August 30, 1991

MEMORANDUM FOR: Charles W. Hehl, Director
Division of Reactor Projects

FROM: Curtis J. Cowgill, Chief
Reactor Projects Branch No.1

SUBJECT: NINE MILE POINT UNIT 2 RESTART/POST-RESTART INSPECTION PLAN

As a result of incident inspection activities (AIT and IIT) and discussions with the involved staff, a team inspection will be conducted to support an NRC restart decision. This team will focus on assessment in the following areas:

-- Personnel Performance
-- Effectiveness of the Maintenance Program
-- Organizational Effectiveness

The inspection team will be led by Mr. James Beall, I will be the team manager. The team membership and inspection plan are provided as Enclosure 1.

The specific issues developed as a result of the AIT and IIT dispatched following the August 13, 1991 event have been broken down into two basic groups, restart and post-restart. The restart issues were further broken down into three sub-groups; equipment issues, personnel performance issues and management issues. These issues are listed in the Enclosure 2, with suggested inspection activities to address the specific issues.

Further, augmented resident coverage of the plant startup subsequent to a restart decision is planned. This will consist of observations of operator and management performance, and physical walkdowns of safety system.

The post-restart issues listed in the Enclosure 3 will be discussed with NMPC and tracked by normal resident staff coverage.

Curtis J. Cowgill, Chief
Reactor Projects Branch No. 1

Enclosures: As stated

cc w/encls:
J. Beall, SRI - Beaver Valley
J. Menning, NRR
J. Yerokun, DRP
R. Bahtia, DRS
C. Gordon, DRSS
R. Temps, RI - Nine Mile Point

ENCLOSURE 1

NINE MILE POINT RESTART TEAM

Team Manager	C. Cowgill
Team Leader	J. Beall
Members:	J. Menning
	J. Yerokun
	R. Bahtia
	C. Gordon
	R. Temps

INSPECTION PLAN

1. Personnel Performance

   a. Review of licensee's event critique and planned corrective actions.

2. Maintenance Program Effectiveness

   a. Review the licensee's UPS modifications and post-modification testing to confirm the causes of their failures are appropriately resolved.

   b. Review of root causes and corrective actions taken to address equipment problems identified during the event in the following components/systems:

      -- Feed water
      -- RCIC
      -- RHR (water hammer)
      -- RWCU (water hammer)

      This should include a review of previous maintenance history.

   c. Confirmation of licensee actions taken to prepare the new main transformer for service.

   d. Review of selected vendor manuals for safety-related and important to safety equipment to ensure that the required preventive maintenance is being conducted (to include the transformer and the UPS).

   e. Review of outstanding preventive maintenance activities to ensure proper tracking and prioritization.

3. Organizational Effectiveness

a. Review of licensee actions taken in response to the SAE declaration and corrective actions identified during the subsequent post event investigation.

b. Review of how previously identified problems (essential lighting, RCIC oscillation, and UPS problems) were identified, prioritized and tracked.

c. Review of licensee's emergency response critique and planned corrective actions.

ENCLOSURE 2

RESTART ISSUES

EQUIPMENT ISSUES:

1. UPS

A. ISSUE: Five non-safety related UPS cabinets did not transfer to DC power and tripped following the main transformer phase B fault to ground.

INFORMATION: Preliminary information suggests that the failures were caused by a poor selection of feeder AC for the internal DC control power supply and by batteries in the control power supply that had been depleted. The modifications being performed by NMPC to correct the logic power design error may be satisfactory to address the issue, provided that testing proved the acceptability of the modification. NMPC during the August 28 meeting stated that they were confident that the modification would correct the problem, but were still reviewing to determine the root cause. NMPC understands that the root cause will have to be addressed prior to restart.

INSPECTION ACTIVITIES:

-- Review the NMPC root cause determination.

-- Review modification for acceptability to correct the tentative root cause. Further, review how NMPC has addressed any generic implications to other UPSs at both Units 1 and 2.

