

10 CFR 50.59
10 CFR 50.90

RS-02-183

October 28, 2002

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Dresden Nuclear Power Station, Units 2 and 3
Facility Operating License Nos. DPR-19 and DPR-25
NRC Docket Nos. 50-237 and 50-249

Subject: Request for License Amendment Related to the Use of Cast Iron Material in
Containment Cooling Service Water and Diesel Generator Cooling Water
Systems

- References:
- (1) Letter from U. S. NRC to L. DelGeorge (Commonwealth Edison Company), "SEP Topic III-1, Quality Group Classification of Components and Systems (Dresden Unit 2)," dated March 9, 1982
 - (2) Letter from U. S. NRC to H. E. Bliss (Commonwealth Edison Company), "IPSAR Topic III-1, Classification of Structures, Systems and Components, Radiography Requirements," dated June 28, 1988
 - (3) Letter from U. S. NRC to T. J. Kovach (Commonwealth Edison Company), "Fracture Toughness Evaluation for Dresden Unit 2, IPSAR Topic III-1," dated May 1, 1989
 - (4) Letter from T. J. Rausch (Commonwealth Edison Company) to P. O'Connor (U. S. NRC), "Dresden Unit 2, SEP Topic III-1, Quality Group Classification of Components and Systems," dated July 16, 1982
 - (5) Letter from Preston Swafford (Commonwealth Edison Company) to U. S. NRC, "Revision to Information Previously Submitted Regarding SEP Topic III-1, Quality Group Classification of Components and Systems," dated March 31, 2000

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company (Exelon), LLC, is requesting changes to Facility Operating License Nos. DPR-19 and DPR-25, for Dresden Nuclear Power Station (DNPS), Units 2 and 3. Specifically, the proposed changes will allow Exelon to revise the DNPS Updated Final Safety Analysis Report (UFSAR) to describe the use of cast iron materials in

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the Containment Cooling Service Water (CCSW) and Diesel Generator Cooling Water (DGCW) Systems, subject to material acceptance criteria that will be included in the proposed UFSAR revision. Cast iron materials are currently being used in the CCSW and DGCW systems. However, information regarding the use of cast iron materials in these systems was not provided to the NRC by Commonwealth Edison Company (now Exelon) and thus was not addressed in NRC Safety Evaluations (SEs) for Systematic Evaluation Program (SEP) Topic III-1, "Quality Group Classification of Components and Systems," for DNPS Unit 2 (References 1, 2, and 3). Therefore, this license amendment request is required by 10 CFR 50.59, "Changes, tests, and experiments," since the use of cast iron materials represents a departure from a method of evaluation described in the UFSAR used in establishing the design bases for DNPS.

In November 1999, DNPS became aware of an error in information previously provided to the NRC in Reference 4 in response to questions on SEP Topic III-1. The information provided by DNPS regarding fracture toughness requirements for materials in various plant systems failed to identify the use of cast iron material in the CCSW and DGCW systems. The NRC used, in part, the inaccurate information provided by DNPS and issued the referenced SEs for DNPS, Unit 2 on this SEP topic. DNPS notified the NRC of this error in Reference 5, but did not request formal NRC approval of this condition.

Exelon requests approval of these proposed changes by September 26, 2003, with a 30-day implementation period.

This request is subdivided as follows.

1. Attachment A gives a description and safety analysis of the proposed changes.
2. Attachment B provides the proposed revisions to the UFSAR.
3. Attachment C describes our evaluation performed using the criteria in 10 CFR 50.91(a), "Notice for public comment," paragraph (1), which provides information supporting a finding of no significant hazards consideration using the standards in 10 CFR 50.92, "Issuance of amendment," paragraph (c).
4. Attachment D provides information supporting an Environmental Assessment.

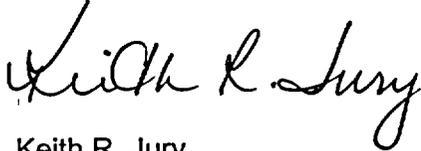
These proposed operating license changes have been reviewed by the DNPS Plant Operations Review Committee in accordance with the requirements of the Exelon Quality Assurance Program.

Exelon is notifying the State of Illinois of this request for changes to the operating license by transmitting a copy of this letter and its attachments to the designated State Official.

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Should you have any questions concerning his letter, please contact Mr. Allan R. Haeger at (630) 657-2807.

