

December 22, 2005

NG-05-2208  
10CFR50.90

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555-0001

Duane Arnold Energy Center  
Docket No: 50-331  
Op. License No: DPR-49

License Amendment Request Pursuant to 10 CFR 50.90: Revision to the Duane Arnold Energy Center Reactor Pressure Vessel Material Surveillance Program (TSCR-081)

- References:
1. Letter from W. H. Bateman (NRC) to C. Terry (BWRVIP), Safety Evaluation Regarding EPRI Proprietary Reports "BWR Vessel and Internals Project; BWR Integrated Surveillance Program Plan (BWRVIP-78)" and "BWRVIP-86: BWR Vessel and Internals Project, BWR Integrated Surveillance Program Implementation Plan," dated February 1, 2002
  2. Regulatory Issue Summary No. 2002-05, NRC Approval of Boiling Water Reactor Pressure Vessel Integrated Surveillance Program, dated April 8, 2002

In accordance with 10 CFR 50.90, Nuclear Management Company, LLC (NMC) hereby requests revision to the Operating License for the Duane Arnold Energy Center (DAEC). The proposed change revises the reactor pressure vessel material surveillance program described within the DAEC Updated Final Safety Analysis Report (UFSAR) from a plant-specific program to the Boiling Water Reactor Vessel and Internals Project (BWRVIP) Integrated Surveillance Program (ISP).

The NRC issued a Safety Evaluation (SE) approving the BWRVIP ISP as an acceptable alternative to all existing BWR plant-specific RPV surveillance programs for the purpose of maintaining compliance with 10 CFR 50 Appendix H, "Reactor Vessel Material Surveillance Program Requirements," through the end of current facility 40-year operating licenses (Reference 1). On April 8, 2002, the NRC issued Regulatory Issue Summary (RIS) 2002-05, NRC Approval of Boiling Water Reactor Pressure Vessel Integrated Surveillance Program (Reference 2). RIS 2005-05 states that licensees who elect to participate in the ISP shall submit a license amendment request to incorporate this program into their licensing basis. The proposed change to the DAEC UFSAR revises the Reactor Pressure Vessel Material Surveillance Program in accordance with References 1 and 2. Exhibit A contains the amendment request; Exhibit B contains the proposed UFSAR revision.

This application has been reviewed by the DAEC Plant Operating Review Committee. A copy of this submittal, along with the evaluation of No Significant Hazards Consideration, is being forwarded to our appointed state official pursuant to 10 CFR Section 50.91.

Approval is requested prior to June 30, 2006, with the amendment being implemented within 90 days following approval. Similar requests were approved for Columbia Generating Station, Docket Number 50-397, by NRC letter dated April 28, 2005 (ADAMS accession number ML050880222) and Susquehanna Steam Electric Station, Units 1 and 2, Docket Numbers 50-387 and 50-388, by NRC letter dated February 6, 2003 (ADAMS accession number ML030370431).

If additional information is required concerning this request, please contact Mr. Steve Catron, DAEC Nuclear Safety Assurance Manager, at (319) 851-7234.

I declare under penalty of perjury that the foregoing is true and correct.  
Executed on December 22, 2005.



12/22/05

Gary Van Middlesworth  
Site Vice President, Duane Arnold Energy Center  
Nuclear Management Company, LLC

Exhibits: A) EVALUATION OF PROPOSED CHANGE  
B) PROPOSED UFSAR CHANGE (MARK-UP)

cc: Administrator, Region III, USNRC  
Project Manager, DAEC, USNRC  
Resident Inspector, DAEC, USNRC  
D. McGhee (State of Iowa)

## EXHIBIT A

### EVALUATION OF PROPOSED CHANGE

- 1.0 DESCRIPTION
- 2.0 PROPOSED CHANGE
- 3.0 BACKGROUND
- 4.0 TECHNICAL ANALYSIS
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  - 4.2 Fluence Methodology Compatibility
- 5.0 REGULATORY SAFETY ANALYSIS
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## 1.0 DESCRIPTION

This license amendment request proposes to revise the reactor pressure vessel material surveillance program described within the Duane Arnold Energy Center (DAEC) Updated Final Safety Analysis Report (UFSAR) to reflect participation in the Boiling Water Reactor Vessel and Internals Project (BWRVIP) Integrated Surveillance Program (ISP).

## 2.0 PROPOSED CHANGE

The DAEC UFSAR will be revised to replace the current plant-specific Reactor Pressure Vessel (RPV) material surveillance program with the BWRVIP ISP. The ISP was approved by the NRC in its Safety Evaluation (SE) dated February 1, 2002 (Reference 1).

