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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of)
NORTHERN STATES POWER COMPANY) DOCKET NO. 50-263
)
Monticello Nuclear Generating) Violation of Provisional
Plant, Unit 1) Operating License No. DPR-22
) (Modification and Installation
) of Defective Spent Fuel Storage
) Racks)

REQUEST AND MOTION FOR ORDER PROHIBITING
THE INSTALLATION OF DEFECTIVE SPENT FUEL
STORAGE RACKS IN VIOLATION OF PROVISIONAL
OPERATING LICENSE, REQUEST TO INSTITUTE A
PROCEEDING, AND PETITION FOR LEAVE TO INTERVENE



The Minnesota Pollution Control Agency (hereinafter "MPCA"), an agency of the State of Minnesota, hereby requests the Nuclear Regulatory Commission (hereinafter "Commission") or such office or official of the Commission, including, but not limited to, the Director of Nuclear Reactor Regulation, the Director of Nuclear Material Safety and Safeguards, or the Director of the Office of Inspection and Enforcement, as appropriate, to institute a proceeding with respect to the modification and installation of defective spent fuel storage racks by Northern States Power Company (hereinafter "Licensee") at the Monticello Nuclear Generating Station Unit No. 1, which modification and installation is presently being carried out by the Licensee in violation of Provisional Operating License No. DPR-22.

The MPCA also requests such office or official of the Commission as may be appropriate to issue an immediately effective order prohibiting the further installation by the Licensee of defective spent fuel storage racks at the Monticello facility in violation of its provisional operating license, and hereby files

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its motion with the Commission seeking issuance of such an immediately effective order.

The MPCA further requests that the Commission grant a hearing on the issue of whether a license amendment authorizing the modification and continued use of defective spent fuel storage racks at the Monticello facility should be issued, and hereby petitions for leave to intervene in such hearing.

These requests, motion, and petition are made pursuant to 42 U.S.C. §2239, 10 C.F.R. §§2.202, 2.204, 2.206, 2.714, 2.730, 50.59, and 50.91, and such other statutory or regulatory provisions as may be applicable. The facts which constitute the basis for the foregoing requests, motion, and petition, are set forth in the following paragraphs.

I. FACTUAL BACKGROUND

The Monticello nuclear generating facility, like most nuclear generating facilities licensed by the Commission, has found it necessary to obtain a license amendment authorizing it to expand on-site storage capacity for the retention of its spent nuclear reactor fuel. To permit a more dense rack configuration than would otherwise be possible, replacement spent fuel storage racks for the Monticello facility have been designed and authorized by license amendment dated April 14, 1978, to include a boron alloy between each spent fuel assembly. This material captures free neutrons precluding the attainment of criticality despite the relatively close spacing of the assemblies when stored in the racks.

The specific racks authorized by the Commission's amendment to the provisional operating license are fabricated by fastening together with angle brackets a series of "tubes" having dimensions of approximately $6\frac{1}{2}$ inches by $6\frac{1}{2}$ inches by 14 feet. Each such tube consists of an outer ring or layer of 0.090 inch thick stainless steel and an inner ring or layer of 0.0355 inch thick stainless steel with a boral "sandwich" pressed between the two stainless steel layers. The boral sandwich is itself comprised of two sheets of 0.010 inch thick aluminum on either side of a 0.056 inch core of boron-aluminum alloy known as boral. See Memorandum from Richard J. Clark of the Commission Staff to Thomas A. Ippolito of the Commission Staff (September 11, 1978) (hereinafter referred to as the "Clark Memorandum"), attached hereto as Exhibit 1.

The design of the racks was such that it was clearly intended that the boral sandwich portion of the tubular walls would be isolated from exposure to spent fuel pool water by means of water-tight seals joining the inner and outer stainless steel layers. The water-tight nature of this design was asserted in several documents prepared by the Licensee and by the Commission Staff. The Licensee's Design Report and Safety Evaluation for Replacement of Spent Fuel Storage Racks (August 1977) (hereinafter "Design Report"), which formed the technical basis for the license amendment, informed the Commission that:

The inner and outer walls of the storage tube are welded together at each end, thereby isolating the Boral plates from direct contact with Spent Fuel Pool (SFP) water.

Id. at 26. Similarly, the Commission Staff Safety Evaluation

(April 14, 1978), setting forth the Commission Staff's reasoning in issuing the license amendment, declared:

The inner and outer walls of the storage tube are welded together at each end, which isolated [sic] the Boral from direct contact with fuel pool water.

Id. at 2.

The most recent review by the Commission Staff confirms that a leak-tight design was intended and served as the basis for the Commission's license amendment. The Clark Memorandum noted that:

The ends of the shrouds are formed together and this interface is then seal-welded by hand "to assure a leak-tight module."

Id. at 3. Its author concluded: "The sandwich construction of the tubes was intended to be leak-tight." Id. at 4.

The license amendment issued by the Commission on April 14, 1978, indicates that the Licensee's permission to receive, possess, and use special nuclear materials is conditioned on compliance with limitations as described in the Design Report and other submissions by the Licensee to the Commission. Elaborate inspection steps undertaken by the vendor of the racks, see Clark Memorandum at 3-4, further confirm that the tubes were intended to be leak-tight and that this was a condition of the license amendment.

