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U S Nuclear Regulatory Commission
Attn: Document Control Desk
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PRAIRIE ISLAND NUCLEAR GENERATING PLANT
Docket Nos. 50-282 License Nos. DPR-42
50-306 DPR-60

Response to Request for Additional Information from NRC Inspection Report 50-282/01-05(DRS); 50-306/01-05(DRS)

In the subject Inspection Report, dated July 16, 2001, the NRC requested additional information to support resolution of an Unresolved Item. In order to respond to the Request for Additional Information, it was necessary to clarify statements made in the Inspection Report. The Prairie Island response to the Inspection Report is included as Attachment 1 to this letter. The Prairie Island response to the Request for Additional Information is included as Attachment 2 to this letter.

In this letter we have made no new Nuclear Regulatory Commission commitments. Please contact Jeff Kivi (651-388-1121) if you have any questions related to this letter.

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Attachments:
1. Response to Inspection Report 50-282/01-05(DRS); 50-306/01-05(DRS)
2. Response to Request for Additional Information

ATTACHMENT 1

RESPONSE TO INSPECTION REPORT 50-282/01-05(DRS); 50-306/01-05(DRS)

NRC Inspection Report 50-282/01-05(DRS); 50-306/01-05(DRS), dated July 16, 2001, presents the results of the fire protection triennial baseline inspection for Prairie Island. We have reviewed the inspection report and wish to respond to some points that we believe should be clarified.

NRC Acceptance of Prairie Island CO_2 Fire Suppression System

The NRC has previously reviewed and accepted the results of the Relay Room CO_2 fire suppression system pre-operational test based on defense in depth principles applied to configurations proposed as alternatives.

The NRC asked specifically for design data on fire suppression systems including CO_2 system soak times in their January 31, 1978, Request for Additional Information (RAI), which resulted from NSP's March 11, 1977, Fire Hazards Analysis (FHA) submittal. NSP's April 18, 1978, response says only that the system was "specified to meet existing NFPA codes." The April 18, 1978, letter also says that NSP hopes to resolve these issues during the NRC's October 1978 inspection.

By letter dated November 21, 1978, the NRC followed up on their understandings from their October site visit. This letter documents that the NRC concluded during their site visit that, "... the CO2 system may not be effective in suppressing a deep seated fire..." and they also dropped their previous concern about system design based on the information they received during the inspection. Review of the documentation that we know existed at the time (the pre-op, the design spec, and the Chemetron sizing calculation) leads to this same conclusion, because the CO_2 system's ability to suppress a deep seated fire is linked directly to the percent concentration developed and the soak time.

The September 6, 1979, NRC SER states that the CO_2 fire suppression system is designed for 50% concentration for 15 minutes, not that tests indicate it is capable of meeting this requirement. The September 6, 1979, SER states that the CO_2 fire suppression system is "acceptable" only based on defense in depth principles applied to configurations proposed as alternatives to Appendix A, per section 2.2 of the SER. The September 6, 1979, SER again states that, "... the CO2 system may not be effective in suppressing a deep seated fire..." and finds the fire protection system for the Relay Room to be "inadequate." The 50% concentration for 15 minutes was not maintained in this area per the pre-op. (Note that this is contrary to information that NSP provided by letter dated December 8, 1976. See the discussion under the heading, "Inaccurate Information Provided to the NRC.")

The September 6, 1979, SER states that the existing detection and suppression would be adequate for a fire in the computer room. The 50% concentration for 15 minutes was maintained in this area per the documented pre-operational test results. This statement in the SER makes it apparent that the NRC Staff reviewed the results of the pre-operational test by accepting the Computer room results and not the Relay Room results.

The September 6, 1979, SER goes on to require modifications to dampers between the Relay Room and the Control Room. These were documented to have leaked in the pre-operational test and the modification requirement is consistent with a knowledge of the pre-operational test results. The SER language demonstrates NRC knowledge of the possible ineffectiveness of the system as tested and changes needed to improve its performance.

NSP completed the modifications called out in the September 6, 1979, SER and, for lack of documented NRC concern for the next 20 years, Prairie Island assumed the CO_2 fire suppression system was considered adequate by the NRC (based on the September 6, 1979, SER accepting the system with modifications.)