The proposed revision to the DAEC UFSAR is provided for information in Exhibit B.

## 3.0 BACKGROUND

The BWR ISP was developed in response to an issue raised by the NRC staff regarding the potential lack of adequate unirradiated baseline Charpy V-notch (CVN) data for one or more materials in plant-specific RPV surveillance programs at several BWRs. The lack of baseline properties would inhibit a licensee's ability to effectively monitor changes in the fracture toughness properties of RPV materials in accordance with Appendix H to 10 CFR 50. The BWR ISP, as approved by the NRC, resolves this issue.

Implementation of the ISP also provides additional benefits. When the original surveillance materials were selected for plant-specific surveillance programs, the state of knowledge concerning RPV material response to irradiation and post-irradiation fracture toughness was not the same as it is today. As a result, many facilities did not include what would be identified today as the plant's limiting RPV materials in their surveillance programs. Hence, this effort to identify and evaluate materials from other BWRs, which may better represent a facility's limiting materials, should improve the overall evaluation of BWR RPV embrittlement.

Second, the inclusion of data from the testing of BWR Owners' Group (BWROG) Supplemental Surveillance Program (SSP) capsules will improve overall quality of the data being used to evaluate BWR RPV embrittlement.

Finally, implementation of the ISP is also expected to reduce the cost of surveillance testing and analysis since surveillance materials that are of little or no value (either because they lack adequate unirradiated baseline Charpy V-Notch (CVN) data or because they are not the best representative materials) will no longer be tested.

## 4.0 TECHNICAL ANALYSIS

In a Safety Evaluation (SE) dated February 1, 2002 (Reference 1), the NRC concluded that the ISP proposed by the BWRVIP, if implemented in accordance with specific conditions, is an acceptable alternative to existing BWR plant-specific RPV surveillance programs for the purpose of maintaining compliance with the requirements of Appendix H to 10 CFR Part 50 through the end of current facility 40 year operating licenses. The SE states that in order to complete ISP implementation, individual BWR licensees must provide, for NRC staff review and approval, information which defines how they will determine RPV and/or surveillance capsule fluences based on the dosimetry data which will be available for their facilities. This information must be submitted concurrently with each licensee's submittal to replace their existing plant-specific surveillance program with the BWR ISP as part of their facility's licensing basis. The information submitted must be sufficient for the staff to determine that:

(1) RPV and surveillance capsule fluences will be established as based on the use of an NRC-approved fluence methodology that will provide acceptable results based on the available dosimetry data,

(2) if one methodology is used to determine the neutron fluence values for a licensee's RPV and one or more different methodologies are used to establish the neutron fluence values for the ISP surveillance capsules which represent that RPV in the ISP, the results of these differing methodologies are compatible (i.e, within acceptable levels of uncertainty for each calculation).

The requested information follows.

### 4.1 Fluence Methodology

The methodology for neutron flux calculation for the DAEC conforms to Licensing Topical Report (LTR) NEDC-32983PA, Revision 1, "General Electric Methodology for Reactor Pressure Vessel Fast Neutron Flux Evaluations," dated December 2001. This methodology was used to develop revised Pressure-Temperature Curves which were approved by the NRC in Amendment 253 (Reference 2). This methodology follows the guidance in Regulatory Guide 1.190 (Reference 3) and has been approved by the NRC staff by letter dated September 14, 2001 (Reference 4).

The proposed UFSAR change includes a statement that an NRC-approved methodology will be used which conforms to Regulatory Guide 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence."

Use of an NRC-approved methodology satisfies the first condition contained within the NRC safety evaluation.

## 4.2 Fluence Methodology Compatibility

Following the issuance of the February 1, 2002 SE, the NRC provided additional clarification regarding neutron fluence methodology compatibility. At an August 29, 2002 workshop regarding the establishment and implementation of the BWRVIP RPV Integrated Surveillance Program, the NRC staff stated that neutron fluence methodology compatibility is satisfied if the surveillance capsules and the RPVs are evaluated with an NRC-approved methodology that complies with Regulatory Guide (RG) 1.190. The requirement to use an NRC-approved methodology that is consistent with RG 1.190 is included in the proposed UFSAR change.

Use of an NRC- approved methodology that is consistent with RG 1.190 satisfies the second condition contained within the NRC safety evaluation.