To date, the Licensee has received and installed at least four of the thirteen new racks which are eventually to be placed in the storage pool pursuant to the license amendment. See id. at 2. The remainder of the racks are to be delivered, possibly in stages, commencing within approximately one month. Experience

within the first few days of exposure of the four initial racks to spent fuel pool water has demonstrated that the racks are defective and that the boral sandwiches in the tubes have been and are constantly being exposed to water. The exposure of the aluminum and boral to water has caused corrosion. See id. at 3. A product of that corrosion has been hydrogen gas. Some hydrogen gas has escaped from the racks, but some has become trapped within the tubular walls, resulting in the inward buckling or "swelling" of the thin inner layer of stainless steel to a point where a dummy fuel assembly could no longer be inserted into some of the tubular cavities. See id. at 2.

Should such swelling continue in the future, following insertion of spent fuel assemblies, it is the MPCA's belief that assemblies may become locked into place in the tubes. The extraction of such jammed spent fuel assemblies would, in the MPCA's judgment, involve difficult and delicate operations which might endanger the health and safety of the public by risking a rupture of a fuel pin with consequent spilling of oxide fuel and fission products into the spent fuel pool. In short, the defects in design and fabrication of the racks have resulted in random deformations in the spent fuel storage cavities which, unless reliably precluded during the remaining lifetime of the racks, will be inimical to the public health and safety.

The defects have apparently stemmed from two causes. First, during the process of fabricating the tubes, it has not been possible to assure that the boral sandwich is absolutely dry prior to its encapsulation in the stainless steel. Because a hydraulic

"sock" is used to form the tubes under a cold pressure process and because that sock contains water, some water has entered the sandwich structure during the fabrication process. Thus, some swelling was noted in the tubes even before insertion of the racks into the spent fuel pool at Monticello. Second, the vendor has not uniformly completed the stainless steel welds in the leak-tight manner provided for in the Design Report. On at least one tube, there was not a juncture between the longitudinal and end-welds and on several tubes there were instances of "burn-through" in the process of welding the angles onto the tubes to join them together. See id. at 4. The nature of these defects is such that review by the Licensee and by the MPCA's own staff has led to the conclusion that the boral sandwich portion of the racks cannot be fabricated to remain reliably leak-tight over the lifetime of the racks, given the present design. 1/

The Commission Staff, acting without advance notice to the public and without soliciting public comment, reviewed the defective rack design with the Licensee. It concluded that the Licensee could remedy the defects in the four initial racks by drilling two holes at the top of each tube and by storing spent fuel only in the spaces between adjacent tubes in the racks (thus assuring that the fuel will not become wedged due to swelling because the spaces are surrounded by the thicker outer layer of stainless steel) until such time as the tubes themselves are needed as storage cavities. The Commission Staff has given no

1/ The mistaken perception by the Licensee and the Commission Staff prior to issuance of the license amendment that this design could be leak-tight is deeply disturbing to the MPCA. So fundamental an error in technical judgment calls for caution in reviewing the technical remedy proposed by these parties.

indication of what can or would be done if the swelling of tubular walls reoccurs after the spaces in a crowded spent fuel storage pool are filled with spent fuel assemblies. To "cure" the design defect in the remaining nine undelivered racks, the Licensee has requested the vendor to omit the seal-welding of the tops of the tubes. Finally, the Licensee has indicated that it will conduct a regular monitoring program to check the gauge of the empty tubes every thirty days to assure that swelling has not immediately reoccurred following the drilling, although the MPCA is not aware of any license amendment which assures that such monitoring will be conducted during the lifetime of the racks and reported to the Commission or to interested persons.

As the foregoing description indicates, the Licensee and the Commission Staff have abandoned their previous theory that a leak-tight construction is possible. They have now theorized that, by relieving the pressure of the hydrogen gas (allowing it, hopefully, to escape out the tops of the tubes either through the newly drilled holes in initial racks or through the deliberately unsealed tops of the future racks) all future swelling over the undefined lifetime of the racks will reliably be precluded. This crude technical solution to the discovery of a profound rack design defect radically sacrifices the previous goal of achieving a leak-tight boral sandwich in the tubular wall. Because the Commission was previously informed that the tubular walls would, in fact, be leak-tight, the need for the structures to be leak-tight is an unreviewed safety question which the Commission Staff

is just now beginning to explore. See Clark Memorandum at 5. 2/ The untested assumption that all future swelling of the defective storage racks may be reliably precluded by means of this major (albeit crude and inexpensive) change in rack design also presents a highly significant unreviewed safety question.

The latter question is by no means trivial. The chosen method for "curing" the rack defect assumes that all hydrogen gas generated by the future exposure of the boral sandwich to water will reliably travel through assumed channels of communication along the entire fourteen foot length of each tube to the holes or openings which are now being introduced at the top of each tubular wall. Should these assumed channels fail to exist in certain walls, or should they become blocked in the future by corrosion, the future swelling of tubular walls appears to be a distinct possibility. Moreover, the corrosion points in the "cured" racks resulting from fabrication defects are entirely random and the corrosion points resulting from the new drilling have been located solely on the basis of a desire to relieve pressure from trapped gas. None of these points of exposure to water have been carefully considered based on any theory of mitigating corrosion.

2/ The Commission Staff concedes the unreviewed nature of this fundamental question:

The design of the GE High-Density Fuel Storage System is being evaluated as a topical report. The need for the tubes to be leak-tight will be evaluated as part of our review."

Clark Memorandum at 5 (emphasis supplied).

Surely a rack can be designed with two goals in mind: release of trapped gas and minimizations of corrosion. In the Licensee's haste to cure its defective racks, it has given hurried attention to the former goal but completely ignored the latter goal.

