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

April 4, 1994

Docket No. 50-331

Mr. Lee Liu
Chairman of the Board and
Chief Executive Officer
IES Utilities Inc.
Post Office Box 351
Cedar Rapids, Iowa 52406

Dear Mr. Liu:

SUBJECT: DUANE ARNOLD ENERGY CENTER - GENERIC LETTER (GL) 92-01, REVISION 1, "REACTOR VESSEL STRUCTURAL INTEGRITY" (TAC NO. M83460)

By letters dated July 7 and December 15, 1993, IES Utilities Inc. provided its response to GL 92-01, Revision 1 for the Duane Arnold Energy Center (DAEC). The NRC staff has completed its review of your responses. Based on its review, the staff has determined that IES Utilities Inc. has provided the information requested in GL 92-01.

The GL is part of the staff's program to evaluate reactor vessel integrity for Pressurized Water Reactors (PWRs) and Boiling Water Reactors (BWRs). The information provided in response to GL 92-01, including previously docketed information, is being used to confirm that licensees satisfy the requirements and commitments necessary to ensure reactor vessel integrity for their facilities.

A substantial amount of information was provided in response to GL 92-01, Revision 1. These data have been entered into a computerized data base designated Reactor Vessel Integrity Database (RVID). The RVID contains the following tables: A pressurized thermal shock (PTS) table for PWRs, a pressure-temperature limit table for BWRs and an upper-shelf energy (USE) table for PWRs and BWRs. Enclosure 1 provides the pressure-temperature table, Enclosure 2 provides the USE table for your facility, and Enclosure 3 provides a key for the nomenclature used in the tables. The tables include the data necessary to perform USE, pressure-temperature limit, and RT_{pts} evaluations. These data were taken from your responses to GL 92-01 and previously docketed information. The information in the RVID for your facility will be considered accurate at this point in time and will be used in the staff's assessments related to vessel structural integrity. References to the specific source of the data are provided in the tables.

As a result of our GL 92-01 review, the NRC staff has identified one open issue for your plant. The initial RT_{NDT} values determined by General Electric's (GE) initial methodology have not been validated and the BWR Owners Group report, GE-NE-523-109-0893, entitled, "Basis for GE RT_{NDT} Estimation Method," did not resolve the issue. GE is in the process of validating its methodology for resolving the initial RT_{NDT} determination issue and will document the results in a topical report. The BWR Owners Group is obtaining

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approval from its members to provide the GE topical report to the NRC staff for its review and approval. We request that within 30 days, you submit a commitment to the BWR Owners Group effort or a schedule for a plant-specific analysis to resolve this issue. Further, we request that you provide confirmation of the plant-specific applicability of the topical report, NEDO-32205, Revision 1, (as specified in Appendix B of that report) and submit a request for approval of the topical report as the basis for demonstrating compliance with 10 CFR Part 50, Appendix G, Paragraph IV.A.1. We further request that you verify that the information you have provided for your facility has been accurately entered in the data base. If no comments are made in your response to the last request, the staff will use the information in the tables for future NRC assessments of your reactor pressure vessel.

Once you have (1) confirmed the applicability of the topical report, NEDO-32205, Revision 1, to your plant, (2) submitted the request for approval, and (3) provided your commitment to the BWR Owners Group effort or a satisfactory schedule for providing a plant-specific analysis, the staff will consider your actions related to GL 92-01, Revision 1, to be complete. Plant-specific licensing action(s) will be initiated to resolve these issues.

The information requested by this letter is within the scope of the overall burden estimated in GL 92-01, Revision 1, "Reactor Vessel Structural Integrity, 10 CFR 50.54(f)." The estimated average number of burden hours is 200 person hours for each addressee's response. This estimate pertains only to the identified response-related matters and does not include the time required to implement actions required by the regulations. This action is covered by the Office of Management and Budget Clearance Number 3150-0011, which expires June 30, 1994.

Sincerely,

Robert M. Pulsifer

Robert M. Pulsifer, Project Manager
Project Directorate III-3
Division of Reactor Projects III/IV/V
Office of Nuclear Reactor Regulation

Enclosures:
1. Pressurized Thermal Shock or Pressure-Temperature Limit Table
2. Upper-Shelf Energy Table
3. Nomenclature Key

cc w/enclosures:
See next page

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Sincerely,

Original Signed By:
Robert M. Pulsifer, Project Manager
Project Directorate III-3
Division of Reactor Projects III/IV/V
Office of Nuclear Reactor Regulation

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1. Pressurized Thermal Shock or Pressure-Temperature Limit Table
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cc w/enclosures:
See next page

