Docket No. 50-346

License No. NPF-3

Serial No. 991

September 30, 1983

TOLEDO EDISON

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Mr. Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Eisenhut:

On August 26, 1983, the Toledo Edison Company (TED) submitted to your staff an evaluation and plan addressing the findings identified during the NRC Appendix R Audit performed at the Davis-Besse Nuclear Power Station, Unit 1 (DB-1). Within that submittal, a schedule for the activities required to satisfactorily demonstrate compliance to the requirements of 10 CFR Part 50, Appendix R was provided. A revision to that submittal was forwarded to the staff's offices on September 13, 1983 (Serial No. 986).

As identified in the above submittals, pursuant to 10 CFR 50.12(a) and 50.48(c), TED hereby petitions the Nuclear Regulatory Commission (NRC) for exemption from certain requirements of Appendix R to 10 CFR Part 50, with respect to DB-1. The specific exemptions from Appendix R requested are as follows:

1. 10 CFR 50 Appendix R Section III.O, Requirement that the oil collection system for reactor coolant pumps be capable of collecting lube oil from leakage sites in the reactor coolant pump lube oil system. The current system is in compliance with Section III.O, except for the ability to collect all oil from both pumps that serve a single reactor coolant loop.

2. 10 CFR 50 Appendix R Section III.L.1, Requirement that the plant be capable of achieving cold shutdown within 72 hours without the use of offsite power. Due to overall safety concerns, the current plant cooldown rate is limited to 1.5° F/hour under natural circulation conditions. Therefore, achieving cold shutdown conditions concurrent without the use of offsite power will require greater than 72 hours.

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3. 10 CFR 50 Appendix R Section III.G.2, Requirement that separation of cables and equipment of redundant trains be provided by a fire barrier having a 3-hour rating. A door located between Rooms 237 and 238 was specifically designed to withstand a differential of 10 psi. The design of the door and its fixtures provide equivalent protection of a 3-hour rated fire door.

Technical and other support for the requested exemptions are provided in the attachment to this letter. TED considers that the granting of these exemptions does not adversely effect the ability to adequately protect the health and safety of the public in the event of a fire at DB-1.

Toledo Edison will meet with you or your staff, if requested, to discuss the information provided.

Very truly yours,

RPC:JSH:nlf
encl.
cc: DB-1 NRC Resident Inspector

1. Reactor Coolant Pump Oil Collection System Exemption Request

1.1 Design Background

In 1975, while Davis-Besse Nuclear Power Station Unit 1 was under construction, the Toledo Edison Company integrated into the reactor coolant pump (RCP) design a lube oil leakage collection system. At the time of incorporation, the NRC had not yet imposed any criteria or regulations concerning the design or requiring the installation of a RCP Oil Collection System.

Toledo Edison Company's decision to incorporate the RCP lube oil collection system into the design was to minimize any potential for oil leakage or high-pressure lube oil spray from coming into contact with other surfaces (i.e., cabling, steam generator, etc.) within the steam generator area. In addition, the RCP lube oil leakage collection system design for each RCP precludes any oil leakage and/or high pressure spray from coming into contact with hot surfaces which could ignite the oil.

The design of the RCP Oil Collection System was based on the single failure concept. Since all four RCP's have separate and independent lube oil systems and there are two pumps associated with each reactor coolant loop, the RCP Lube Oil Collection System design considered a single failure of any one RCP Lube Oil System on a reactor coolant loop. Thus the RCP Lube Oil Collection System design associated with each reactor coolant loop did not consider the failure of both RCP lube oil systems on a given loop simultaneously.

On August 23, 1976, Appendix "A" to Branch Technical Position 9.5-1 was issued. Section F "Guidelines for Specific Plant Areas", Paragraph 1 (A) "Primary and Secondary Containment - Normal Operation" required the following:

- Fire protection requirements for the primary and secondary containment areas should be provided on the basis of specific identified hazards. For example:

  Lubricating oil or hydraulic fluid system for the primary coolant pumps.

- Fire Suppression Systems should be provided based on the fire hazard analysis.

Appendix A guidelines did not consider the utilization of RCP Oil Collection System in lieu of a fire suppression system for the RCP lube oil hazard. Based on the fire hazard analysis evaluation, Davis-Besse's response to Appendix A indicated that the oil collection system in conjunction with the fire detection

device installed over the RCP motors afforded equivalent protection to that of a Fixed Fire Suppression System.