It is one thing to conclude, as the Licensee has now concluded, that the racks should have been designed from the outset to expose the boral sandwich to water; it is quite another thing to conclude that racks which have not been so designed may be successfully and reliably rendered safe without redesigning them. It is hard to believe that, if the vendor had started with the proposition that the boral should be exposed to water, the fundamental design would have remained completely unchanged. In any event, that is an unreviewed matter, for which we cannot know the answer at this time.

Despite these significant unreviewed safety questions, the Licensee has already undertaken modifications to the four initial racks and, unless restrained by the Commission, will continue to install modified defective racks in the future, without having submitted any application for a license amendment which would authorize these violations of its provisional operating license. Because the Licensee intends to install additional defective racks within the next thirty to sixty days, the MPCA urges the Commission or its appropriate office or officials to issue an immediate order preserving the status quo until the MPCA's concerns on behalf of the public have been fully considered by the Commission.

II. REQUEST AND MOTION FOR ORDER PROHIBITING THE INSTALLATION OF DEFECTIVE SPENT FUEL STORAGE RACKS IN VIOLATION OF THE PROVISIONAL OPERATING LICENSE

Section 2.730(a) of 10 C.F.R. provides that, when no proceeding is pending, all motions are to be addressed to the Commission. For that reason, the MPCA addresses its present motion for an order prohibiting the installation of defective spent fuel storage racks to the Commission. Section 2.206(a) of 10 C.F.R. provides that any person may file a request with any of three Directors within the Commission to institute a proceeding pursuant to 10 C.F.R. §2.202. Section 2.202(f) of 10 C.F.R. provides that any of three Directors within the Commission may issue orders which are immediately and temporarily effective when exercising their powers under that provision. For that reason, the MPCA also requests the appropriate office or official of the Commission to issue an immediately effective order prohibiting the installation of defective spent fuel storage racks at the Monticello facility.

The MPCA is entitled to the issuance of such an immediately effective order because there is a substantial likelihood that the MPCA will prevail on the merits of its claim that a license amendment is required for the modification activities undertaken by the Licensee and because the further installation of defective spent fuel storage racks at the Monticello facility may result in irreparable injury to the people of Minnesota.

A. There is a Substantial Likelihood that the MPCA Will Prevail on the Merits of its Claim that a License Amendment is Required

The requirement of a formal license amendment for the modification activities being conducted by the Licensee is so clear that there is no possibility that the MPCA will not prevail on the merits of its claim. This can be readily seen by examining the relevant portions of the governing regulatory provision, 10 C.F.R. §50.59: 3/

(a)(1) The holder of a license . . . may (i) make changes in the facility as described in the safety analysis report, (ii) make changes in the procedures as described in the safety analysis report, and (iii) conduct tests or experiments not described in the safety analysis report, without prior Commission approval, unless the proposed change, test or experiment involves a change in the technical specifications incorporated in the license or an unreviewed safety question. (2) A proposed change, test or experiment shall be deemed to involve an unreviewed safety question (i) if the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report may be increased; or (ii) if a possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report may be created; or (iii) if the margin of safety as defined in the basis for any technical specification is reduced.

(b) The licensee shall maintain records These records shall include a written safety evaluation which provides the bases for the determination that the change, test, or experiment does not involve an unreviewed safety question. . . .

3/ The Clark Memorandum concluded: "[F]or the four racks, NSP [the Licensee] can modify the racks (by drilling the holes in the tubes) under Section 50.59." Clark Memorandum at 5-6. In the MPCA's view, the need for a license amendment under §50.59 is so obvious that the Commission Staff's conclusion to the contrary is incomprehensible.

(c) The holder of a license . . . who desires . . . (2) to make a change in the facility or the procedures described in the safety analysis report or to conduct tests or experiments not described in the safety analysis report, which involve an unreviewed safety question or a change in technical specifications, shall submit an application for amendment of his license pursuant to §50.90.

The application of this regulation to the Licensee's activities compels the conclusion that a license amendment is required. First, the drilling of holes and the planned future installation of racks without the sealing welds is a change in the facility which has not been described in the safety analysis report. Thus, the Licensee cannot avail itself of 10 C.F.R. §50.59(a)(1)(i) or (ii) to undertake the activity without Commission approval. Second, the drilling of such holes and the planned future installation of modified racks cannot properly be characterized as a "test or experiment." Thus, the Licensee cannot avail itself of 10 C.F.R. §50.59(a)(1)(iii) to excuse the requirement that the activity must have been previously described in the safety analysis report. Third, whether characterized properly as a facility change or improperly as a test or experiment, the activities do involve "unreviewed safety questions" as discussed at pp. 5-9, supra. 4/ Thus, even if the activity could conceivably be

4/ Even if the safety analysis report has analyzed the possibility of a jammed fuel assembly due to some other cause, the probability of occurrence of such a malfunction has been increased within the meaning of 10 C.F.R. §50.59(a)(2)(i). Similarly, even if the safety analysis report has analyzed the possibility of a jammed fuel assembly due to some other cause, the possible swelling of large numbers of fuel assembly storage cavities, resulting in a large number of jammed spent fuel assemblies, is a malfunction of a different type than any evaluated previously in the safety analysis report within the meaning of 10 C.F.R. §50.59(a)(2)(ii).

construed---as it cannot be---to be a mere "test or experiment," 10 C.F.R. §50.59(a)(1)(iii) would not authorize the activity in the absence of Commission approval. Fourth, because such unreviewed safety questions are involved, the Licensee is required by 10 C.F.R. §50.59(c) to apply for an amendment to its license. ^{5/}

Because a license amendment is required by law, a denial of the MPCA's motion and request for an immediate order preserving the status quo would constitute a partial grant of a license amendment through the summary disposition of disputed issues of fact prior to the Licensing Board's examination of unreviewed safety questions, in violation of the Commission's rules of practice. See In the Matter of Northern States Power Company (Prairie Island Nuclear Generating Plant, Units 1 and 2)(Sprt Fuel Pool Modification), 5 NRC 1267 (May 13, 1977); id., 6 NRC 131 (July 5, 1977); id., Licensing Board Order Denying Summary Disposition (July 20, 1977).

