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Subject: Status of Implementation of Actions in Response to NRC  
Generic Letter Number 88-17, Loss of Decay Heat Removal

Gentlemen:

This letter responds to a request from Mr. Jon B. Hopkins, NRC Senior Project Manager, for an update of the status of Toledo Edison's implementation of actions to be taken in response to NRC Generic Letter (GL) Number 88-17, Loss of Decay Heat Removal, dated October 17, 1988. GL 88-17 requested Toledo Edison to respond with two plans of action for the Davis-Besse 1 Nuclear Power Station (DBNPS):

- a. A short term program entitled "expeditious actions" and
- b. A longer term program entitled "programmed enhancements."

Toledo Edison responded to the eight recommended expeditious actions, as outlined in GL 88-17, in a letter (Serial Number 1623) dated January 3, 1989. Toledo Edison subsequently responded to the six programmed enhancements in a letter (Serial Number 1631) dated February 1, 1989.

GL 88-17 identified that the expeditious actions were applicable to reduced inventory conditions. GL 88-17 also identified that both the expeditious and programmed enhancements were applicable when there was irradiated fuel in the reactor vessel. The original schedule for the completion of these actions, as described in the above Toledo Edison letters, was based upon the next expected reduced inventory condition occurring during the sixth refueling outage (6RFO). However, the DBNPS only performed reduced inventory operations during the 6RFO when the fuel was off loaded from the reactor vessel. Therefore, it was not necessary to fully implement the recommendations of GL 88-17 until entry into the next, applicable reduced inventory conditions of the seventh refueling outage (7RFO). Since Toledo Edison's implementation

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of the responses to GL 88-17 were completed before the plant was operated in its next reduced inventory condition with irradiated fuel in the reactor vessel, the intent of the scheduling recommendations of the Generic Letter and Toledo Edison's responses were met.

The implementation of Toledo Edison's responses to GL 88-17 was completed before entry into the reduced inventory conditions of the 7RFO (September 11, 1991). Toledo Edison modified the facility, provided the necessary training, and made the necessary procedural and administrative changes to ensure the responses to GL 88-17 were implemented. The enhancements proved to be effective and contributed to a safe 7RFO. A brief summary matrix of the responses that were pending actions for resolution and the description of the completed actions to implement these responses to GL 88-17 is attached.

If you have any questions, please contact Mr. R. W. Schrauder, Manager  
Nuclear Licensing, at (419) 249-2366.

Very truly yours,



RS

Attachments

cc: A. B. Davis, Regional Administrator, NRC Region III  
J. B. Hopkins, NRC Senior Project Manager  
W. Levis, DE-1 NRC Senior Resident Inspector  
Utility Radiological Safety Board

SUMMARY MATRIX OF  
COMPLETED ACTIONS FOR GL 88-17

I. Expeditionary Actions

GL ITEM	PENDING ACTIONS AS REQUIRED BY RESPONSES	COMPLETED ACTIONS	COMPLETION DATE
1) <u>Training.</u>	<p>a) Operators will receive training on SOER 88-3. Losses of Residual Heat Removal with Reduced Reactor Vessel Water Level at PWRs, prior to the next entry into a reduced inventory condition.</p> <p>b) Additional training will be provided as needed in response to future industry events, procedure revisions, the addition of administrative controls and the implementation of programmed enhancements.</p>	<p>Licensed operator received training on the Institute of Nuclear Power Operations Significant Operating Event Report (SOER) 88-3 prior to entering the next expected reduced inventory condition (6RFO) at the DBNPS.</p> <p>Additional completed actions:  For the 7RFO, licensed operators also received classroom and simulator training on loss of decay heat removal during reduced Reactor Coolant System (RCS) inventory. Classroom training for the 7RFO included instruction on the procedural and administrative changes to procedure DB-OP-06002 (Draining and Nitrogen Blanketing of the RCS) and DB-OP-02527 (Loss of Decay Heat Removal) that were implemented as a result of Toledo Edison's responses to GL 88-17. With the addition of an onsite plant-referenced simulator in 1991, training for the 7RFO also included the use of low RCS level scenarios to improve the licensed operator's ability to diagnose, respond to, and mitigate various conjectured problems associated with the Decay Heat Removal System.</p>	<p>Prior to 6RFO  (starting  01/26/90)</p> <p>Prior to 7RFO  (starting  08/31/91)</p>

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COMPLETED ACTIONS FOR GL 88-17

