AEOD TECHNICAL REVIEW REPORT*

UNIT: Pilgrim 1
DOCKET: 50-293
LICENSEE: Boston Edison Company
NSSS/AE: General Electric/Bechtel

TR REPORT NO.: AEOD/T307
DATE: April 19, 1983
EVALUATOR/CONTACT: J. Pellet

SUBJECT: CONDENSATE DEMINERALIZER RESIN MIGRATION THROUGH THE PLANT VENT AND THE STANDBY GAS TREATMENT SYSTEM

EVENT DATE: June 11, 1982

SUMMARY

This report reviews the safety significance of the June 1982 discovery at Pilgrim that demineralizer resins had migrated throughout the plant contaminated exhaust vent to external plant areas inside the protected area fencing. Also, sufficient resin had migrated through the reactor building ventilation system to block proper operation of the Standby Gas Treatment System (SBGTS). References are cited which show that resin migration into the ventilation system and SBGTS had occurred at least three years previously. This report finds that the event was of minimal safety significance and concludes that current NRC efforts are adequate without additional AEOD involvement.

DISCUSSION

Plant & Status

Pilgrim 1 was in steady state power operation on June 11, 1982 while performing a surveillance instruction (SI) on the SBGTS.

Occurrence-Cause & Effect [1]

The SBGTS failed its routine SI due to low flow. The low flow was caused by carryover of resin beads from the condensate demineralizer vent piping to the reactor building ventilation system and contaminated exhaust vent and from there to the SBGTS. This carryover occurred during backwashing of the demineralizer. Backwashing with air and water resulted in resin fines, particulates, and some resin beads being entrained in the air/water backwash. An air scrubber was installed during initial startup to prevent resin migration into the ventilation system. However, it did not perform as expected since installation. As a result, substantial resin migrated to the radwaste and ventilation systems over a considerable time period.

After this event, contaminated resin beads were discovered outside of the plant buildings (but not offsite) as well as inside the vent system. Less than 70 cubic feet of resin was removed from the ventilation system and less than 1/2 of a cubic foot was found inside the protected area. Root cause of the substantial resin migration appears to be inadequate design of the scrubber intended to preclude such migration.

*This document supports ongoing AEOD and NRC activities and does not represent the position or requirements of the responsible NRC program office.

History

At least two cases of resin intrusion into the SBGTS have been previously reported[2,3] since June, 1979. This indicates that resin intrusion into the ventilation system and SBGTS has been a recognized problem at Pilgrim for several years without adequate resolution. However, prior to the June 11, 1982 event there was no evidence of contamination outside of the plant buildings.

Consequences

The consequences of this event may be broken down into three categories: 1) offsite release, 2) personnel exposure, and (3) system performance or availability. The resin migration problem produced no evidence of offsite release during this review. However, the resin migration clearly has resulted in added equipment contamination and substantial cleanup efforts by plant personnel over a period of several years, but this review found no indication of unacceptable personnel exposure. From a system viewpoint, this event demonstrates the potential for failure in a nonsafety system to act as a common cause initiator affecting multiple trains of a safety system (in this case SBGTS). This potential is mitigated because failure is as a result of flow restriction due to resin buildup and is therefore very slow with respect to the test interval (i.e., only two failures over the last three years). Also, even though one train of SBGTS was inoperable due to low air flow, the train was capable of performing at a reduced level. In summary, the resin migration produced minimal actual consequences in the three areas of concern.

Corrective Actions

The licensee actions to preclude further resin migration into the vent system may be divided into short-term and long-term efforts. The immediate actions by the licensee to remove existing resin and preclude additional migration were set out in Confirmative Action Letter No. 82-19[4]. Additionally, the licensee disconnected the ventilation system from the poorly functioning gas scrubber and rerouted the scrubber discharge (liquid, air, and resin) to the Reactor Building Equipment Sump. However, the equipment sump was not intended for either the quantity of air/water mixture or the entrained resins produced by demineralizer backwashing. This resulted in sump discharge to the HPCI room during demineralizer backwash. Due to a loose cap on a floor drain, approximately 12 inches of water accumulated in the B RHR pump room as well as in the HPCI room. Resin contamination was also evident in the HPCI room[5]. The licensee corrected this problem by securing the leaking floor drain and administratively requiring low sump level prior to demineralizer backwash. The above details introduce considerable uncertainty as to the long-term efficacy of the corrective actions implemented by the licensee thus far. The licensee is currently studying potential long-term corrective actions and can be expected to implement such actions when they are determined. The NRC Resident Inspector is following this subject and can be expected to require an adequate resolution based on his past efforts.

FINDINGS

Findings for this investigation were:

1) Resin migration through the ventilation system can produce a common mode failure of both trains of SBGTS.

2) The safety significance of this event is minimal due to the slow propogation rate and limited actual consequences of the resin migration.

3) Corrective actions by the licensee are adequate at present.

CONCLUSIONS

The safety significance of this event is relatively minor given the radiological release and system performance effects previously discussed. The personnel exposure effects may be more significant, especially since this has evidently been a problem for over three years. However, this review produced no evidence of excess personnel exposure. Given the limited significance discussed above, followup and resolution of this event by the resident inspector appears to be adequate. At present there is no need for additional AEOD involvement on this event. However, this type of common mode failure is potentially generic, depending on plant specific arrangement of demineralizer vents, SBGTS, and reactor building ventilation.

REFERENCES

1. LER 82-019/03L-0 on Pilgrim unit 1.
2. LER 79-020/03L-0 on Pilgrim Unit 1.
3. IE Inspection No. 50-293/82-20
4. Confirmative Action Letter 82-19
5. IE Inspection No. 50-293/82-30