-- Following NRC determination of the causes of the failures, confirm appropriate modifications are performed.

-- Review post-modification testing to ensure that it demonstrates it performs its intended function under a variety of upset conditions.

B. The preventive maintenance program for the UPSs did not include the replacement of the batteries in the DC logic circuit.

INFORMATION: Had NMPC replaced the batteries, there may have been no loss of the UPSs. The replacement was specified in the UPS technical manual. NMPC stated during the August 28 meeting that they had not completed the root cause analysis. However they stated that the requirements in the preventive maintenance section of the manual were being followed. Further, the system engineer believed, based on statements in the Operations section of the vendor's manual, that the logic power supply was powered from the UPS output not from the maintenance supply. NMPC stated that if the manual was

correct there would have been no UPS loss since the UPS output would not have seen the phase B transient.

The NMPC system engineer was reviewing industry event data and had taken actions to upgrade the PM program on the units.

INSPECTION ACTIVITIES:

-- Review UPS preventive maintenance program. Determine if the program was within the scope of the vendor manual recommendations.

-- Review the planned upgrade to the UPS PM program to determine what information the system engineer had.

-- Determine if the system engineer had fully reviewed the vendor manual in accordance with NMPC's PM program procedures.

2. Reactor Water Cleanup Issues

ISSUE: Operators reported hearing water hammer during restoration of the RWCU system to operation. Further the system isolated on high delta flow during restoration to service.

INFORMATION: RWCU was isolated by the operators as part of the scram recovery procedure. Following the scram as directed by the EOPs the operator proceeded to place RWCU in operation to allow a path to control (drain) reactor vessel level. On a normal scram the operators isolate RWCU and leave it isolated until the unit is cooled down. When placing the system in operation operators reported hearing noises (water hammer). NMPC has walked down the system and found no damage. Further, they believe that the water hammer was caused by having the drain valve open when returning the system to operation allowing the warm water in the piping to flash because of the flow path to the condenser, where a vacuum was still being maintained. NMPC was planning procedure changes to address the hot restart of the system.

INSPECTION ACTIVITIES:

-- Walkdown the RWCU system, looking for damaged pipe support and piping.

-- Review NMPC's root cause determination and their procedure change to address the hot restart of the system with condenser vacuum.

3. **Residual Heat Removal System**

ISSUES: While preparing to startup RHR in shutdown cooling there were reports of water hammer in the system. There were problems with the system drain valve operation from the control room.

INFORMATION: NMPC has completed system walkdowns and found no damage. NMPC stated that they believe that the situation was normal heatup noises during system warmup by draining to the condenser.

INSPECTION ACTIVITIES:

-- Walkdown the RHR system looking for damaged piping and pipe supports.

-- Review the shutdown cooling procedure and discuss the procedure with operators to determine if the noises heard were normal.

-- Review the operators actions following identification of the valve problem.

4. **Reactor Core Isolation Cooling**

ISSUES:

A. When the RCIC system was started in the automatic flow control mode, by operators, to restore vessel level an oscillatory response was observed and operator took manual speed control.

INFORMATION: NMPC had problems with oscillatory responses during surveillance testing prior to the event. This system response indicates that the flow and speed controllers were fighting each other in the automatic mode of operation. NMPC is aware of this problem and was taking actions to correct it including: I&C troubleshooting of the controllers and review of startup testing requirements to demonstrate system operability.

INSPECTION ACTIVITIES:

-- Determine if NMPC properly handled the knowledge that the system was producing an oscillatory response during previous surveillance testing.

-- Review I&C troubleshooting.

-- Review the planned system startup testing.

B. Problems were observed with the RCIC injection testable check valves.

INFORMATION: AOV-157 (inboard) did not indicated open during the injection and AOV-156 (outboard) appeared to hang open following the injection. NMPC stated that they have repaired limit switch problems on both valves. Further they needed to disassemble AOV-157 to determine why it would not stroke open following testing. NMPC determined that the valve was vacuum locked and could not be opened using the normal air operator. In order to test the valve NMPC needed to break flanges at the vessel head. This will require a vessel hydro to retest these connections.