Respectfully,



Keith R. Jury
Director - Licensing
Mid-West Regional Operating Group

Attachments: Affidavit
Attachment A Description and Safety Analysis for Proposed Changes
Attachment B Proposed Revisions to the UFSAR
Attachment C Information Supporting a Finding of No Significant Hazards
Consideration
Attachment D Information Supporting an Environmental Assessment

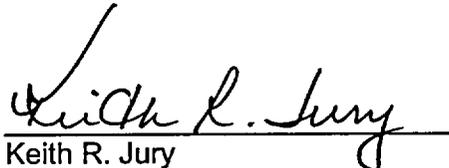
cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Dresden Nuclear Power Station
Office of Nuclear Facility Safety – Illinois Department of Nuclear Safety

STATE OF ILLINOIS)
COUNTY OF DUPAGE)
IN THE MATTER OF)
EXELON GENERATION COMPANY, LLC) Docket Numbers
DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3) 50-237 and 50-249

SUBJECT: Request for License Amendment Related to Use of Cast Iron Material in Containment Cooling Service Water and Diesel Generator Cooling Water Systems

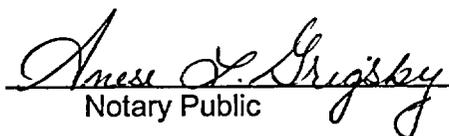
AFFIDAVIT

I affirm that the content of this transmittal is true and correct to the best of my knowledge, information, and belief.



Keith R. Jury
Director – Licensing
Mid-West Regional Operating Group

Subscribed and sworn to before me, a Notary Public in and
for the State above named, this 28th day of
October, 2002.



Notary Public



Attachment A

DESCRIPTION AND SAFETY ANALYSIS FOR PROPOSED CHANGES

A. SUMMARY OF THE PROPOSED CHANGES

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company (Exelon), LLC, is requesting changes to Facility Operating License Nos. DPR-19 and DPR-25, for Dresden Nuclear Power Station (DNPS), Units 2 and 3. Specifically, the proposed changes will allow Exelon to revise the DNPS Updated Final Safety Analysis Report (UFSAR) to describe the use of cast iron materials in the Containment Cooling Service Water (CCSW) and Diesel Generator Cooling Water (DGCW) Systems, subject to material acceptance criteria that will be included in the proposed UFSAR revision. Cast iron materials are currently being used in the CCSW and DGCW systems. However, information regarding the use of cast iron materials in these systems was not provided to the NRC by Commonwealth Edison Company (now Exelon) and thus was not addressed in NRC Safety Evaluations (SEs) for Systematic Evaluation Program (SEP) Topic III-1, "Quality Group Classification of Components and Systems," for DNPS Unit 2 (References I.1, I.2, and I.3). Therefore, this license amendment request is required by 10 CFR 50.59, "Changes, tests, and experiments," since the use of cast iron materials represents a departure from a method of evaluation described in the UFSAR used in establishing the design bases for DNPS.

In November 1999, DNPS became aware of an error in information previously provided to the NRC in Reference I.4 in response to questions on SEP Topic III-1. The information provided by DNPS regarding fracture toughness requirements for materials in various plant systems failed to identify the use of cast iron material in the CCSW and DGCW systems. The NRC used, in part, the inaccurate information provided by DNPS and issued the referenced SEs for DNPS, Unit 2 on this SEP topic. DNPS notified the NRC of this error in Reference I.5, but did not request formal NRC approval of this condition.

The specific proposed revisions to the UFSAR are provided in Attachment B.

B. DESCRIPTION OF THE CURRENT REQUIREMENTS

The UFSAR does not discuss the use of cast iron materials in the CCSW and DGCW piping systems. The only location in the UFSAR that specifies material composition for these systems is Table 6.1-1, "Fracture Toughness Requirements." This table specifies that the material composition of these systems, including pump casings and valves, is carbon steel.

C. BASES FOR THE CURRENT REQUIREMENTS

UFSAR Section 3.2, "Classification of Structures, Components, and Systems," describes the classification of structures, components, and systems (SSCs) for DNPS, Units 2 and 3. The CCSW and DGCW piping systems were originally designed to Safety Class I requirements as indicated in UFSAR Section 3.2. During original design of DNPS, Units 2 and 3, the term Safety Class I was equivalent to a safety-related classification in today's terminology. Like other safety-related systems, the CCSW and DGCW piping systems are designed to remain within the allowable stress levels of USA Standard (USAS) Code for Pressure Piping B31.1-1967, "Power Piping," during a design basis earthquake. The design of the CCSW and

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DGCW piping systems is consistent with the proposed General Design Criteria (issued July 1967) which were used by the Atomic Energy Commission (AEC) to evaluate the original design of DNPS, Units 2 and 3.

In addition, based on the classification criteria in Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," Revision 3, both the CCSW and DGCW systems would be classified as Quality Group C systems. Current design criteria for nuclear power plants would require that these systems be designed and constructed to the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code Section III, Class 3.