I. Expeditious Actions

GL ITEM	PENDING ACTIONS AS REQUIRED BY RESPONSES	COMPLETED ACTIONS	COMPLETION DATE
2) <u>Containment Closure</u>	<p>a) Prior to operating the DBNPS in a drained condition of 14" above the hot leg centerline (with fuel in the reactor vessel), the equipment hatch will either be closed and held in place by a minimum of four bolts, or the Maintenance Department will be informed so that the necessary preparations can be made to ensure the equipment hatch can be closed in one hour or less if necessary.</p> <p>If a loss of Decay Heat Removal (DHR) occurs, the loss of DHR Abnormal procedure will require:</p> <p>(1) Actions be initiated immediately to close the equipment hatch if the RCS is drained to a water level 14" above the hot leg centerline.</p> <p>(2) Actions be initiated prior to core boiling to close the equipment hatch and initiate containment closure per the guidance provided in the loss of DHR Abnormal Procedure, if the RCS is drained to a water level &gt;14" above the hot leg centerline.</p>	<p>Prior to entering a reduced RCS inventory condition (with fuel in the reactor vessel), procedure DB-OP-06002 requires the equipment hatch to be closed and held in place by a minimum of four bolts, or the capability to close the equipment hatch within one hour must exist.</p> <p>Procedure DB-OP-02527 (Loss of Decay Heat Removal) presently requires the evacuation and closure of containment if any of the following conditions are met:</p> <p>(1) The RCS is at reduced inventory.</p> <p>(2) Compliance with a Technical Specification 3.9.8.1 (DHR and Coolant Circulation during refueling with water level equal to or greater than 23 feet above the reactor vessel fuel assemblies) Action Statement is required, or</p> <p>(3) RCS temperature rises to 200°F (on incore thermometer, if available). It</p>	<p>Prior to 6RFO (starting 01/26/90)</p> <p>Prior to 7RFO (starting 08/31/91)</p>

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I. Expeditionary Actions

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<p>The loss of DHR Abnormal Procedure will provide guidelines for the time to boil and the time to core uncover based on the time after shutdown. Curves will be provided for a reduced RCS inventory 148" above the hot leg centerline, and for a drained RCS water level of 114" above the hot leg centerline. (A drained RCS water level of 114" above the hot leg centerline corresponds to the lowest drained level for maintenance).</p>	<p>should be noted that the present requirements of procedure DB-OP-02527 are more conservative (e.g., reduced inventory versus 114" above the hot leg centerline to initiate actions to close the equipment hatch) than Toledo Edison's original response. Any future procedure changes will remain bounded by Toledo Edison's original response.</p>	<p>Procedure DB-OP-02527 (Loss of Decay Heat Removal) addresses both the time to boil and the time to core uncover. The procedure refers to procedure DB-PF-06703 (Miscellaneous Operation Curves) and its associated curves "Time to Heat Reactor Vessel Water to 212 F As a Function of Decay Heat, Initial Reactor Vessel Temperature and Initial Reactor Vessel Level" and "Time to Boil to Top of Core As a Function of Initial Level and Decay Heat". These curves provide for the interpolation and extrapolation of conservative times for the RCS water levels of 30" above the hot leg centerline and 6" above the hot leg centerline.</p>	<p>Prior to 7RFO  (starting  08/30/91)</p>

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I. Expeditious Actions

GL ITEM	PENDING ACTIONS AS REQUIRED BY RESPONSES	COMPLETED ACTIONS	COMPLETION DATE
	<p>b) Prior to operating the DENPS in a drained condition of 14" above the hot leg centerline (with fuel in the reactor vessel), the containment local leak rate testing lineups that provide a direct flow path to the atmosphere will be isolated.</p>	<p>Prior to entering a reduced RCS inventory condition (with fuel in the reactor vessel), procedure DB-OP-06002 requires the Containment Vessel Local Leak Rate Test Penetrations to be closed or have a dedicated individual assigned to isolate the penetrations within one hour in the event containment closure is required. (This is a change from TE's response dated 01/03/89).</p>	<p>Prior to TRFO (starting 08/31/91)</p>
	<p>c) Prior to operating the DENPS in a drained condition of 14" above the hot leg centerline (with fuel in the reactor vessel), the containment direct access flow paths to the atmosphere from the secondary system will be closed. As an example, if a steam generator secondary side manway is open, then the Main Steam Isolation Valves will be closed, and if any Main Steam Safety Valves are removed blank flanges will be installed.</p>	<p>Prior to entering a reduced RCS inventory condition (with fuel in the reactor vessel), procedure DB-OP-06002 requires that containment direct access flow paths to the atmosphere from the secondary system are closed or are capable of being closed within one hour in the event containment closure is required. If the secondary side of a steam generator is open to the containment atmosphere during reduced RCS inventory conditions, procedure DB-OP-06002 also requires the Main Steam Safety Valves to be in place and the Atmospheric Vent Valves to be manually isolated, and if any Main Steam</p>	<p>Prior to TRFO (starting 08/31/91)</p>



