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ComEd

January 8, 1998

JMHLTR: #98-0001

US Nuclear Regulatory Commission
Washington, DC 20555
Attn.: Document Control Desk

Subject: Dresden Nuclear Power Station Unit 2
Submittal of Core Spray Inspection Plan for Dresden Unit 2
NRC Docket Number No. 50-237

References: (1) Boiling Water Reactor Vessel and Internals Project (BWRVIP) document BWRVIP-18, BWR Core Spray Internals Inspection and Evaluation Guidelines, Dated July, 1996.

(2) J.S. Perry (ComEd) letter to USNRC, Submittal of Core Spray Inspection Plan for Unit 3, Dated October 3, 1996

(3) E.D. Swartz (ComEd) letter to USNRC, Response to IE Bulletin 80-13 "Cracking in Core Spray Spargers", Dated May 4, 1982

(4) NUREG/CR-4523, Closeout of IE Bulletin 80-13, "Cracking in Core Spray Sparger", Dated January, 1988

The purpose of this letter is to inform the NRC Staff of ComEd's intention to implement the recommendations of Reference (1) in the performance of internal core spray piping examinations and evaluations during the upcoming D2R15 refueling outage. The inspection rationale is the same as that described in Reference (2) for the last Dresden Unit 3 refueling and it's scope is outlined in Attachment 1.

IE Bulletin 80-13 required BWR's to perform a visual inspection of the core spray spargers each outage and segments of the piping from the RPV to the shroud at the next and each subsequent refuel outage until further notice. The bulletin also provided minimum requirements for the resolution capability of the inspection equipment. In Reference (3), ComEd provided the NRC Staff the results of the initial core spray examination of Unit 3. The letter also stated the inspection of the core spray spargers on both Dresden 2 and 3 would continue to be performed every refuel outage until

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further notice. NUREG/CR-4523 [Reference (4)] closed out IE Bulletin 80-13 for Dresden Units 2 and 3 based on the conclusion that ComEd would continue to apply the requirements of the bulletin in the future.

The increased rate of internal cracking of Core Spray piping prompted development of Reference (1), the "guideline". This provides direction for the specific inspection of all locations of this piping taking into consideration safety significance, susceptibility, and industry wide experience and is designed to ensure continued integrity of this piping. The implementation of an inspection plan based upon the guideline will satisfy the Reference (4) commitment regarding the performance of core spray inspection at each refueling outage.

The internal core spray inspection plan for Unit 2 was developed in accordance with Section 3 of Reference (1). Section 3 provides specific inspection recommendations for both baseline inspections and reinspections of piping and sparger locations at and away from welds, hidden welds, brackets and repairs. The Dresden Unit 2 Inspection Plan for each of these items is provided in Attachment 1.

Implementation of the BWRVIP "BWR Core Spray Inspection and Flaw Evaluation Guidelines" as described in Attachment 1, during the upcoming Unit 2 refueling and subsequent refueling outages will assure continued integrity of the internal core spray piping at Dresden Unit 2.

Sincerely,

J.M. Heffley
Station Manager
Dresden Station

Attachments: Attachment 1, Dresden Unit 2 Core Spray Inspection Plan for D2R15
Attachment 2, J.H. Riddle (Siemens) letter to R.J. Chin (ComEd), Importance of LPCS Spray Distribution During a LOCA, Dated August 30, 1996

cc: A.B. Beach, Regional Administrator - RIII
J.F. Stang, Project Manager - NRR
K. Riemer, Senior Resident Inspector - Dresden
Office of Nuclear Facility Safety - IDNS

# Attachment 1

# Dresden Unit 2 Core Spray Inspection Plan for D2R15

**Attachment 1**
**Dresden Unit 2 Core Spray Inspection Plan for D2R15**

## Piping Locations

Per section 3.2.2 of Reference (1), the scope of the baseline inspection for piping welds depends upon the inspection method to be used (visual or volumetric) and the type of piping material. The core spray piping material used in Unit 2 is type 304 stainless steel. Dresden is currently planning to perform a fully automated ultrasonic examination of all core spray piping welds from the tee-box at the RPV nozzle down to the connection to the shroud during D2R15 per the guidelines of BWRVIP document BWRVIP-03, "Reactor Vessel and Internals Guidelines". The scope and frequencies of subsequent piping examinations will be performed per section 3.3.1 of Reference (1) for the inspection methods utilized. Any welds inaccessible for ultrasonic examination will be inspected using the enhanced VT-1 visual inspection method.

## Sparger Locations

Per section 3.2.3 of Reference (1), the scope of the baseline inspection for spargers is dependent upon whether a plant is classified as "geometry tolerant" or "geometry critical". A "geometry tolerant" plant is one in which post-LOCA steaming at two-thirds core height is sufficient to meet fuel safety limits. For these plants it is only necessary to deliver the core spray coolant flow to the inside of the shroud to maintain two-thirds core coverage. As such, a less detailed examination of the sparger is warranted for "geometry tolerant" plants. The LOCA Analysis for Unit 2 does not rely upon any assumptions related to the sparger spray distribution (Attachment 2). Consequently, Dresden Unit 2 is considered a "geometry tolerant" plant and will perform examinations per Section 3.2.3.2 of Reference (3). Specifically, Dresden will perform a modified VT-1 ( also known as a CSVT-1) of the sparger tee-box cover plate welds (location S1), sparger to tee-box welds (location S2) and sparger end cap welds (location S4) during D2R15 refuel outage per BWRVIP-03 guidelines. Additionally, a VT-3 examination will be performed of the remaining sparger piping and spray nozzles. The scope and frequency of subsequent sparger examinations will be performed per Section 3.3.2.2 of Reference (1).

