued NMSS Information Notices

\*\*A copy of this document is available for inspection and copying at the NRC Public Document Room, 2120 L St, NW, Washington DC 20037.

\*See previous concurrence

*OECB/DOPS	*Tech Ed	*SRXB/DSSA	*SRXB/DSSA	*C:SRXB/DSSA	*D:/DSSA
CVHodge	MFMejac	SWu	LEPhillips	RCJones	GMHolahan
02/01/95	02/01/95	02/01/95	02/03/95	02/03/95	02/20/95
IMOB/NMSS	D:FCSS/NMSS	*OECB/DOPS	C:OECB/DOPS	D:DOPS/NRR	
KMRamsey <i>KMR</i>	RFBurnett	RLDennig	AEChaffee	BKGrimes	
03/9/95	03/4/95	02/22/95	02/ /95	02/ /95	

Document: hibusupl.inf

This supplemental information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate NRC project manager.

Brian K. Grimes, Director  
Division of Operating Reactor Support  
Office of Nuclear Reactor Regulation

Technical Contacts: L. E. Phillips, NRR  
(301) 415-3232  
  
S. Wu, NRR  
(301) 415-3284

Attachments: Referenced letter and enclosures  
\*See previous concurrence

*OECB/DOPS	*Tech Ed	*SRXB/DSSA	*SRXB/DSSA	*C:SRXB/DSSA
CVHodge	MFMejac	SWu	LEPhillips	RCJones
02/01/95	02/01/95	02/01/95	02/03/95	02/03/95
D:DSSA/NRR GMHolahan	OECB/DOPS RLDeinig	C:OECB/DOPS AEChaffee	D:DOPS/NRR BKGrimes	
02/20/95	02/22/95	02/ /95	02/ /95	

Document: hibusupl.inf

This supplemental information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate NRC project manager.

Brian K. Grimes, Director  
Division of Operating Reactor Support  
Office of Nuclear Reactor Regulation

Technical Contacts: L. E. Phillips, NRR  
(301) 504-3232

S. Wu, NRR  
(301) 504-3284

Attachments: Referenced letter and enclosures  
\*See previous concurrence

*OECB/DOPS	*Tech Ed	*SRXB/DSSA	*SRXB/DSSA	*C:SRXB/DSSA
CVHodge <i>vh</i>	MFMejac	SWu	LEPhillips	RCJones
02/01/95	02/01/95	02/01/95	02/03/95 <i>2/14/95</i>	02/03/95
D:DSSA/NRR	OECB/DOPS	C:OECB/DOPS	D:DOPS/NRR	
GMHolahan	RLDennig	AEChaffee	BKGrimes	
02/ /95	02/ /95	02/ /95	02/ /95	

Document: hibusupl.inf

This supplemental information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate NRC project manager.

Brian K. Grimes, Director  
Division of Operating Reactor Support  
Office of Nuclear Reactor Regulation

Technical Contacts: L. E. Phillips, NRR  
(301) 504-3232

S. Wu, NRR  
(301) 504-3284

Attachment: Referenced letter and enclosures

\*See previous concurrence

OECB/DOPS	*Tech Ed	SRXB/DSSA	SRXB/DSSA	C:SRXB/DSSA
CVHodge <i>uh</i>	MFMejac	SWu <i>SW</i>	LEPhillips <i>LEP</i>	RCJones <i>RCJ</i>
02/01/95	02/01/95	02/1/95	02/3/95	02/3/95
D:DSSA/NRR	OECB/DOPS	C:OECB/DOPS	D:DOPS/NRR	
GMHolahan	RLDennig	AEChaffee	BKGrimes	
02/ /95	02/ /95	02/ /95	02/ /95	

174