



# IP3 CRDM NOZZLE EVALUATION

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# **SUSCEPTIBILITY**

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- **NO THROUGH WALL CRACKS HAVE BEEN FOUND AT WESTINGHOUSE PLANTS WITH CE HEADS.**
- **IP3 IS A MODERATE SUSCEPTIBILITY PLANT.**
- **MILLSTONE 2 IS THE ONLY CE MANUFACTURED HEAD THAT HAS HAD MINOR CRACKING (MODERATE SUSCEPTIBILITY).**
  - **HEAT OF MATERIAL AT MILLSTONE 2 IS NX1405**
  - **NOT USED AT IP3**



# **SUSCEPTIBILITY** (Cont.)

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- **NO OTHER MODERATE SUSCEPTIBILITY PLANTS HAVE FOUND CRACKING.**
- **SEVERITY OF CRACKING AND THROUGH WALL CRACKING HAS CLOSELY FOLLOWED MRP MODEL.**



# **EVIDENCE OF NO CRDM LEAKAGE**

- o VIDEO TAPE REVIEWED – AREAS  
DISPOSITIONED**
- o INSPECTIONS PER NRC GENERIC  
LETTER 88-05**
- o OPPORTUNITIES FOR EARLY  
LEAKAGE DETECTION**



# CONTAINMENT INDICATORS

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- **RCS UNIDENTIFIED LEAKAGE IS LOW AND THE TREND SHOWS NO INCREASE.**
- **TOTAL RCS HISTORICAL LEAKAGE TREND SHOWS SIGNIFICANT DECREASE FOLLOWING RFO10 OUTAGE.**



# CONTAINMENT INDICATORS

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- **PARTICULATE MONITOR ACTIVITY SHOWS NO UNEXPLAINED TREND INCREASE.**
- **CONTAMINATION SURVEYS SHOW VERY LOW LEVELS OF CONTAMINATION.**



# **R11 RADIATION MONITOR FILTER**

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- o R11: NO INCREASE IN FREQUENCY OF FILTER PAPER CHANGEOUT.**
- o R11 FILTER PAPER SHOWS NO SIGNS OF BORIC ACID OR RUST TYPE DEPOSITS.**
- o PAPER WAS VISUALLY INSPECTED FOR RUST/BORON. NO DEPOSITS NOTED.**
- o CHEMICAL ANALYSIS PERFORMED ON FILTER PAPER SHOWS NO BORON/IRON CONCENTRATIONS.**



# FAN COOLER UNITS

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- o **FILTERS SHOW NO VISUAL SIGNS OF BORON COATING OR RUST TYPE RESIDUE DEPOSITS.**
- o **COOLING COILS SHOW NO SIGN OF BORIC ACID DEPOSITS OR RUST TYPE DEPOSITS.**





# **FAN COOLER UNITS**

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- o WEIR CHEMISTRY SAMPLES SHOW NO SIGN OF IRON. BORON CONCENTRATION IS CONSISTENT WITH SUMP WATER CHEMISTRY.**
- o RECENT WALKDOWN AND INSPECTION SHOWED NO EVIDENCE OF BORON RESIDUE OR RUST TYPE RESIDUE IN FAN COOLER #33.**



# **CONTAINMENT ENTRY**

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- o ENTRY WAS CONDUCTED ON MAY 10th, 2002.**
- o INSPECTED RPV HEAD, CONOSEALS, RPV FLANGE WITH BINOCULARS.**
- o SAW NO EVIDENCE OF BORON LEAKAGE OR RESIDUE.**



# **RISK ASSESSMENT**

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- o RISK ASSESSMENT WAS PROVIDED IN OUR 2001 BULLETIN RESPONSE.**
- o A QUALITATIVE REVIEW OF THE POTENTIAL RISK OF CORE DAMAGE FREQUENCY (CDF) AT INDIAN POINT 3 ASSOCIATED WITH DELAYING THE INSPECTION UNTIL RFO13 SHOWS THAT THE RISK IS VERY SMALL.**