D. NEED FOR REVISION OF THE REQUIREMENTS

In the early 1980's, DNPS Unit 2 was part of the NRC's SEP. Under SEP Topic III-1, "Quality Group Classification of Components and Systems", the NRC reviewed the classification of SSCs of plants designed and constructed from the late 1950's to late 1960's against current (i.e., early 1980's) classifications, codes, and standards for seismic and quality groups. The DNPS, Unit 2 safety-related systems, which were designed to the USAS B31.1-1967 Code, were evaluated against the fracture toughness requirements of the ASME B&PV Code, Section III, 1977 Edition as supplemented by the Summer 1978 Addenda. Of particular interest are the significant ASME Section III Code changes in fracture toughness requirements that occurred in 1972.

During the SEP evaluation process, DNPS failed to identify that the CCSW and DGCW systems contained cast iron valves, and that the CCSW system also contained cast iron pump casings. Following DNPS discovery of this error in late 1999, the NRC was notified (Reference I.5), but DNPS did not request formal NRC approval of this condition. Because the use of cast iron in safety-related systems was not evaluated at the time of the SEP, cast iron was not addressed in the NRC SEs (References I.1, I.2, I.3) regarding SEP Topic III-1 for DNPS, Unit 2. Cast iron has lower ductility and fracture toughness than other materials typically used in safety-related piping systems. Although it is an acceptable material in the USAS B31.1-1967 Code, there are no material specifications for cast iron that are acceptable in the 1977 ASME Section III Code, which formed the basis for the evaluation criteria of SEP Topic III-1.

Therefore, this license amendment request is required by 10 CFR 50.59, "Changes, tests, and experiments," since the use of cast iron materials represents a departure from a method of evaluation described in the UFSAR used in establishing the design bases for DNPS.

E. DESCRIPTION OF THE PROPOSED CHANGES

Exelon proposes to revise the DNPS UFSAR to describe the use of cast iron materials in the CCSW and DGCW systems, subject to material acceptance criteria that will be included in the proposed UFSAR revision.

The components containing cast iron materials are the CCSW pump casings (eight CCSW pumps), certain CCSW valve bodies (eight valves), and certain DGCW valve bodies (41 valves).

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Cast iron valve bodies and pump casings shall be considered acceptable for service at DNPS provided they meet the requirements stated below. The cast iron components will be listed in the UFSAR as not requiring impact testing.

The specific proposed revisions to the UFSAR are provided in Attachment B. The proposed acceptance criteria are also included below.

Compliance with Code of Construction:

General

1. The CCSW and the DGCW system piping are designed to USAS B31.1, 1967 Edition.
2. All cast iron valves and the CCSW pump meet the manufacturers specified pressure and temperature service ratings.
3. The design temperature is not higher than 400°F, and not lower than 32°F.
4. The material of the cast iron components meets American Society for Testing and Materials (ASTM) Specification A-126 or A-48.
5. All cast iron valves are manually operated, and meet the American National Standards Institute (ANSI) B16.10 Standard.
6. The cast iron components are not used with flammable, combustible, or toxic fluids.
7. The cast iron components are not subject to water hammer or rapid thermal or pressure transients. Mechanical impact such as hammering to disassemble flanged joints is not permitted.
8. There are no pipe supports at the cast iron valves.
9. Welding to cast iron components is not permitted.

Valve Nozzle Stresses

The valve nozzle stresses caused by the connecting piping end moments meet the following stress limits (see Notes, below):

- Sustained Loads:

$$\text{Pressure Stress} + \text{Deadload Stress} \leq 1.0 S_{CI} \text{ (Stress Allowable for cast iron)}$$

- Level B Loads:

$$\text{Pressure Stress} + \text{Deadload Stress} + \text{Operating Basis Earthquake (OBE)}$$

$$\text{Stress} \leq 1.2 S_{CI}$$

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- Level D Loads:
Pressure Stress + Deadload Stress + Design Basis Earthquake (DBE) Stress
 $\leq 2.4 S_{CI}$
- Thermal Expansion plus Sustained Loads:
Pressure Stress + Deadload Stress + Thermal Expansion Stress $\leq 2.5 S_{CI}$

Notes:

1. Definition of the stress terms is per ASME B31.1, 1989 Edition.
2. $S_{CI} = 6.0$ ksi.
3. The Level D allowable is per Code Case 1606-1.
4. The thermal expansion plus sustained load allowable assumes fewer than 7000 thermal transient cycles. For cast iron, the stress allowable for cold conditions (S_c) equals the stress allowable for hot conditions (S_h).