## 5. REGULATORY SAFETY ANALYSIS

### 5.1 No Significant Hazards Consideration

Nuclear Management Company (NMC), LLC has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The proposed change implements an integrated surveillance program that has been evaluated by the NRC staff as meeting the requirements of paragraph III.C of Appendix H to 10 CFR 50. Consequently, the proposed change does not significantly increase the probability of any accident previously evaluated. The proposed change provides the same assurance of RPV integrity. As a result, the consequences of any accident previously evaluated are not significantly increased.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

The proposed change revises the DAEC licensing bases to reflect participation in the BWRVIP ISP. The ISP was approved by the NRC staff as an acceptable material surveillance program which complies with 10CFR50, Appendix H. The proposed change maintains an equivalent level of RPV material surveillance and does not introduce any new accident initiators. The proposed change will not impact

the manner in which the plant is designed or operated. This change will not affect the reactor pressure vessel, as no physical changes are involved. The proposed change will not cause the reactor pressure vessel or interfacing systems to be operated outside of any design or testing limits. Furthermore, the proposed changes will not alter any assumptions previously made in evaluating the radiological consequences of any accident.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No.

The proposed change has been evaluated as providing an acceptable alternative to the plant-specific RPV material surveillance program that meets the requirements of the regulations for RPV material surveillance. The material surveillance program requirements contained in 10CFR50, Appendix H provide assurance that adequate margins of safety exist for the reactor coolant system against nonductile or rapidly propagating failures during normal operation, anticipated operational occurrences, and system hydrostatic tests. The BWRVIP ISP has been approved by the NRC staff as an acceptable material surveillance program which complies with 10CFR50, Appendix H. The ISP will provide the material surveillance data which will ensure that the safety margins required by NRC regulations are maintained for the DAEC reactor coolant system.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

#### Conclusion

Based on the above, NMC concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

Attorney for Licensee: Jonathan Rogoff, Esquire, General Counsel, NMC, LLC, 700 First St., Hudson, WI, 54016

## 5.2 Applicable Regulatory Requirements/Criteria

10 CFR 50.60, "Acceptance criteria for fracture prevention measures for light water nuclear power reactors for normal operation," requires that all light water power reactors, with certain exceptions, must meet the fracture toughness and material surveillance program requirements for the reactor coolant pressure boundary set forth in 10 CFR 50 Appendices G and H. 10 CFR 50 Appendix G, "Fracture Toughness Requirements," specifies fracture toughness requirements for ferritic materials of pressure-retaining components of the reactor coolant pressure boundary, including RPVs. 10 CFR 50 Appendix H, "Reactor Vessel Material Surveillance Program Requirements," requires licensees to implement an RPV material surveillance program in order to monitor changes in the fracture toughness properties in the reactor beltline region which result from exposure of these materials to neutron irradiation and the thermal environment.

10 CFR 50 Appendix H, Paragraph III.C, "Requirements for an Integrated Surveillance Program," provides specific criteria upon which approval of an ISP shall be based. An ISP is an alternative method to a plant specific material surveillance program. Appendix H Paragraph III.C states that in an ISP, "the representative materials chosen for surveillance for a reactor are irradiated in one or more other reactors that have similar design and operating features." In Reference 1 the NRC documented that the BWRVIP ISP met the criteria specified in Appendix H, Paragraph III.C provided that all licensees use one or more compatible neutron fluence methodologies acceptable to the NRC staff to determine capsule and RPV neutron fluences. In addition, the NRC required a plant specific license amendment to be submitted by each licensee wishing to adopt the ISP confirming their incorporation of the ISP into their licensing basis.

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner; (2) such activities will be conducted in compliance with the Commission's regulations; and, (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

## 6.0 ENVIRONMENTAL CONSIDERATION

10 CFR Section 51.22(c)(9) identifies certain licensing and regulatory actions which are eligible for categorical exclusion from the requirement to perform an environmental assessment. A proposed amendment to an operating license for a facility requires no environmental assessment if operation of the facility in accordance with the proposed amendment would not: (1) involve a significant hazards consideration; (2) result in a significant change in the types or significant increase in the amounts of any effluents that may be released offsite; and (3) result in a significant increase in individual or cumulative occupational radiation exposure. The Nuclear Management Company, LLC (NMC) has reviewed this request and determined that the proposed amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR Section 51.22(c)(9). Pursuant to 10 CFR Section 51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with the issuance of the amendment. The basis for this determination follows:

