

October 19, 1998



United States Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, D.C. 20555

Dresden Nuclear Power Station Units 2 and 3  
Facility Operating License Nos. DPR-19 and DPR-20  
NRC Docket Nos. 50-237 and 50-249  
Quad Cities Nuclear Power Station Units 1 and 2  
Facility Operating License Nos. DPR-29 and DPR-30  
NRC Docket Nos. 50-254 and 50-265  
LaSalle County Station Units 1 and 2  
Facility Operating License Nos. NPF-11 and NPF-18  
NRC Docket Nos. 50-373 and 50-374

**Subject:** Results of the Review of the NRC's Safety Evaluation of the Boiling Water Reactor Owners' Group Report, "Utility Resolution Guidance for Resolution of ECCS Suction Strainer Blockage"

- References:**
- (1) Letter from J. Hosmer (ComEd) to NRC "Initial Response to Bulletin 96-03" dated October 31, 1996.
  - (2) Letter from W.T. Subalusky (ComEd) to NRC "LaSalle County Station Response to NRC Bulletin 96-03, Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling Water Reactors" dated November 1, 1996.
  - (3) Letter from R.M. Krich (ComEd) to NRC "Information Concerning NRC Bulletin 96-03 - Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling Water Reactors" dated May 16, 1998.
  - (4) Letter from T. H. Essig (NRC) to R. Sgarro (Pennsylvania Power and Light) "Safety Evaluation for NEDO-326896, Rev. 0, Utility Resolution Guidance Document for ECCS Suction Strainer Blockage" dated August 20, 1998.

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The purpose of this letter is to submit to the NRC ComEd's actions in response to our review of the NRC's Safety Evaluation (SE), Reference (4), issued on the Boiling Water Reactor Owners' Group (BWROG) report NEDO-326896 "Utility Resolution Guidance for Resolution of ECCS Suction Strainer Blockage." As discussed in Reference (3), ComEd committed to provide our review of the SE within 60 days of its issuance (i.e., October 19, 1998). This letter contains our review for Dresden Nuclear Power Station and LaSalle County Station only. Due to higher priority work being performed by the same engineering personnel responsible for performing this review, Quad Cities Nuclear Power Station's response will be delayed until December 18, 1998.

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**Background and Status of Strainer Work**

ComEd's required 180-day response to NRC Bulletin 96-03 "Potential Plugging of Emergency Core Cooling Suction Strainers By Debris in Boiling-Water Reactors" for Dresden Nuclear Power Station Units 2 and 3 and Quad Cities Nuclear Power Station Units 1 and 2 was provided in Reference 1. ComEd's required 180-day response to NRC Bulletin 96-03 for LaSalle County Station Units 1 and 2 was provided in Reference 2. Both responses state that ComEd has evaluated its options and has elected to install large capacity passive strainers as the optimum method to resolve the ECCS suction strainer plugging issues.

ComEd has completed larger capacity passive strainer installations on four units and is currently on schedule to complete installation on the two remaining units. The status of these installations is outlined below.

<b>Station and Unit</b>	<b>Scheduled Installation Date</b>
Dresden Unit 2	Completed
Dresden Unit 3	Completed
Quad Cities Unit 1	Fall '98 Refueling Outage
Quad Cities Unit 2	Completed
LaSalle Unit 1	Completed
LaSalle Unit 2	In Progress

**Review of the NRC SER**

The BWROG has developed suction strainer sizing guidance that is contained in NEDO-326896. ComEd used NEDO-326896 to determine the suction strainer sizes necessary to accommodate all debris expected to result from the worst case LOCA.

The NRC's SE, transmitted by Reference (4), was reviewed by Dresden Nuclear Power Station and LaSalle County Station as detailed in the attachments to this letter. Each attachment is broken into four sections: 1) Exceptions or Clarifications to the SE, 2) Summary of Key Voluntary Conservatisms Contained in Each Analysis 3) NRC Bulletin 96-03 Closure Commitments and 4) References. Neither Station took technical exception to the SE.

ComEd will submit a report to the NRC confirming completion and summarizing all actions taken within thirty (30) days of completion of all required actions.

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If you have any questions, please contact B. Rybak at (630) 663-7286.