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I. Expeditionary Actions

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		Safety Valves are not in place blank flanges will be installed.	
	d) Prior to operating the DENPS in a drained condition of 14" above the hot leg centerline (with fuel in the reactor vessel), outage management will be consulted and outstanding Maintenance Work Orders reviewed to determine if other containment flow paths that provide direct access to the atmosphere exists. These will be evaluated for the ability to close prior to core boiling and either closed or listed on an Operations open flow path list.	The normal work control process requires the Shift Supervisor's approval for work on containment penetrations in order for Opera- tions to track them. Addition- ally, prior to entering a reduced ECS inventory condition (with fuel in the reactor vessel), procedure DB-OP-06002 requires consultation with Outage Management to identify containment penetrations that provide a direct path to the atmosphere. If a penetration is identified as open to the atmos- phere, the procedure requires the penetration to be either closed or have a dedicated individual assigned to isolate the penetration within one hour in the event containment closure is required.	Prior to TRFO (starting 08/31/91)
		Procedures DB-OP-06002 also pro- vides for tracking changes to containment closure. If a change is required from the established containment closure, then the containment closure status is updated, and an operator is assigned to return the affected penetrations to meet containment	

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GL ITEM	PENDING ACTIONS AS REQUIRED BY RESPONSES	COMPLETED ACTIONS	COMPLETION DATE
3) <u>Temperature Indication.</u>	a) Prior to entering a mid-loop condition with RCS water level 118" above the hot leg centerline as it enters the reactor vessel and with the reactor vessel head located on top of the reactor vessel, procedure revisions will be implemented to require at least two independent and continuous incore exit thermocouples be available and capable of Control Room readout. Procedures will require the Control	closure requirements in the event containment closure is required.	Prior to 7RFO (starting 08/31/91)
	e) Prior to operating the DBNPS in a drained condition 114" above the hot leg centerline (with fuel in the reactor vessel), the ability to close at least one door of the personnel hatch and the emergency hatch will be maintained.	Prior to entering a reduced RCS inventory condition (with fuel in the reactor vessel), procedure DB-OP-06002 requires the personnel and emergency hatches to have at least one airlock door closed or capable of being closed within one hour.	Prior to 7RFO (starting 08/31/91)
	f) Prior to operating the DBNPS in a drained condition of 114" above the hot leg centerline (with fuel in the reactor vessel), the containment penetrations that are used for routing inspection cables will be appropriately sealed.	Procedure DB-OP-06002 requires the containment penetration that is used for routing inspection cables to be closed whenever the DBNPS is in reduced inventory conditions (with fuel in the reactor vessel).	Prior to 6RFO (starting 01/26/90)
	a) Prior to entering a mid-loop condition with RCS water level 118" above the hot leg centerline as it enters the reactor vessel and with the reactor vessel head located on top of the reactor vessel, procedure revisions will be implemented to require at least two independent and continuous incore exit thermocouples be available and capable of Control Room readout. Procedures will require the Control	Administrative and procedural steps have been taken to require two independent and continuous incore exit thermocouples are available in the Control Room for temperature indication prior to and during reduced RCS inventory operations. For reduced inventory operations (with fuel in the reactor vessel), procedure DB-OP-06002 presently requires the trending of two incore thermocouple computer points on a	Prior to 7RFO (starting 08/31/91)



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GL ITEM	PENDING ACTIONS AS REQUIRED BY RESPONSES	COMPLETED ACTIONS	COMPLETION DATE
	Room Operator to record the in- core exit thermocouple temper- ature hourly whenever the RCS water level is $\leq 18^{\circ}$ above the hot leg centerline.	recorder in the Control Room. The procedure also requires the recording of the incore thermo- couple temperatures on a hourly basis during reduced inventory operations (with fuel in the reactor vessel). It should be noted that the present require- ments of procedure DB-OP-06002 are more conservative (e.g., reduced inventory versus mid- loop for implementation) than Toledo Edison's original re- sponse. Any future procedure changes will remain bounded by Toledo Edison's original response.	
	b) Procedures for removing incore closure seals will require that two incore thermocouples remain available for Control Room read- out until initiating refueling canal fill.	Procedure DB-OP-06002 requires two incore thermocouple computer points to be placed on a trend recorder in the Control Room whenever the plant is configured for maintenance where entry into reduced inventory conditions (with irradiated fuel in the reactor vessel) is needed.	Prior to 7RFO (starting 08/31/91)
4) RCS Water Level Indication.	a) Prior to entering a reduced in- ventory condition with the RCS water level $\leq 18^{\circ}$ above the hot leg centerline as it enters the reactor vessel, procedure revi- sions will be implemented to	Plant instrumentation available during reduced inventory condi- tions for 6RFO included a tygon tube standpipe and a closed circuit camera/television for control room monitoring. This	Prior to 6RFO (starting 01/26/90)