Regulatory Requirements for the CO_2 System (Inspection Report Section 1.10.b.4)
This section of the inspection report cites Generic Letter (GL) 86-10, Section 3.8.1, which states that Fire Protection Features should conform to the NFPA codes. It also cites Section 8.9, which discusses fire protection feature design, deviations from design, and documentation of such deviations.

This section of the inspection report also cites some sections of NFPA 12-1972. However, the inspection report does not distinguish between testing that is required by NFPA 12-1972 and testing that is only recommended by NFPA 12-1972. NFPA 12-1972 does not require a full discharge test as described later in Attachment 2 (response to Part 4).

The inspection report also mentions that the licensee was performing hourly fire watches for this area as a compensatory measure. As clarification, the compensatory measures currently in effect in Fire Area 18 are not in place due to any concerns on our part over CO_2 fire suppression system functionality – these compensatory measures are in place while we complete resolution of the motor-operated valve hot shorts issue. In 1998, there were compensatory measures in place (due to concerns over CO_2 fire suppression system functionality) for about one month (while the system evaluation and tracer gas testing were being completed).

Inaccurate Information Provided to the NRC (Inspection Report Section 1.10.b.6)
The inspection report notes NSP provided inaccurate information with respect to CO_2 fire suppression system pre-operational test results in a letter dated December 8, 1976. This letter indicated that the pre-operational test resulted in 50% concentration for 15 minutes at all measured points. We acknowledge that the information provided in 1976 was inaccurate.

The inspection report also notes that the licensee evaluated this inaccurate information during the inspection and determined that no report per 10 CFR 50.9 was required. The basis for this determination was that, given the current evaluation of the CO_2 fire suppression system functionality, the inaccurate information did not have any potential for significant impact on the health and safety of the public. While the pre-operational test did not meet the 50% concentration for 15 minutes criteria, the Relay Room sealing has been improved and the discharge rate of the system has been increased, thus, our current evaluation demonstrates that 50% concentration for 15 minutes can now be met.

In addition, as a point of clarification, the inaccurate information in the December 8, 1976, submittal was identified years before the inspection. At that time, the CO_2 fire suppression system was declared inoperable and a fire watch was posted as a compensatory measure until the evaluation of CO_2 fire suppression system functionality was completed. The Condition Report identified in the inspection report was primarily a means of documenting the review of reportability of this issue with respect to 10 CFR 50.9.

The inspection report concludes that the inaccurate information (with respect to the CO_2 fire suppression system pre-operational test results) in the 1976 submittal appears to be a violation of Section 186 of the Atomic Energy Act. Presumably, this is because the submittal with inaccurate information was submitted before 10 CFR 50.9 was promulgated by the NRC. As noted above, it is clear that:

- after 1976, the NRC was made aware of accurate information regarding the CO_2 fire suppression system pre-operational test results,
- the pre-operational test results were factored into the actions the NRC required of Prairie Island, and
- absent any documented inspector concerns to the contrary in the next 20 years, the NRC considered the Prairie Island follow-up modifications acceptable and, thus, considered the CO_2 fire suppression system to be in compliance.

Authority Having Jurisdiction (Inspection Report Section 1.10.b.2)
The inspection report states that the approach for performing a tracer gas test and system analysis to demonstrate system CO_2 fire suppression system operability has neither been reviewed nor approved by the NRC, the authority having jurisdiction.

The explicit assertion that the NRC is the authority having jurisdiction with respect to NFPA codes is contrary to our understanding. Our understanding is that GL 86-10, our standard operating license condition, and NEI 96-07, allow the licensee to perform changes to the Fire Protection program without prior NRC approval. This allowance would seem to be inconsistent with the responsibilities of the authority having jurisdiction as prescribed in the NFPA codes.

NFPA 12-1972, as well as other NFPA documents, describe the responsibilities and role of the authority having jurisdiction. These include having a part in the various processes of system procurement, design and testing - including advice in these different areas to ensure an acceptable system is installed and accepted. Current industry fire protection programs do not appear to include the NRC in this manner.

ATTACHMENT 2

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

The Request for Additional Information (RAI) in Enclosure 2 of Inspection Report 50-282/01-05(DRS); 50-306/01-05(DRS) is a multi-part request. This request will be addressed in five parts by separating it sentence by sentence.

NRC Request – Part 1:
Provide an evaluation which demonstrates functionality of the Fire Area 18 carbon dioxide (CO_2) system i.e., the ability to suppress a deep-seated fire by providing a CO_2 concentration of at least 50 percent for at least 15 minutes.