Respectfully,



R. M. Krich  
Vice President - Regulatory Services

Attachment - Dresden Nuclear Power Station Review of NRC SE on BWROG Report NEDO-326896 "Utility Resolution Guidance for ECCS Suction Strainer Blockage"

Attachment - LaSalle County Station Review of NRC SE on BWROG Report NEDO-326896 "Utility Resolution Guidance for ECCS Suction Strainer Blockage"

cc: Regional Administrator – NRC Region III  
NRC Senior Resident Inspector – Dresden Nuclear Power Station  
NRC Senior Resident Inspector – Quad Cities Nuclear Power Station  
NRC Senior Resident Inspector – LaSalle County Station

Bcc: NRR Project Manager – Dresden Nuclear Power Station  
NRR Project Manager – Quad Cities Nuclear Power Station  
NRR Project Manager – LaSalle County Station  
Office of Nuclear Facility Safety – IDNS  
DCD Licensing – (Hardcopy and Electronic Copies)

## Attachment

### **Dresden Nuclear Power Station Review of NRC SE on BWROG Report NEDO-326896 "Utility Resolution Guidance for ECCS Suction Strainer Blockage"**

Dresden Station Nuclear Power Station has completed their review of the Safety Evaluation (SE) as transmitted via letter, Essig (USNRC) to Sgarro (Pennsylvania Power and Light), dated August 20, 1998. Our technical response is broken down into the following sections:

- I. Exceptions or Clarifications to the SE
- II. Summary of Key Voluntary Conservatisms Contained in the Plant- Specific Analysis
- III. NRC Bulletin 96-03 Closure Commitments, and
- IV. References

#### **I. Exceptions or Clarifications to the SE**

Dresden Nuclear Power Station takes no exception to the material provided in the Final SE.

In Reference 1, Dresden Nuclear Power Station chose NRC Bulletin 96-03 resolution Option 1 as the basic solution. Option 1 has increased the total ECCS suction strainer surface area by more than twenty (20) times that of the original strainer design.

Dresden Nuclear Power Station has calculated the total ECCS suction strainer head loss based on the mathematical sum of the clean strainer head loss (obtained by actual testing), the calculated head loss contribution due to RMI debris, and the calculated head loss contribution of fibrous insulation and miscellaneous debris (dust, dirt, paint...).

Dresden Nuclear Power Station is conservatively assuming that the flued heads (drywell piping penetrations) contain asbestos insulation. There are no other sources of asbestos in the drywell / torus. Because test data on the clogging of strainers by asbestos is limited, the allowable quantity of asbestos was determined based on limiting the quantity of asbestos that can be deposited on the strainers to a 1/8" thick bed, which is below the thickness needed to produce a measurable head loss. Data on debris generation, transportation, and settlement of asbestos were not readily available, so values believed to be conservative were used.

Dresden Nuclear Power Station has no plans to propose changes to the Technical Specifications incorporating a surveillance requirement for the ECCS strainers. Periodic torus desludging / strainer inspections are included in the ECCS suction strainer surveillance procedure, which is tracked by a separately for each Unit.

Dresden Nuclear Power Station transmitted their 90-Day Response to NRC Generic Letter (GL) 97-04 (Reference 2). As noted in NRC Generic Letter (GL) 97-04, "Assurance of Sufficient Net Positive Suction Head for Emergency Core Cooling and

Containment Heat Removal Pumps," containment overpressure has been accepted by the NRC per license amendments. Calculations are still required to demonstrate that adequate NPSH is available when the license basis is changed to consider all of the strainers as partially clogged. We have no other open/unresolved design basis NPSH issues at this time.

The containment coatings are monitored during every refueling outage. The implementation of this procedure is tracked by a separately for each Unit. As localized areas of degraded coatings are identified, those areas are evaluated and scheduled for repair or replacement, as necessary. The periodic condition assessments, and the resulting repair/replacement activities, assure that the amount of Service Level 1 coatings that may be susceptible to detachment from the substrate during a LOCA event is minimized.

Dresden Nuclear Power Station has periodically visually inspected the unqualified coatings in the drywell or wetwell, and has found them to be in good condition. There is not a significant amount of degraded coatings in the drywell or wetwell. Results of BWR Owners' Group LOCA testing of coupons representing unqualified coating systems provide compelling evidence that failure of typical coating systems which passes a visual inspection is highly unlikely in the first 30 minutes of the LOCA. Therefore, the debris from unqualified and/or degraded coatings that has passed a visual inspection need not be included in the ECCS strainer debris design criteria.