## Hidden Welds

The design of the Dresden Unit 2 Core Spray piping contains one partially obstructed and one hidden weld at the RPV nozzle thermal sleeve and tee-box areas, and one hidden weld at the downcomer piping connection to the shroud. Per Section 3.2.4 of Reference (1), Dresden will perform a "best effort" ultrasonic or an enhanced visual inspection of partially obstructed welds during D2R15 per the guidelines of BWRVIP-03. The scope and frequency of partially obstructed or hidden welds examination will be per Section 3.3.2.2 of Reference (1).

## Piping and Sparger Brackets

Per Section 3.2.4 of Reference (1), Dresden will perform a modified VT-1 (also known as a CSVT-1) and VT-3 examinations of the core spray piping brackets per BWRVIP-03 guidelines. The scope and frequency of the subsequent piping and sparger bracket examinations will be performed per Section 3.3.3 of Reference (1).

## Repairs

There is no repair hardware present on the Dresden Unit 2 core spray internals piping and so there are no repairs which could preclude inspection of welds. Should the inspections reveal defects exist that would not permit operation for another cycle prior to repair, the repair material would be baseline examined per Section 3.2.4 of Reference (1). The scope and frequency of any subsequent repair examinations will be performed per Section 3.3.3 of Reference (1).

## Piping and Sparger Surfaces Away From Welds

Per Section 3.2.4 of Reference (1), arc strikes, draw beads or cold work could have the potential to initiate cracking on the surfaces of the core spray piping away from welds. However, these potential sources of crack initiation would not tend to sustain cracking through-wall unless they are located in the vicinity of a sensitized weld. Consequently, no detailed future inspections of piping and sparger surfaces away from welds are planned for Dresden Unit 2.

# Attachment 2

# J.H. Riddle (Siemens) letter to R.J. Chin (ComEd), Importance of LPCS Spray Distribution During a LOCA, Dated August 30, 1996

SIEMENS

August 30, 1996
JHR:96:341

Dr. Ronald J. Chin
Nuclear Fuel Services (Suite 400)
Commonwealth Edison Company
1400 Opus Place
Downers Grove, IL 60515-5701

Dear Dr. Chin:

Importance of LPCS Spray Distribution During a LOCA

Ref: 1. Compendium of ECCS Research for Realistic LOCA Analysis, NUREG-1230 R4, December 1988.

2. Contract between Commonwealth Edison Company and Siemens Power Corporation for the Supply of Nuclear Fuel and Related Materials and Services for the Dresden, Quad Cities, and LaSalle Nuclear Power Stations, October 1, 1993, as amended.

John Freeman of ComEd requested SPC to identify any assumptions in the SPC loss of coolant accident analysis (LOCA) methodology related to the effectiveness of the low pressure core spray (LPCS). This information is being requested by ComEd to determine if any plant testing is required to confirm LPCS flow distribution assumptions used in SPC LOCA analyses for Dresden, LaSalle, or Quad Cities. Please provide the following response to ComEd.

During a LOCA, the LPCS system injects coolant into the upper plenum region above the core. The coolant is sprayed into the upper plenum by a large number of nozzles located on a circular header above the core. The nozzles are designed to distribute the ECCS flow across the top of the core. In the 1970s, GE tested the LPCS sparger and nozzle design to determine the minimum flow that would reach each bundle in the core at rated LPCS flow conditions. The SPC LOCA methodology has a spray cooling period which uses Appendix K spray cooling coefficients. The Appendix K coefficients were supported based on BWR-FLECHT and SPC spray cooling tests. The tests were performed with a minimum spray flow rate supplied to the test assembly.

Subsequent to the GE spray distribution tests discussed above, a number of large-scale BWR tests were performed (Reference 1) which demonstrate that the ability of the core spray to provide cooling is not strongly dependent on the spray distribution. During a LOCA, countercurrent flow conditions exist at the top of the fuel assemblies resulting in an accumulation of ECCS liquid above the top of the core. Because the core is covered by a layer of liquid, the core spray pattern has essentially no effect on how much water enters the active fuel region. Some of the liquid above the core flows into the fuel assemblies as allowed by countercurrent flow conditions. Much larger amounts of the liquid flow into the bypass region and subsequently into the lower plenum. The flow to the lower plenum assists the low pressure coolant injection (LPCI) system in refilling the lower plenum and results in an earlier core reflood.

The amount of cooling provided by LPCS prior to core reflood is limited by countercurrent flow conditions and not by the core spray distribution. The SPC LOCA analysis methodology does not rely on any assumptions related to the LPCS flow distribution; the spray heat transfer coefficients used by SPC are supported by tests with countercurrent flow conditions at the upper tie plate.

Very truly yours,

J H Riddle

J. H. Riddle
Project Manager

ecm

cc: Max L. Hymas (SPC)
James E. Nevling (ComEd)