### Basis

The change meets the eligibility criteria for categorical exclusion set forth in 10 CFR Section 51.22(c)(9) for the following reasons:

1. As demonstrated in the No Significant Hazards Consideration Evaluation, the proposed amendment does not involve a significant hazards consideration.
2. The proposed change does not result in an increase in power level, does not increase the production, nor alter the flow path or method of disposal of radioactive waste or byproducts. The proposed change does not involve any physical alteration of the plant (no new or different type of equipment will be installed) or change in methods governing normal plant operation. Therefore, the proposed changes will not affect the types or increase the amounts of any effluents released offsite.
3. There is no significant increase in individual or cumulative occupational radiation exposure. The proposed change does not involve any physical alteration of the plant (no new or different type of equipment will be installed) or change in methods governing normal plant operation. There will be no change in the level of controls or methodology used for processing of radioactive effluents or handling of solid radioactive waste nor will the proposal result in any change in the normal radiation levels within the plant. Therefore there will be no increase in individual or cumulative occupational radiation exposure resulting from these changes.

## **7. REFERENCES:**

- 1. Letter from W. H. Bateman (NRC) to C. Terry (BWRVIP Chairman), "Safety Evaluation Regarding EPRI Proprietary Report 'BWR Vessel and Internals Project, BWR Integrated Surveillance Program Plan (BWRVIP-78)' and 'BWRVIP-86: BWR Vessel and Internals Project, BWR Integrated Surveillance Program Implementation Plan,'" dated February 1, 2002.**
- 2. Letter from D. Hood (NRC) to M. Peifer (NMC), Amendment 253, Pressure and Temperature Limit Curves," dated August 25, 2003.**
- 3. Regulatory Guide 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence," March 2001.**
- 4. Letter from S. Richards (NRC) to J. Klapproth (GENE), Safety Evaluation for NEDC-32983P, General Electric Methodology for Reactor Pressure Vessel Fast Neutron Flux Evaluation MFN 01-050, dated September 14, 2001.**

**EXHIBIT B**

**PROPOSED UFSAR CHANGE**

**(MARK-UP)**

## UFSAR/DAEC-1

The surplus base metal is approximately 12 by 21 by 4-11/16 in. The surplus weld sample plate is approximately 6 by 33 by 4-11/16 in. The surplus plates, if it becomes necessary, can be made into specimens with the following dimensions:

Charpy V-notch specimen - 2.1 by 0.39 by 0.39 in.  
Tensile specimen - 0.25 in. in diameter by 3 in. long

In addition to the capsule dosimeter, one basket has a special holder with a capsule containing iron and copper dosimeter wire. This special dosimeter can be removed independently of the surveillance samples.

### Withdrawal Schedule

Test specimens of the reactor vessel base, weld and heat affected zone metal were installed in the reactor vessel adjacent to the vessel wall at the core midplane level at the start of operation. A withdrawal of specimens ~~are~~ <sup>was</sup> performed in accordance with the following:

Withdrawal Period (Approx. effective full power years)	Estimated Max. Fluence @ 1/4 T ( $10^{18}$ nvt > 1 MeV)
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6

0.7

15

1.2

Future specimen <sup>32</sup> withdrawal is in accordance <sup>2.8</sup> with the Boiling Water Reactor Vessel and Internals Project Integrated Surveillance First Surveillance Capsule Program. Insert 1.

The first surveillance capsule at the 288° location was withdrawn after 5.9 effective full power years (Cycle 7) for testing. It contained 24 Charpy V-notch specimens, six tensile specimens and six flux wires. The test results are presented in Reference 3. These results are superseded by those results of the Second Surveillance Capsule which is summarized below and contained in Reference 6.

### Second Surveillance Capsule

The second surveillance capsule at the 36° location was removed at approximately 14.7 EFPY in October 1996 (end of Cycle 14). The capsule contained 9 flux wires for neutron fluence measurement and 36 Charpy and 8 tensile test specimens for material property evaluations. The flux wires were evaluated to determine the fluence experienced by the test specimens. Charpy V-Notch impact testing and uniaxial tensile testing were performed to establish the properties of the irradiated surveillance materials.