## **II. Summary of Key Voluntary Conservatisms Contained in the Plant- Specific Analysis**

As discussed in Section 5.0 of the SE, the NRC recognized the built-in conservatism contained in the URG analysis methodology. Further, the SE defined the concept of 'voluntary' conservatisms and states that licensees should consider implementing additional conservative design values or measures to enhance strainer head loss margin. Following is a list of key voluntary conservatisms implemented by Dresden Nuclear Power Station:

- 1) Dresden Nuclear Power Station sized their replacement ECCS Pressure Suppression Pool (PSP) Suction Strainers based upon the physical limitations (geometric, structural and hydrodynamic loading) to maximize the strainer size. Primary strainer sizing requirements were not based upon postulated LOCA debris head loss considerations.
- 2) Dresden Nuclear Power Station utilized a Hydrodynamic Mass for the structural analysis based on a conservative inertial mass coefficient,  $C_m$ , value of 1.5. Test results are being reviewed that would justify the use of lower  $C_m$  values during future re-analyses, and we intend to submit those results under a separate cover.
- 3) Dresden Nuclear Power Station utilized a value of 7.0 D when implementing URG Methods 2 and 3 to increase the inventory of destroyed / transported when calculating the insulation destruction Zone of Influence (ZOI) around flued heads

(drywell piping penetrations). Due to restrained pipe movement within the flued heads, the actual ZOI will be smaller. The ZOI for "typical" pipes was based on the URG methodology.

- 4) Dresden Nuclear Power Station calculated the head loss across the strainers based on the performance of 6 mil RMI Aluminum foils. We actually have a 'mixture' of RMI inventory, including 6 mil Aluminum and 2 mil Stainless Steel foils. The use of 6 mil Aluminum properties in the calculations results in a conservative analytical head loss.

### **III. NRC Bulletin 96-03 Closure Commitments**

- 1) Dresden Nuclear Power Station shall replace the one section of "Sure Hold" banded NUKON insulation in Unit 2 with RMI prior to startup from the next refueling outage, D2R16. This is the only piece of banded NUKON insulation at the station.
- 2) Dresden Nuclear Power Station shall replace the NUKON insulation in Unit 3 that is within the ZOI of the flued heads (drywell piping penetrations) and which, when combined with other LOCA generated debris, would exceed the allowable head loss limitations across the ECCS Suction Strainers. Those portions of insulation will be replaced with RMI prior to startup from the next refueling outage, D3R15. This effort has already been completed in Unit 2 (with the exception of Item 1 above).
- 3) Dresden Nuclear Power Station shall revise the UFSAR to change the design basis of the ECCS Suction Strainers so that all of the strainers are considered to be partially clogged, and revise the supporting calculations accordingly.
- 4) Dresden Nuclear Power Station shall define and implement an administrative Program to ensure that the potential for debris to be generated and transported to the strainer surface does not, at any time, exceed the calculated capacity of the replacement strainers. Elements of the Program shall include, as a minimum: a) Administrative procedure defining the Program, b) Training/Qualification requirements to perform LOCA debris analyses, c) Administrative procedure to control Primary Containment materials including interfaces with existing Programs and procedures.
- 5) Dresden Nuclear Power Station shall define and implement a long-term surveillance procedure(s) to inspect the drywell and wetwell. This procedure shall contain detailed acceptance criteria consistent with our ECCS suction strainer head loss analysis, and Required Actions if the Acceptance Criteria is not met. This includes Primary Containment housekeeping standards and drywell and wetwell closeout inspection criteria.

These commitments have been placed in our Action Item Tracking System.

In addition, Dresden Nuclear Power Station will continue performing desludging every refueling outage, and will continue performing a detailed FME inspection of the drywell and torus each refueling outage.

Within 30 days of completion of the commitments cited above, we shall transmit to the Staff a report confirming completion of NRC Bulletin 96-03 requested actions and summarizing all actions taken for each Unit.

#### **IV     References**

- 1) Letter from J. Hosmer to USNRC, "Initial Response to IE Bulletin 96-03" dated October 31, 1996
- 2) Letter from J. Hosmer to USNRC, "90 Day Response to Generic Letter 97-04" dated January 5, 1998

## Attachment

### **LaSalle County Station Review of NRC SE on BWROG Report NEDO-326896 "Utility Resolution Guidance for ECCS Suction Strainer Blockage"**

LaSalle County Station Units 1 and 2 has completed review of the Safety Evaluation (SE) as transmitted via letter, Essig (USNRC) to Sgarro (Pennsylvania Power and Light), dated August 20, 1998. Our 60-day technical response is divided into the following sections:

- I. Exceptions and Clarifications to the SE
- II. Summary of Key Voluntary Conservatism Contained in the Plant-Specific Analysis
- III. Status of Bulletin 96-03 Closure Activities
- IV. NRC Bulletin 96-03 Closure Commitments

#### **I. Exceptions and Clarifications to the SE**

At this time, LaSalle County Station takes no exception to the material provided in the Final SE. The Station is characterized as a Reflective Metal Insulation (RMI) Plant, and has followed the analysis methodology endorsed by the NRC in Appendix K of the SE.

