

# **NUCLEAR REGULATORY COMMISSION**

**Docket No. 50-263;**

**Norther States Power Company**

**Monticello Nuclear Generating Plant**

**Exemption**

## **I. Background.**

Northern States Power Company, doing business as Xcel Energy (the licensee), is the holder of Renewed Facility Operating License Number 50-263 which authorizes operation of the Monticello Nuclear Generating Plant (MNGP). The license provides, among other things, that the facility is subject to all rules, regulations, and orders of the U.S. Nuclear Regulatory Commission (NRC, the Commission) now or hereafter in effect.

The facility consists of a boiling water reactor located in Wright County, Minnesota.

## **II. Request/Action.**

Section III.G.2. of Appendix R to Title 10 of the *Code of Federal Regulations* (10 CFR)

Part 50 states in part:

Except as provided for in paragraph G.3 of this section, where cables or equipment, including associated non-safety circuits that could prevent operation or cause maloperation due to hot shorts, open circuits, or shorts to ground, of redundant trains of systems necessary to achieve and maintain hot shutdown conditions are located within the same fire area outside of primary containment, one of the following means of ensuring that one of the redundant trains is free of fire damage shall be provided:

a. Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers

shall be protected to provide fire resistance equivalent to that required of the barrier[.]

The licensee determined that certain structural steel columns and beams supporting the floor of the Cable Spreading Room are not coated with fireproofing material that provides a fire resistance equivalent to that of the fire barrier. To address this finding, by letter dated March 21, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18080A161), as supplemented by letter dated July 20, 2018 (ADAMS Accession No. ML18201A558), the licensee requested an exemption from the portion of paragraph III.G.2.a. of Appendix R that requires structural steel to be protected by an equivalent 3-hour fire barrier. The licensee indicated that the scope of its exemption request is limited to the unprotected structural steel in the floor of Fire Zone 8 (Cable Spreading Room) forming the barrier with all or parts of Fire Zones 7A, 7B, and 10 (125V Division I Battery Room, 250V Division I Battery Room, and Plant Administration Building (PAB), respectively).

### **III. Discussion.**

Pursuant to 10 CFR 50.12(a)(1), the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of 10 CFR Part 50 which are authorized by law, will not present an undue risk to public health or safety, and are consistent with the common defense and security. However, 10 CFR 50.12(a)(2) states that the Commission will not consider granting an exemption unless special circumstances are present. Further, per 10 CFR 50.12(a)(2), special circumstances are present whenever:

- (i) Application of the regulation in the particular circumstances conflicts with other rules or requirements of the Commission; or
- (ii) Application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule; or

(iii) Compliance would result in undue hardship or other costs that are significantly in excess of those contemplated when the regulation was adopted, or that are significantly in excess of those incurred by others similarly situated; or

(iv) The exemption would result in benefit to the public health and safety that compensates for any decrease in safety that may result from the grant of the exemption; or

(v) The exemption would provide only temporary relief from the applicable regulation and the licensee or applicant has made good faith efforts to comply with the regulation; or

(vi) There is present any other material circumstance not considered when the regulation was adopted for which it would be in the public interest to grant an exemption. If such condition is relied on exclusively for satisfying paragraph (a)(2) of this section, the exemption may not be granted until the Executive Director for Operations has consulted with the Commission.

The licensee stated that special circumstances as described in 10 CFR 50.12(a)(2)(ii) are present in that the application of the regulation in this particular circumstance is not necessary to achieve the underlying purpose of the rule (i.e., the underlying purpose of paragraph III.G.2.a. of Appendix R (stating in part that structural steel forming a part of, or supporting, a fire barrier shall be protected to provide fire resistance equivalent to a 3-hour fire barrier)).

*A. Underlying Purpose of Protecting Structural Steel with 3-Hour Barrier*

The Commission proposed its fire protection rules in 1980 via Proposed Rule, Fire Protection Program for Nuclear Power Plants Operating Prior to January 1, 1979, 45 Fed. Reg. 36082 (May 29, 1980) (proposing, among other things, a new Appendix R to 10 CFR Part 50). Proposed section III.M “Fire Barriers” of Appendix R (45 Fed. Reg. at 36089) stated in part:

**M. Fire Barriers.** Fire barriers (floors, walls, ceilings, or other enclosures) separating fire areas, or equipment or components of redundant systems important to safe shutdown within an area shall have a fire rating of 3 hours unless a lower rating is justified by the fire hazard analysis.