Prairie Island Response:
Calculation M-4163-001 Rev.1 evaluates the CO_2 concentrations in the Relay/Computer Room (Fire Area 18). This calculation was provided to the NRC Inspection Team. This calculation concludes that the CO_2 system would effectively extinguish a deep-seated fire in this Fire Area and would provide at least 50% concentration for at least 15 minutes with the existing injection settings.

In the December 8, 1976, response to BTP APCSB 9.5-1, Prairie Island stated that, "the CO_2 system design is for 50% concentration to be held for 15 minutes." The 15 minute soak time is not required by NFPA 12-1972, but is treated as a commitment because NSP stated as much in a docketed submittal to the NRC. A 15 minute soak time duration has subsequently been recommended for extinguishing fully developed cable tray fires in Section 3.6 of NUREG/CR 3656. Cables are the primary combustibles in Fire Area 18 as described in the Prairie Island Fire Hazards Analysis and its references. Therefore, we continue to use 15 minutes as the desired soak time.

In addition to concluding that a 50% CO_2 concentration could be maintained for 15 minutes, the calculation also concluded that an equivalent "double shot" capacity is available, because the 50% concentration can be maintained for an additional 15 minutes (total 30 minute soak time), with a properly-timed second shot of the remaining storage tank contents. The current Prairie Island Operations Procedure C31 and F5 Appendix A Fire Strategies Procedure for Detection Zone #12, Relay Room, directs initiation of this manual second shot at the discretion of the Fire Brigade.

NRC Request – Part 2:

The evaluation should specifically address the CO_2 concentrations in the overhead area (15 to 19 feet above the floor)

Prairie Island Response:

The evaluation does not specifically address concentration versus elevation, but this is consistent with the guidance of NFPA 12. The Prairie Island calculation meets the NFPA as written and adding such a consideration would be neither practical nor required by the NFPA. Section 242 of NFPA 12-1972 discusses determination of flooding factors. Section 242 states that for combustible materials capable of producing deep-seated fires, the required carbon dioxide concentrations cannot be determined with the same accuracy possible with surface burning materials. The extinguishing concentrations will vary with the mass of material present because of the thermal insulating effects. Flooding factors have, therefore, been determined on the basis of practical test conditions for specific fire hazards.

For dry electrical, wiring insulation hazards in general the 50% flooding factor is provided in Table 6. Flooding factors are calculated per Section 24 and Appendix A based on total enclosure (room) volume and not specific to any enclosure elevation. No guidance is provided for performing a calculation by enclosure elevation. Instead, Sections 243, 244, 2441 and, by reference, 242, 2352, 2353, 253, and 2212 provide specific guidance for special considerations related to the volume/flooding factor calculation which address the inspection report concerns related to this request.

Prairie Island has addressed each of these special considerations in a conservative manner that provides additional assurance that the 50% concentration will be met as required. The special considerations are addressed as follows:

NFPA 12-1972 Section	Requirement	Prairie Island Compliance
243	Volume Consideration. The volume of the space shall be determined in accordance with Sub-section 2331. The basic quantity of carbon dioxide required to protect an enclosure shall be obtained by treating the volume of the enclosure by the appropriate flooding factor given in Section 242.	See discussion of 2331 for volume. The Relay/Computer Room contains dry electrical, wiring insulation hazards in general and the appropriate 50% flooding factor provided in Table 6 was used in the calculation.
2331	In figuring the net cubic capacity to be protected, due allowance may be made for permanent nonremovable impermeable structures materially reducing the volume.	The overall volume of the enclosure is 76,547.2 ft^3. (Ref. 2) Calculation M-4163-001 (Ref. 1)used a volume of 69,347 ft^3 consisting of 8,320 ft^3 for the Computer Room (contained within the Relay Room) which is the total volume of that room with no reduction for