LaSalle County Station utilizes jacketed Armaflex insulation for the chilled water piping systems (VP and WR) in each containment. Armaflex is a closed-cell anti-sweat insulation that is non-hygroscopic and determined not to be a challenge to suction strainer performance.

LaSalle County Station utilizes jacketed Microtherm insulation on selected condensing pot lines of the Main Steam (MS) and Nuclear Boiler (NB) systems in each containment. Absent applicable Microtherm specific head loss data, we have taken a conservative approach by defining head loss behavior based on a similar (but known to be more fibrous) type of insulation for which published data is available.

In Reference 1, LaSalle County Station chose NRC Bulletin 96-03 resolution Option 1 as the basic solution. Option 1 has increased the total ECCS suction strainer surface area by a factor of approximately six (6) over the original strainer design.

As stated in Reference 2, LaSalle County Station has no plan to propose changes to the Technical Specifications incorporating a surveillance requirement for the ECCS strainers. Periodic Drywell and Wetwell inspections to confirm actual debris quantities are below the calculational limits shall be included in our ECCS suction strainer surveillance procedures (Commitment #3, Section IV.).

Per Reference (3), LaSalle County Station transmitted the 90-Day Response to NRC Generic Letter (GL) 97-04. In summary, LaSalle County Station is a Regulatory Guide 1.1 plant; therefore no containment overpressure is credited. We have no open/unresolved NPSH issues related to NRC Bulletin 96-03.

By SER dated March 1981, Reference (4), NRC documented their review and approval of the known quantity of unqualified coatings in the containment. LaSalle County Station utilized this 44-gallon amount as the limiting value of unqualified coatings in the ECCS strainer head loss evaluation. We have no open/unresolved containment coating issues related to Bulletin 96-03.

## **II. Summary of Key Voluntary Conservatism Contained in the Plant-Specific Analysis**

As discussed in Section 5.0 of the SE, the NRC recognized the built-in conservatism contained in the URG analysis methodology. Further, the SE defined the concept of 'voluntary' conservatism and states that licensees should consider implementing additional conservative design values or measures to enhance strainer head loss margin. Following is a list of current key voluntary conservatism implemented by LaSalle County Station:

- 1) As described in Reference 1, ECCS suction strainer primary sizing requirements were not based upon postulated LOCA debris head loss considerations. LaSalle County Station sized their replacement strainers based upon physical (geometric, structural and hydrodynamic loading) limitations to maximize the strainer size. The total surface area of the each new ECCS suction strainers is approximately six (6) times greater than the original strainer, and provides sufficient margin to meet net positive suction head requirements.
- 2) Use of a value of 2.0 for the hydrodynamic mass coefficient. Although reduced values for this coefficient have been defined via testing, we used the original licensing/design basis value for qualification of the strainers.
- 3) Our Reactor Core Isolation Cooling (RCIC) Systems are not classified as Emergency Core Cooling Systems. However, we upgraded the RCIC suction strainer with a suction strainer having a total surface area approximately twelve (12) times greater than the original strainer.
- 4) Although the calculated insulation destruction Zone of Influence (ZOI) for Transco Reflective Metal Insulation (RMI) was 6.13 D, we utilized a conservative value of 7.0 D when implementing URG Method 2 to increase the inventory of destroyed/transported RMI.

- 5) Use of a combined RMI destruction/transport factor of 0.5 as described in Appendix K of the SE. This value is conservative in light of the physical barriers (downcomer openings are eight (8) inches above the drywell floor and have cover plates to protect direct entry of debris) afforded by the Mark II downcomer design.
- 6) Although the NRC reported on Pages K-3 and K-4 of the SE that RMI debris settling was observed during their confirmatory testing, we took no credit for wetwell LOCA debris settling in the strainer head loss analysis. All LOCA debris inventory was analyzed to have accumulated on a strainer.
- 7) Assumption of the failure of a single ECCS electrical division to reduce the number of available ECCS suction strainers from five (5) to three (3). All wetwell debris was then accumulated on three (3) ECCS strainers.
- 8) Use the head loss performance of 1.5 mil aluminum foil. LaSalle County Station actually has a 'mixture' of RMI inventory because the equipment manufacturer upgraded their product line to a heavier foil subsequent to the original Unit 1 installation. The heavier foil has been, and may in the future be used on repairs and modifications to the RMI of each Unit. The use of 1.5 mil aluminum (i.e., the thinnest foil) is conservative since it generates the greatest head loss. In addition, we used an RMI size distribution that was biased toward 'fines' to conservatively increase the measured head loss across the strainer.
- 9) LaSalle County Station defined a threshold value of fiber-based debris based upon the insights obtained from testing an actual LaSalle ECCS suction strainer at the EPRI Test facility. Below this experimentally determined quantity, the strainer head loss contribution due to fiber-based debris is negligible. In addition, control of the fiber debris below this value prevents the formation of the fiber 'thin bed' and makes the strainers much less sensitive/susceptible to fiber/particulate (sludge, dust, dirt) strainer head loss.