# MONITORING PLANS

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- o **MONTHLY INSPECTION OF ONE FAN COOLER UNIT**
- o **MONTHLY INSPECTION/CHEMICAL ANALYSIS OF R11 FILTER PAPER FOR RUST/BORON**
- o **MONTHLY CHEMISTRY SAMPLE OF ONE FCU WEIR OR DRAIN TRAY**
- o **QUARTERLY ROBOT INSPECTION OF VC**
- o **MONTHLY INSPECTION OF VC**
- o **MONTHLY RANDOM CONTAMINATION SMEARS FROM THE VC**
- o **MONTHLY CHEMISTRY SAMPLE OF THE VC SUMP**



# CONCLUSION

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- 1. IP3 IS A MODERATE SUSCEPTIBILITY PLANT.**
- 2. NO SIGNS OF CRDM NOZZLE LEAKAGE**
- 3. NO CRDM LEAKAGE AT IP3 IS CONSISTENT WITH INDUSTRY DATA SHOWING THAT NO CE-MANUFACTURED HEADS HAVE LEAKED.**



# **FUTURE ACTIONS**

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- 1. INCREASED MONITORING UNTIL THE NEXT REFUELING OUTAGE WHEN INSPECTION IS SCHEDULED**
- 2. ADDITIONAL VOLUMETRIC NDE IS ALSO BEING CONSIDERED. NRC SUBMITTAL IS REQUIRED 90 DAYS PRIOR TO IP3 REFUELING OUTAGE.**



# **FUTURE ACTIONS**

## **(cont.)**

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### **3. ENTERGY INTENDS TO REPLACE INSULATION NEXT REFUELING OUTAGE.**

- REVIEWED POINT BEACH PROJECT**
- DISCUSSED WITH INSULATION VENDOR**
- REVIEWED INSULATION REMOVAL WITH VENDOR**
- DESIGN CHANGE TO INCLUDE ACCESS TO RPV HEAD FOR BARE METAL INSPECTION (SIMILAR TO POINT BEACH)**



# **FUTURE ACTIONS**

## **(Cont.)**

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- 4. EVALUATE 'PREVENT EVENTS' IN INPO SER 2-02, DATED MAY 2002.**



## **Timeline Overview of Reactor Vessel Head Leaks**

- ❖ CRDM's were vented using vent valves on CRDM columns prior to criticality; practice was discontinued and vent plugs were installed under MWR 0115 performed 12-29-75. IP3 went critical on April 6<sup>th</sup>, 1976.
- ❖ March 1990: Active Leakage noted from canopy seal weld area of Penetration 28 (Spare CRDM penetration); Boron deposits/potential leakage noted on Penetration 26 (Spare CRDM penetration). Mechanical clamps installed on canopy seals. Insulation near penetration 28 replaced surrounding approximately 14 penetrations.
- ❖ April 1990: Modification to CRDM cooling shroud installed to provide access ports for future inspections (DEM 90-072 RCS)
- ❖ September 1990: Boron deposits noted on penetration 77 (Gasketed conoseal) and repaired during outage. (WR 24417/23986)
- ❖ September 1990: Mechanical clamps installed on canopy seals for all five CET penetrations (74, 75, 76, 77, 78) and remaining 10 spare penetrations (2, 3, 4, 5, 15, 17, 19, 21, 27, 29) (WR 23986)
- ❖ September 1992: Suspected leak form canopy seal weld on Penetration 35 (Part Length CRDM) (PID 5762). Dye-penetrant testing, visual inspections and pressure testing concluded that no actual leak existed. (NSE 92-3-213 RCS).
- ❖ September, 1999: Boron residue/streaks found on RV head outside cooling shroud from stud locations 5 through 18 (PID 45407 and DER 99-1968) prompting RO10 video inspection of RV head inside shroud.
- ❖ March 2001: Boron deposits observed on Penetration 77 conoseal (DER 01-00952). Weekly monitoring established for balance of Cycle 11 (R011 outage commenced end of April 2001).
- ❖ May 2001: Repairs to Penetration 77 conoseal completed. Video inspection of RV head inside shroud performed; inspection had been planned in response to Ocone findings and industry/MRP recommendations.
- ❖ February 2002: Boron deposits identified near 34 RCS Intermediate Loop. Leak investigation confirmed active leak past from RCS drain valve packing. Hand wheel tightening on series RCS drain valves RC-515A & B resulted in leak termination. (DER 02-00601, -00614, -00642)
- ❖ May 2002: Increase in RCS unidentified leakage investigated and determined to be from packing leak off from valve CH-HCV-142 (Charging line hand-control valve). (CR 2002-01653)