On July 26, 1979, the NRC issued Amendment No. 18 to Facility Operating License No. NFP-3 and the Fire Protection Safety Evaluation Report for the Davis-Besse Nuclear Power Station. The safety evaluation report stated that, "The major fire hazard within the containment is the reactor coolant pump lube oil system. To prevent a fire due to oil leakage, the licensee has provided an engineered oil containment and collection system for each RCP. The system has been designed to contain the oil from leakage or a pipe failure and drains to an oil collection tank which is periodically emptied to assure tank capacity for the oil contained in one motor at all times while the reactor is critical". Section 4.4 of this report concluded that with the addition of the RCP oil collection system, appropriate fire protection was provided for this area. This protection meets the guidelines of Appendix A of BTP ASB 9.5-1 and was therefore acceptable.

1.2 Fire Zone Description and Location of Combustibles

Fire Zone D-3, Steam Generator Area 218.

Two cable trays running in parallel with a horizontal spatial separation of 6 inches penetrate the north wall of the steam generator compartment at elevation 598 approximately 33 feet above floor level where they terminate at Reactor Coolant Pump No. 1-2-2, 8 feet away. A two tray stacked configuration penetrates the east wall near the southeast corner of steam generator compartment at elevations 590 and 591 approximately 30 and 31 feet above floor level. The trays run west along the south wall for approximately 17 feet, then the trays separate and turn 90 degrees and run towards the north, where they extend 4 feet from the turn and terminate at Reactor Coolant Pump No. 1-2-1.

Reactor Coolant Pump No. 1-2-2 is located 8 feet away from the north wall and 3-1/2 feet away from the west steam generator compartment wall. Reactor Coolant Pump No. 1-2-1 is located 4 feet away from the south wall and 3-1/2 feet away from the west wall of the steam generator compartment. The two reactor coolant pumps in Steam Generator Compartment 218 are separated from each other by 17 feet. Each reactor coolant pump contains approximately 225 gallons of lube oil. No other combustibles exist at this location. The steam generator is positioned between and east of the reactor coolant pumps approximately 8-1/2 feet from the west steam generator compartment wall. This provides a level of separation through curbing and opposite sloping flooring. Each reactor coolant pump is approximately 4-1/2 feet away from the steam generator. The pressurizer vessel is located near the northeast corner of the steam

generator compartment, 4 feet away from Reactor Coolant Pump No. 1-2-2.

Fire Zone D-7, Steam Generator Area 216.

A stacked cable tray configuration, consisting of two trays, penetrates the west wall near the northwest corner of the steam generator compartment at elevations 596 feet-4 inches and 595 feet approximately 31 feet-4 inches and 30 feet above the floor level. The trays run east along the north wall for approximately 18 feet, then they separate and turn 90 degrees toward the south where they extend 8 feet from the turn and terminate at Reactor Coolant Pump No. 1-1-2. Another stacked cable tray configuration, consisting of two trays, penetrates the west wall near the southeast corner of the steam generator compartment on elevations 596 feet-4 inches and 595 feet approximately 31-feet-4 inches and 30 feet above the floor level. The trays run east along the south wall for approximately 17 feet, then they separate and turn 90 degrees towards the north where they extend 4 feet from the turn and terminate at Reactor Coolant Pump No. 1-1-1.

Reactor Coolant Pump No. 1-1-2 is located 8 feet away from the north wall and 3-1/2 feet away from the east steam generator compartment wall. Reactor Coolant Pump No. 1-1-1 is located 4 feet away from the south wall and 3-1/2 feet away from the east wall of Steam Generator Compartment 216.

The two reactor coolant pumps in Steam Generator Compartment 216 are separated by 17 feet. Each reactor coolant pump contains approximately 225 gallons of lube oil. No other combustibles exist at this location.

The steam generator is positioned between and west of the reactor coolant pumps approximately 8-1/2 feet from the east steam generator compartment wall. This provides a level of separation through curbing and opposite sloping flooring. Each reactor coolant pump is approximately 4-1/2 feet away from the steam generator.

1.3 <u>Combustible Loading</u>

The approximate floor area bounded by the secondary shield walls is 1311 sq. ft. The fixed combustibles associated with these areas inside the containment consists of approximately 225 gallons of lube oil for each reactor coolant pump and approximately 4,296 lbs. of exposed cable insulation in cable trays in each steam generator area. The lube oil is contained and enclosed in each reactor coolant pump lube oil system. The lube oil utilized has a flash point of approximately 450°F and an ignition temperature of approximately 700°F. The lube oil associated with each reactor coolant pump, even though it is not exposed as

a direct fuel source, is considered a part of the fixed combustible inventory associated with this area. The fire load based on the fixed combustibles located in each steam generator area is 82,271 BTU/FT^2.

