

**From:** Jacob Zimmerman - NRR  
**To:** CRDM Comm. Team  
**Date:** 11/14/01 4:45PM  
**Subject:** Bulletin 2001-01 Status Update

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During the past several weeks, the staff has been working on its' technical assessment of vessel head penetration (VHP) nozzle cracking, outage related inspection issues at several plants, supplemental bulletin 2001-01 responses, and draft orders for D.C. Cook Unit 2 and Davis-Besse.

Today a briefing was held with the Commissioners' TA's on the staff's updated results of bulletin response reviews and the basis for proposed Orders for D.C. Cook, Unit 2 and Davis-Besse. The slides are attached.

The staff has prepared and is the process of forwarding a memorandum from Sam Collins, NRR, to Bill Travers, EDO, associated with the issuance of Orders regarding responses to NRC Bulletin 2001-01. The purpose of the memo is to inform the EDO that NRR intends to issue, immediately effective Orders to FirstEnergy Nuclear Operating Company and Indiana Michigan Power Company modifying the operating licenses for Davis-Besse and D.C. Cook, Unit 2, respectfully. NRR intends to issue these Orders 5 days from the date in which the EDO informs the Commission. A memo from the EDO to the Commissioners will probably go up this Friday, November 16, 2001. The Orders will require these licensees to cease power operations by December 31, 2001, and bring these units to cold shutdown. To comply with the staff's requirements as contained in the Orders, each licensee must demonstrate to the NRC that there is reasonable assurance that the VHP nozzles are free of significant defects and, in effect, certify compliance with NRC rules and regulations and stipulations contained in the Order to return to normal power operation. This demonstration must include performance of the inspections recommended in the Bulletin for the most highly ranked (susceptible) plants (which includes Davis-Besse Nuclear Power Station, Unit No. 1) or for those plants that have already experienced primary water stress corrosion cracking of vessel head penetrations (which includes Donald C. Cook Nuclear Plant, Unit No. 2).

The staff continues to engage the licensees regarding their bulletin responses, inspections plans, and timing of those inspections. In addition, the staff is open to reviewing any new and relevant information that would justify operation beyond December 31, 2001. NRR staff and management have been engaged with appropriate licensee management to ensure the sensitivity and awareness of potential safety concerns. NRR will continue to provide feedback to licensee management regarding the chosen regulatory path and allow the licensees the opportunity to commit to shutdown the facility and perform the recommended inspections by December 31, 2001, which would preclude the need for an Order.

If you have any questions, please email or call me.

Thanks,  
Jake Zimmerman, Lead PM Bulletin 2001-01  
(301) 415-2426

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**CC:** Burkhart, Lawrence

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E-37



**Commissioners' Technical Assistants Brief**  
Wednesday, November 14, 2001  
1:00 P.M. - 2:00 P.M.  
Room: 18<sup>th</sup> Floor Commissioners, Conference Room

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**Purpose:** 1) To discuss updated results of the staff's review of responses to Bulletin 2001-01, "Circumferential Cracking of Reactor Pressure Vessel Head Penetration Nozzles."  
2) To discuss the basis for proposed Order(s).

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**Success:** Commissioners' Technical Assistants understands the results of the staff's review and basis for the proposed Order(s).

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Introduction:	Larry Burkhart	5 mins.
Discussion of updated results of the staff's review:	Allen Hiser	15 mins.
Discussion of Basis for Order(s):	Larry Burkhart	15 mins.

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**PLANTS WITH CRACKING/LEAKAGE HISTORY (BIN 1) AND HIGH SUSCEPTIBILITY PLANTS (BIN 2)**