B. The Public May Suffer Irreparable Injury if the Status Quo is Not Maintained Pending Commission Review

The foregoing discussion establishes that there is an overwhelming likelihood that the MPCA will prevail on the merits of its contention that a license amendment is needed prior to the rack modification activity presently being undertaken by the Licensee. An immediately effective order to preserve the status

^{5/} It should also be noted that the MPCA has seen no indication that the Licensee has complied with the requirement of 10 C.F.R. §50.59(b) that a written safety evaluation be prepared by the Licensee justifying the absence of a license amendment application.

quo is also appropriate because the public may suffer irreparable injury if the further installation of modified defective racks is not enjoined during the period of Commission review. Irreparable injury may be of two types.

First, if the Commission, following its review of the safety questions, determines that a further modification in rack design is necessary, the Licensee will be obliged to engage in modification activities in the spent fuel pool itself, possibly including the activity of removing all newly installed defective racks. The Licensee's proposed installation of additional defective racks within the immediate future would unnecessarily make this scenario possible and is thus inherently inimical to the public health and safety. 6/ As has been amply established in other spent fuel pool modification proceedings, the movement of the very heavy storage racks over stored spent fuel assemblies is a delicate operation involving risks of accidental damage to spent fuel. Activities in congested spent fuel storage pools also expose workers to occupational radiation exposures which must, under Commission regulations, be kept as low as reasonably achievable ("ALARA"). See 10 C.F.R. §20.1(c). See also In the Matter of Northern States Power Company (Prairie Island Nuclear Generating Facility, Units 1 and 2) (Spent Fuel Pool Modification), Initial Decision, 6 NRC 265, 281-86 (August 12, 1977), modified & aff'd ALAB-455 (January 27, 1978), appeal filed, No. 78-1269 (D.C. Cir.) (March 21, 1978).

6/ The immediate installation of more racks in the pool is unnecessary because there are presently sufficient available storage cavities to permit a full core off-load until at least the end of 1979. See p. 16, infra.

The installation of presently superfluous defective storage racks which may have to be removed or further modified in underwater operations in the vicinity of stored spent fuel is the antithesis of the ALARA standard. Moreover, previous spent fuel pool modification proceedings have established that the very installation of racks in spent fuel storage pools results in radioactive contamination of the large racks which must eventually be cleaned and crated by workers and safely disposed of as radioactive waste. The installation of defective racks which are presently not needed and which may be removed following Commission review runs the risk that solid radioactive waste is being needlessly created.

Second, the interests of the MPCA and the public good may be irreparably injured by the hasty installation of additional defective racks because the very installation of those racks in the spent fuel storage pool will serve to limit the options available to the Commission when reviewing possible courses of action to remedy the defects. The Commission will find it difficult if not impossible to ignore the occupational exposures and accident risks which are associated with options involving significant redesign ^{7/} of racks which have already been installed in a congested spent fuel storage pool. This burden on the Commission's oversight responsibilities would serve no purpose other than the short-term convenience of the Licensee.

C. A Balancing of the Equities Confirms the Need for an Immediately Effective Order Maintaining the Status Quo

For the foregoing reasons, the MPCA is entitled to an

^{7/} The Clark Memorandum at 4 suggests such an option: "If the wall thickness of the inside stainless steel tubes were increased to withstand more than 6 psig, the swelling would not likely occur even if there were a leak in a tube." Id.

immediately effective order 8/ directing the Licensee to suspend the installation of any additional modified defective spent fuel storage racks in the Monticello spent fuel pool. A consideration of the minimal burdens which would be suffered by the Licensee in the event of such an order confirms the propriety and equity of maintaining the status quo.

Such an order would in no way impair the Licensee's ability to safely operate its nuclear generating facility; the facility presently has room to accommodate an entire core off-load and will retain such ability at least until the next refueling, which is scheduled for late 1979 or early 1980. Moreover, because the Licensee has been supplied patently defective racks by the vendor, it is not appropriate for the Licensee to argue that the minimal financial costs associated with postponing rack installation compel a denial of the MPCA's request and motion. Those costs should be borne by the vendor or designer of the racks.

The order sought by the MPCA is a reasonable and good faith method for subjecting a substantial rack design defect to the orderly review of the Commission as provided by its governing statutes and regulations. It in no way raises the specter of plant shutdown. The technical issues raised by the MPCA in this proceeding will be narrow and will not require voluminous discovery or preparation. The MPCA respectfully submits that it should be possible to

8/ Section 2.202(f) of 10 C.F.R. provides that any one of three Directors may issue orders which are effective immediately, based upon a finding that "the public health, safety, or interest so requires." Section 2.204 of 10 C.F.R. similarly provides that the Commission may issue an immediately effective order, based on the same finding. For the reasons set forth herein, the MPCA submits that this is a case in which an immediately effective order to preserve the status quo is compelled.

complete the requested license amendment proceeding within a matter of several months. All reasonable requests by the Licensee and the Commission Staff for an expedited hearing will be honored by the MPCA.