Pump Nozzle Stresses

The pump nozzle stresses caused by the connecting piping forces and moments meet the following stress limits (see Notes, below):

- Level B Loads:
General Membrane Stress $\leq 1.1 S_{CI}$
General or Local Membrane Stress + Bending Stress $\leq 1.65 S_{CI}$
- Level D Loads:
General Membrane Stress $\leq 2.0 S_{CI}$
General or Local Membrane Stress + Bending Stress $\leq 2.4 S_{CI}$

Notes:

1. Definition of stress terms is per ASME Section III, ND-3416, 1989 Edition.
2. Level B general membrane stress is due to pressure, and axial forces from deadload, OBE, and thermal expansion.
3. Level B bending stress is due to deadload, OBE, and thermal expansion. No stress intensification factors are applied.
4. Level D general membrane stress is due to pressure, and axial forces from deadload and DBE.
5. Level D bending stress is due to deadload and DBE. No stress intensification factors are applied.
6. $S_{CI} = 6.0$ ksi.

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Fracture Toughness Acceptance Criteria:

1. All cast iron components are connected to piping of wall thickness 5/8" or smaller.
2. The lowest service temperature is not lower than 32°F.
3. The cast iron components are not subject to water hammer or rapid thermal or pressure transients. Mechanical impact such as hammering to disassemble flanged joints is not permitted.
4. There are no pipe supports at the cast iron valves. Displacements of the cast iron components are limited such that they do not contact other components in a seismic event.
5. Welding to cast iron components is not permitted.

F. SAFETY ANALYSIS OF THE PROPOSED CHANGES

Exelon has determined that the current use of cast iron materials in the CCSW and DGCW systems at DNPS is acceptable. The following analysis supports this determination. The analysis discusses the material properties of cast iron and supports the proposed acceptance criteria, including the reasons that impact testing is not required.

F.1 Material Properties of Cast Iron

The primary disadvantage of cast iron when compared to ferritic steel is that cast iron has much lower ductility and fracture toughness. The ASME Code Section III equations are based on the assumption that the material has sufficient ductility to deform plastically under high load, so as to provide an acceptable margin of safety between initial local yielding and ultimate fracture. The low fracture toughness makes castings vulnerable to shock loadings such as pressure spikes, thermal shock, and mechanical impact. However, these two issues can be addressed by limiting the design loads to below yield, and by placing restrictions on the system service to avoid shock loads.

The cast iron material used in the CCSW and DGCW systems is ASTM Specification A-126 Class B (Reference I.6). That specification references ASTM A-48 and shows the equivalent A-48 Class to be 30B. Specification A-126 lists Class B cast iron as having a minimum tensile strength of 31 ksi. The tensile strength does not change significantly between 32°F and 450°F, with the tensile strength at 32°F being slightly higher than at 70°F (Reference I.7).

In general, the compressive strength of cast iron is about 3.5 times the tensile strength, and the shear strength is about 1.4 times the tensile strength. Unlike carbon steels, the bending strength is higher than the tensile strength. The minimum bending strength can be determined from a transverse test. Following the method described in ASTM A-126, the minimum bending strength resulting from an acceptable transverse test is 58.4 ksi. Using a

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stress allowable based on tension and applying it to bending loads is very conservative for cast iron.

For cast iron, there is very little elongation prior to fracture. The elongation is only 0.6 % (Reference I.7), and the yield stress is very close to the ultimate tensile stress. The design stresses must therefore be kept below yield. The fatigue endurance limit is 14 ksi for Class 30 cast iron (Reference I.7), which is similar to carbon steel. The fatigue strength does not change appreciably between 32°F and 450°F (Reference I.7). The fatigue strength of grey cast iron is less sensitive to geometric discontinuities than carbon steel, as the fatigue strength already includes the effects of micro-notches that are present in the casting. Thus, stress intensification factors related to geometric discontinuities such as fillets and tapers, which are applied to the cast iron, are a source of conservatism.

The fracture toughness of grey cast iron is about 20 ksi $\sqrt{\text{in}}$ (Reference I.8). It does not have a transition temperature, so the fracture toughness does not reduce further at low temperatures. Although this value indicates reduced resistance to cracking from high strain rates, such as are associated with impact loads, the potential for brittle fracture can be controlled by limiting the service conditions to non-shock loading. Cast iron is commonly used in service water systems due to its wear resistance and the moderate service conditions.