NFPA 12-1972 Section	Requirement	Prairie Island Compliance
		occupied space and 61,027 ft^3 for the Relay Room which represents an approximate 10% reduction for occupied space. This is a conservatively small reduction. The resulting volume is conservatively large yielding conservatively low estimates of CO_2 concentration.
244	Additional quantities of carbon dioxide shall be provided to compensate for any special condition that may adversely affect the extinguishing efficiency. See also Sub-sections 2352 and 2353.	2352 applies when ventilating systems cannot be shutdown during injection; this does not apply in Fire Area 18. 2353 applies when normal room temperatures are above 200 degrees F; this does not apply in Fire Area 18.
2441	Any openings that cannot be closed at the time of extinguishment shall be compensated for by the addition of carbon dioxide equal in volume to the expected leakage volume during the extinguishing period. If leakage is appreciable, consideration shall be given to an extended discharge system as covered in Section 253. Also see Sub-section 2212.	No significant openings have been identified other than the doors themselves which can open to relieve room pressure during CO_2 injection. The leakage out the doors during venting and the effects of measured room leakage during the soak time have been addressed in calculation M-4163-001 and it has been determined that the required CO_2 concentration and soak time is achieved. Therefore an extended discharge system is not required.
2212	For deep-seated fires such as will be involved with solids, unclosable openings should be restricted to small openings near or in the ceiling. If any other openings than ceiling openings are involved, the system should be tested to assure proper performance.	Openings were sealed in the original plant design and under modification 79Y084, after sealing was re-evaluated for conformance to requirements for 3-hour fire rated barriers. Fire Area 18 was subsequently gas-tracer leak tested to determine leakage.

A more detailed analysis that includes calculating CO_2 concentrations at specific points within the room would not be feasible considering the assumptions that would have to be made and the variables encountered during a fire and subsequent CO_2 discharge. There is also a lack of test data by elevation for carbon dioxide discharges during a fire to substantiate the calculated results.

A calculation properly addressing these variables would require a large number of assumptions that could not be verified because of the lack of empirical data to substantiate them.

Section 1.10.b.2 of the inspection report identified a concern that, "...a higher concentration of CO2 could be vented from the room during CO2 discharge than

assumed by the analysis." Analysis M-4163-001, Revision 1, assumes that the discharge vented through the door(s) is of time-varying concentration over the duration of the venting according to the time-varying concentration calculated in the room. A sensitivity analysis assuming a 10% higher concentration of CO_2 was performed to address the concern in the inspection report. The 10% value was chosen to check for sensitivity to concentration versus elevation, because there was an (approximately) 10% difference between the floor and ceiling elevation concentrations documented in the pre-operational test results. The preliminary results indicate that, even with higher concentration CO_2 venting out the door, the acceptance criterion (50% concentration maintained in the room for 15 minutes) will be met.

The system design, leak testing, and evaluation meets or exceeds all of the NFPA 12-1972 requirements and special considerations. Therefore, no further analysis (beyond formalizing the sensitivity analysis) is planned to address concentration at particular room elevations.

NRC Request – Part 3:
In addition, the evaluation should specifically address the potential effects of the method for venting over pressure using the fire doors. Specifically, the effect upon Operations personnel due to smoke propagation and CO2 leakage out of the room should be addressed.

Prairie Island Response:
Smoke or CO_2 in concentrations high enough to affect Operations personnel would be noticable. As such, it is reasonable to expect Operations personnel would choose to either use an alternate path or return to the Control Room and don SCBA. These alternatives do not preclude the ability of these personnel to perform their required actions in the time required to meet Appendix R performance goals.

System Actuation Response
The Relay Room fire detection system consists of Ionization Smoke Detectors and Thermal Detectors (set for 140 degrees F). The Ion Detectors actuate an annunciator on the Control Room fire panel; the Thermal Detectors automatically actuate the CO_2 fire suppression system. It is expected that in case of a fire, the Ion Detectors would alarm before the Thermal Detectors actuate fire suppression. Upon receipt of an alarm at the fire panel, an operator would be dispatched to the area and if a fire is found the fire brigade is called to respond. The brigade members have a response time of ten minutes and are equipped with Self-Contained Breathing Apparatus (SCBA) which would protect brigade members against the effects of smoke/CO_2 propagation. Actuation of the Relay Room automatic fire suppression system is preceded by a local

alarm that would alert any personnel present in the area to exit. The brigade would implement the fire strategies for the area, which include setting up ventilation fans to exhaust smoke/CO_2. Calculation SYS-FP-016 indicates ventilation would reduce concentrations of smoke/CO_2 considerably within a small amount of time. Operations Personnel (other than the appropriately protected fire brigade) would not be expected in the area near the primary room leakage path unless a Control Room evacuation had been initiated.