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GL ITEM	PENDING ACTIONS AS REQUIRED BY RESPONSES	COMPLETED ACTIONS	COMPLETION DATE
	require that continuous RCS water level indication will be provided. One local level indication using tygon will be installed and continuously monitored locally by an operator, or a closed circuit television may be used instead of a local operator. (A long term modification is planned which will provide two Control Room level indications).	RCS level indicating system was replaced by a new system that was installed during the 6RFO (see Programmed Enhancement Number 1.a).	
	b) During reduced inventory conditions, procedure will require the RCS water level to be recorded at 15 minute intervals. The local operator will contact the Control Room hourly and relay the RCS water level indication to check communications. Closed circuit television in the Control Room may be used instead of a local operator. Under this condition, the Control Room Operator monitoring the closed circuit television will record the RCS water level at least once per hour.	If the RCS water level was monitored by using the control room closed circuit television, procedure DB-OP-06002 required the recording of levels once per hour during reduced inventory operations. If the level was monitored locally during reduced inventory operations, the levels were required to be logged in the Reactor Operator Log at 15 minute intervals.	Prior to 6RFO (starting 01/26/90)
	c) The Loss of DHR Abnormal Procedure will require the Control Room operator to notify the operator who is locally monitoring RCS level, to evacuate Contain-	If a loss of DHR occurs, procedure DB-OP-02527 (Loss of Decay Heat Removal) requires containment evacuation at any time the RCS temperature rises to 200°F	During 6RFO (starting 01/26/90)

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GL ITEM	PENDING ACTIONS AS REQUIRED BY RESPONSES	COMPLETED ACTIONS	COMPLETION DATE
5) <u>RCS</u> <u>Perturbations</u>	<p>ment prior to an incore exit temperature reaching 200°F.</p> <p>Prior to entering a reduced inventory condition with an RCS water level 543" above the hot leg centerline, administrative guidelines will be provided to address reduced inventory operations. The guidance will direct the operators to avoid specific operations or testing that could lead to perturbations to the RCS and/or to systems that are necessary to maintain the RCS in a stable and controlled condition while the RCS is in a reduced inventory condition. If operations or testing that could perturb the RCS and/or the systems supporting the RCS while in a reduced inventory condition are planned, prior specific permission is required from the Plant Operations Manager. In addition, the Operations Superintendent will provide precautions and guidance, including both prevention of a loss of DHR and enhanced monitoring requirements to ensure a timely response to a loss of DHR should such an event occur.</p>	<p>(using incore thermocouples if available).</p> <p>Administrative controls were in place to avoid RCS perturbations (e.g., swapping DH loops, electrical loads, or testing) which could affect RCS inventory during the 6RFO (See Programmed Enhancement Number 6 for a re-review of this expeditious action).</p>	Prior to 6RFO (starting 01/26/90)

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I. Expeditionary Actions

GL ITEM	PENDING ACTIONS AS REQUIRED BY RESPONSES	COMPLETED ACTIONS	COMPLETION DATE
6) RCS <u>Inventory</u>	<p>a) Prior to entering a reduced inventory condition with an RCS water level 548" above the hot leg centerline, procedure revisions will be implemented to require at least two means of adding water to the RCS, in addition to the DHR pumps. Any two of the following six means of adding water will be available:</p> <ul style="list-style-type: none"> <li>o High Pressure Injection (HPI) Pump 1-1</li> <li>o High Pressure Injection (HPI) Pump 1-2</li> <li>o Makeup Pump (MU) Pump 1-1</li> <li>o Makeup Pump (MU) Pump 1-2</li> <li>o Gravity feed from the Borated Water Storage Tank (BWST)</li> <li>o Clean Waste Receiver Tank (CWRT) flow path and transfer pump</li> </ul> <p>b) As part of the establishment of a gravity feed flowpath to the RCS, the procedures will include guidelines to determine an adequate size opening from the RCS to containment for successful gravity feed.</p>	<p>Procedure DB-OP-06002 specified that any two of the following six means for adding water to the RCS must be available for reduced inventory operations (with fuel in the reactor vessel):</p> <ul style="list-style-type: none"> <li>o High Pressure Injection (HPI) Pump 1-1</li> <li>o High Pressure Injection (HPI) Pump 1-2</li> <li>o Makeup (MU) Pump 1-1</li> <li>o Makeup (MU) Pump 1-2</li> <li>o Gravity feed from the Borated Water Storage Tank (BWST)</li> <li>o Clean Waste Receiver Tank (CWRT) flow path and transfer pump</li> </ul> <p>Procedure DB-OP-06002 requires the establishment of a RCS opening greater than 12-inches in diameter as part of the availability of BWST gravity feed. The procedure also requires the removal of at least one 16-inch diameter Steam Generator upper primary manway cover for venting</p>	<p>Prior to 6RFO  (starting  01/26/90)</p> <p>Prior to 7RFO  (starting  08/31/91)</p>