The 36° azimuth position surveillance capsule was removed and shipped to VNC. The flux wires and Charpy V-Notch and tensile test specimens removed from the capsule were tested according to ASTM E185-82. The methods and results of the testing are presented in Reference 6. This evaluation was re-performed to incorporate ASME Code

UFSAR/DAEC-1

REFERENCES FOR SECTION 5.3

1. L. C. Hsui, An Analytical Study on Brittle Fracture of GE-BWR Vessel Subject to the Design Basis Accident (LOCA), NEDO-10029, 1969.
2. General Electric Company, Duane Arnold Energy Center Reactor Pressure Vessel Fracture Toughness Analysis to 10 CFR 50, Appendix G, May 1983, NEDC-30839, December 1984.
3. General Electric Company, Duane Arnold Energy Center Reactor Pressure Vessel Surveillance Materials Testing, NEDC-31166-1, Revision 1, 1986.
4. NEDO-32205, "BWR Owners' Group Topical Report on Upper Shelf Energy Equivalent Margin Analysis", dated March 21, 1994.
5. Letter from J. Franz (IES) to T. Murley (NRC) dated July 30, 1993, NG-93-2800, Response to Request for Additional Information Regarding Response to Generic Letter (GL) 92-01, Revision 1, "Reactor Vessel Structural Integrity."
6. General Electric Company, Duane Arnold RPV Surveillance Materials Testing and Analysis, GE-NE-B1100716-01, Revision 0, July 1997.
7. General Electric Company, Pressure-Temperature Curves for Duane Arnold Energy Center, GE-NE-A22-00100-08-01-R2, Revision 2, August 2003.
8. Letter, S. A. Richards, USNRC to J. F. Klapproth, GE-NE, "Safety Evaluation for NEDC-32983P, General Electric Methodology for Reactor Pressure Vessel Fast Neutron Flux Evaluation (TAC No. MA9891)", MFN 01-050, September 14, 2001.
9. Amendment No. 253 regarding Pressure and Temperature Limit Curves, dated August 25, 2003.

Insert 2.

## INSERT 1

The program for implementation of the scheduling, withdrawal, and testing of the material surveillance specimens is governed and controlled by the Boiling Water Reactor Vessel and Internals Project (BWRVIP) BWRVIP-78, "BWR Vessel and Internals Project, BWR Integrated Surveillance Program Plan" (Reference 10); BWRVIP-86, "BWR Vessel and Internals Project, BWR Integrated Surveillance Program Implementation Plan" (Reference 11); NRC letter dated December 15, 2000, "Request for Additional Information Regarding BWRVIP-78" (Reference 12); NRC letter dated May 30, 2001, "Project No. 704 - BWRVIP Response to Second NRC Request for Additional Information on the BWR Integrated Surveillance Program" (Reference 13); and the NRC Safety Evaluation (Reference 14) which approved BWRVIP-78 and BWRVIP-86. The BWRVIP Integrated Surveillance Program (ISP) complies with the requirements of 10 CFR 50, Appendix H. The specimens will be pulled in accordance with the test matrix included in BWRVIP-86 as modified by the NRC's safety evaluation.

A neutron fluence calculation methodology which has been approved by the NRC staff and conforms with U.S. Nuclear Regulatory Commission Regulatory Guide 1.190, "Calculational and Dosimetry Methods for Determining 'Pressure Vessel Neutron Fluence", will be used for the determination of neutron fluence values for the DAEC.

## INSERT 2

10. Boiling Water Reactor Vessel and Internals Project (BWRVIP) BWRVIP-78, "BWR Vessel and Internals Project, BWR Integrated Surveillance Program Plan", EPRI TR-1 14228, dated December 1999.

11. Boiling Water Reactor Vessel and Internals Project (BWRVIP) BWRVIP-86, "BWR Vessel and Internals Project, BWR Integrated Surveillance Program Implementation Plan", EPRI Technical Report 1000888, dated December 2000.

12. Letter to U.S. NRC Document Control Desk from Mr. C. Terry, dated December 15, 2000, subject: "Project No. 704 - BWRVIP Response to NRC Request for Additional Information Regarding BWRVIP-78."

13. Letter to U.S. NRC Document Control Desk from Mr. C. Terry, dated May 30, 2001, subject: "Project No. 704 - BWRVIP Response to Second NRC Request for Additional Information on the BWR Integrated Surveillance Program."

14. Letter to Mr. Carl Terry, BWRVIP Chairman, from Mr. William H. Bateman, Nuclear Regulatory Commission, dated February 1, 2002, subject: "Safety Evaluation Regarding EPRI Proprietary Reports "BWR Vessel and Internals Project, BWR Integrated Surveillance Program Plan (BWRVIP-78)" and "BWRVIP-86: BWR Vessel and Internals Project, BWR Integrated Surveillance Program Implementation Plan."