Plants	Last Inspection		Next Inspection				CCDP* (IPE)	Response Acceptable ?
	Date	Method	Date	Method	Method	Method		
Oconee 1	11/2000	Qual. Visual - 100%	03/2002	OK	Qual. Visual - 100%	OK	1E-2 3.5E-3 (Response)	YES
Oconee 2	04/2001	Qual. Visual - 100%		OK	Qual. Visual - 100%	OK	1E-2 3.5E-3 (Response)	YES
Oconee 3	2/2001	Qual. Visual - 100%	11/2001	OK	Qual. Visual - 100%	OK	1E-2 3.5E-3 (Response)	YES
ANO-1	03/2001	Qual. Visual - 100%		OK	Qual. Visual - 100%	OK	3E-3	YES
Robinson	04/2001	Qual. Visual - 100%		OK	Qual. Visual - 100%	OK	2E-2	YES
TMI-1	09/1999	Qual. Visual - 100%	10/2001	OK	Qual. Visual - 100%	OK	7.5E-3	YES
Surry 1	Spr 2000	GL 88-05 & GL 97-01	Ongoing	OK	Qual. Visual - 100%**	OK	5.3E-3	YES
Surry 2	Fall 2000	GL 88-05 & GL 97-01	Prior to 12/31/01***	OK	Qual. Visual - 100%**	OK	5.3E-3	YES
North Anna 1	02/1996	ID NDE - 31%	09/01 (completed)	OK	Qual. Visual (100%) & ECT/UT**	OK	6.6E-3	YES
North Anna 2	Spr 2001	GL 88-05 & GL 97-01	Ongoing	OK	Qual. Visual - 100%**	OK	6.6E-3	YES
D.C. Cook 2	09/1994	ID NDE - 91%	1/19/2002	NO	Remote Visual & ECT/UT	NO	4.7E-3	NO
Davis-Besse	03/2000	Eff. Visual - 65%	04/2002	NO	Qual. Visual - 100%	OK	6.9E-3	NO

- \* Conditional core damage probability.
- \*\* Licensee stated its intention to submit information to "qualify" the visual inspection.
- \*\*\* Licensee stated its intention to perform "qualified" inspection of 100% of VHP nozzles prior to 12/31/01.
- Pending acceptability of licensee's supplemental response.

As of 11/13/01

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**PLANTS HAVING MODERATE SUSCEPTIBILITY TO PWSCC**

Plant	Ranking (EFPY)	Next Inspection			Response Acceptable?
		Date	Method	Method	
ANO-2	17.1	April 2002	Eff. Visual, Vol. Surface (100%) in Spring 2002	OK	YES
Beaver Valley 1	11.5	Sept. 2001	Eff. Visual (100%) in Sept. 2001	OK	YES
Beaver Valley 2	16.5	Feb. 2002	Eff. Visual (100%) in Feb. 2002	OK	YES
Calvert Cliffs 1	9.8	Feb. 2002	Eff. Visual (100%) or Qual. Vol. Feb. 2002	OK	YES
Calvert Cliffs 2	10.2		Eff. Visual (100%) or Qual. Vol.	OK	YES
Crystal River 3	5.9	Oct. 2001	Eff. Visual (100%) in Fall 2001	OK	YES

Diablo Canyon 1	20.8	May 2002	Eff. Visual (100%) in May 2002 <input type="checkbox"/>	OK <input type="checkbox"/>	YES <input type="checkbox"/>
Diablo Canyon 2	16.1		Eff. Visual (100%) in	OK <input type="checkbox"/>	YES <input type="checkbox"/>
Farley 1	6.9	Oct. 2001	Eff. Visual (All) in Oct. 2001	OK	YES
Farley 2	8.3		Eff. Visual (All) or Qual Vol.	OK	YES
Fort Calhoun	17.9	Apr./May 2002	Eff. Visual (100%) in Spring 2002	OK	YES
Kewaunee	21.9	Oct. 2001	Eff. Visual (100%) in Fall 2001	OK	YES
Prairie Island 1	26.7		Eff. Visual (All) in	OK	YES
Prairie Island 2	26.8	Feb. 2002	Eff. Visual (All) in Feb. 2002	OK	YES
Salem 1	13.8		Eff. Visual (All) in	OK	YES
Salem 2	17.4	Apr. 2002	Eff. Visual (All) in Apr. 2002	OK	YES
San Onofre 2	10.7	May 2002	Eff. Visual (All) or Qual Vol. May 2002	OK	YES
San Onofre 3	10.8		Eff. Visual (All) or Qual Vol.	OK	YES
St. Lucie 1	10.3		Eff. Visual (100%) in	OK	YES
St. Lucie 2	11.3	Nov. 2001	Eff. Visual (100%) in Nov. 2001	OK	YES
Turkey Point 3	6.3	Oct. 2001	Eff. Visual (100%) in October 2001	OK	YES
Turkey Point 4	6.4	Mar. 2002	Eff. Visual (100%) in Spring 2002	OK	YES
Waterford 3	7.8	Mar. 2002	Eff. Visual (100%) in Spring 2002	OK	YES
Ginna	15.0	Mar. 2002	Not Specified (notify 1/02)**	?	?
Millstone 2	14.3	Feb. 2002	Not Specified (notify 1/02)**	?	?
Point Beach 1	11.5		Eff. Visual (100%) in	?	?
Point Beach 2	9.6	April 2002	Eff. Visual (100%) in Spring 2002*	?	?
Indian Point 2	26.6		GLs 88-05 & 97-01***	NO	NO
Indian Point 3	14.5		GLs 88-05 & 97-01***	NO	NO
Palo Verde 1	17.0		None (Vol. in	NO	NO
Palo Verde 2	17.7	May 2002	None (Vol. in	NO	NO
Palo Verde 3	17.3	Sept. 2001	None (Vol. in	NO	NO

