ATTACHMENT #1

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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Docket No. 50-286

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MEMORANDUM FOR: E. L. Jordan, Deputy Director
Division of Resident and
Regional Reactor Inspection, IE

FROM: H. W. Woods, Reactor Systems Specialist, Events Evaluation Section, Reactor Engineering Branch, DRRRI, IE

SUBJECT: RESTART OF INDIAN POINT UNIT 3 SUBSEQUENT TO THE INDIAN POINT UNIT 2 CONTAINMENT FLOODING EVENT DISCOVERED OCTOBER 17, 1980

I. Description of Event

a. Chronology

The detailed sequence of events at IP-2 is under investigation by the IE staff now at the site (the Resident Inspectors and Region I staff). It will be published separately as soon as the investigation is complete.

Preliminary chronologies have been published in IE Information Notice 80-37 (October 24, 1980) and Press Release Number I-80-149 (October 27, 1980) (both enclosed).

b. Actual Consequences

Brackish water reached a depth of about 4" on the containment floor and filled the reactor cavity to a depth of about 9 feet above the bottom of the pressure vessel.

This raised the possibility of damage to the reactor pressure vessel from thermal stresses. Extensive calculations (hand and computer) were performed by the licensee indicating that cracking would not be produced from the event. Additionally, inspection of the vessel by "mag particle" methods has verified the lack of cracking.

The possibility also existed of chloride-induced cracking in the stainless steel conduits and instrument thimbles below the reactor vessel due to the brackish water. Detailed inspection of those components showed that no such damage has occurred.

No safety-related electrical equipment is located where it would have been wetted during this event.

c. Potential Consequences

Since containment design pressure is greater than normal service water pressure inside the containment fan coolers, any holes in the service water system in the containment (such as those which caused this event) would present a potential post-LOCA release path from containment.

Also, any such leakage could cause boron dilution in the recirculation water (long-term cooling) inventory inside containment following a LOCA. This would contribute to a recriticality (restart) event.

In addition, leakage from the fan coolers could cause the necessity for isolation of one or more coolers, which would degrade the post-LOCA ability to cool the containment.

II. Cause of Event

The most significant of the multiple causes of the event were:

1. The history of service water leakage from the containment fan coolers, culminating in the leaks which caused this event.

2. The failure of both vapor containment sump pumps, one due to tripped circuit breakers and the other due to a stuck float (the rod connecting the float to the sump starter lever was caught in the grating on top of the sump.)

3. The lack of any external (to containment) direct indication that the sump pumps were not operating.

4. The failure of the operators to observe decreased flow to the waste holdup tanks (WHUT)(due to failure of the sump pumps). This effect was masked by the fact that other water flows into the WHUTS (laboratory drain water, etc).

5. The failure of the operators to act upon the sump level instrument columns which were indicating water in the sump (the indicated level was within the normal range but it was not normal for the indicated level to exist constantly for several days as was the case during this event).

III. Corrective Action

A. Short Term

The above-described event occurred at Indian Point Unit 2 (IP-2). However, since Indian Point Unit 3 (IP-3) is a nearly identical design,

and since IP-3 was shutdown for maintenance and inspection at the time of the IP-2 incident, it is necessary to determine if features exist at IP-3 which would preclude "IP-2" type events. Those features are discussed below.

1. The maintenance history on the containment fan coolers is significantly better at IP-3 compared to IP-2; therefore, major leakage inside containment is much less likely to occur. Although the better condition is probably largely because IP-3 fan coolers are newer, at the present time the fact is they are in significantly better condition and are expected to remain so during the upcoming cycle.

   At IP-3, there have been no leaks in the piping associated with the fan coolers (such as the main contributing leak to the IP-2 event in a 10" service water return pipe). IP-3 has replaced five motor cooler units in their history after experiencing leakages up to approximately 2 gpm maximum from those units.

   Also, there are no "episeal" or "adams clamp" patches on the IP-3 coolers (there are numerous patches of both types on IP-2, some of which have had to be re-repaired). IP-3 has used "hard" solder (90/5/5) to build up a patch over several small leaks. Those patches, while not considered permanent, have proven more satisfactory than the IP-2 method.

   Finally, the fan-cooler service water isolation valves at IP-3 have all been rebuilt even though no recent problems have been experienced, and each fan cooler unit has passed the Technical Specification required 0.36 gpm/cooler leak rate test (this includes all valves, coils, pipes, etc., not just the isolation valves).

2. There are more indications in the control room of the sump levels in containment than there were at IP-2.

   a. The sump pump on/off levels of the vapor containment (VC) sump are adjusted so that five level lights (three on one column and two on another column) will turn on before water spills onto the 46' elevation floor (as opposed to four at IP-2). Since two are normally on even after the sump pumps have pumped the sump at each plant (the lowest 2 lights) that means 3 additional lights will come on at IP-3 as opposed to 2 at IP-2, before water spills onto the 46' elevation floor.

   b. A new capacitive detector device will detect approximately 1" of water on the 46' floor, with an audible control room alarm.

At IP-3, the recirculation sump is normally kept dry so that increasing levels in containment will also be detected by the two additional level indicating columns in that sump before water could flow into the reactor cavity (at IP-2, the recirculation sump is kept full of borated water, thereby negating usefulness of these indicators).

One of the two level indicating columns in each sump must be operable by Technical Specifications for continued plant operation.