Structural steel forming a part of or supporting such fire barriers shall have fire resistance equivalent to that required of the barrier. Such fire resistance shall be provided by protection equivalent to metal lath and plaster covering.

Penetrations in these fire barriers, including conduits, cable trays, and piping shall be sealed or closed to provide fire resistance rating equivalent to that required of the barrier. Door openings shall be protected with doors, frames, and hardware that have been tested and approved by a nationally recognized testing laboratory to have a fire resistance rating equivalent to that required of the barrier. Penetrations for ventilation systems shall be protected by a standard "fire door damper."

The Commission subsequently finalized its fire protection rule in 1980 (Final Rule, Fire Protection Program for Operating Nuclear Power Plants, 45 Fed. Reg. 76602 (Nov. 19, 1980)). The Commission explained (45 Fed. Reg. at 76608) that it "has selected 3 hours as an acceptable minimum fire resistance rating for fire barriers separating redundant trains for safe shutdown systems. This will give ample time for automatic and manual fire suppression activities to control any potential fire and for safe shutdown activities to properly control the reactor." The Commission addressed several comments related to the proposed (45 Fed. Reg. at 36089) fire barrier and structural steel requirements, writing (45 Fed. Reg. at 76608):

Several commenters made a number of suggestions of an editorial nature. One suggestion was to add "or unless other fire protection features have been provided to ensure equivalent protection" in the first paragraph, where three-hour rated fire barriers were stipulated unless a lower rating was justified by the fire hazards analysis. The Commission feels that this adds nothing in the way of clarification and the suggestion was not adopted. The second paragraph requires that structural steel forming a part of or supporting any fire barrier have a fire resistance equivalent to that required of the barrier. An example was given of metal lath and plaster covering as being one means of providing equivalent protection. Several commenters stated that they thought this was too narrow and would be interpreted by some people as the only acceptable method permitted. Since the example seemed to be confusing, a decision has been made to eliminate it. Other comments to the effect that the requirement was excessively restrictive with regard to fire barrier penetrations, including fire doors and their associated frames and hardware, and ventilation systems have been acted upon by the staff and the requirement, as it had affected these items, was deleted.

The final rule moved the structural steel fire barrier requirement to paragraph III.G.2.a. of Appendix R (45 Fed. Reg. 76613) (saying “Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier.”).

Therefore, the underlying purpose of paragraph III.G.2.a. is to ensure that the protection of structural steel provides (i.e., does not undermine) the 3-hour minimum fire resistance rating for fire barriers separating redundant trains for safe shutdown systems. Three hours will give ample time for automatic and manual fire suppression activities to control any potential fire and for safe shutdown activities to properly control the reactor.

#### Licensee’s application for exemption

The licensee stated that for Fire Zones 7A, 7B, 8, and 10, MNGP is required to comply with 10 CFR 50, Appendix R, and that the deterministic requirements of section III.G.2 mandate that, using one of the options given, the redundant trains should be adequately separated and protected, such that in the event of a fire in that fire area, at least one train will remain free of fire damage. The licensee further stated that contrary to the requirement, the structural steel in a portion of the floor of the Cable Spreading Room is not protected with fireproofing material to provide fire resistance equivalent to that of the barrier.

The licensee stated that the intent of section III.G.2 has been met by means other than the deterministic physical separation requirements, and that instead, based on a detailed fire modeling analysis, it has determined that the structural steel will not fail in the event of a fire. The licensee stated that the approach used in the detailed fire modeling analysis was similar in nature to a previously approved structural steel survivability analysis known as the “Limerick Methodology” and described in NUREG-0991, Supplement 2, “Safety Evaluation Report Related to the Operation of Limerick Generating Station, Units 1 and 2,” dated October 1984 (Legacy ADAMS Accession No. 8411090445).

The licensee stated that this conclusion is further supported by instructions provided in the American Society of Mechanical Engineers/American Nuclear Society (ASME/ANS) Probabilistic Risk Assessment (PRA) Standard (ASME/ANS RA-Sa-2009, "Addenda to ASME/ANS RA-S-2008 Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Application," dated February 2, 2009), which recommends the screening of such structural steel when high hazard fire sources are not present.