III. REQUEST TO INSTITUTE A PROCEEDING

Section 2.206(a) of 10 C.F.R. provides that any person may file a request with any one of three Directors to institute a proceeding pursuant to 10 C.F.R. §2.202 for such action as may be proper. For the reasons set forth above, the MPCA believes that a license amendment is required prior to the rack modification activity presently being undertaken by the Licensee. Because any such license amendment would involve obvious significant hazards considerations, the opportunity for a public hearing on such an amendment must be afforded by the Commission. See 42 U.S.C. §2239; 10 C.F.R. §§2.105, 50.91. The MPCA hereby files its request for the institution of a proceeding and for the holding of a public hearing on the issue of defective rack modification.

IV. PETITION FOR LEAVE TO INTERVENE

The MPCA hereby files its petition, pursuant to 10 C.F.R. §2.714, for leave to intervene as a party in the public hearing which it has requested. Although the amended rules of the Commission do not require the filing of contentions until fifteen days prior to the prehearing conference, see 10 C.F.R. §2.714(b), the MPCA will set forth its present contentions in this pleading in an effort to expedite these proceedings.

A. The Interests of the MPCA

The MPCA is an agency of the State of Minnesota. It is charged with regulatory responsibilities in the environmental areas of air quality, solid and hazardous waste, and noise pollution. See Minn. Stat. chs. 115, 116, and 116F (1976). As such, the Monticello nuclear generating facility is subject to MPCA regulation for all non-radioactive discharges and emissions. In addition, pursuant to §§116 and 302(g) of the Clean Air Act, as amended in 1977, 42 U.S.C. §§7416 and 7602(g), the MPCA has authority to regulate radioactive air emissions from the Monticello nuclear generating facility.

The MPCA has had a long history of participation as a party in numerous Commission proceedings involving both the Prairie Island and Monticello nuclear generating facilities. The MPCA was a party to Commission proceedings concerning the modification of the spent fuel pool at the Prairie Island facility and is presently appealing portions of the Commission's ruling in that case to the United States Court of Appeals for the District of Columbia Circuit. See State of Minnesota, by the Minnesota Pollution Control Agency v. United States Nuclear Regulatory Commission, No. 78-1269 (D.C. Cir., filed March 21, 1978).

More significantly, the MPCA's interest in the storage of radioactive spent fuel at the Monticello site led it to file a petition for leave to intervene in recent Commission proceedings concerning the amendment of the Monticello facility's provisional operating license to permit an increase in spent fuel storage

capacity. See Petition for Leave to Intervene (October 17, 1977). That petition was granted by the Atomic Safety and Licensing Board, see Memorandum and Order (December 13, 1977), and a hearing on the license amendment application was scheduled. See Notice of Hearing on Amendment of Facility Operating License (December 13, 1977). After a series of negotiations between the MPCA, the Licensee, and the Commission Staff, during which the MPCA was repeatedly assured of the technical soundness of the replacement rack design, a settlement agreement between the parties was executed and a joint motion to terminate the proceedings was transmitted to the Licensing Board. Following a prehearing conference on January 31, 1978, the joint motion was granted and the proceedings were terminated. See Order Dismissing Proceedings (February 27, 1978). The amendment to the provisional operating license was issued on April 14, 1978.

As set forth herein, developments since the issuance of that license amendment have demonstrated that the spent fuel storage racks being installed at the Monticello facility are defective and do not comply with the descriptions filed by the Licensee with the Commission. The MPCA has an interest in a full examination of the Licensee's response to that discovery, to assure that the public health and safety of the people of Minnesota will be protected.

As stated by the MPCA in its previous petition for leave to intervene, the MPCA seeks to ensure that any modification of the spent fuel storage pool shall be designed, constructed, operated and maintained in such a manner as to prevent adverse environmental

and health effects within the State of Minnesota and to prevent hazards to public health resulting from the modification activities or from additional storage of spent fuel. These interests of the MPCA were sufficient to allow intervention in the spent fuel pool modification proceeding one year ago; they are the same interests which underlie the present petition. 9/

B. Contentions

In the event that the MPCA's petition for leave to intervene is granted, the MPCA intends to pursue the following three contentions:

1. Because of defects in design and fabrication, the modified spent fuel storage racks which the Licensee has installed and intends to continue installing in the Monticello spent fuel storage pool are not in conformance with the provisional operating license as amended.

2. The past and proposed activities of the Licensee in modifying and installing the defective spent fuel storage racks cannot lawfully be carried out until a license amendment application has been filed, the Commission has fully examined all unreviewed safety questions, and a license amendment has been issued.

9/ The interests of the MPCA are also demonstrated by the fact that the MPCA is presently a party in the on-going full term operating license proceedings which are pending before the Commission with respect to the Monticello facility. The Licensing Board in that proceeding presently has before it a motion to terminate the proceedings and to issue the full term operating license, a motion concurred in by the MPCA.

3. Whether the defective racks, as modified, will reliably assure over the undefined lifetime of the racks that no further swelling of the tubular walls of those racks will occur, resulting in wedged spent fuel assemblies, is an unreviewed safety question precluding the issuance of a license amendment authorizing the modification and installation of the defective racks at Monticello as proposed by the Licensee.

All correspondence and pleadings relating to the MPCA's petition for leave to intervene should be addressed to John-Mark Stensvaag, Special Assistant Attorney General, Minnesota Pollution Control Agency, 1935 W. County Road B2, Roseville, Minnesota 55113; telephone: (612) 296-7342.