1.4 Reactor Coolant Pump Lube Oil System

A high pressure oil lift system is provided for each Reactor Coolant Pump (RCP) motor. The oil lift system is designed to provide lubrication simultaneously to the upper and lower sets of thrust bearing shoes during RCP motor start-up and shutdown. High pressure oil is essential during start-up but is not essential for shutdown of a single pump. Operation of the oil lift system on shutdown is recommended primarily to allow the pumps to windmill with natural circulation of the reactor coolant when all four pumps are shut down.

Each RCP motor will only be started after its associated oil lift pump has been running for at least 60 seconds or the pressure switches indicate that full oil lift pressure is available. The oil lift pumps will be stopped after the RCP motor has been running at full speed for a minimum of 15 seconds. The total duration of operation of the high pressure oil lift system during start-up will be approximately three minutes.

During normal operation of the RCP motors, low pressure oil is provided for lubrication of the lower guide bearing and the upper bearing assembly. The entire lower guide bearing assembly is located in the lower oil pot which also contains an integral oil-to-water heat exchanger. The lower oil pot has a capacity of approximately 25 gallons and is an integral part of the lower bracket. For the upper bearing assembly, a low pressure viscosity pump at the outer periphery of the thrust bearing runner circulates oil through an external oil-to-water heat exchanger to cool the bearing. The upper oil pot has a capacity of approximately 200 gallons.

1.5 RCP Oil Collection System

The two reactor coolant pump motors associated with each reactor coolant loop each contain approximately 225 gallons of oil in the bearing lubrication system. To contain any leakage, an enclosure has been installed around the oil cooler, fill pipe, and bearing lift pump. The enclosure has been designed to contain any oil from leakage or a pipe failure and drains to a vented collection tank. The tank is periodically emptied to assure adequate capacity for the oil contained in one motor at all times while the reactor is critical. The exposed piping which is not enclosed within the oil collection tank enclosure is either not pressurized (e.g., it is drain piping) or it is sleeved. The lube oil collection tank associated with each reactor coolant loop has a capacity of 250 gallons.

To eliminate the potential hazard resulting from a possible oil spill from the RCP motor lube oil system, upper and lower oil drip pans have been installed for each RCP motor to direct the spilled oil to a drain tank.

The upper oil pan is installed to collect the oil spill from the RCP motor's oil cooler, oil lift pumps, and upper bearing oil fill and drain their piping. To prevent oil splash due to the pipe rupture or gasket failure in the high pressure portion of the oil system, i.e., the oil cooler and lift pumps, a shield wall and cover have been provided in this area.

The oil drip pan is of conical type, installed along the motor shaft to contain any oil spill downward along the motor shaft and the oil collected from the lower bearing oil fill and drain connections.

Both oil drip pans have a drain connection piped individually to one of two drain tanks located at El. 565 feet - 0 inches. No valves are installed on the drain line. Each drain tank serves two reactor coolant pumps.

1.6 Fire Protection

Fire detection is provided for each Steam Generator Area inside the containment. Steam Generator Area 218 (Fire Zone D-3) and Steam Generator Area 216 (Fire Zone D-7) are protected by ionization type smoke detectors. There are three (3) detectors protecting Steam Generator Area 218 and two (2) detectors protecting Steam Generator Area 216. These detectors are designed to operate in a high radiation environment. These detectors are installed within the two steam generator compartments above each reactor coolant pump motor and the pressurizer heater bundles. These detectors are annunciated on Panel C-4709 on elevation 603'-0" in corridor 411 near the containment personnel access hatch and are also annunciated in the main control room.

The fire suppression inside the containment relies on manual fire fighting action. During normal plant operations, access to the containment by fire-fighting personnel is prohibited because of the high neutron dose levels. In order to gain access, the reactor would have been shut down. After the reactor has been shut down, access by fire-fighting personnel will have to be delayed for 15 minutes. This time delay allows the neutron level to diminish. Emergency fire fighting access is allowed for a time period consistent with previous normal reactor coolant system leakage, the prevailing radioactive, airborne particulate contribution, and allowable 10 CFR 20 occupancy limits.

Portable fire suppression equipment in the form of four 20-lb., multipurpose dry chemical, and five 15-lb. CO_2 portable fire extinguishers are located near hazard areas and at access points to these areas. In addition to the portable fire extinguishers inside the containment, there are two 150-lb. ordinary dry chemical, wheeled fire extinguishers, equipped with 50 feet of 3/4 inch hose and a smooth bore-type nozzle. One of these wheeled-type fire extinguishers is stored under the northeast stairs near the elevator on elevation 565'-0", and the other is stored in Passage 410 near the stairs on elevation 603'-0".