The licensee stated that because the structural steel will not fail, a fire that originates in Fire Zones 7A, 7B, or 10 will not propagate into Fire Zone 8 and that the existing barriers between Fire Zones 8 and 7A, 7B, and 10 provide protection commensurate with the fire hazards therein and ensure the safe shutdown strategy will be preserved. The licensee concluded that MNGP retains the ability to reach and maintain safe shutdown in the event of a fire in any plant area and protecting the exposed steel members would have no demonstrable safety benefit over current conditions.

The licensee further stated that the underlying purpose of the rule, which is to provide reasonable assurance that safe shutdown of the reactor can be achieved and maintained in the event of a single postulated fire in any plant area, is satisfied and the application of the deterministic requirements of section III.G.2 in these particular circumstances is not necessary to achieve the underlying purpose of the rule.

The licensee stated that a fire area approach is employed at MNGP to demonstrate compliance with 10 CFR 50, Appendix R, and that fire zones are combined into fire areas based on the redundant trains of safe shutdown equipment therein and the feasibility of providing adequate fire boundary barriers to separate them from other fire areas. The licensee further stated that the Cable Spreading Room (Fire Zone 8) is a part of Fire Area VI with the remainder of the fire area being comprised of Fire Zones 7A, 7B, 10, and 11, and that the alternate shutdown system is the credited safe shutdown strategy for Fire Zone 8 and that Division II equipment is the credited safe shutdown strategy for Fire Zones 7A, 7B, 10, and 11. The

licensee further stated that because the shutdown strategy is different for the Cable Spreading Room than the rest of Fire Area VI, it is not appropriate for the Cable Spreading Room to be a part of Fire Area VI and, therefore, the barriers between the Cable Spreading Room and adjacent fire zones must meet the requirements of 10 CFR, Part 50, Appendix R.

The licensee stated that the MNGP Fire Protection Program (FPP), which is consistent with Branch Technical Position (BTP) APCSB 9.5-1, 10 CFR 50.48, Appendix R of 10 CFR 50, and supporting generic communications, is designed and implemented based on a foundation of defense-in-depth that consists of:

Fire Prevention – Preventing fires from starting through control of fuel and ignition sources and conditions.

Fire Detection and Suppression – Providing the capability to promptly detect any fires that may occur and the capability to promptly and effectively control and extinguish any such fire.

Protection of Safe Shutdown Capability – Providing protection for systems, structures, and components important to safety such that any fire that is not promptly detected and extinguished will not prevent the safe shutdown of the plant.

The licensee stated that the Cable Spreading Room is located on the 939-foot elevation of the PAB and is bordered by the Turbine Building to the north, other PAB areas to the east and south, and the Reactor Building to the west. The licensee further stated that the Cable Spreading Room is directly above the 125V Division I and II Battery Rooms, 250V Division I Battery Room, and other portions of the basement of the PAB and that the Cable Spreading Room is directly below the Control Room.

The licensee stated that because the Cable Spreading Room north and west walls, the entirety of the ceiling, and the portion of the floor over the 125V Division II Battery Room were previously classified as fire barriers between adjacent fire areas, they have already been demonstrated to meet the requirements of 10 CFR 50, Appendix R. The licensee further stated that the east and south walls separating the Cable Spreading Room from other rooms on the 939-foot elevation of the PAB are comprised of poured concrete and provide a 3-hour fire

barrier. Therefore, the only boundary of the Cable Spreading Room which will not meet 10 CFR, Part 50, Appendix R, is the portion of floor that is not directly above the Division II Battery Room. The licensee indicated that the scope of its exemption request is limited to the unprotected structural steel in the floor of Fire Zone 8 (Cable Spreading Room) forming the barrier with all or parts of Fire Zones 7A, 7B, and 10 (125V Division I Battery Room, 250V Division I Battery Room, and PAB, respectively).

The licensee provided the details of combustible loading/fire severity and active fire protection features for the specific fire zones of concern in Table 1 of its request. The licensee stated that the localization of the hazards and combustibles by fire zone, combined with the separation between fire zones by spatial and barrier separation, provide reasonable assurance that fires that occur within a given zone will be confined to the fire zone of origination.

The licensee provided summary descriptions of each of the fire zones that included the types of combustibles, available detection and suppression, and smoke/hot gas ejection methods.