F.2 Justification for Proposed Acceptance Criteria

The proposed acceptance criteria for the currently installed cast iron components in the CCSW and DGCW systems at DNPS will ensure that these components possess adequate fracture toughness to maintain their integrity under all expected conditions. Since the ASME Code does not provide acceptance criteria for cast iron materials, the proposed acceptance criteria reflect a combination of the requirements of the ASME Codes and the original code of construction. The discussion is subdivided into general requirements, valve stresses, pump stresses, and impact testing

General Requirements

The original code of construction, USAS B31.1-1967, permits the use of cast iron in piping systems. In paragraph 123.2.4, it places a caution on its use, stating that its low ductility should be recognized and applications where shock loading can occur should be avoided. Table 126.1 lists the acceptable material specifications, which includes A-126 cast iron. Appendix A of the code provides values for S, the stress allowable, for cast iron, by fabrication process. For a sand mold casting, which is the most common process for valves and pump casings, the S value is 6.0 ksi for temperatures from -20°F to 400°F. Although B31.1-1967 gives some design guidance applicable to nuclear piping systems, it does not provide load combinations and allowable stresses for occasional loads, nor does it address valve and pump nozzle allowable stresses. In areas where B31.1 is silent, it is appropriate to obtain guidance from the ASME codes.

The following requirements are specified in the 1989 Edition of ASME B31.1 (Reference I.9) regarding the use of cast iron in piping systems:

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- Cast iron pipe may be used within the ratings established by the material specifications listed, which include A-126 and A-48 (105.2.1(B)).
- Cast iron may be used in components meeting the standards listed, which include B16.10 for cast iron valves. This standard specifies minimum valve dimensions for each pressure rating.
- Table A-5 provides some stress allowables for cast iron materials. It lists an S value of 3.0 ksi for A-126 Class B, between -20°F and 400°F . However, Note (g) to the table is significant, as discussed below.
- Cast iron pipe shall not be used for flammable, combustible, or toxic fluids.
- Possible shock loadings (pressure, temperature, or mechanical) and consequences of failure must be considered before specifying the use of cast iron (124.4).
- There are restrictions for the use of cast iron in boiler external blowoff and blowdown piping. This is not applicable to the CCSW and DGCW systems.
- Piping stress combinations, allowables, and stress intensification factors are provided (as they have been in Editions since 1973). These apply equally to cast iron.

Note (g) to Table A-5 of B31.1-1989 states that the allowable stresses provided are for use in designing components that are not manufactured in accordance with the referenced standards. The cast iron valves in use at DNPS are all manufactured to the referenced Standard ASA B16.10. This standard specifies minimum radii so as to minimize stress concentrations; a component that does not have these radii would presumably require a penalty factor in the allowable stress. B31.1-1989 does not state what the stress allowable is for components that do meet the standard. The S value of 3.0 ksi would be very conservative, as it is about 10 % of minimum tensile stress, in contrast to the code basis for the S value, which is 25% of minimum tensile.

ASME Section IV, Subsection HC (Reference I.10), which is for heating boilers, is significant in that it provides more comprehensive allowable stress guidance for cast iron. It specifies a design stress allowable in tension for cast iron of 6 ksi. It also specifies a bending stress allowable that is 1.5 times the allowable in tension, or 9 ksi, and an allowable in compression of 12 ksi. In the cast iron applications at DNPS, which include only low-pressure systems, nearly all of the stress in the code piping stress qualification equations is bending stress.

In view of the above, the cast iron evaluation criteria at DNPS will use an allowable stress S of 6 ksi in the code stress equations. This value is sufficiently conservative, is consistent with the original code of construction, and will hold the stresses to magnitudes where the reduced ductility is not a concern.

Valve Stresses

ASME B31.1 does not specify stress allowables for valves. ASME Section III, ND-3521 (Reference I.11) provides guidance for Class 3 valves. It states the following.

- Valves with extended structures must satisfy the stress allowables of Table ND-3521-1. The CCSW and DGCW system cast iron valves in service at DNPS are manually operated valves with rigid, compact bodies, with no extended structures.
- If there is no extended structure, the valve must only meet the pressure rating of the specification, and must be able to withstand the piping end loads. The valve is considered adequate to withstand piping end loads if 1) the valve nozzle section modulus

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is at least 10% greater than that of the attaching pipe, and 2) the stress allowable of the valve material is equal or better than the attaching pipe. Condition 1 is inherently met if the valve conforms to the B16.10 Standard. Condition 2 is not inherently met, but the intent can be met by restricting the allowable stress in the pipe material, at the pipe-to-valve connection, to the valve material stress allowable. The cast iron CCSW and DGCW valves at DNPS meet these conditions.

Pump Stresses

The adequacy of the cast iron CCSW pump casing to withstand design loads consists of three considerations.

- 1) The service conditions must be within the pressure-temperature rating of the pump.
- 2) The external loads applied at the nozzle by the attached piping do not overstress the region of the nozzle/shell junction.
- 3) The pump supports meet component support criteria.

