JUN 7 1974

K. Goller, Assistant Director for Operating Reactors, L

TAR-879, REVIEW OF MODIFIED OFFGAS TREATMENT SYSTEMS FOR DRESDEN-1

Plant Name: Dresden Unit 1
Docket No: 50-10
Licensing Stage: OL issued
Project Leader: R. D. Silver
Requested Completion Date: June 7, 1974
Description of Response: Review of Modified Offgas Treatment System for Dresden-1

We have reviewed the Modified Offgas (MOG) Treatment System for Dresden-1. Our evaluation of the proposed system is enclosed. We find the system capable of reducing the release of radioactive materials in gaseous effluents during normal operation, including anticipated operational occurrences, to "as low as practicable" levels, in accordance with 10 CFR Part 20 and 10 CFR Part 50.34a. However, due to the potential for hydrogen explosions during periods when the recombiners are not operating, the design should include liquid seals downstream of rupture disks, and provisions to prevent permanent loss of liquid seals in the event of an explosion.

Original signed by:
Robert L. Tedesco

Robert L. Tedesco, Assistant Director
for Containment Safety
Directorate of Licensing

Enclosure:
Review of MOG Treatment
System for Dresden-1

cc: w/o enclosure
A. Giambusso
W. McDonald

MEMO

cc: w/enclosure
J. Hendrie
R. Purple
V. Benaroya
J. Kastner
B. Grimes
S. Varga
D. Eisenhut
R. W. Klecker
J. Carter
R. D. Silver
M. Bell
PDR (2)
J. Glynn

Distribution:
Docket
L Reading
CS Reading
ETSB Reading
ETSB Staff

OFFICE ➤	ETSB	ETSB	AD/CS			
SURNAME ➤	MBell:ks	VBenaroya	RLTedesco			
DATE ➤	6/7/74	6/7/74	6/7/74			

I. System Description

The Modified Offgas (MOG) Treatment System includes equipment and instrumentation to control the releases of radioactive materials in gaseous effluents from the Dresden Unit 1 main condenser air ejectors. The system will consist of redundant preheaters, catalytic recombiners, moisture separators, an existing holdup pipe, four 6.5 ton charcoal beds, and associated instrumentation and cooling equipment. Prior to entering the charcoal beds, the gas will be dried to a dew point of 40°F. The charcoal beds will be maintained at a temperature of 70°F. Upon exiting the charcoal beds, the remaining gases will be released to the atmosphere via a 300 ft stack.

II. System Evaluation

Dresden Unit 1 has a single shell condenser; therefore, we have employed a value of 10 scfm air inleakage in our evaluation. Based on the parameters given in Appendix B to WASH-1258, we calculate holdup times in the delay beds of 1 day for krypton and 18 days for xenon. With the addition of the catalytic recombiner, the existing 10 minute holdup pipe will provide a delay of one hour. Using these parameters and the modified version of the STEFFEG computer code given in Appendix C to WASH-1258, we calculate a noble gas release rate from the MOG of 5300 Ci/yr, and we expect that almost all of the iodine from this source will be held in the charcoal. The licensee has calculated a noble gas release rate from the MOG of 25,000 Ci/yr. The licensee's higher value is due to the assumption a higher air inleakage rate (12 scfm) and a higher off-gas rate (100,000 uCi/sec at 30 minutes decay) used in their evaluation.

Dresden-1 shares a site with Dresden Units 2 and 3. The releases have been calculated in the FES for Units 2/3 to be 48,000 Ci/yr/unit of noble gases and 0.34 Ci/yr/unit of I-131. Unit 1 will release an additional 1900 Ci/yr of noble gases and 0.35 Ci/yr of I-131 from sources other than the MOG. Based on our evaluation, the releases of radioactive materials in gaseous effluents from Dresden Units 1, 2 and 3 will not result in an annual air dose, at or beyond the site boundary, in excess of 10 mrad for gamma radiation and 20 mrad for beta radiation, the annual thyroid dose to an individual will not exceed 15 mrem considering the location of the nearest dairy herd, 2.3 miles north of the site, and the annual quantity of iodine-131 released will not exceed 1 Ci for each reactor at the site.

III. System Design

The proposed MOG system is designed to Quality Group D and non-Seismic Category I criteria. The system includes redundant preheaters, recombiners, desuperheaters, condensers, moisture separators, reheaters and particulate filters, and we therefore consider that the design includes sufficient redundancy to perform its function during periods of maintenance and equipment downtime. The design has the capability to maintain concentrations of radioactive materials in gaseous effluents at and beyond the site boundary within the limits of Table II Column 1 of Appendix B to 10 CFR Part 20 during periods when the offgas rate at 30 minutes decay is 70,000 uCi/sec, which we consider the appropriate design value for a reactor of this size.

In the design, dilution with steam is employed to maintain hydrogen concentrations below the lower explosive limit. A hydrogen analyzer is provided to ensure that the recombiner is operating properly. The system is designed to 350 psig or higher to maintain its integrity in the event of a hydrogen explosion. However, the system is equipped with rupture disks which relieve to the building atmosphere in the event of an explosion. Gases escaping by this pathway will be released, undecayed, via the 300 ft stack, to the environment. Operating experience has shown that hydrogen explosions are expected to occur in BWR offgas systems, and that as long as one hour may be required to terminate the release following an explosion. Because of the potential for a hydrogen explosion during periods when the recombiner is not operating, the design should include liquid seals downstream of rupture disks, and provisions to prevent permanent loss of seals following an explosion.

The design includes provisions to automatically terminate releases from the MOG in the event the concentrations of radioactive material in the gas entering the holdup pipe exceeds a predetermined level. A radiation monitor is provided at the outlet of the charcoal beds that will automatically alarm in the event concentrations of radioactive materials in the effluent exceed a predetermined value.

IV. Evaluation Findings

We have reviewed the system's capability to reduce releases of radioactive materials in gaseous effluents to "as low as practicable" levels in accordance with 10 CFR Parts 20 and 50.36a considering normal operation and anticipated operational occurrences, the design provisions incorporated to preclude hydrogen explosions and to control releases of radioactive materials in gaseous effluents in accordance with General Design Criteria 60 of Appendix A to 10 CFR Part 50, and the quality group and seismic design classification of the MOG system. We have reviewed the applicant's system descriptions, process flow diagrams, design objectives, and design criteria for the components of the MOG system. We have performed an independent calculation of the releases of radioactive materials in gaseous effluents based on the methods of WASH-1258. The basis for acceptance in our review has been conformance of the applicant's designs, design criteria, and design bases for the gaseous waste system to the applicable Commission Regulations referenced above, as well as to staff technical positions and industry standards. Based on our evaluation, we find the proposed gaseous waste system acceptable.

However, due to the potential for hydrogen explosions during startups and other periods when the recombiner is bypassed, the design should include liquid seals downstream of rupture disks, and provisions to prevent permanent loss of seals following an explosion.

V. References

1. Appendix B to 10 CFR Part 20 - Published December 31, 1970.

2. Appendix A to 10 CFR Part 50 - Published July 15, 1971.

3. 10 CFR Part 50 Section 50.34a - Published March 16, 1971.

4. WASH-1258 "Final Environmental Statement Concerning Proposed Rule Making Action: Numerical Guide for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low As Practicable" for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents" Vol. 2, July 1973.