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	c) The Shift Supervisor will be responsible for maintaining the availability of equipment, including an available flowpath for adding water to the RCS.	As a prerequisite for entry into a reduced inventory condition.  As a limit and precaution, procedure DB-C2-06002 requires the Shift Supervisor's approval to perform work on systems affecting decay heat removal while the RCS is drained.	Prior to 7RFO (starting 08/31/91)
	d) The Loss of DHR Abnormal Procedure will provide guidance for the operation of the water addition means during a Loss of DHR event.	Procedure DB-OP-02527 addresses the methods of providing alternative cooling to the core on a loss of pumps, loss of flow path, or a loss of inventory. The use of the RCS (pressure boundary intact and either Steam Generator functional) either under natural circulation or forced circulation is the first priority, followed by HPI/MJ, CWR transfer pumps, and gravity drain of the EWST to the RCS. The procedure then refers to other plant equipment that can be used to inject water into the RCS.	Prior to 6RFO (starting 01/26/90)
7) <u>Hot Leg Flowpaths</u>	This is not applicable to the DENPS, Unit 1.	This action is applicable to Westinghouse and Combustion Engineering nuclear steam supply system (NSSS) design and is not applicable to the DENPS, Unit 1.	Not applicable.
8) <u>Loop Stop</u>	This is not applicable to the	This action is applicable to	Not applicable.

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I. Expeditious Actions

GL ITEM	PENDING ACTIONS AS REQUIRED BY RESPONSES	COMPLETED ACTIONS	COMPLETION DATE
<u>Valves</u>	DENPS, Unit 1.	NSSSs with loop stop valves and is not applicable to the DENPS, Unit 1.	



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II. Programmed Enhancements

GL ITEM	PENDING ACTIONS AS REQUIRED BY RESPONSES	COMPLETED ACTIONS	COMPLETION DATE
i) <u>Instrumentation.</u>			
a) <u>RCS Levels.</u>	<p>i) Toledo Edison will install a new RCS level monitoring system which will be used to monitor RCS inventory during reduced inventory operations. Planned features for the modification included:</p> <ul style="list-style-type: none"> <li>o Removal of the existing installed midrange (refueling level local indicator (LI-214) and replacement with an electronic AP transmitter.</li> <li>o Installation of two RCS hot leg narrow range level transmitters using the existing instrument sensing lines for the RCS hot leg wide range level transmitters (LT 5448A and LT 5448B).</li> <li>o The new narrow range level transmitter will replace the use of tygon tubing for locally measuring 0-10 feet in the RCS hot leg.</li> <li>o The transmitters will provide the Control Room operators</li> </ul>	<p>During the 6RFO, a plant modification installed a new RCS level monitoring system to monitor RCS inventory during reduced inventory operations. This new system added two narrow range level indicators and a wide range indicator (replacing the existing installed midrange local level indicator LI-214) for the RCS hot leg. The range of the wide range indicator overlaps the ranges of the narrow range indicators to provide continuous RCS water level indication whenever the RCS is in a reduced inventory condition. The narrow and wide range electronic AP transmitters provide the Control Room operators with direct indication of RCS level in the Control Room. The narrow range instrument strings also provide the operators with two different (low and low/low) level alarms in the Control Room, and procedure DE-OP-0602 provides steps to verify that the level alarms are set at their proper setpoints prior to entry into re-</p>	<p>Prior to 7RFO  (starting  08/31/91)</p>

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	with direct indication of the RCS level in the Control Room.	duced RCS operations (with fuel in the reactor vessel);.	
	o The narrow range instrument strings will also provide a low level alarm in the Con- trol Room to alert personnel of conditions which could re- sult in the loss of decay heat removal capability if the level is allowed to drop further.		
	o The detailed design, the alarm setpoint calculations, and the system operating pro- cedures will consider various phenomena and instrumentation behavior that are of concern as identified in Enclosure 2 to GL 88-17.		
ii)	Since the three instruments will utilize a common liquid tap, procedures will specify the actions to be taken to ensure that the tap is not blocked and the instrument readings are rep- resentative of the RCS level. Procedures for periodic main- tenance and calibration will be developed.	Since all three transmitters in this new RCS hot leg level moni- toring system utilize the same instrument sensing lines as transmitters LT 5448A and LT 5448B and a common tap, pre- ventive maintenance and associ- ated procedures are used to verify the reference legs are full, sensing lines are clear of blockage, and instrument readings	Prior to 7RFO (starting 08/31/91)