Meeting the pressure-temperature rating of the pump satisfies item 1. Item 3 is met by applying the DNPS generic component support design criteria; the fact that the pump casing is made of cast iron does not affect the pump supports, which are made of steel.

Regarding item 2, ASME B31.1 does not specify stress allowables for the pump nozzle loads. ASME Section III, ND-3410 (Reference I.10) provides guidance for Class 3 pumps. Table ND-3416-1 gives the stress limits for the various service levels in terms of S. The S value defined above will be conservatively used in these equations. The pump nozzle stress combination equations differ from the B31.1 piping equations in that thermal expansion loads are combined with other primary mechanical loads, but stress intensification factors are not applied.

Impact Testing

The ASME Section III Code (Reference I.10) requires that the materials be one of the approved specifications of Section II. Neither the SA-126 nor SA-48 specifications are listed in Section II. Under SEP Topic III-1, DNPS's safety-related systems, which were designed to USAS B31.1-1967, were evaluated against the fracture toughness requirements of ASME Section III, Classes 1, 2, and 3. This evaluation did not recognize that cast iron materials were used in the CCSW and DGCW systems. USAS B31.1-1967 does not require impact testing to verify adequate fracture toughness. It merely includes a caution that the low ductility of cast iron should be recognized and the use of cast iron where shock loading may occur should be avoided.

ASME Section III requires that under certain conditions where fracture toughness may be a concern, impact testing shall be performed to assure adequate ductility and energy absorption. ND-2311 specifies the impact testing requirements for materials in Class 3 systems. It provides a series of exemptions from impact testing, one of which is for pump and valve material connected to piping of nominal wall thickness of 5/8" or less. The cast iron components at DNPS are all connected to pipe of wall thickness below 5/8". This exemption from impact testing applies regardless of material (some materials are exempt altogether). ND-2332 requires that impact testing be done at the lowest service temperature. The lowest service temperature in the CCSW and DGCW systems is 32°F. There are a

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number of Section III approved materials that at 32°F are close to their lower shelf fracture toughness, such as SA-216 and SA-352 annealed or normalized cast carbon steel. At the lower shelf, these materials are not much different than cast iron in their fracture toughness, however they are still exempt from impact testing (when used as pump or valve material) if the connecting pipe wall thickness is less than 5/8". Thus, it is inferred that the cast iron components in the CCSW and DGCW systems at DNPS do not require impact testing.

Conclusion

From a practical standpoint, fracture toughness is a concern only in applications that involve shock loading. Paragraph ND-3622 of ASME Section III requires that impact loads, whether internal or external, be considered in design. The use of cast iron at DNPS is exclusively in service water systems. These systems are not currently vulnerable to water hammer as they are kept full, there is no change of phase of the contained liquid, and there are no rapidly closing valves or rapidly starting pumps. Although these systems are designed for seismic loading, the seismic loads do not produce impact loads in the cast iron components. This is because the use of cast iron is limited to valve bodies and pump casings. The valve bodies are not enclosed in pipe supports, and therefore do not impact the support members during seismic motion. The pump casings also do not impact against other components during an earthquake.

The proposed acceptance criteria for cast iron are consistent with guidance in Section D of Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," and Section 3.2.1, "Seismic Classification," of the Standard Review Plan (NUREG-0800). Both of these documents allow an applicant to propose an acceptable alternative method for complying with specified portions of the NRC's regulations.

The proposed cast iron acceptance criteria for DNPS address the concerns regarding the fracture toughness of cast iron. This is performed by limiting the allowable stress level (S) in the cast iron valves and pump casings to 6 ksi in the code stress equations. This value is sufficiently conservative, is consistent with the original code of construction, and will hold the stresses to magnitudes where the reduced ductility is not a concern. Additional restrictions are placed on the use of cast iron to avoid brittle fracture.

Based on the considerations discussed above, Exelon has concluded that the current use of cast iron materials in the CCSW and DGCW systems is acceptable, since these components meet applicable standards to ensure they will maintain their integrity under all expected service conditions.

G. IMPACT ON PREVIOUS SUBMITTALS

Exelon has reviewed the proposed change and has determined that there is no impact on any previous license amendment requests awaiting NRC approval.

H. SCHEDULE REQUIREMENTS

We request approval of this license amendment request by September 26, 2003. Once approved, the amendment will be implemented within 30 days.