Fire Zone 7A – 928 foot elevation, PAB (125V Division I Battery Room)  
The combustible loading in this zone primarily consists of battery cases and cable insulation. Combustible loading is administratively controlled by procedures. Ignition sources within the fire zone include batteries, battery chargers, and electrical cabinets. There is no fixed fire suppression system installed in this zone, but hose stations and portable extinguishers are available in an adjacent fire zone. The ionization detection system alarms in the control room thereby providing an early warning of a fire and, subsequently, an early response of the fire brigade to extinguish the fire. Smoke and hot gases can be evacuated using normal air handling systems or opening the access door. Portable smoke ejectors can be used as a backup. The zone contains Division I safe shutdown equipment. In the event of a fire in this zone, Division II safe shutdown equipment would be available for shutdown.

Fire Zone 7B – 928 foot elevation, PAB (250V Division I Battery Room)  
The combustible loading in this zone primarily consists of battery cases and cable insulation. Combustible loading is administratively controlled by procedures. Ignition sources within the zone include batteries, battery chargers, and electrical cabinets. There is no fixed fire suppression system installed in this zone, but hose stations and portable extinguishers are available in an adjacent fire zone. The ionization detection system alarms in the control room thereby providing an early warning of a fire and, subsequently, an early response of the fire brigade to extinguish the fire. Smoke and hot gases can be evacuated using



normal air handling systems or opening the access door. Portable smoke ejectors can be used as a backup. The zone contains Division I safe shutdown equipment. In the event of a fire in this zone, Division II safe shutdown equipment would be available for shutdown.

**Fire Zone 8 – 939 foot elevation, PAB (Cable Spreading Room)**

The combustible loading in this zone primarily consists of cable insulation. Combustible loading is administratively controlled by NSPM [Northern States Power Company – Minnesota) procedures. Ignition sources within the zone include electrical cabinets. The fire zone is equipped with an automatic halon suppression system as well as portable extinguishers. Hose stations are located in adjacent fire zones. The ionization and thermal detection systems alarm in the control room thereby providing an early warning of a fire and, subsequently, an early response of the fire brigade to extinguish the fire. Smoke and hot gases can be evacuated using normal air handling systems with portable smoke ejectors available as a backup, if necessary. The zone contains both Division I and Division II safe shutdown equipment. In the event of a fire in this zone, the alternate shutdown system would be available for safe shutdown.

**Fire Zone 10 – multiple elevations, PAB (Plant Administration Building excluding the Battery, Cable Spreading, Control, and heating, ventilation and air conditioning (HVAC) Rooms).** The scope of this exemption request is limited to a portion of this fire zone on the 928 foot elevation, however, the discussion below includes features of the fire zone in its entirety. The combustible loading in this zone primarily consists of those combustibles typical of office occupancy. As Fire Zone 10 is comprised mostly of office space, the introduction of combustible material is not controlled in the same manner as fire zones in the power block. Ignition sources include an electric motor, a power transformer, ventilation systems, and electrical cabinets. However, electrical cabinets and one dry power transformer are the only ignition sources present in the portion of the fire zone below the Cable Spreading Room. Portions of the fire zone (Records Storage Vault and Computer Room) are equipped with automatic halon suppression systems. There is no fixed fire suppression system installed in the remainder of the fire zone, but hose stations and portable extinguishers are available throughout. Ionization detectors are available in portions of the fire zone and will alarm in the control room thereby providing an early warning of a fire and, subsequently, an early response of the fire brigade to extinguish the fire. However, none of the ionization detectors are installed in the portions of Fire Zone 10 pertinent to this request. Smoke and hot gases can be evacuated using normal air handling systems with portable smoke ejectors available as a backup, if necessary. The zone contains Division I safe shutdown equipment. In the event of a fire in this zone, Division II safe shutdown equipment would be available for shutdown.

The licensee provided a discussion of its detailed fire modeling analysis regarding the survivability of the structural steel for the postulated fire hazards present in the fire zones in question. Similar to the referenced Limerick Methodology, the licensee used a mathematical model to calculate the time-temperature profile for potential fires in each fire area and that if any

of the calculations show that the time-temperature profile in an area will exceed 1100 degree Fahrenheit (°F) within 3 hours, an evaluation is performed to calculate the corresponding temperature response of the supporting structural steel and that if the steel temperature does not exceed 1100 °F within 3 hours, the steel need not be protected.