3. Several features are present in the reactor cavity to prevent and detect collection of water there.

   a. Two new pumps have been installed which will not operate in such a way as to be subject to trips on thermal overload, as might have been the case with the previous pumps. The pumps have been installed with a "siphon breaker" (3/4" vacuum relief line in the discharge loop above the 46' floor, where it will discharge into the VC sump).

   b. A column has been installed in the cavity that will activate two independent audible alarms in the control room when approximately 1" and approximately 3" of water respectively are in the bottom of the cavity.

   c. A search has been conducted for other siphon paths into the reactor cavity, resulting in sealing of one conduit connection on the 46' floor which represented a potential siphon path.

   d. Two unlabeled lights inside containment that were incorrectly assumed to indicate cavity pump operation (when on) at IP-2 have been properly labeled at IP-3 (they do indicate cavity pump operation at IP-3, unlike IP-2 where they indicate moisture in the cavity).

   e. The 46' floor has been "surveyed" using a water-filled tygon hose, with the result that water depth on the 46' floor at the sump before water would flow into the cavity would be approximately 5-1/2" (compared to variously reported 2" to 4" at IP-2 due to a reverse slope in the IP-2 46' floor).

4. In addition to Technical Specification requirements already mentioned (0.36 gpm leakage/fan cooler, one float column operable/sump) several plant requirements, some with calibration procedures, exist for equipment important for detection/prevention of "IP-2" type events.

a. Level switches and the capacitive level indicator must be calibrated by procedure each refueling outage.

b. Dew point detectors and weir level (containment fan cooler condensate and/or leakage flow detector) must be calibrated every two years.

c. Plant procedures require each shift recording and supervisory review of trends on the rotometer flow meter/totalizer installed on the line from the VC sumps to tanks outside containment. Changes in that flow would signal leaks in containment (by an increase) or the possibility of pump failure (by a decrease).

B. Long Term

With the above noted exceptions, many of the preventative and mitigative features described above are not defined as "safety-related" and/or they do not have formal operability requirements.

However, IP-3 personnel have been "tuned" to look for this type of event by IE Information Notice 80-37 concerning the IP-2 event, and by extensive discussion with NRC personnel. We are convinced that in the near term, a flooding event at IP-3 is unlikely, and that if it did happen it would be promptly detected and corrected long before consequences become as severe as they did at IP-2.

The NRC is considering the desirability of requiring upgrading of certain equipment to safety-related status and/or imposition of operability requirements and implementation of formal operating and/or emergency procedures, etc. for plants having non-closed cooling systems in containment. In the near future a Bulletin will be issued dealing with those issues.

IV. Evaluation

We believe adequate features exist as described above so that in the near term, occurrence of an IP-2 type flooding event with lack of early detection is precluded.

V. Recommendation

We recommend that after the Resident Inspectors have verified existence of the equipment/Technical Specifications/Procedures described above, that

IP-3 be allowed to return to power operation pending long term actions to be determined as described in Section III B above.

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Enclosures:
1. Information Notice No. 80-37
2. Press Release No. I-80-149

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

October 24, 1980

IE Information Notice No. 80-37: CONTAINMENT COOLER LEAKS AND REACTOR CAVITY FLOODING AT INDIAN POINT UNIT 2

Discription of Circumstances:

This Notice contains information regarding multiple service water leaks into containment with resulting damage to reactor instrumentation and potential damage to the reactor pressure vessel.

Upon containment entry on October 17, 1980 at Indian Point Unit 2, to repair a malfunctioning power range nuclear detector, it was discovered that a significant amount of water was collected (approximately 100,000 gal) on the containment floor, in the containment sumps, and in the cavity under the reactor pressure vessel (RPV). This collected water probably caused the detector malfunction, and the water in the cavity under the RPV is believed to have been deep enough to wet several feet of the pressure vessel lower head, causing an unanalyzed thermal stress condition of potential safety significance.

This condition resulted from the following combination of conditions: (1) Both containment sump pumps were inoperable, one due to blown fuses from an unknown cause and the other due to binding of its controlling float; (2) The two containment sump level indicating lights which would indicate increasing water level over the water level range present in the containment were stuck (on) and may have been for several days. leaving the operator with no operable instrumentation to measure water level in the containment; (3) The moisture level indicators in the containment did not indicate high moisture levels, apparently because they are designed to detect pressurized hot water or steam leaks (i.e., a LOCA), and are not sensitive to the lower airborne moisture levels resulting from relatively small cold water leaks; (4) The hold-up tanks which ultimately receive water pumped from the containment sump also receive Unit 1. process water, lab drain water, etc. These other water sources masked the effect of cessation of water flows from the Unit 2 sump; (5) There were significant, multiple service water leaks from the containment fan cooling units directly onto the containment floor. These coolers have a history of such leakage, which cannot be detected by supply inventory losses since the supply system (service water system) is not a closed system; (6) The two submersible pumps in the cavity under the Reactor Pressure Vessel were ineffective since they pump onto the containment floor for ultimate removal by the (inoperable) containment sump pumps. There is no water level instrumentation in the cavity under the RPV, nor was there any indication outside the containment when these pumps are running.

The licensee has installed redundant sump level annunciated alarms in the control room and has installed an annunciated alarm in the control room to indicate if either submersible pump in the reactor cavity activates. The licensee has also repaired the service water leaks, installed guide bushings on the sump pump control floats to prevent their binding, and has repaired the containment sump water level indicators.

The licensee plans in the longer term to replace the containment fan unit cooling coils.

It is anticipated that results of a continuing NRC investigation into this incident will result in issuance of an IE Bulletin and/or an NRR Generic Letter in the near future which will recommend or require specific licensees and applicant actions. In the interim, we recommend that all licensee ascertain that the potential does not exist for undetected water accumulation in the containment.

This Information Notice is provided to inform licensees of a possibly significat matter. No written response to this Information Notice is required.