### **III. Status of NRC Bulletin 96-03 Closure Activities**

During the most recent forced outage (L1F35) on Unit 1, all six (6) Duke/Performance Contracting, Inc. Sure-Flow stacked disk strainer assemblies were successfully installed and tested. This was earlier than the L1R08 commitment contained in Reference 1. Unit 2 continues to be in an extended refueling outage (L2R07). The Unit 2 ECCS suction strainers are currently being installed. Installation and testing will be completed prior to Unit 2 startup.

To establish a baseline for inspections and cleanings, the Unit 1 wetwell was de-sludged during L1F35, and an inspection of the Suppression Chamber, strainers, and downcomers was performed. A similar scope of work shall be completed for Unit 2 prior to restart from the current refueling outage, L2R07.

While performing insulation repair activities in the drywell during L1F35, it was discovered that the jacketing (lagging) used on the anti-sweat (Armaflex) insulation and Microtherm insulation contained a fiber-based vapor barrier backing. Non-RMI insulation systems in the drywell were inspected and re-worked to remove this fiber source term prior to start-up from L1F35. A similar scope of work shall be completed in Unit 2 prior to restart from the current refueling outage, L2R07.

#### **IV. NRC Bulletin 96-03 Closure Commitments**

The following commitments have been placed in our Action Tracking System.

LaSalle County Station Units 1 and 2

- 1) We shall revise the UFSAR to incorporate NRC Bulletin 96-03 considerations.
- 2) We shall define and implement an administrative Program to ensure that the potential for debris to be generated and transported to the strainer surface does not, at any time, exceed the calculated capacity of the replacement strainers.
- 3) We shall define and implement a long-term surveillance procedure(s) to inspect the drywell and wetwell.

Commitments 1, 2, and 3 above are scheduled to be completed prior to restart from the current refueling outage, L2R07.

- 4) We have 'base-lined' the cleanliness of the Suppression Chamber during L1R07 and L1F35 for Unit 1 and L2R07 (current outage) for Unit 2. LaSalle County Station shall de-sludge and inspect the wetwell during the next refueling outage of each Unit (L1R08/L2R08). If Primary Containment Foreign Material Exclusion (FME) controls are demonstrated to be effective during these future inspections, then LaSalle County Station shall perform de-sludging on an alternating refueling outage frequency.
- 5) We shall perform an inspection of the drywell and wetwell each refueling outage.

LaSalle County Station Unit 2

- 6) We shall install the larger capacity ECCS suction strainers in Unit 2 prior to startup from current refueling outage, L2R07.
- 7) We shall perform an inspection and rework of Unit 2 anti-sweat and Microtherm insulation lagging to remove fiber-based vapor barrier material prior to startup from current refueling outage, L2R07.

NRC Bulletin 96-03 Closure

- 8) Within 30 days of completion of commitments 1, 2, and 3 for Unit 1 or commitments 1, 2, 3, 6 and 7 for Unit 2, LaSalle County Station shall transmit

to the NRC a report confirming completion of NRC Bulletin 96-03 requested actions and summarizing all actions taken for each Unit.

#### References

- 1 Letter from W.T. Subalusky (ComEd) to NRC "LaSalle County Station Response to NRC Bulletin 96-03, Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling Water Reactors" dated November 1, 1996.
- 2 Letter from R.M. Krich (ComEd) to NRC "Information Concerning NRC Bulletin 96-03 - Potential Plugging of Emergency Core Cooling Suction Strainers by Debris in Boiling Water Reactors" dated May 16, 1998.
- 3 Letter from J. Hosmer to NRC "90 Day Response to Generic Letter 97-04" dated January 5, 1998.
- 4 NUREG-0519 – "Safety Evaluation Report Related to the Operation of LaSalle County Station Units 1 and 2" March 1981, Section 6.1.2, 'Organic Materials.'