The plant procedure which directs Control Room evacuation and plant shutdown activities is procedure F5 Appendix B "Control Room Evacuation (Fire)", Revision 22. That procedure lists the following symptoms for entry:

2.3.1 A catastrophic fire as evidenced by flames or smoke in the Control Room (Zone 57) and/or Relay Room (Zone 12) that requires evacuation.

2.3.2 Actuation of fire detection and suppression in other fire areas which indicates conditions i.e., (smoke, fumes) that require Control Room evacuation.

Effects of post-suppression discharge atmosphere on F5 Appendix B Implementation
In the unlikely event a Control Room Evacuation were required, there is no way to pinpoint the specific point in time during a Relay Room fire scenario that the decision to evacuate the Control Room would be made. As noted above:

- Prairie Island's fire brigade has a required 10 minute response time to a fire in the Relay Room.
- Fire strategies identify the use of portable fans to remove smoke from the area.
- Calculation SYS-FP-016 shows that with adequate ventilation (fans) the CO_2 and smoke generated during a fire could be removed or dispersed in a short period of time.

In the event of a fire, it would most likely take some time for the fire to propagate to a point where Control Room evacuation was required, allowing the Fire Brigade to respond and implement the fire strategies.

In the unlikely event the entry conditions were reached and a Control Room evacuation were to occur, F5 Appendix B would be entered and Operators would proceed to various plant locations and perform actions as directed by individual appendices of the procedure. Operators with access and egress routes potentially involving the 695' and 715' levels of the Turbine Building are summarized below:

- U1 SS proceeds to Auxiliary Feedwater Pump Rooms. (Attachment A)
- U2 SS proceeds to 11 Battery Room. (Attachment B)
- U1 RO proceeds to the Plant Screenhouse. (Attachment C)

- U2 RO proceeds to Access Control. (Attachment D)
- U1 LPEO proceeds to Bus 15 Room then to D1 Room. (Attachment F)

Direction regarding access/egress pathways is provided in some of those appendices as follows:
Loss of offsite power could occur at any time during this event. The Operators should use stairways and pathways with emergency lights.

Then further:
Use lighted stairwell near Records room.

The stairwell near the records room (East Stairwell) was identified as the most convenient and shortest path to those areas. That path would place Operators directly outside the east door of the Relay Room, that door is the primary vent path for the Relay Room CO_2 fire suppression system (it should be noted that the procedural guidance identified above is being reviewed for revision/clarification based on the results of calculation SYS-FP-016 described below).

Calculation SYS-FP-016 contains an evaluation of the atmosphere of the 695' and 715' elevations of the East Side of the Turbine Building in the immediate area around the east Relay Room door following a bounding Appendix R type exposure fire and subsequent fire suppression system actuation in the Relay Room. The calculation notes that, between 2 and 45 minutes after the CO_2 fire suppression system actuates, CO_2 concentrations in that immediate area could exceed the NIOSH allowable levels, and that between 2.4 and 32 minutes after actuation, O2 concentrations could drop below NIOSH allowable levels.

<u>715' Elevation</u>
If the East Stairwell were used, the Operators following F5 Appendix B, Attachments A, B, C and D would be in that environment on the order of seconds as they proceed to other plant areas. Conversations with Industrial Safety personnel indicate that although highly undesirable, remaining in those conditions for a matter of seconds would probably not prevent Operators from being able to continue through the area.

The Operator following F5 Appendix B, Attachment F proceeds to the Bus 15 Room, which is on the 715' elevation of the Turbine Building. The Bus 15 room is in the 'safeguards corridor' portion of the turbine building, habitability inside the Bus 15 Room is not expected to be affected by a Relay Room fire or suppression system actuation. After performing actions in the Bus 15 Room the Operator proceeds to the D1 Room, then eventually back to the Bus 15 Room. If all the activities in Appendix F are performed using the East Stairwell the operator could pass outside the door of the

Relay Room three separate times. Again, the operator would only be in the environment outside the door on the order of seconds each time.

695' Elevation

If they use the East Stairwell, the Operators following F5 Appendix B, Attachments A, B, C, D and F would be in this environment on the order of seconds as they proceed to other plant areas. Conversations with Industrial Safety personnel indicate that although undesirable, remaining in those conditions for a matter of seconds would most likely not prevent Operators from being able to continue through the area. The Operators following Appendices A and B proceed to locations (AFW Pump Room, Safeguards Battery Rooms) on this elevation to perform actions. Habitability in those areas is not expected to be affected by Relay Room CO_2 fire system actuation and venting.