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II. Programmed Enhancements

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		are representative of RCS level. Procedure DB-OP-06002 also requires level comparisons among the RCS water level indications during draindown to ensure that the instrument readings are representative of the RCS level.	
		Preventive maintenance and supporting procedures have also been established to calibrate the wide range and the two narrow range channels of this new system prior to entering reduced inventory conditions.	Prior to 7RFO (starting 08/31/91)
	iii) Post implementation testing will be performed to functionally verify proper operation of the system.	During the initial use of this new RCS hot leg level monitoring system during the 7RFO, a nonconformance report was written against the system since the indicated level for the RCS was not completely reliable due to instrument drift. The apparent cause for the instrument drift was attributed to evaporative losses in the transmitter reference legs (note-locally installed tygon tube level indicators had been installed to allow for independent monitoring of the RCS level during the initial use of the new RCS hot leg level monitoring system). The reference legs of	During 7RFO (starting 08/31/91)

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		<p>the narrow range and wide range transmitters were subsequently backfilled such that the transmitters operated adequately. During the VRFO, post implementation testing was also conducted on the new RCS hot leg level system. During the initial drain down, RCS hot leg levels, as indicated on the narrow and wide range indicators, were verified by checking RCS vents/drain at known levels. The level instruments tracked accurately during this initial drain down. Additionally, RCS hot leg level was monitored during and following the initial drain down to observe evaporative losses in the transmitter reference legs. The initial preventive maintenance for a weekly backfilling of the RCS hot leg level transmitters was recognized as needing revision to ensure reliable level indications. The preventive maintenance is being revised to change the frequency and method of backfilling the RCS hot leg level transmitters to ensure that the transmitters will accurately indicate the RCS level.</p>	



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II. Programmed Enhancements

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b. <u>RCS Temperature</u>	Procedures will be revised to require that at least two independent core exit thermocouple readings are available in the Control Room prior to entering and during reduced RCS inventory operations. In addition, the feasibility of providing variable setpoint alarms (e.g., a step change or a gradual change in core exit temperature from the steady state conditions) will be investigated.	The completed actions are the same as for Expeditionary Action Number 3. In addition, an engineering study on the feasibility of providing variable setpoint alarms for the core exit temperature was evaluated by Operations. It was concluded that the addition of variable setpoints alarms for the core exit temperature was not necessary since the recording and logging of core exit temperature is procedurally controlled by Dr-OP-06002 to adequately meet the concerns of GL 88-17.	Prior to 7RFO (starting 08/31/91)
c. <u>DMR System Monitoring.</u>	The feasibility of providing Control Room personnel with trending information on decay heat pump motor current during reduced RCS inventory operations is being investigated. These investigations include creation of CRT display screens to aid Control Room personnel in monitoring required instrumentation and equipment performance.	An engineering study on the feasibility of providing Control Room personnel with Decay Heat Pump motor current trending during reduced inventory operations (with fuel in the reactor vessel), as well as providing a display to aid Control Room personnel in monitoring system instrumentation and performance, was evaluated by Operations. The engineering recommendations were dispositioned and the following actions were taken:	Prior to 7RFO (starting 08/31/91)

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II. Programmed Enhancements

GL ITEM	PENDING ACTIONS AS REQUIRED BY RESPONSES	COMPLETED ACTIONS	COMPLETION DATE
		1. A new DHR display for the Safety Parameter Display System (SPDS) was developed for the 7RFO reduced inventory operations to provide status indication for Control Room operators of key DHR system valves and process parameters and to provide alarm functions for major parameters during reduced inventory operations.	Prior to 7RFO reduced inventory conditions (starting 09/11/91)
		2. Procedure DB-OP-06002 was revised to require Control Room monitoring and hourly recording of key parameters associated with the DHR system (i.e., running DH pump current/suction temperature/flow and incore thermocouple temperatures) during reduced inventory operations. The procedure also requires the RCS level to be recorded hourly in the Control Room or once every 15 minutes if the RCS level is monitored locally.	Prior to 7RFO (starting 08/31/91)
d. <u>Alarms.</u>	The decay heat flow annunciator alarm set points will be adjusted to provide alarm functions during reduced RCS inventory operations.	Procedure DB-OP-06002 was changed to provide steps to verify that the DER low flow and high flow annunciator alarms, RCS Hot Leg	Prior to 7RFO (starting on 08/31/91)



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	<p>The available alarms and their effectiveness in indicating an approach to a loss of decay heat removal (DHR) will be reviewed. If this review indicates that additional alarms are required to adequately detect and/or mitigate the loss of DHR condition, additional alarms will be provided.</p>	<p>Level annunciator alarms, and DHR Cooler outlet temperature annunciator alarms were adjusted to provide appropriate warning during reduced inventory operations. The DHR pump flow annunciator is also interlocked with the pump breaker so that the annunciator is off when the pump breaker is open. If the pump breaker were to open while on DHR, the low flow annunciator would not be received. To ensure that the alarm would be received, especially while at low RCS water levels, procedure DB-OP-06903 (Plant Shutdown and Cooldown) was changed to defeat the pump breaker interlock logic while the plant is being cooled down.</p>	<p>Prior to 7RFO (starting on 08/31/91)</p>
2) Procedure.	<p>a) Plant procedures will specify the minimum equipment that is required to be operable prior to entry into reduced RCS inventory operations, and requirements for support systems, electrical power supplies, instrumentation and containment closure. Plant administrative procedures will specify any administrative controls (e.g., required number of operation personnel) that may</p>	<p>When entry into reduced inventory conditions (with irradiated fuel in the reactor vessel) are required for maintenance activities, the sections of procedure DB-OP-06002 that address these activities include:</p> <p>a. Steps specifically related to the equipment batch, containment penetrations, and the personnel and emergency air-</p>	