V. CONCLUSION

For the foregoing reasons, the MPCA prays for the issuance of an immediately effective order prohibiting the further installation by the Licensee of any spent fuel storage racks at the Monticello facility. 10/ The MPCA further prays for the institution of a proceeding and the scheduling of a public hearing concerning the modification and installation of defective spent fuel storage racks at the Monticello facility. The MPCA further prays that its petition for leave to intervene in such a proceeding be granted. Finally, the MPCA prays that unless and until all of its

10/ In accordance with 10 C.F.R. §2.730(b), the MPCA is enclosing, herewith, a proposed form of order.

Contentions are satisfactorily answered and resolved, no license amendment should issue.

Respectfully submitted,

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Subscribed and sworn to before
me this 8th day of December, 1978:

Sebastian L. McMahon
Notary Public





UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555
SEPTEMBER 11 1978



Docket Nos. 50-259, 50-260,
50-296 and 50-263

MEMORANDUM FOR: Thomas A. Ippolito, Chief, Operating Reactors Branch #3,
DOR

FROM: Richard J. Clark, Project Manager, Operating Reactors
Branch #3, DOR

SUBJECT: SWELLING IN G.E. HIGH-DENSITY SPENT FUEL STORAGE RACKS

On Thursday, August 24, 1978, we met with representatives of General Electric Company (GE), Tennessee Valley Authority (TVA), Northern States Power Company (NSP) and Brooks and Perkins Incorporated (B&P) to discuss the swelling noted by NSP in the four GE High Density Spent Fuel Storage racks which were recently installed in the Monticello spent fuel pool (SFP). A list of attendees is enclosed. A previous meeting had been held with the above four organizations on June 5, 1978, to discuss swelling noted in the GE racks during fabrication of the racks for Monticello and Browns Ferry.

By letter dated April 14, 1978, the Commission issued Amendment No. 34 to Operating License No. DPR-22 authorizing Northern States Power Company to increase the storage capacity of the Monticello SFP from 740 to 2237 spent fuel assemblies using high density storage racks supplied by GE. The GE storage racks consist of a number of square tubes fastened together at the corners as shown in Figure 1. The tubes consist of concentric inner and outer square shrouds of Type 304 stainless steel which integrally encapsulate Boral neutron absorber plates. The Boral plates consist of a matrix of 35% Boron Carbide and Type 1100 aluminum, clad on both sides with Type 1100 aluminum. The inner tube of Type 304 stainless steel is 36 mils thick; the outer stainless tube is 90 mils thick. A cut-away sketch showing a typical tube and how they are joined together is shown in Figure 2. The tubes are supplied to GE by Brooks and Perkins, who is also supplying similar tubes (i.e., Boral encapsulated in stainless steel) to Exxon Corporation for proposed use at Salem and Cook and to Nuclear Service Corporation for proposed use at Zion 1, and 2 and Dresden 2 and 3. The method of fabricating the tubes and a picture of a finished tube is shown in Figure 3.

EXHIBIT 1

On July 10 and 11, 1978, Monticello installed two of the new GE racks in their SFP. On August 8 and 9, 1978, two additional racks were installed. Prior to installation in the SFP, every cell in all the racks had been checked with a 5.96" full-length guage. (The nominal inside dimension of the tubes is 6.25".) There was no evidence of any swelling in the tubes. Following installation of the fourth rack in the Monticello SFP, NSP proceeded with neutron attenuation measurements of the tubes and spaces outside the tubes. The source was contained in a pig with a nominal outside dimension of 5.90" and a maximum measured dimension of 6.00". (At one point near the bottom of the pig, the polyethylene shielding was rippled to the 6.00" dimension.) There are a total of 85 tubes in each module plus 84 storage spaces between the tubes. Of the total 340 tubes in the four modules, the pig would not go into 9 tubes. On a tenth tube, the pig hung up near the top, but went down on its own accord. These measurements were made on August 11 and 12, 1978, or within 3 to 4 days after installation of the third and fourth modules. On August 15 and 16, 1978, the ten suspect tubes were rechecked with the 5.96" full length guage; the guage would not fit in any of the 10 tubes. The tubes were also checked with a 5.45" dummy fuel assembly that is the same dimensions as a regular spent fuel assembly. The dummy fuel assembly could not be inserted into 2 tubes, both of which were in the modules that had been under water about 5 weeks (i.e., the modules installed July 10 and 11, 1978). There were two tubes in the two recently installed modules (i.e., the two modules that had only been under water for 4 days when the swelling was noted) in which the dummy fuel assembly hung-up but slide into the tube of its own weight. GE and NSP are certain that none of the 10 tubes in which swelling was noted had been tubes in which the bladder had ruptured during fabrication so as to wet the boral plates.

On Thursday, August 17, 1978, NSP inspected the swollen tubes with a TV camera and lights. The swelling was confirmed by visual observation. It was noted that the swelling was primarily in the upper half of each tube.

Following installation of the second and fourth modules under water, NSP noted bubbles coming up from some tubes. The bubbling was readily observable for 3 to 5 days. The escaping gas was analyzed and found to be rich in hydrogen. None of the tubes that were bubbling showed any indications of swelling when subsequently examined.

Since the modules were installed in the Monticello SFP, the water temperature has been about 80°F. Specific conductance of the water has been less than 1 micromhos and the pH has been essentially neutral.

There has not been any spent fuel stored in the new GE racks at Monticello. However, the facility is scheduled to shutdown for refueling on October 14, 1978, at which time 121 fuel assemblies are scheduled to be replaced. There are presently 616 spent fuel assemblies in the SFP as a result of five previous refuelings. At the forthcoming refueling, MSP will have to store spent fuel in 112 of the 676 storage spaces in the four new racks.