Alternate Courses of Action

The large amounts of smoke/suppression agent that could result in an environment outside OSHA standards would be visible to the Operators (black smoke and/or white vapor cloud) as they attempted to enter the stairwell. As such, a more likely scenario than Operators proceeding directly into the stairwell under the conditions identified above, would be a decision to either use alternate pathways or return to the Control Room and don SCBA.

Alternate Access/Egress Pathways

Numerous alternate paths to the 715' and 695' elevations of the Turbine Building are available. Two of those paths (West Turbine Building stairwells and D5/D6 Building stairwells) are illuminated by Appendix R Section III.J compliant emergency lighting units. Those paths could be used by Operations to bypass the East Stairwell.

Operators following F5 Appendix B, Attachments B, C, D, and F would then need to either proceed through the 695' elevation of the east side of the Turbine Building (with Appendix R lighting) or follow other paths (west side of turbine building, east side of turbine building 715' elevation away from Relay Room door, outside plant) that are not lighted with Section III.J Emergency Lights to complete their activities. Operators are directed by procedure to carry flashlights and would be able to follow these alternate paths even if normal plant lighting and plant incandescent emergency lighting were affected by the fire or otherwise unavailable.

The Appendix R Timelines (GEN-PI-030) were generated using the East Stairwell as the primary route to/from the 695' and 715' Turbine Building elevations. A review of the timelines indicates the potential consequences of using alternative pathways (in regards to completing critical shutdown activities in time to meet Appendix R performance goals) are greatest for the Unit 1 Lead Equipment Operator. That Operator has to

proceed to the Bus 15 Room on the 715' elevation of the Turbine Building, perform some manual activities, then proceed to the D1 Diesel Room on 695' elevation of the Turbine Building, perform some manual activities, then return to the Bus 15 Room. Under normal circumstances this would send the Operator through the area of concern (East Stairwell) three times. Limited trials were run using available alternate pathways. In those trials it was noted that the time from initial evacuation to the Bus 15 room could be increased by approximately 7 seconds by using alternate pathways, the time from the Bus 15 room to the D1 room could be increased by up to 1 minute, and the time from the D1 room back to the Bus 15 room by up to 1 minute for a total increase of approximately 2 minutes.

The time critical activity the Operator is performing is the restoration of a train of 480V switchgear to power the Unit 1 Charging Pump. By analysis (reference SE 584), the charging pump must be starting within 34.6 minutes to meet Appendix R performance requirements. The timelines indicate that by using the East Stairwell it took 22 minutes for completion of all the required activities. That left a margin of 12.6 minutes, which is more than the time found as required to use alternate access/egress routes. It should be noted that the required time (34.6 minutes) is based on the Appendix R performance requirement of maintaining Pressurizer Level on-scale, not on restoring Charging prior to uncovering the reactor core or the plant being placed in an unrecoverable condition.

SCBA Use

Control Room operators are trained in the use of SCBA, which are readily available. If the decision were made to don SCBAs, the donning/doffing would add time to the F5 Appendix B shutdown evolution. Conversations with Operations indicate the additional time would be on the order of several minutes. This would be an alternative to using alternate pathways. As detailed above, adding minutes worth of activities to the shutdown evolution would not affect the ability of the plant to meet Appendix R safe shutdown goals.

Likelihood of Control Room Evacuation due to Relay Room Fire

The determination that a Relay Room fire 'requires evacuation' would be made based on the habitability of the Control Room area and/or the potential to lose control of critical plant functions due to fire-induced circuit failures (i.e., a fully developed fire is evident in the Control Room or Relay Room). The Relay Room was evaluated as part of the 'Prairie Island Nuclear Generating Plant Individual Plant Examination of External Events (IPEEE)' (NSPLMI – 96001 Revision 1). In Attachment 3 of Appendix B of the IPEEE, fire scenarios for the Relay Room are evaluated in detail. In that attachment it is noted that, "a bounding Appendix R type exposure fire is not credible." In essence, the evaluation performed as part of the IPEEE found credible fires to be of limited size and controllable by the fire suppression system and manual brigade response.

In the event of a credible fire, it is unlikely that the entry conditions into F5 Appendix B would be met. Three-hour fire barriers and permanently closed fire dampers separate the Control Room and Relay Room. During the original discharge test of the Cardox system operations personnel were stationed in the Control Room and did not note any conditions that would prompt an evacuation.