Attachment A

DESCRIPTION AND SAFETY ANALYSIS FOR PROPOSED CHANGES

I. REFERENCES

- I.1 Letter from U. S. NRC to L. DelGeorge (Commonwealth Edison Company), "SEP Topic III-1, Quality Group Classification of Components and Systems (Dresden Unit 2)," dated March 9, 1982
- I.2 Letter from U. S. NRC to H. E. Bliss (Commonwealth Edison Company), "IPSAR Topic III-1, Classification of Structures, Systems and Components, Radiography Requirements," dated June 28, 1988
- I.3 Letter from U. S. NRC to T. J. Kovach (Commonwealth Edison Company), "Fracture Toughness Evaluation for Dresden Unit 2, IPSAR Topic III-1," dated May 1, 1989
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- I.5 Letter from Preston Swafford (Commonwealth Edison Company) to U. S. NRC, "Revision to Information Previously Submitted Regarding SEP Topic III-1, Quality Group Classification of Components and Systems," dated March 31, 2000
- I.6 ASTM Standard Specification for Grey Iron Castings for Valves, Flanges, Pipe Fittings, A-126-93, 1993
- I.7 ASM Metals Handbook, Volume 1, "Grey Cast Iron," Tenth Edition, ASM International, 1990
- I.8 ASM Metals Handbook, Volume 19, "Fatigue and Fracture Properties of Cast Iron," ASM International, 1996
- I.9 ANSI/ASME B31.1 Power Piping Code, 1967 and 1989 Editions
- I.10 ASME Boiler and Pressure Vessel Code, Section IV, Subsection HC, 1989 Edition
- I.11 ASME Boiler and Pressure Vessel Code, Section III, Subsection ND, 1989 Edition

Attachment C

INFORMATION SUPPORTING A FINDING OF NO SIGNIFICANT HAZARDS CONSIDERATION

DGCW systems would be capable of performing their intended safety-related functions of supplying cooling water to essential plant equipment, even during a design basis earthquake.

In summary, the proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

The proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

The proposed changes allow for the use of cast iron materials in the CCSW and DGCW systems at DNPS by adding acceptance criteria to the UFSAR for such material. No other changes in requirements are being proposed. The added acceptance criteria establish requirements for cast iron that ensure the CCSW and DGCW systems would be capable of performing their safety-related functions of supplying cooling water to essential plant equipment, even during a design basis earthquake. No new failure modes are introduced by the proposed change. No new sources of energy are added. There is no change being made to the parameters within which DNPS is operated, nor do the proposed changes physically alter the plant. The proposed changes do not adversely impact the manner in which the CCSW or DGCW systems will operate under normal and abnormal operating conditions. The plant response to any single failure is not changed. The proposed changes will not alter the function demands on credited equipment. No alteration in the procedures, which ensure DNPS remains within analyzed limits, is proposed, and no change is being made to procedures relied upon to respond to an off-normal event. Therefore, these proposed changes provide an equivalent level of safety and will not create the possibility of a new or different kind of accident from any accident previously evaluated.

The proposed changes do not involve a significant reduction in a margin of safety.

The CCSW and DGCW systems are addressed in Technical Specifications (TS) Sections 3.7.1 and 3.7.2. However, the Bases of these TS sections do not discuss the codes to which the systems are designed. Margins of safety are established in the design of components, the configuration of components to meet certain performance parameters, and in the establishment of setpoints to initiate alarms and actions. The proposed cast iron acceptance criteria will ensure that any implied margin of safety is maintained regarding the ability of the CCSW and DGCW systems to perform their safety functions during all design basis conditions. Therefore, it is concluded that the proposed changes do not result in a significant reduction in the margin of safety.

Conclusion

Based upon the above evaluation, Exelon has concluded that the criteria of 10 CFR 50.92(c) are satisfied and that the proposed UFSAR changes involve no significant hazards consideration.

Attachment D

INFORMATION SUPPORTING AN ENVIRONMENTAL ASSESSMENT

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company (Exelon), LLC, is requesting changes to Facility Operating License Nos. DPR-19 and DPR-25, for Dresden Nuclear Power Station (DNPS), Units 2 and 3. Specifically, the proposed changes will allow Exelon to revise the DNPS Updated Final Safety Analysis Report (UFSAR) to describe the use of cast iron materials in the Containment Cooling Service Water (CCSW) and Diesel Generator Cooling Water (DGCW) Systems, subject to material acceptance criteria that will be included in the proposed UFSAR revision. Cast iron materials are currently being used in the CCSW and DGCW systems. However, information regarding the use of cast iron materials in these systems was not provided to the NRC by Commonwealth Edison Company (now Exelon) and thus was not addressed in NRC Safety Evaluations (SEs) on Systematic Evaluation Program (SEP) Topic III-1, "Quality Group Classification of Components and Systems," for DNPS Unit 2. Therefore, this license amendment request is required by 10 CFR 50.59, "Changes, tests, and experiments," since the use of cast iron materials represents a departure from a method of evaluation described in the UFSAR used in establishing the design bases for DNPS.