- \* Documented reservations regarding achieving 100% inspection.
- \*\* Licensee stated its intention to provide more information to the staff regarding the scope and schedule of inspection.
- \*\*\* Licensee stated that it would reconsider its position regarding scope of inspection and would provide feedback to the staff.
- Pending acceptability of licensee's supplemental response.

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As of 11/13/01

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## PLANTS THAT HAVE PERFORMED "BARE METAL" VISUAL INSPECTIONS

Plants	Most Recent Inspection				
	Date	Method & Scope	Summary of Cracked or Leaking CRDM Nozzles		
			Total Number	Circumferential Nozzle Cracks	Number Repaired
Oconee 1	11/2000	Qualified Visual - 100%	1 <input type="checkbox"/>	0	1
Oconee 3	02/2001	Qualified Visual - 100%	9	3 <input type="checkbox"/>	3
	11/2001	Qualified Visual - 100%	4 (3)	TBD	TBD
ANO-1	03/2001	Qualified Visual - 100%	1	0	1
Oconee 2	04/2001	Qualified Visual - 100%	5	1	5
Robinson	04/2001	Qualified Visual - 100%	0	0	0
North Anna 1	09/2001	Qualified Visual - 100% <input type="checkbox"/> <input type="checkbox"/>	8	0	0
Crystal River 3	10/2001	Effective Visual - 100% <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	1	1	1
TMI-1	10/2001	Qualified Visual - 100%	8 <input type="checkbox"/>	0	6
Surry 1 (in progress)	10/2001	Qualified Visual - 100% <input type="checkbox"/> <input type="checkbox"/>	10	TBD	5
North Anna 2 (in progress)	10/2001	Qualified Visual - 100% <input type="checkbox"/> <input type="checkbox"/>	1 (3)	TBD	TBD

- Thermocouple nozzles also cracked/leaking: Oconee 1 (5 out of 8), TMI 1 (8 out of 8)
- The size of 2 out of 3 circumferential flaws were identified from destructive examination.

- Pending acceptability of licensee's supplemental response
- The highest ranked MODERATE susceptibility plant.  
Moderate susceptibility plants that have completed effective visual examinations in Fall 2001 with no evidence of boric acid deposits:  
Beaver Valley 1, Farley 1, Kewaunee, and Turkey Point 3

As of 11/13/01

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**DAVIS BESSE**

• **Previous Inspections**

- 10<sup>th</sup> RFO 1996 - Visual Examination of 65 out of 69 CRDMs (94%)
  - 4 CRDMs (center head) not examined since licensee evaluation showed insufficient interference gap
- 11<sup>th</sup> RFO 1998 - Visual Examination of 50 out of 69 CRDMs (72%)
  - 19 Obscured by boric acid from leaking motor tube flanges and Not Examined (includes 4 CRDMs with insufficient gap and 15 new nozzles obscured)
  - Staff review of documentation (video) does not support effective examination
- 12<sup>th</sup> RFO 2000 - Visual Examination of 45 out of 69 CRDMs (65%)
  - 24 Obscured by boric acid and Not Examined (includes 4 CRDMs with insufficient gap and 15 obscured in 1998)
  - Staff review of documentation (video) does not support effective examination