The licensee stated that the Limerick Methodology is based on the availability and quantity of two specific types of fixed combustibles found in a nuclear power plant: cable insulation and lubricating oil. The licensee further stated that lube oil is not present and there are no significant concentrations of exposed cable insulation in the applicable fire zones and, therefore, the areas beneath the Cable Spreading Room would screen out of the Limerick Methodology and the structural steel would not need to be protected with no further analysis required. The licensee further stated that while the results of this analysis appropriately reflect the low significance of the exposed structural steel, it determined it was prudent to perform additional analysis to demonstrate the acceptability of the exposed structural steel.

The licensee stated that it performed fire modeling using the Fire Dynamics Simulator (FDS) code which is a computational fluid dynamics model of fire-driven fluid flow that numerically solves the governing equations of fluid dynamics with a particular emphasis on fire and smoke transport. The licensee further stated that FDS is known to provide better predictions for heat flux and surface temperatures than comparable tools (e.g., CFAST and MAGIC) and that it has been shown to predict heat flux and wall temperature within 20 percent with a bias towards over-prediction. The licensee further stated that two distinct analyses were performed using FDS, the first examined the plant access control area, while the second examined the battery rooms.

The licensee stated that an acceptance criterion of 1100 °F was established to determine the acceptability of the exposed structural steel and that Generic Letter (GL) 83-33, "NRC Positions on Certain Requirements of Appendix R to 10 CFR 50," (ADAMS Accession No. ML031080522) states that this temperature is typically considered the critical temperature of

steel because at this temperature the yield stress in the steel has decreased to about 60 percent of the value at room temperature. The licensee further stated that it reviewed the structural design for the as-built configuration of the PAB and determined that the acceptance criterion in GL 83-33 is applicable to the exposed structural steel supporting the MNGP Cable Spreading Room floor.

The licensee stated that for the plant access control area, a transient fire was assumed to occur directly below a structural beam and immediately adjacent to a structural steel column and that the assumed fire was the 98<sup>th</sup> percentile transient fire with a heat release rate (HRR) of 317 kW, consistent with the guidance in NUREG/CR-6850, "EPRI/RES Fire PRA Methodology for Nuclear Power Facilities," Table G-1 (ADAMS Accession Nos. ML15167A401, and ML15167A411). The licensee further stated that this fire was determined to be the most limiting postulated fire based on a walkdown of the applicable plant areas and review of all potential ignition sources and that the duration of the fire was assumed to be 1 hour. The licensee further stated that sensitivity studies were performed to verify the adequacy of the results of the final FDS model and that these studies were performed to verify the numerical grid size, the use of a simplified small-scale model, and the effects on structural steel temperature based on the location of the fire.

The licensee stated that the ignition sources in the area consist of batteries, battery chargers, a dry transformer, or electrical cabinets so it is unclear to the NRC staff why the licensee stated that a 317 kW transient fire was assumed to represent the most limiting postulated fire because the identified ignition sources all represent larger fires. The NRC staff requested that the licensee provide technical justification for why the smaller transient fire was selected as more limiting than a battery, battery charger, dry transformer, or electrical cabinet fire. In its letter dated July 20, 2018 (ADAMS Accession No. ML18201A558), the licensee responded to the NRC staff's request and stated that the licensee used information contained in NUREG-2178, "Refining and Characterizing Heat Release Rates from Electrical Enclosures

During Fire (RACHELLE-FIRE),” Volume 1 (ADAMS Accession No. ML16110A140), to support its assumption that electrical cabinets in the areas containing low fuel loading would exhibit a shorter fire duration and smaller peak HRR than the 317 kW transient fire selected for their analysis. The licensee stated that the heat rates and shorter durations demonstrated by other potential ignition sources (i.e. batteries, battery chargers, a dry transformer, or electrical cabinets ) are subsumed by the transient fire that continues for 60 minutes which is used in the analysis. The licensee also stated that they performed a sensitivity study using the default HRR value for the cabinets and determined that the transient fire resulted in higher calculated peak steel temperatures, thereby representing a conservative approach. The staff found the licensee’s response acceptable because it represents a conservative analysis that was based on plant walk down information and accepted methods or guidance.