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	be necessary to support reduced RCS inventory operations.	lock access hatches to ensure minimum containment closure and control requirements (see Expeditious Action Number 2).	
		b. Necessary prerequisite, pre- cautions and entry steps for reduced inventory operations.	
		c. Avoidance of perturbations while in a reduced RCS in- ventory condition (See Programmed Enhancement Number 3).	
		d. Means to add water inventory to the RCS to provide long- term cooling if normal DHR systems become inoperative during reduced inventory operations (see Programmed Enhancement Number 3).	
		e. Removal of at least one 16-inch diameter Steam Gener- ator upper primary manway cover for venting as a pre- requisite for entry into a reduced inventory condition.	
		f. Establishment of a RCS open- ing greater than 12-inches in diameter as part of the availability of BWST gravity	

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feed or the CWRT transfer  
pumps flow path as an alter-  
nate means to add water the  
RCS.

NOTE

Although maintenance for the replacement/removal of the cold leg temperature well is accomplished at a reduced RCS inventory water level, the implementation of the responses to GL 88-17 is not necessary since procedure DB-OP-06002 presently requires core removal from the reactor vessel for this maintenance activity.

- b) Plant procedures will provide guidance on actions to be taken if abnormal conditions develop. The guidance developed will take into account various symptoms associated with an approach to a loss of DHR including the conditions identified in section 3.2.2.1 of Enclosure 2 to GL 88-17.

Procedure D2-OP-02527 provides guidance for operators to mitigate a loss of DHR, address both the time to boil and the time to core uncover, provides for containment evacuation and closure, and addresses the use of the alternate methods of cooling the reactor in the event normal Decay Heat Removal cooling can not be recovered. This procedure also addresses the symptoms associated with an approach to a loss of DHR due to a loss of flow path, loss of a DHR pump, and a loss of inventory (e.g., rising RCS temperature, rising RCS pressure, no DHR flow, dropping RCS levels, erratic DHR pump current, up-scale indication on local radia-

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		tation monitors, along with computer and annunciator alarms).	
3) <u>Equipment</u>			
a.	In addition to Technical Specification requirements, plant procedures would specify the additional equipment that is needed to be maintained available to provide cooling water to the RCS and to prevent a loss of DHR capability.	See Programmed Enhancement 3.b.	Prior to 7RFO (starting on 08/31/91)
b.	Any two of the following six means of adding water to the RCS will be available during reduced RCS inventory operations: <ul style="list-style-type: none"> <li>o High Pressure Injection (HPI) Pump 1-1</li> <li>o High Pressure Injection (HPI) Pump 1-2</li> <li>o Makeup (MU) Pump 1-1</li> <li>o Makeup (MU) Pump 1-2</li> <li>o Gravity flow path from the BWST</li> <li>o Clean Waste Receiver Tank (CWRT) flow path and transfer pump</li> </ul> <p>Plant procedures will define the pumps that are needed to remove decay heat based on the analyses performed.</p>	Procedure DB-OP-06002 requires various pumps to be available prior to entering a reduced inventory conditions (reference Expeditionous Action Number 6). All of these listed pumps, as well as the BWST gravity feed, are capable of delivering adequate flow to the RCS. (reference Programmed Enhancement Number 4). The 12-inch diameter RCS vent path (required for the availability of the BWST gravity feed flow path and the CWRT pump flow path) provides sufficient flow capacity to prevent the RCS from pressurizing above the pressure/temperature limits of the RCS.	Prior to 7RFO (starting on 08/31/91)