In the case of the Browns Ferry Nuclear Plant (BFNP), there are four of the new GE racks on site. Browns Ferry Unit No. 3 is scheduled to shutdown on September 8, 1978 for the first refueling of this unit. The entire core of 764 fuel assemblies is scheduled to be off-loaded into the SFP to permit modifications to the control rod drive return line. At the completion of the refueling and maintenance outage, 208 spent fuel assemblies will remain in the BFNP-3 SFP. Since the new fuel is also stored in the SFP, TVA needs storage space for 972 fuel assemblies at the time of shutdown.

TVA has used a dummy fuel assembly to check all tubes in the four racks on-site. No swelling was evident in any tube. GE also checked the racks under fabrication by Chicago Bridge and Iron Nuclear-General Electric (CBIN) at Memphis with a 6.050" gauge.

The cause of the swelling in the tubes at Monticello is due to corrosion of the aluminum cladding on the Boral. Whenever corrosion occurs, hydrogen is liberated as the metal surface is oxidized (corroded). All metals exhibit an initially high corrosion rate when exposed to an aqueous environment. If the metal forms a protective corrosion product oxide film, and the film is not removed by chemical or mechanical action, the corrosion rate levels off with time. The Boral sheets in the GE racks are not anodized prior to being encapsulated in stainless steel. If water contacts this non-passivated surface, there is an initially high rate of corrosion (and thus high rate of hydrogen generation) until a protective oxide film is formed. GE estimates that if water enters the encapsulating stainless steel tubes, the initial corrosion of the aluminum cladding generates about a liter of hydrogen until the surface is passivated.

As discussed previously, Brooks and Perkins (B&P) is the only supplier for Boral. B&P supplies the Boral sheets either encapsulated or plain. The shroud (encapsulating) materials offered by B&P include Type 304 stainless steel, Type 6061 aluminum or Type 5083 aluminum. Brooks and Perkins weld the inner and outer tube configurations on a custom made 20 foot longitudinal seam welder. The ends of the shrouds are formed together and this interface is then seal-welded by hand "to assure a leak-tight module". Brooks and Perkins states in their literature that "each full-penetration weld is 100% visually inspected" and subjected to various

types of NDE testing. The end welds are 100% dye penetrant tested. When NSP inspected the tubes in the Monticello SFP from which bubbles were emanating with the underwater light and TV camera, they noted at least one instance where there was not a juncture between the longitudinal and end-welds. These tubes had passed the QA inspections by Brooks and Perkins at Levonia, Michigan and the QA inspections by Chicago Bridge and Iron and GE at Memphis, Tennessee. According to B&P, the dye penetrant inspection should have detected the lack of closure. With B&P's concurrence, NSP completed the welds using Code qualified welders.

After the tubes were fabricated and inspected at Brooks and Perkins, the tubes were fabricated into racks (modules) at Memphis, Tennessee by CBIN/GE. As shown in Figure 2, an angle is welded onto the sheet metal tubes to join them together. When the initial racks were being fabricated by CBIN, there were instances of burn-through during welding of the angles.

The sandwich construction of the tubes was intended to be leak-tight. It appears that the leaks in the tubes at Monticello (evidenced by the bubbling and swelling) was most likely the result of (1) failure to seal the tubes during fabrication at Brooks and Perkins, (2) the welding performed on the tubes during fabrication of the racks at Memphis and/or (3) on stresses induced on the angle welds during transport and handling of the racks.

The tubes in the GE racks are about 14 feet long. Under water, there is a differential pressure of about 5.5 psig between the top and bottom of the tubes due to the hydrostatic head of water. GE estimates that the 36 mil stainless steel tube will withstand about 4.5 psig internal pressure before deforming. If there is a leak at the bottom of a tube which allows water to enter, the hydrostatic head of water prevents the hydrogen from escaping through the same hole until the internal pressure is greater than the hydrostatic head and this pressure is greater than that which deforms the tube. If the wall thickness of the inside stainless steel tubes were increased to withstand more than 6 psig, swelling would not likely occur even if there were a leak in a tube.

The presence of water within the tubes will cause corrosion of the boron (evidenced by the hydrogen generation). The potential extent of the corrosion attack was discussed based on corrosion data submitted by Brooks and Perkins, the experience and test results with Boron in the Brookhaven Reactor and experience with Boron in military and test reactors. The

staff's main concern was the potential for galvanic corrosion because of the relatively large areas of cathode (stainless) to anode (aluminum) under crevice conditions. NSP and TVA have committed to install corrosion test specimens in the Monticello and Browns Ferry SFP's that will be examined each year to evaluate the corrosion behavior of the Boral. The available corrosion data is adequate to support the conclusion that corrosion and pitting of the Boral is not a safety concern for the near future. The staff is continuing the evaluation of the corrosion behavior of Boral under coupled and crevice conditions for long-term exposures (i.e., 20 to 30 years) to various aqueous environments.