The licensee provided a figure that displayed the manner in which the structural steel columns and beams were modeled in the plant access control area which showed a 2 foot by 2 foot fire located immediately adjacent to a structural steel column as it was found to be the most limiting configuration (i.e., highest resultant temperatures). The licensee also provided a figure that showed the temperature response of an exposed structural steel beam located directly above the transient fire in the plant access control area. This figure identified that the temperature of the structural steel beam is beginning to level off at approximately 350 °F after 1 hour and the licensee concluded that the critical temperature of 1100 °F will not be reached and the structural steel will continue to support the Cable Spreading Room floor despite the lack of fireproofing material.

The licensee stated that for the battery rooms, FDS runs were completed only for the Division I 125 V Battery Room (Fire Zone 7A). The licensee stated that citing the significantly smaller air volume in Fire Zone 7A, it determined the air temperature and resulting structural steel temperature would bound that of a similar analysis for Fire Zone 7B. The licensee further stated that a 98th percentile transient fire with a HRR of 317 kW was assumed to occur directly

below the structural steel, immediately adjacent to a concrete wall and that the duration was assumed to be 1 hour. The licensee further stated that sensitivity studies were performed to verify the adequacy of the results of the final FDS model and that these studies were performed to verify the numerical grid size, the effects of different fire soot yields, and the effects on structural steel temperature based on the location and size of the fire.

The licensee provided a figure that displayed the manner in which the structural steel beams were modeled in the Division I 125 V Battery Room. The figure showed a 1ft by 1ft fire located adjacent to a wall and directly below a structural steel beam as it was found to be the most limiting configuration (i.e., highest resultant temperatures). The licensee provided a figure that showed the temperature response of the exposed structural steel beam for a variety of modeled conditions (e.g., different fire position, mesh size, soot yields, room door open and closed) that showed the temperature of the structural steel beam in the most limiting case levels off at approximately 800 °F during the 1-hour duration of the fire. The licensee concluded that the critical temperature of 1100 °F will not be reached and the structural steel will continue to support the Cable Spreading Room floor despite the lack of fireproofing material.

The licensee stated that physical fire dimensions of the assumed 317 kW fire were 2 foot by 2 foot for the plant access control area and 1 foot by 1 foot for the battery rooms but did not provide any technical justification for the use of different fire dimensions. The NRC staff requested that the licensee provide technical justification for using different fire sizes. In its letter dated July 20, 2018, the licensee responded to the NRC staff's request and stated that the physical dimensions, i.e., 1 foot by 1 foot and 2 foot by 2 foot, of the transient fires used in their analysis were based on scenarios that represented bounding cases for the steel beams and columns, respectively. The staff found the licensee's response acceptable because it represents a conservative analysis that was based on plant walk down information that reflects the physical design of the plant and sound engineering judgement.

The licensee stated that the following conservatisms were built into the FDS runs:

FDS only simulates one-dimensional heat conduction; therefore, conduction of heat away from the fire plume is not included in the calculations.

Transient fires were assumed to burn continuously for 1 hour at the 98<sup>th</sup> percentile HRR. This is especially conservative when reviewing the HRR over time for the various fires studied in Table G-7 of NUREG/CR-6850 that show transient fires have a growth and decay period on either side of the peak HRR and do not last longer than 15 minutes. These fire studies also show that the higher HRR fires (such as the 98<sup>th</sup> percentile fire) have durations much shorter than 15 minutes since they quickly burn away the available fuel.

Ventilation was assumed to be failed for all fire simulations. This conservatively overpredicts the air temperatures in the room since the HVAC would likely run for at least some portion of a real fire.

No manual or automatic suppression of the fire was assumed to occur for 1 hour. There is no automatic suppression in the areas, but there is a continuously staffed room (Secondary Alarm Station (SAS)) in the vicinity with open ventilation paths between the SAS and the plant access control area. The personnel in the SAS are likely to identify a fire in any of the areas quickly and alert the fire brigade. Furthermore, the plant access control area is the main entrance and exit for all personnel into and out of the Turbine and Reactor Buildings. If there is a fire in the area, there is a high likelihood of it being discovered and suppressed rapidly.

For the battery room analysis, the door to the room is assumed to be open for all scenarios to ensure the fire does not become oxygen-limited. This is conservative as these doors are typically kept closed and a postulated fire was determined to burn out within 3 minutes of ignition.

