



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REGARDING POST-ACCIDENT COMBUSTIBLE GAS CONTROL

COMMONWEALTH EDISON COMPANY

DRESDEN, UNITS 2 AND 3, AND QUAD CITIES, UNITS 1 AND 2

DOCKET NOS. 50-237, 50-249, 50-254 AND 50-265

1.0 INTRODUCTION

On December 2, 1981, Section 50.44 of Title 10 of the Code of Federal Regulations was changed to add additional post-Three Mile Island (TMI) requirements for combustible gas control in light water power reactors. On May 8, 1984, the NRC issued Generic Letter (GL) 84-09 which identified acceptance criteria for a staff finding that a Mark I containment does not rely on purge/repressurization (P/R) as the primary means of combustible gas control and is, thus, not subject to the recombiner requirement. The staff forwarded a Safety Evaluation to Commonwealth Edison Company (ComEd, the licensee) on June 29, 1993, concluding that the modified nitrogen inerting system provides a reliable P/R system capability and the facility thereby meets the GL 84-09 criteria. By letter of September 12, 1988, the staff issued its evaluation of General Electric Topical Report NEDO-31331, "Emergency Procedure Guidelines, Revision 4 (EPG-Rev 4)." By letter of February 16, 1996, the licensee notified the staff that they had chosen the purge and vent (P/V) strategy described in EPG-Rev 4 rather than the P/R strategy that was previously reviewed by the staff. The purpose of this evaluation is to acknowledge the ability of the Dresden and Quad Cities facilities to provide nitrogen dilution capability, meet the criteria of GL 84-09 and implement the P/V strategy as recommended by EPG-Rev 4. These abilities, along with the licensee's removal of the Air Containment Atmosphere Dilution (ACAD) system as a potential post-accident oxygen source, allow the staff to close GL 84-09 for Dresden and Quad Cities.

2.0 DISCUSSION AND EVALUATION

GL 84-09 states that the Commission has determined that a Mark I Boiling Water Reactor (BWR) plant will be found to not rely upon P/R systems as the primary means of hydrogen control (and, thus, is not subject to the 10 CFR 50.44 recombiner capability requirement), if certain technical criteria were satisfied. These criteria are:

- (1) the facility has Technical Specifications requiring that the containment be inerted to less than four percent oxygen,
- (2) the facility has only nitrogen or recycled containment atmosphere for use in all pneumatic control systems within containment, and

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- (3) there are no potential post-accident containment oxygen sources other than radiolysis.

Dresden and Quad Cities Technical Specification (TS) 3.7.A.5.a requires that the primary containment oxygen concentration be maintained below 4 percent by volume. The TSs operability and surveillance requirements, thus, assure that the first criterion is satisfied.

The licensee has stated (Letter to H. R. Denton (NRC) dated June 25, 1984) that all pneumatic control systems use recycled containment atmosphere for operation. This satisfies the second criterion.

To meet the third criterion, the staff's position is that Mark I facilities must, in addition to being operated with an inerted containment, have a post-accident nitrogen purge capability in order to meet design-basis accident/loss-of-coolant accident (DBA-LOCA) combustible gas control requirements. The licensee modified the existing nitrogen makeup and inerting systems. In a Safety Evaluation dated June 29, 1993, the staff confirmed that the modified systems would provide P/R capability meeting the system design requirements of General Design Criteria (GDC) 41, 42, 43 and have capacity sufficient to cope with Regulatory Guide (RG) 1.7 radiolysis oxygen generation assumptions.

By letter dated February 16, 1996, the licensee notified the staff that they had chosen the P/V strategy recommended in EPG-Rev 4 rather than the P/R strategy which was previously reviewed by the staff. As stated previously, the staff issued its evaluation of EPG-Rev 4 on September 12, 1988. The staff found the overall guidance dealing with venting, including the P/V strategy for primary containment hydrogen control, to be appropriate.

The capability to purge is provided by the nitrogen makeup and inerting system which provides multiple pathways for containment post-accident nitrogen dilution. One pathway utilizes the smaller "makeup" path normally used to maintain a positive pressure in the containment. Another utilizes the high capacity "inerting" pathway normally used during startup to establish an inerted containment. Due to single failure concerns relating to manual cutout valves that would be inaccessible under post-accident conditions, additional redundant pathways were provided in the makeup and inerting pathways for Dresden, Units 2 and 3, and in the makeup pathways for Quad Cities, Units 1 and 2. The systems will use the existing nitrogen storage tanks provided for inerting and makeup to the containment. In the event of loss or depletion of the on-site storage tank(s), nitrogen can be supplied from tank truck connections. The licensee has identified vendors capable of providing additional nitrogen within 8 hours during emergency situations.

Nitrogen vaporization capability will be provided by steam vaporizers in the inerting pathway (one shared vaporizer at each site), redundant electric vaporizers in the makeup pathway (Quad Cities, Units 1 and 2, only), a shared atmospheric vaporizer in the makeup pathway (Dresden, Units 2 and 3, only), and an atmospheric vaporizer for the truck supply connection (one shared vaporizer at each site). These combinations including the capability for passive vaporization provide multiple redundancy. The vaporizers, flow-limiting orifices, and plant procedures preclude inadvertent liquid nitrogen injection into containment.

When combustible gas levels are below the deflagration limit, containment is vented through the normal containment vent (2-inch line) which can be aligned to vent the torus (preferred) or the

drywell through the Standby Gas Treatment System. Guidance is provided to ensure release rates are closely monitored during venting operations to ensure TS limits are not violated.

3.0 CONCLUSION

The staff concludes that the Dresden and Quad Cities facilities satisfy the criteria of GL 84-09 and that the nitrogen dilution capability provided by the nitrogen makeup and inerting systems allows the licensee to implement the P/V strategy recommended by EPG-Rev 4. This capability along with the licensee's removal of the ACAD system as a potential post-accident oxygen source allows the staff to close GL 84-09 for Dresden and Quad Cities Stations.

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