1.7 Exemption Request Justification

The described RCP oil collection system is in compliance with Appendix R, Section III.0 except for the failure of both reactor coolant pumps lubricating oil system in a single loop. In the unlikely event of an overflow from a multiple reactor coolant pump lube oil spill, the RCP oil would be discharged from the RCP oil collection tank to floor drains that are routed to the containment building sump. As stated, curbing and the slope of the containment floor prohibits oil leakage from one pump to involve the second pump.

The bases for the exemption request are as follows:

1. The oil lubrication systems for each RCP are completely separate. The oil reservoirs and supply piping and components are independent for each RCP. The only common piping between the RCP lube oil systems is the drain pipe to the lube oil collection tank which is shared by the two RCPs on a reactor coolant loop.

2. The RCP oil collection system is seismically designed and is capable of collecting lube oil from all potential pressurized and unpressurized leakage sites in the four RCP lube oil systems. Each of the two oil collection tanks is sized to accommodate the entire lube oil system inventory of one RCP lube oil system (one tank provided for each loop).

3. If an oil leakage failure were to occur, it most probably would occur while the oil system was in the high pressure mode of operation. This would only occur during an RCP start-up or shutdown. Since the oil system is operated at high pressure for a very short period of time (approximately three minutes for each pump start-up), it is not credible to assume that more than one failure oculd occur during this period. Additionally, only one pump is started at one time precluding the possibility of multiple failures due to this mode.

4. The RCP utilizes a lubrication oil with a high (450°F) flashpoint. Therefore, a high energy ignition source would be necessary to sustain combustion in the unlikely event of multiple RCP oil spills occurring of greater than 250 gallons, and the cil is discharged through the overflow pipe.

5. Relative to the oil-to-water heat exchanger serving each bearing assembly, bearing temperatures are monitored and alarmed in the control room. Therefore, it is not deemed credible for the RCP lubricating oil to reach temperatures approximating its flashpoint.

6. In the unlikely event of multiple RCP lube oil spills, the RCP lubrication oil collection tank overflow pipe discharges to the floor drain outside of the steam generator pit curb. The floor drain would then route the oil to the containment sump. There is an absence of ignition sources in the floor drain area.

In summary, the Davis-Besse existing RCP oil collection system design meets the overall intent of 10 CFR 50, Appendix R, Section III.0 in that no single failure of the RCP lubricating oil system will lead to a fire during normal operations or design basis accident conditions. Upgrading of the current RCP lube oil collection system to collect the total capacity (450 gallons) of both pumps would not enhance to a significant degree the protection provided by the current system. Therefore, TED requests an exemption for the capacity requirements of RCP oil collection system.

2. Allowable Time to Achieve Safe Shutdown Exemption Request

2.1 Background

Section III.L.1 of Appendix R states that the alternative shutdown capability shall be able to achieve cold shutdown within 72 hours. Sections III.L.1 and III.L.5 state that the plant must be capable of achieving cold shutdown (Mode 5) using only onsite power prior to the elapse of 72 hours.

With the absence of off-site power, the reactor coolant pumps cannot be operated and therefore pressurizer spray capability is lost. Without pressurizer spray, depressurization and subsequent cooldown is controlled by the rate of pressurizer heat loss to the environment. This problem has been identified in the exemption request filed by other B&W type facilities and results in a minimum total time of approximately 140 hours to reach cold shutdown.

An additional restriction which further extends the minimum time to cold shutdown has also been identified. In order to prevent the formation of steam void in the upper reactor vessel

head, the cooldown rate is limited to no more than 1.5°F/hour under natural circulation conditions. The justification for this conservative cooling rate was an analysis conducted by Babcock & Wilcox as documented in Report 86-1140819-00 and the C.W. Tally report "Single Loop Natural Circulation Prepared for Consumers Power Company," August, 1982. These reports were cited in the NRC letter of June 1, 1983, John F. Stolz to Richard P. Crouse. This information was originally forwarded to you in our letter of April 15, 1983 (Serial No. 935).

2.2 Analysis of Most Conservative Approach

2.2.1 Assumptions

The following conservative assumptions were utilized in the analysis to determine the maximum time required to achieve cold shutdown.

1. Cold shutdown initiation begins one hour after reactor scram and stabilization of hot standby (Mode 3 at approximately 550° and 2150 psig) condition.