• **Planned Future Inspections**

- Qualified Visual Examination April 2002
  - Some form of qualified NDE (UT, ECT, PT) for 4 CRDMs with insufficient gap; supplemental response with details by January 29, 2002
  - RAI Response Submitted October 31, 2001 - Still Under Staff Review

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## D. C. COOK UNIT 2

- **Previous Inspections**

Fall 1994 - eddy current examination (ECT) of inside diameter only of 71 of the 78 VHP nozzles

Three axial indications in one CRDM; repaired in 1996

- **Planned Future Inspections**

Remote visual inspection with ECT and UT at next RFO - January 19, 2002

Planned inspection in January 2002 is more than 7 years from the prior inspection (plant did not operate for about 33 months -- September 1997 to June 2000)

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## SURRY UNIT 2

- **Previous Inspections**

Fall 2000 - inspection performed with the insulation on the head (e.g., not a bare metal inspection as described in Bulletin 2001-01)

Would not have been effective in detecting boric acid deposits from VHP nozzle leaks

Inspection of Surry Unit 1 (on-going) has identified 10 cracked/leaking nozzles and a need to repair 5 nozzles

- **Planned Future Inspections**

Bulletin response - Qualified visual examination at the next RFO - March 2002

Telecon on November 2 - will shutdown for examination before December 31, 2001

Licensee has not submitted supplemental plant-specific information to demonstrate qualification of the visual examination method

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## **RECOMMENDED ORDERS REGARDING RESPONSES TO BULLETIN 2001-01**

- Staff recommends issuance of orders for two plants based on an insufficient inspection history and the relatively high likelihood of cracking at those plants
- A potentially hazardous condition exists (i.e., it is reasonable to assume that the reactor coolant pressure boundary is compromised at these facilities)
- Licensees have not provided sufficient basis to continue to operate without performing the recommended inspections by December 31, 2001
- December 31, 2001, is a reasonable date for requiring inspections:
  - Results of inspections have not revealed conditions of incipient failure, but findings are precursors that could lead to failure if undetected and uncorrected,
  - There are large uncertainties surrounding this crack initiation and growth phenomenon, and
  - The extent of VHP cracking already observed at 9 out of 10 plants that have inspected

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### DAVIS-BESSE

- Proposed to shutdown in late March 2002 (at next RFO) to perform inspections:
  - High-susceptibility plant
  - The licensee has never performed a qualified visual inspection of all of the VHP nozzles (prior two inspections were not effective to detect the very small boric acid deposits)
  - 9 of 10 similarly-ranked plants have found VHP nozzle cracking
  - All six of the other B&W plant have found VHP nozzle cracking (Davis-Besse is the only B&W plant that has not inspected)
  - 3 of 6 B&W plants have found circumferential cracking
  - Risk implications:
    - Loss of defense in depth
    - Loss of safety margins
    - Monitored using performance measurement strategies
    - Probable violation of quantitative guidelines (if failure frequency > 0.04 per year)
    - Failure to comply with Regulations and Technical Specifications
- Order would be immediately effective:
  - Require plant shutdown by December 31, 2001
  - Require demonstration, by inspection, of reasonable assurance that all of the VHPs are free of significant defects (cracks) that exceed the requirements of the ASME Code
  - Prohibit power operation until the licensee demonstrates acceptability of the results of the inspection to the staff

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**D. C. COOK**

- Originally proposed to conduct inspection in 2001. Due to a forced outage earlier in the year, the licensee delayed the refueling outage and inspections until January 2002.
  - Experienced VHP cracking (axial) in 1994
  - It is reasonable to assume the plant continues to experience cracking
  - The licensee did not commit to appropriate examination, a "qualified" visual inspection
  - Risk implications:
    - Loss of defense in depth
    - Loss of safety margins
    - Monitored using performance measurement strategies
    - Probable violation of quantitative guidelines (if failure frequency > 0.03 per year)
    - Failure to comply with Regulations and Technical Specifications
- Order will be immediately effective:
  - Require plant shutdown by December 31, 2001
  - Require demonstration, by inspection, of reasonable assurance that all of the VHPs are free of significant defects (cracks) that exceed the requirements of the ASME Code
  - Prohibit power operation until the licensee demonstrates acceptability of the results of the inspection to the staff