DISTRIBUTION

Docket File	Local & NRC PDRs	PDIII-3 r/f	JRoe
JZwolinski	JHannon	RPulsifer	MRushbrook
OGC	ACRS (10)	EGreenman, RIII	

LA:PDIII-3	PM:PDIII-3	D:PDIII-3
MRushbrook	RPulsifer:dy:sw	JHannon
3/31/94	4/1/94	4/4/94

cc:

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Summary File for Pressure-Temperature Limits

Plant Name	Beltline Ident.	Heat No. Ident.	ID Neut. Fluence at EOL/EFPY	IRT_{ndt}	Method of Determin. IRT_{ndt}	Chemistry Factor	Method of Determin. CF	%Cu	%Ni
Duane Arnold EOL: 2/21/2014	Lower Int. Shell 1-20	B0436-2	3.6E18	10°F	Plant specific	111	Table	0.15	0.64
	Lower Int. Shell 1-21	B0673-1	3.6E18	10°F	Plant specific	110.25	Table	0.15	0.61
	Lower Shell 1-18	C6439-2	3.6E18	40°F [1]	Plant specific	58	Table	0.09	0.51
	Lower Shell 1-19	B0402-1	3.6E18	40°F	Plant specific	87.1	Table	0.13	0.47
	Circ. Weld	09L853	3.6E18	-50°F	Plant specific	41	Table	0.03	0.88
	Circ. Weld	07L669	3.6E18	-50°F	Plant specific	41	Table	0.03	1.02
	Circ. Weld	CTY538	3.6E18	-50°F	Plant specific	41	Table	0.03	0.83
	Axial Welds	43224521	3.6E18	-50°F	Plant specific	20	Table	0.01	0.98
	Axial Welds	43220471	3.6E18	-50°F	Plant specific	41	Table	0.03	0.91

<u>Reference for Duane Arnold</u>

Chemical composition, some UUSE, IRT, and fluence data are from July 6, 1992, letter from J. F. Franz, Jr. (IEL&P) to T. E. Murley (USNRC), subject: Response to NRC Generic Letter 92-01, Revision 1, "Reactor Vessel Structural Integrity"

Licensee's response to GL 92-01 does not indicate which welds are in which shell, so all weld RT_{pts} calculations will be made for the thinner (4.[illegible]7 in.) wall thickness.

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[1]Additional information required to confirm value.

Summary File for Upper Shelf Energy

Plant Name	Beltline Ident.	Heat No.	Material Type	1/4T USE at EOL	1/4T Neutron Fluence at EOL	Unirrad. USE	Method of Determin. Unirrad. USE
Duane Arnold	Lower Int. Shell, 1-20	B0436-2	A 533B-1	72	2.75E18	87	65%
EOL: 2/21/2014	Lower Int. Shell, 1-21	B0673-1	A 533B-1	103	2.75E18	107	65%
	Lower Shell 1-18	C6439-2	A 533B-1	EMA[2]	2.66E18	EMA[2]	---
	Lower Shell 1-19	B0402-1	A 533B-1	EMA[2]	2.66E18	EMA[2]	---
	Circ. Weld	09L853	E8018, SMAW	EMA[2]	2.75E18	EMA[2]	---
	Circ. Weld	07L669	E8018, SMAW	EMA[2]	2.75E18	EMA[2]	---
	Circ. Weld	CTY538	E8018, SMAW	EMA[2]	2.75E18	EMA[2]	---
	Axial Welds	43224521	E8018, SMAW	EMA[2]	2.75E18	EMA[2]	---
	Axial Welds	43220471	E8018, SMAW	89	2.75E18	103	10°F data

Reference for Duane Arnold

Chemical composition, UUSE, and fluence data are from July 6, 1992, letter from J. F. Franz, Jr. (IEL&P) to T. E. Murley (USNRC), subject: Response to NRC Generic Letter 92-01, Revision 1, "Reactor Vessel Structural Integrity"

Licensee's response to GL 92-01 does not indicate which welds are in which shell, so all weld UUSE calculations will be made for the thinner (4.47 in.) wall thickness.

NOTE: It is not known which welds are in the lower shell. Therefore, I used the higher of the 1/4T EOL fluences, 2.75E18 n/cm², because it gave lower 1/4T EOL USEs.