INSPECTION ACTIVITIES:

-- Review work packages on both valves.

-- Review prior work history on valve limit switches.

-- Review the hydrostatic test procedure.

5. Feed Water System

ISSUE: Operators were hampered in their efforts to use the condensate booster pumps to maintain vessel level during cooldown by feedpump suction valves that could not be opened.

INFORMATION: Following the loss of the UPS power supplies the feed system underwent a transient because of loss of control power. The feed control valves failed as is and the condensate booster pump and feedpump minimum flow valves opened. This caused the feedpumps to trip on low suction pressure as expected. Once power was restored the minimum flow valves went shut, as RCIC lowered vessel pressure to below the condensate booster pump shutoff head these pumps began injection through the normal flow path. Operators tripped the booster pumps before reactor vessel level 8 was reached. As reactor vessel level slowly decreased operators desired to start the condensate booster pumps and feed the vessel on the low flow control valves. To start the booster pumps the procedure required that the feedpump suction valves be shut to prevent a pressure transient on the feedpump suction piping. Operators closed these valves and started the condensate booster pumps. The next step was to open bypass valves around the feedpump suction valves to minimize differential pressure prior to opening the valves. Operators could not get out into the plant to open these locally operated valves because of unknown radiological conditions. The operators then tried to open the feedpump suction valves without opening the bypasses and the valve did not open. Operators achieved a flow path through the startup valve to the reactor vessel and adequately controlled level.

NMPC has reviewed the history on the feedpump suction valves. These 24" Clow butterfly valves had their internals replaced during the first refueling outage. Because these valve rotate open NMPC was unable to perform normal MOV post-maintenance testing on the valves. The torque needed to over come 1050 psid was determined by manufacture testing and the limitorque operator set to provide that torque. Torque switch setpoint were verified as acceptable by NMPC following the failure to open. NMPC did identify potentially loose operator to valve body bolting. This could cause the limitorque operator to move to one side during operation possibly causing binding.

NMPC continues to investigate this issue. At the August 28 meeting NMPC was asked to determine if any maintenance problems caused this event. If so what are the implications on other plant system.

NMPC stated that they were reviewing procedural changes to prevent the need for opening locally operated valves during a transient recovery.

INSPECTION ACTIVITIES:

-- Review NMPC's determination of root cause and implication on other systems.

-- Review post-maintenance testing.

-- Review any applicable procedure changes.

6. Emergency Operating Procedures

A. ISSUE: Have systems/components utilized as a result of EOP entry been verified back to normal standby conditions.

INFORMATION: The EOPs require that jumpers be installed to bypass scram signals to allow a reactor scram to be reset and reinsertion if control rods do not indicate full in. Following the reactor scram there was no indication of control rod position since the full core display, the rod control system and rod worth minimizer and the CRD reed switches were deenergized. Once power was restored there was indication that six rods were not fully inserted. Operators proceeded to install the jumper and reset the scram. Once the scram was rest the rod settled to their 00 position indicating that the rods had over-traveled.

The method of controlling the jumper, to ensure its proper installation and removal, is in question.

At the August 28 meeting NMPC was asked to review the EOPs for other instances of equipment being taken out of its normal standby line up and to verify proper restoration.

INSPECTION ACTIVITIES:

-- Review RPS jumper instructions and installation procedures to see if they meet normal temporary modification controls.

-- Review NMPC's actions on review of EOPs for other equipment status issues.

7. Main Transformer

ISSUE: NMPC needed to replace the faulted transformer with an installed spare to support startup.

INFORMATION: NMPC replaced the phase B transformer with the installed spare D transformer. The root cause for the failure of the B will not be completed before restart. A review of NMPC actions taken before the fault to determine normal transformer performance did not identify any indications that would have revealed the upcoming failure. Following installation NMPC performed a minimum 24 hour backfeed of the transformer to soak the newly installed unit.