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c.	None (The plant communication systems are discussed in USAR Section 9.5.2.)	No further action is necessary: adequate communication equipment existed.	Not applicable
4) <u>Analyses.</u>	The B&W Owners Group has been funded to develop required analyses to support the basis for procedural guidance. These analyses will consider the thermodynamic behavior of the PCS during reduced inventory operations. These analyses will determine the vent area in the RCS required for gravity feed to be effective. Additionally, analyses will be performed to support the procedural requirements for containment integrity.	<p>B&amp;W completed the analysis of gravity feeding the RCS from the BWST and the vent size needed to maintain BWST gravity feed. Procedure DB-OP-06002 was revised to require the removal of at least one 16-inch diameter Steam Generator upper primary manway cover to provide a vent path prior to entry into reduced inventory conditions (with fuel in the reactor vessel). This vent path was shown to be an adequate size in the B&amp;W analysis, and the calculation for the analysis included a range of flow resistances between the RCS and the containment which would bound the values expected at any plant.</p> <p>Procedures DB-OP-06002 also requires various pumps to be available prior to entering reduced inventory conditions (reference Programmed Enhancement Number 3.b). All of these listed pumps, as well as, the BWST gravity feed, are capable of delivering adequate flow to the RCS. The 12-inch diameter RCS vent path</p>	Prior to 7RFO (starting on 8/31/91)



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		(required for the availability of the BWST gravity flow path or the CWRT pump flow path) provides sufficient flow capacity to prevent the RCS from pressurizing above the pressure/temperature limits of the RCS. This is based on the comparison to the 4-inch diameter vent provided by the Decay Heat Removal drop-line relief valve DH-4849, which can limit RCS pressure at its lift pressure with two HPI pumps injecting water into the RCS.	
		The B&W analysis also included calculations of the time required for the RCS to heatup to 212°F and subsequently boil the water level down to the top of the core after a loss of DHR. Procedure DE-OP-02527 addresses the time to boil and the subsequent time for the water level to boil down to the top of the core after a loss of DHR event.	
		Toledo Edison also completed a calculation regarding containment pressurization following a loss of DHR. The results of this calculation indicated that, with a Containment Air Cooler avail-	



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		able, the containment pressure will stabilize at approximately 6 psig after seven hours. At this pressure, all but seven feet of the BWST can still be gravity fed to the RCS from BWST. Significant leakage of radioactive contamination to the environment is not expected to occur at this pressure. Procedures DB-OP-06002 and DB-OP-02527 were changed to address the availability and the means for cooling the containment atmosphere.	
5) <u>Technical Specifications.</u>	A preliminary review of Davis-Besse Technical Specifications has indicated that changes to Technical Specification 3.4.2 (RCS Safety Valves - Shutdown) may be required. This Technical Specification requires both HPI pumps and automatic transfer of makeup pump suction to the BWST be disabled if relief valve DH-4849 is not operable. This equipment is to provide low temperature overpressure protection of the RCS. However, if an equivalent vent opening in the	A review of the Davis-Besse Technical Specifications (TS) for their impact on the responses to the programmed enhancements of GL 88-17 was performed by Toledo Edison.  It was determined that TS changes were not necessary. The procedure requirements for the availability and use of the means of adding water to the RCS, in addition to the DHR pumps, were found to be sufficient alternatives to placing new	Prior to 7RFO (starting on 08/31/91)

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	<p>RCS is available, this Technical Specification requirement is not necessary for reduced inventory operations.</p> <p>Other applicable Technical Specification sections will be reviewed and appropriate changes will be submitted in an expeditious manner.</p>	<p>requirements in TSs for reduced inventory operations.</p> <p>The effectiveness of RCS openings for venting was analyzed by Toledo Edison (see Programmed Enhancement Number 4). Procedure DB-OP-06002 presently requires the establishment of a RCS opening greater than 12-inches in diameter as part of the availability of BWST gravity feed or the CWRT transfer pump flow path as alternative means to add water to the RCS for reduced inventory operations. As a prerequisite for reduced inventory operations, the procedure also requires the removal of at least one 16-inch diameter Steam Generator upper primary manway cover for venting.</p>	
6) <u>RCS</u> <u>Perturbations.</u>	<p>The expeditious actions cited in Item 5 of Serial Number 1623 will be re-examined during procedural development to ensure these actions have been completely addressed, and operations will be refined based on this re-examination to reasonably minimize the possibility of loss of DHR events. Additional refinements will be included in procedures to mitigate the possibil-</p>	<p>Item (5) of the expeditious actions was re-examined and operations were refined. Procedure DB-OP-06002 was revised to specifically require the permission of the DB Operations Manager prior to activities (i.e., swapping DH loops, electrical loads, or testing) that may lead to perturbations of the RCS and/or to systems that are necessary to maintain the RCS in</p>	<p>Prior to 7RFO  Reduced Inventory Operations  (starting  09/11/91)</p>

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	ity of a loss of DHR as further industry experience and analyses are available and are assessed.	a stable and controlled condition while the RCS is in a reduced inventory condition.  If the above evolutions are allowed, procedure DB-OP-06002 also requires the Operations Superintendent to provide pre- cautions and guidance to avoid a loss of DHR and to ensure a timely response if a loss of DHR occurs. An Outage Policy for the 7RFO also required the Operations Superintendent to provide con- tingencies and guidance for per- forming these evolutions.	