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## HEAT OF MATERIALS

Heat of Materials attached for IP3.

Similar heats are at other plants.

- NX-5836                      Diablo 1/McGuire 1
- NX-5965                      Diablo 1/Salem 1
- NX-7547                      Diablo 1
- NX-5843                      Diablo 1/McGuire 1/Salem 2
- NX-7760                      Kewaunee/Cook 1/Diablo 1
- NX-4882                      IP2/Salem 1

Diablo 1 – May 2002 Bare Metal Visual – No leaks

Cook 1 – May 2002 (No cracking detected-visual/volumetric)

McGuire 1 – Cold Head/Visual VT of 11 nozzles 3/2001 No leaks

Salem 1/2 – Bare Metal Visual no leaks (Salem 1 – 4/2001, Salem 2 – 4/2002)

Kewaunee – 9/2001 Bare Metal Visual – No leaks

WCAP-13453  
DIABLO 1  
MCGUIRE 1  
DIABLO 1  
CANYON 1  
SALEM 1  
DIABLO 1  
CANYON 1  
DIABLO 1  
MCGUIRE 1  
SALEM 2  
NEWARK 1  
COOK 1  
DIABLO 1  
IP2 1  
SALEM 1  
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Table A-24: Indian Point Unit 3 R/V Head Adapter Material Information

HT. No.		C	Mn	Fe	S	Si	Cu	Ni	Cr	Co	YS (psi)	UTS (ksi)	Mtl. Spec	Vendor	Heat Treatment
NX-5836	Ladle	0.07	0.16	7.61	0.007	0.27	0.27	76.23	15.36	0.07	45	93	SB-167	Huntington	1725F 1.5 hr - Air Cooled
	Check	0.067	0.15	7.68	0.004	0.3	0.3	76.15	15.31	0.06					
NX-5965	Ladle	0.08	0.17	6.74	0.007	0.26	0.08	77.66	14.98	0.07	35	91	SB-167	Huntington	1725F 1.5 hr - Air Cooled
	Check	0.068	0.16	6.89	0.003	0.33	0.11	77.02	15.03	0.06					
NX-7547	Ladle	0.08	0.16	7.7	0.008	0.3	0.22	76.25	15.26	0.03	40.5	101	SB-167	Huntington	1725F 1.5 hr - Air Cooled
	Check	.083-.082	0.18	7.87	0.005	0.3	0.23	75.26	14.99	0.03					
NX-5843	Ladle	0.06	0.18	7.2	0.007	0.22	0.17	76.84	15.3	0.07	44	89.5	SB-167	Huntington	1725F 1.5 hr - Air Cooled
	Check	0.069	0.17	7.33	0.005	0.31	0.2	75.64	15.23	0.06					
NX-7760	Ladle	0.06	0.16	8.2	0.007	0.3	0.15	74.83	16.27	0.06	38	97.5	SB-167	Huntington	1725F 1.5 hr - Air Cooled
	Check	0.062	0.18	8.01	0.003	0.33	0.14	73.86	16.32	0.05					
NX-4882	Ladle	0.08	0.16	7.28	0.007	0.22	0.08	76.9	15.25	0.08	63	99	SB-167	Huntington	1725F 1.5 hr - Air Cooled
	Check														

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MULTI-PAGE CORRESPONDENCE**