INSPECTION ACTIVITIES:

-- Confirmations of completion of actions needed to place the new transformer in service.

PERSONNEL PERFORMANCE ISSUES

1. Operator Training

ISSUE: The operator should receive training on lessons learned from this event.

INFORMATION: The operators appeared to perform well during the event. They had not receive specific training on the loss of all annunciators or specifically what loads came off of what UPS. Operators had not received specific training on the operation of the UPSs, however the system engineer had given individual training on their operation. Operating procedures did not reflect the effects on a system operation if a UPS was lost.

INSPECTION ACTIVITIES:

-- Review the training provided to the operators on the issues discussed above.

-- Ensure that operating procedures for equipment effected by the loss of a UPS reflect compensatory actions that operator need to take on a loss of UPS. Include review of effects on stack gas monitor and other non-safety, but technical specification, monitors.

2. **Missed Suppression Pool to Drywell Vacuum Breaker Surveillance Test**

INFORMATION: Following the reactor scram two SRVs lifted as expected before the bypass valves opened. The chart recorder for SRV tailpipe temperature was not functioning because it had lost power. It took operators several hour to confirm that SRVs had lifted by monitoring the slope of the tailpipe cooldown following restoration of tailpipe recorder power. Further, the operators did not conduct the cycling of the suppression pool to drywell vacuum breakers as required by technical specifications within four hours.

INSPECTION ACTIVITIES:

-- Review changes to scram procedure to ensure that the cycling of vacuum breaker is not missed again.

EVENT MANAGEMENT ISSUES

1. ISSUE: NMPC should review their response to the event and make changes necessary.

A. Notifications of the event were not made in the required sequence.

B. There was no contingency for persons without a green card to cross checkpoints in a timely manner to respond to the site.

C. Accountability took 2 1/2 hours vice 30 min.

INFORMATION: NMPC has committed to perform an evaluation of this activity and to discuss the results with NRC prior to restart.

INSPECTION ACTIVITIES:

-- Review the NMPC evaluation to correct the above problems and any others of significance to restart that they might identify.

ENCLOSURE 3

POST STARTUP ISSUES

1. UPS Power Supply Load Lists

   ISSUE: NMPC did not have predetermined load list for the UPSs.

2. Control Rod Position Indications

   ISSUE: The CRD position indication would be lost if the UPS which supplies power to the reed switches is lost. Is this a generic issue and should they be powered off a 1E source.

3. Essential Lighting

   ISSUE: Essential lighting was lost because of a the UPS failure and 8-hour battery lighting did not function to provide light because of a design flaw in its power sensing system. NMPC knew of the problem and has a modification planned to correct it.

4. Loss of All Control Room Annunciators

   ISSUE: Operator training on this issue should be incorporated in to the requalification program and the simulator should be able to model it.

5. Emergency Plan Issues

ATTACHMENT 2

Persons Contacted

* B. Sylvia, Executive Vice President, Nuclear
* J. Firlit, Vice President, Nuclear Generation
* J. Perry, Vice President, Quality Assurance
  S. Wilczek, Jr., Vice President, Nuclear Support
* C. Terry, Vice President, Nuclear Engineering
* M. McCormick, Jr., Plant Manager, Unit 2
* R. Abbot, Engineering Manager, Unit 2
  D. Hosmer, Manager, Unit 2 Outage Work Control
  K. Coates, Manager, Unit 2 Maintenance
  M. Colomb, Manager, Unit 2 Operations
  D. Greene, Manager, Licensing
  C. Beckman, Manager, Operations Quality Assurance
  A. Salemi, Director, Emergency Preparedness
  J. Spadafore, Director, Independent Safety Evaluation Group
  J. Helker, Unit 2 Operations Department Supervisor
  R. Crandall, System Engineer
  E. Tomlinson, Lead Reactor Analyst
  M. Conway, Station Shift Supervisor

* Denotes those present at the September 16, 1991 Exit Meeting.