2. Hot leg temperature of 560°F based on no manual control of steam generator atmospheric dump (operation of code safeties).

3. Cooldown rate of 1.5°F per hour maintained through to cold shutdown temperature 200°F.

4. Unavailability of off-site power.

5. Decay Heat Removal System initiation at 280°F.

2.2.2 Results of Analysis

Based on the above conservative assumptions, the time to reach cold shutdown is 193 hours with hot standby in one hour, cooldown to 280°F in 187 hours, and Decay Heat Removal System (DHR) cooldown to 200°F in 5 hours.

2.3 Exemption Request

The analysis previously presented shows a conservative analysis of the time required to reach cold shutdown. The estimated time of 193 hours as indicated would only be required if the plant did not have off-site power.

TED believes that an exemption from achieving cold shutdown in 72 hours should be granted since it will not endanger public health and safety.

3. Fire Door Exemption Request

3.1 Background

Door 215 separates the two auxiliary feedpump unit rooms 237 (Fire Area E, Fire Zone No. E-1) and 238 (Fire Area F, Fire Zone No. F-1) at 565' elevation of the Auxiliary Building. Room 237 with an area of approximately 435 ft^2 contains 540 lbs. of cable insulation (fire load of 11,325 BTU/ft^2) and 4 gallons of lube oil (fire load of 1,328 BTU/ft^2). While Room 238 with an area of approximately 700 ft^2 contains 740 lbs. of cable insulation (fire load of 9,124 BTU/ft^2) and 4 gallons of lube oil (fire load of 825 BTU/ft^2).

Since Door 215 was designed to serve as a pressure rated door between the two auxiliary feedpump rooms, a UL rated fire door could not be installed.

3.2 Analysis

A major factor in this analysis is the low combustible material content in both Rooms 237 and 238. In Room 237, the cable insulation (over 90% of the combustible material) is located on the east wall opposite Door 215 and at least one foot above the door. Similarly in Room 238, the cable insulation (over 90% of the combustible material) is located on the west wall opposite Door 215 and at least one foot above the door. This results in a space over 20 feet wide which is clear of major cable combustibles. The other combustible in each of these fire areas is lubricating oil which is contained within the pumps and is unlikely to contribute to any postulated fire. Additionally the fire loading in Room 237 is 12653 BTU/ft^2 with a fire duration of 9.5 minutes. The fire loading in Room 238 is 9949 BTU/ft^2 with a fire duration of 7.5 minutes.

As previously stated, Door 215 was designed and constructed as a pressure rated door for overriding nuclear safety concerns. This need for a pressure rated door precluded the use of a UL rated fire door.

Door 215 has been designed to withstand a 10 psi pressure differential potentially arising from a High Energy Line Break in either Room 237 or 238. The overall door thickness is 9 9/16", consisting of two sets of separated hollow chambers, seal welded in series. The door surfaces are constructed of ASTM A36 3/16" steel plate. The first set of door chambers

consist of plating separated 6" using 3/4" AISI CR 1018 steel. These chambers are seal welded to multiple 3" I beams of ASTM A36 specifications. To the other face of these I beams, a final 3/16" ASTM A36 steel plate is welded to make the door surface. Additionally, the series of I beam formed chambers are sealed using AISI CR 1018 3/4" stock.

The sealing mechanism consists of a handwheel operated dogging arrangement to tightly seal dual surface neoprene gaskets. A visual inspection would lead one to believe the door approximates a bank vault configuration.

An engineering evaluation of Door 215's fire resistance has been conducted. This evaluation simulated the fire test requirements of NFPA 251 and clearly demonstrated that the door, if tested, would have a fire resistance which is significantly longer than the maximum postulated fire duration.

Also each room is equipped with four ionization type smoke detectors allowing for early detection of any fire. Fire suppression for these rooms is provided in the form of a 15 lb. CO_2 hand portable fire extinguisher in Room 238 and an accessible hose line from Hose Station (HR) No. 5 located in the turbine building on elevation 585'.

3.3 Justification

TED requests an exemption from the requirements of Section III.G.2 for a fire barrier housing a three hour rating for Door 215. This request is based on the fact that the design of the door and its fixtures provides:

1. An adequate level of protection considering the low combustible loading and the short fire duration (9.5 minutes).

2. Door 215 is designed as a pressure rated door and constructed of heavy steel. The overriding nuclear safety requirement to provide a pressure rated door precluded the use of a UL rated fire door.

3. An engineering analysis of this door has demonstrated that the door, if subjected to a fire test in accordance with NFPA 251, would have a fire resistance which was greater than the postulated fire duration.