In the event of a fire/suppression system actuation, some amount of smoke and suppression agent may enter the Control Room, however SCBA are readily available to Control Room Operators if necessary and a decision to don the SCBA and continue to maintain plant control from the Control Room would be more likely than a decision to evacuate the Control Room.

Summary
Credible fire scenarios for the Relay Room, which might result in actuation of the CO_2 fire suppression system, would be unlikely to require entry into the Control Room Evacuation Procedure. The actuation of the suppression system in that case would not adversely affect Operations personnel. In the unlikely event Control Room Evacuation were required (due to a bounding Appendix R type fire in the Relay Room concurrent with a Relay Room suppression system actuation), the situation would be readily identifiable and alternate access/egress paths would be available and/or SCBAs could be used while performing F5 Appendix B. The activities critical to achieve Safe Shutdown could still be performed in a manner that would meet the Appendix R Safe Shutdown performance goals.

NRC Request – Part 4:
If the evaluation does not rely upon testing methodology specified by NFPA 12 (i.e. satisfactory full discharge test) provide justification for the alternative testing methodology employed.

Prairie Island response:
Although NFPA 12-1972 does require testing, it does not require a full discharge test. The sections that refer to a full discharge test are phrased with "should." Per NFPA 12-1972 provided definitions, "should" is intended to indicate recommendations of that which is advised but not required. Other testing, which is required, is directed by a "shall."

NFPA 12-1972 does not identify alternative test methods for evaluating acceptance of an installed total flooding CO_2 system. Later versions of NFPA 12 which require the full discharge test (directed as a "shall") also refer to waiving the requirement when

necessary and again they do not identify alternative test methods for evaluating acceptance of an installed total flooding CO_2 system. (Reference for example NFPA 12-1989 Section 1-7.3.d. and A-1-7.3.)

NFPA 12A-1989 standard for Halon 1301 Fire Extinguishing Systems acknowledges that full discharge testing may be undesirable due to cost and environmental considerations with Halon systems. The standard provides alternate agents to use if a full discharge test is to be performed, and provides alternative tests if a full discharge test is not desired (reference Appendix B to the standard).

The NRC has previously addressed concerns with CO_2 system testing in Information Notice (IN) 92-28 "Inadequate Fire Suppression System Testing". IN 92-28 indicates that performing full discharge tests in operating nuclear power plants may present hazards (e.g., thermal shock to safety related components, uncontrolled electrostatic discharge, and hazards to personnel). The NRC describes the room pressurization test for Halon systems in NFPA 12A-1989 Appendix B as an alternative test method which was used at Vermont Yankee to evaluate room leakage. Vermont Yankee then used the results of the test as input to an engineering evaluation of the installed CO_2 system to verify that the system would operate as designed to deliver a sufficient amount of CO_2.

The room pressurization test methodology was described in IN 92-28 as conservative because the effects of the thermal expansion of the mixture of CO_2 and air are not included and a "worst case" distribution of measured leakage area is assumed.

Prairie Island has used a similar approach to that described in IN 92-28. First, a test was performed to determine room leakage. Prairie Island used a tracer gas test rather than the room pressurization test outlined in Appendix B NFPA 12A to verify room leakage. Prairie Island felt this tracer gas testing was more conservative than the fan test outlined in NFPA 12A, because:

- NFPA 12A-1989 specifically states that the room pressurization test procedure only concerns Halon total flooding systems using Halon 1301 and designed, installed, and maintained in accordance with NFPA 12A,
- all measurements are taken at actual room pressures and temperatures (no air density or temperature correction are required),
- the results are based on measurement of only one variable (concentration), and
- the model is straightforward and mathematically sound, and
- vendors have identified issues with accurate readings conducted during fan tests on rooms as large as our Relay Room.

Prairie Island used the results of the room leakage test as input to the engineering evaluation previously described in this response. This combination of a room leakage test and engineering evaluation is consistent with the alternative approaches described in IN 92-28.

NRC Request – Part 5:
If the evaluation has not yet been performed, provide a plan and a schedule for performing such an evaluation and testing required to support such an evaluation.

Prairie Island response:
The evaluation is described above. As noted above, a sensitivity analysis (that investigates the effect of the differing concentrations between floor and ceiling) is being formalized. The preliminary results of this analysis indicate the calculation acceptance criteria would still be met. No further action is planned.