The licensee stated that for the battery room analysis, the door to the room was assumed to be open, but does not state whether the same assumption was made for the plant access control area. The NRC staff requested that the licensee discuss whether the same assumption was made for the plant access control area or provide the technical justification for not doing so. In its letter dated July 20, 2018, the licensee responded to the NRC staff's request and stated that the ventilation and enclosure characteristics used in their analysis were based on conditions present in the plant, i.e., open to adjacent spaces where walls or doors are not present and enclosed where walls or doors are present. The licensee stated that the approach taken yielded conservative results because the enclosed scenarios provided less air entrainment and higher room and steel temperatures. The staff found the licensee's response

acceptable because it represents a conservative analysis that was based on plant walk down information that reflects the physical design of the plant and sound engineering judgement.

The licensee stated that it has determined that, based on fire modeling, the critical temperature of 1100 °F for the structural steel will not be reached during a postulated fire, and therefore, the exposed structural steel will not fail despite the lack of fireproofing and need not be protected.

*B. Authorized by Law*

This exemption would allow MNGP to rely on the results of a structural steel survivability analysis and fire modeling that demonstrated that unprotected steel columns and beams supporting the floor of the Cable Spreading Room will not fail in the event of a fire, to ensure that at least one means of achieving and maintaining hot shutdown remains available during and following a postulated fire event as part of its fire protection program, in lieu of meeting the requirements specified in 10 CFR part 50, appendix R, section III.G.2.a, for a fire in the analyzed fire areas. As stated above, 10 CFR 50.12 allows the NRC to grant exemptions from the requirements of 10 CFR part 50. The NRC staff has determined that granting of this exemption will not result in a violation of the Atomic Energy Act of 1954, as amended, or the Commission's regulations. Therefore, the exemption is authorized by law.

*C. No Undue Risk to Public Health and Safety*

The underlying purpose of 10 CFR part 50, appendix R, section III.G, is to ensure that at least one means of achieving and maintaining hot shutdown remains available during and following a postulated fire event. Based on the licensee's analysis, the staff has determined that lack of fire proofing in the subject locations does not represent any additional risk to public health and safety because the licensee demonstrated that for the postulated, credible fire scenarios, the structural steel would not be exposed to conditions that would result in a structural failure.

#### *D. Consistent with the Common Defense and Security*

This exemption would allow MNGP to rely on the results of a structural steel survivability analysis and fire modeling to demonstrate that unprotected steel columns and beams supporting the floor of the Cable Spreading Room will not fail in the event of a fire, in lieu of meeting the requirements specified in 10 CFR part 50, appendix R, section III.G.2.a. Because the lack of protection on the structural steel does not lead to a failure of the associated 3-hour fire barriers, there is no change to any site security matters. Therefore, the exemption is consistent with common defense and security.

#### *E. Special Circumstances*

One of the special circumstances described in 10 CFR 50.12(a)(2)(ii) is that the application of the regulation is not necessary to achieve the underlying purpose of the rule. The underlying purpose of 10 CFR part 50, appendix R, section III.G, is to ensure that at least one means of achieving and maintaining hot shutdown remains available during and following a postulated fire event. While the licensee does not comply with the explicit requirements of 10 CFR part 50, appendix R, section III.G.2.a, specifically, it does meet the underlying purpose of section III.G as a whole by ensuring that safe shutdown capability remains available. Therefore, special circumstances exist that warrant the issuance of this exemption as required by 10 CFR 50.12(a)(2)(ii).

### **IV. Environmental Considerations.**

The NRC staff determined that the issuance of the requested exemption meets the provisions of categorical exclusion 10 CFR 51.22(c)(9) because the exemption is from a requirement, with respect to the installation or use of a facility component located within the restricted area, as defined in 10 CFR part 20 and the issuance of the exemption involves: (i) No significant hazards consideration; (ii) no significant change in the types or significant increase in



the amounts of any effluents that may be released offsite; and (iii) no significant increase in individual or cumulative occupational radiation exposure. Therefore, in accordance with 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the NRC's issuance of this exemption. The basis for the NRC staff's determination is provided in the following evaluation of the requirements in 10 CFR 51.22(c)(9)(i) – (iii).

Requirements in 10 CFR 51.22(c)(9)(i)

The NRC staff evaluated whether the exemption involves no significant hazards consideration by using the standards in 10 CFR 50.92(c), as presented below:

1. Does the requested exemption involve a significant increase in the probability or consequences of an accident previously evaluated?