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[2]Licensee must confirm applicability of Topical Report NEDO-32205, Rev. 1

ENCLOSURE 3

PRESSURE-TEMPERATURE LIMIT TABLES AND USE TABLES FOR ALL BWR PLANTS

NOMENCLATURE

Pressure-Temperature Limits Table

Column 1: Plant name and date of expiration of license.
Column 2: Beltline material location identification.
Column 3: Beltline material heat number; for some welds that a single-wire or tandem-wire process has been reported, (S) indicates single wire was used in the SAW process, (T) indicates tandem wire was used in the SAW process.
Column 4: End-of-life (EOL) neutron fluence at vessel inner wall; cited directly from inner diameter (ID) value or calculated by using Regulatory Guide (RG) 1.99, Revision 2 neutron fluence attenuation methodology from the quarter thickness (T/4) value reported in the latest submittal (GL 92-01, PTS, or P/T limits submittals).
Column 5: Unirradiated reference temperature.
Column 6: Method of determining unirradiated reference temperature (IRT).

<u>Plant-Specific</u>
This indicates that the IRT was determined from tests on material removed from the same heat of the beltline material.

<u>MTEB 5-2</u>
This indicates that the unirradiated reference temperature was determined from following MTEB 5-2 guidelines for cases where the IRT was not determined using American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section III, NB-2331, methodology.

<u>Generic</u>
This indicates that the unirradiated reference temperature was determined from the mean value of tests on material of similar types.

Column 7: Chemistry factor for irradiated reference temperature evaluation.
Column 8: Method of determining chemistry factor

<u>Table</u>
This indicates that the chemistry factor was determined from the chemistry factor tables in RG 1.99, Revision 2.

<u>Calculated</u>
This indicates that the chemistry factor was determined from surveillance data via procedures described in RG 1.99, Revision 2.

Column 9: Copper content; cited directly from licensee value except when more than one value was reported. (Staff used the average value in the latter case.)

No Data
This indicates that no copper data has been reported and the default value in RG 1.99, Revision 2, will be used by the staff.

Column 10: Nickel content; cited directly from licensee value except when more than one value was reported. (Staff used the average value in the latter case.)

No Data

This indicates that no nickel data has been reported and the default value in RG 1.99, Revision 2, will be used by the staff.

Upper Shelf Energy Table

Column 1: Plant name and date of expiration of license.
Column 2: Beltline material location identification.
Column 3: Beltline material heat number; for some welds that a single-wire or tandem-wire process has been reported, (S) indicates single wire was used in the SAW process. (T) indicates tandem wire was used in the SAW process.
Column 4: Material type; plate types include A 533B-1, A 302B, A 302B Mod., and forging A 508-2; weld types include SAW welds using Linde 80, 0091, 124, 1092, ARCOS-B5 flux, Rotterdam welds using Graw Lo, SMIT 89, LW 320, and SAF 89 flux, and SMAW welds using no flux.
Column 5: EOL upper-shelf energy (USE) at T/4; calculated by using the EOL fluence and either the cooper value or the surveillance data. (Both methods are described in RG 1.99, Revision 2.)

EMA
This indicates that the USE issue may be covered by the approved equivalent margins analysis in the BWR Owners Group Topical Report: NEDO-32205, Revision 1.

Column 6: EOL neutron fluence at T/4 from vessel inner wall; cited directly from T/4 value or calculated by using RG 1.99, Revision 2 neutron fluence attenuation methodology from the ID value reported in the latest submittal (GL 92-01, PTS, or P/T limits submittals).

Column 7: Unirradiated USE.

<u>EMA</u>
This indicates that the USE issue may be covered by the approved equivalent margins analysis in the BWR Owners Group Topical Report: NEDO-32205, Revision 1.

Column 8: Method of determining unirradiated USE

<u>Direct</u>
For plates, this indicates that the unirradiated USE was from a transverse specimen. For welds, this indicates that the unirradiated USE was from test date.

<u>65%</u>
This indicates that the unirradiated USE was 65% of the USE from a longitudinal specimen.

<u>Generic</u>
This indicates that the unirradiated USE was reported by the licensee from other plants with similar materials to the beltline material.

<u>NRC generic</u>
This indicates that the unirradiated USE was derived by the staff from other plants with similar materials to the beltline material.

<u>10, 30, 40, or 50 °F</u>
This indicates that the unirradiated USE was derived from Charpy test conducted at 10, 30, 40, or 50 °F.

<u>Surv. Weld</u>
This indicates that the unirradiated USE was from the surveillance weld having the same weld wire heat number.

<u>Equiv. to Surv. Weld</u>
This indicates that the unirradiated USE was from the surveillance weld having different weld wire heat number.

<u>Sister Plant</u>
This indicates that the unirradiated USE was derived by using the reported value from other plants with the same weld wire heat number.

<u>Blank</u>
indicates that there is insufficient data to determine the unirradiated USE. These licensees will utilize Topical Report NEDO-32205, Revision 1 to demonstrate USE compliance to Appendix G, 10 CFR Part 50.