Exelon has evaluated this proposed change against the criteria for identification of licensing and regulatory actions requiring environmental assessment in accordance with 10 CFR 51.21, "Criteria for and identification of licensing and regulatory actions requiring environmental assessments." Exelon has determined that this proposed change meets the criteria for a categorical exclusion set forth in 10 CFR 51.22, "Criterion for categorical exclusion; identification of licensing and regulatory actions eligible for categorical exclusion or otherwise not requiring environmental review," paragraph (c)(9), and as such, has determined that no irreversible consequences exist in accordance with 10 CFR 50.92, "Issuance of amendment," paragraph (b). This determination is based on the fact that this change is being proposed as an amendment to a license issued pursuant to 10 CFR 50, "Domestic Licensing of Production and Utilization Facilities," which changes a requirement with respect to installation or use of a facility component located within the restricted area, and the amendment meets the following specific criteria:

(i) The proposed changes involve no significant hazards consideration.

As demonstrated in Attachment B, the proposed changes do not involve a significant hazards consideration.

(ii) There is no significant change in the types or significant increase in the amounts of any effluent that may be released offsite.

The proposed changes, which allow the use of cast iron material in the CCSW and DGCW systems by adding appropriate material acceptance criteria to the UFSAR, is consistent with the plant design basis. There will be no significant increase in the amounts of any effluents released offsite. The proposed changes do not result in an increase in power level, do not increase the production, nor alter the flow path or method of disposal of radioactive waste or byproducts. Therefore, the proposed change will not affect the types or increase the amounts of any effluents released offsite.

Attachment C

INFORMATION SUPPORTING A FINDING OF NO SIGNIFICANT HAZARDS CONSIDERATION

According to 10 CFR 50.92, "Issuance of amendment," paragraph (c) a proposed amendment to an operating license involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not:

- (1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or
- (2) Create the possibility of a new or different kind of accident from any previously accident previously evaluated; or
- (3) Involve a significant reduction in a margin of safety.

In support of this determination, an evaluation of each of the three criteria set forth in 10 CFR 50.92 is provided below regarding the proposed license amendment.

Overview

In accordance with 10 CFR 50.90, "Application for amendment of license or construction permit," Exelon Generation Company (Exelon), LLC, is requesting changes to Facility Operating License Nos. DPR-19 and DPR-25, for Dresden Nuclear Power Station (DNPS), Units 2 and 3. Specifically, the proposed changes will allow Exelon to revise the DNPS Updated Final Safety Analysis Report (UFSAR) to describe the use of cast iron materials in the Containment Cooling Service Water (CCSW) and Diesel Generator Cooling Water (DGCW) Systems, subject to material acceptance criteria that will be included in the proposed UFSAR revision. Cast iron materials are currently being used in the CCSW and DGCW systems. However, information regarding the use of cast iron materials in these systems was not provided to the NRC by Commonwealth Edison Company (now Exelon) and thus was not addressed in NRC Safety Evaluations (SEs) on Systematic Evaluation Program (SEP) Topic III-1, "Quality Group Classification of Components and Systems," for DNPS Unit 2. Therefore, this license amendment request is required by 10 CFR 50.59, "Changes, tests, and experiments," since the use of cast iron materials represents a departure from a method of evaluation described in the UFSAR used in establishing the design bases for DNPS.

The proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

The proposed changes allow for the use of cast iron materials in the Containment Cooling Service Water (CCSW) and Diesel Generator Cooling Water (DGCW) Systems at Dresden Nuclear Power Station (DNPS). The use of cast iron materials in these systems would be subject to acceptance criteria proposed for incorporation into the DNPS Updated Final Safety Analysis Report (UFSAR).

A failure in the CCSW or DGCW systems is not an initiator of any analyzed accident described in the UFSAR. Therefore, these proposed changes would not involve an increase in the probability of an accident previously evaluated. Additionally, these proposed changes would not increase the consequences of an accident previously evaluated because the proposed changes would not adversely impact structures, systems, or components. The proposed UFSAR acceptance criteria establish requirements for cast iron use that ensure the CCSW and

Attachment D

INFORMATION SUPPORTING AN ENVIRONMENTAL ASSESSMENT

- (iii) **There is no significant increase in individual or cumulative occupational radiation exposure.**

The proposed changes will not result in changes in the configuration of the facility. The proposed changes only allow the use of cast iron material in the CCSW and DGCW systems by adding appropriate material acceptance criteria to the DNPS UFSAR. 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 this change.