No. This exemption would allow MNGP to rely on the results of a structural steel survivability analysis and fire modeling that demonstrated that unprotected steel columns and beams supporting the floor of the Cable Spreading Room will not fail in the event of a fire, to ensure that at least one means of achieving and maintaining hot shutdown remains available during and following a postulated fire event as part of its fire protection program, in lieu of meeting the requirements specified in 10 CFR part 50, appendix R, section III.G.2.a, for a fire in the analyzed fire areas. Coating of the structural steel is to maintain the integrity of the fire barrier during a postulated fire and therefore, no new accident precursors are created by the use of the unprotected steel. Therefore, the probability of postulated accidents is not increased. Also, the critical temperature of 1100°F for the structural steel will not be reached during a postulated fire, and therefore, the exposed structural steel will not fail despite the lack of fireproofing and need not be protected. Therefore, granting of the exemption does not increase the consequences of an accident previously evaluated.

Therefore, the exemption does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the requested exemption create the possibility of a new or different kind of accident from any accident previously evaluated?

No. The underlying purposes of 10 CFR Part 50, Appendix R, III.G.2 is to provide reasonable assurance of fire protection safe shutdown capability. No new accident precursors are created by the use of the unprotected steel in response to a fire in the analyzed fire areas.

Therefore, the exemption does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the requested exemption involve a significant reduction in a margin of safety?

No. The use of unprotected steel in response to a fire in the analyzed fire areas does not alter plant operation and does not impact any safety margins because codes and standards or their alternatives approved by the NRC are met, and the safety analysis acceptance criteria described in the licensing basis are met.

Therefore, the exemption does not involve a significant reduction in a margin of safety.

Based on the evaluation above, the NRC staff has determined that the proposed exemption involves no significant hazards consideration. Therefore, the requirements of 10 CFR 51.22(c)(9)(i) are met.

Requirements in 10 CFR 51.22(c)(9)(ii) and (iii)

The proposed exemption would for structural steel columns and beams supporting the floor of the Cable Spreading Room that are not coated with fireproofing material to provide a fire resistance equivalent to that of the fire barrier as required by 10 CFR part 50, Appendix R, Section III.G.2.a for MNGP. The exemption does not modify plant operation because fire protection for structures, systems, and components important to safe shutdown continue to be provided. Thus, the exemption does not result in a significant change in the types or amount of effluents that may be released and does not result in any additional occupational exposure. Therefore, the requirements of 10 CFR 51.22(c)(9)(ii) and (iii) are met.

## **V. Conclusions.**

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12, the exemption is authorized by law, will not present an undue risk to the public health and safety, and is consistent with the common defense and security. Also, special circumstances are present in that application of the regulation is not necessary to achieve the underlying purpose of the rule. Therefore, the Commission hereby grants Northern States Power Company, doing business as Xcel Energy, an exemption from the requirements of 10 CFR 50, Appendix R, Section III.G.2.a, for MNGP, for structural steel columns and beams supporting the floor of the Cable Spreading Room that are not coated with fireproofing material to provide a fire resistance equivalent to that of the fire barrier.

## VI. Availability of Documents.

The documents identified in the following table are available in ADAMS.

DOCUMENT	ADAMS ACCESSION NO.
Request for Permanent Exemption from 10 CFR 50 Appendix R III.G.2.a Requirements for Exposed Structural Steel	ML18080A161
Response to Request for Additional Information regarding Request for Permanent Exemption from 10 CFR 50 Appendix R III.G.2.a Requirements for Exposed Structural Steel (EPID L-2018-LLE-0001)	ML18201A558
NUREG-0991, Supplement 2, "Safety Evaluation Report Related to the Operation of Limerick Generating Station, Units 1 and 2," dated October 1984	Legacy Library: 8411090445
Generic Letter (GL) 83-33, "NRC Positions on Certain Requirements of Appendix R to 10 CFR 50"	ML031080522
NUREG/CR-6850, "EPRI/RES Fire PRA Methodology for Nuclear Power Facilities" Volume 1: Summary and Overview	ML15167A401
NUREG/CR-6850, "EPRI/RES Fire PRA Methodology for Nuclear Power Facilities" Volume 2: Detailed Methodology	ML15167A411
NUREG-2178, "Refining and Characterizing Heat Release Rates from Electrical Enclosures During Fire (RACHELLE-FIRE)," Volume 1	ML16110A140

Dated at Rockville, Maryland, 14<sup>th</sup> day of February, 2019.

For the Nuclear Regulatory Commission.

**/RA/**

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