At the conclusion of the meeting, a caucus was held with the NRC attendees and management. Conclusions reached were:

1. To approve GE's proposal to drill a hole in the top of the tubes in the four racks currently in the Monticello SFP and the four racks at Browns Ferry Unit No. 3 to prevent swelling in these racks.
2. To request a commitment from NSP and TVA to store spent fuel for the immediate future only in the spaces adjacent to tubes. NSP stated that it is their intent to store the spent fuel discharged during the fall 1978 outage in the spaces adjacent to tubes until the use of the poison tubes is required for a full core offload or until initiation of Phase II of the rack replacement program. TVA agreed to the same commitment.
3. TVA was requested and committed to install corrosion test specimens in the Browns Ferry Unit No. 3 SFP that will be periodically removed and examined to check the long-term corrosion behavior of Boral sandwiched between Type 304 stainless steel.
4. I&E will be requested to review the QA procedures at Brooks and Perkins, CBIN-GE, NSP and TVA with respect to determining whether the inspections can detect if a tube is leak-tight prior to and after fabrication into racks.
5. The design of the GE High-Density Fuel Storage System is being evaluated as a topical report. The need for the tubes to be leak-tight will be evaluated as part of our review.
6. The design and installation of the spent fuel storage racks for Monticello has been approved by NRC; for the four racks, NSP can modify the racks (by drilling the holes in the tubes) under

Section 50.59. For Browns Ferry, TVA will have to amend their submittal of December 5, 1977, describing the proposed design modification, why the modification is acceptable, and a revised environmental assessment. The revised submittal should describe the proposed temporary rearrangement of racks in the Unit No. 3 SFP (i.e., 4 new high density racks and 39 existing racks rather than 19 new modules as described in the existing submittals, since only 4 of the new modules are presently fabricated and available).



Richard J. Clark, Project Manager
Operating Reactors Branch #3
Division of Operating Reactors

ENCLOSURE

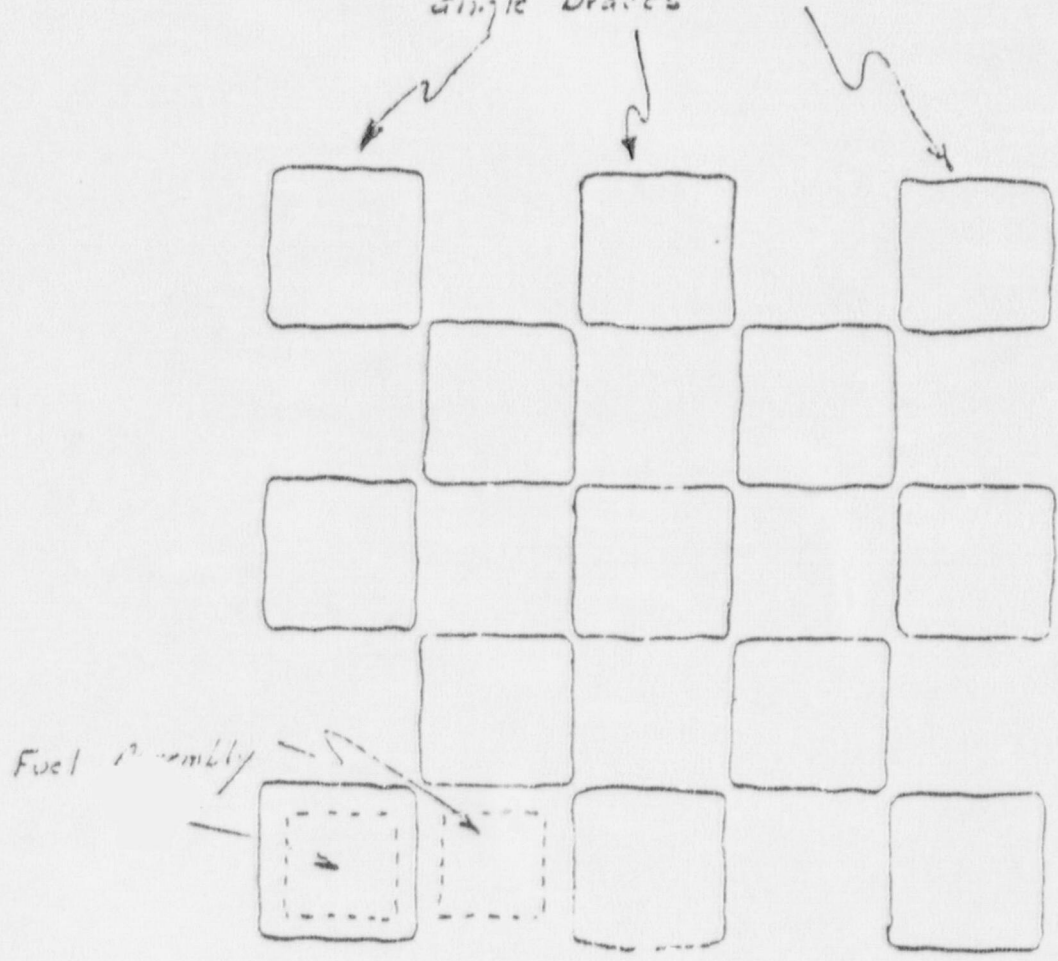
ATTENDANCE - MEETING ON SWELLING IN GE

SPENT FUEL STORAGE RACK

AUGUST 24, 1978

<u>Name</u>	<u>Organization</u>
Dick Clark	NRC
Don Kirkpatrick	NRC
Ed Lantz	NRC
John Zudans	NRC
Bill Russell	NRC
Bart Buckley	NRC
Gary Zech	NRC
Wally Wheadon	GE
Hal Huntley	GE
David Dawson	GE
Ed Grinon	GE
Dennis McCloud	TVA
John Hutton	TVA
John Weeks	Brookhaven National Lab
Leslie Mollon	Brooks & Perkins Inc.
Leon Rafner	Commonwealth Edison
David Nevinski	NSP
Tom Eckhart	Exxon Nuclear

Boral encapsulated tubes
fastened together with
angle braces



Spent Fuel is stored both within
the square tubes and in the spaces
between the tubes.

Figure 1

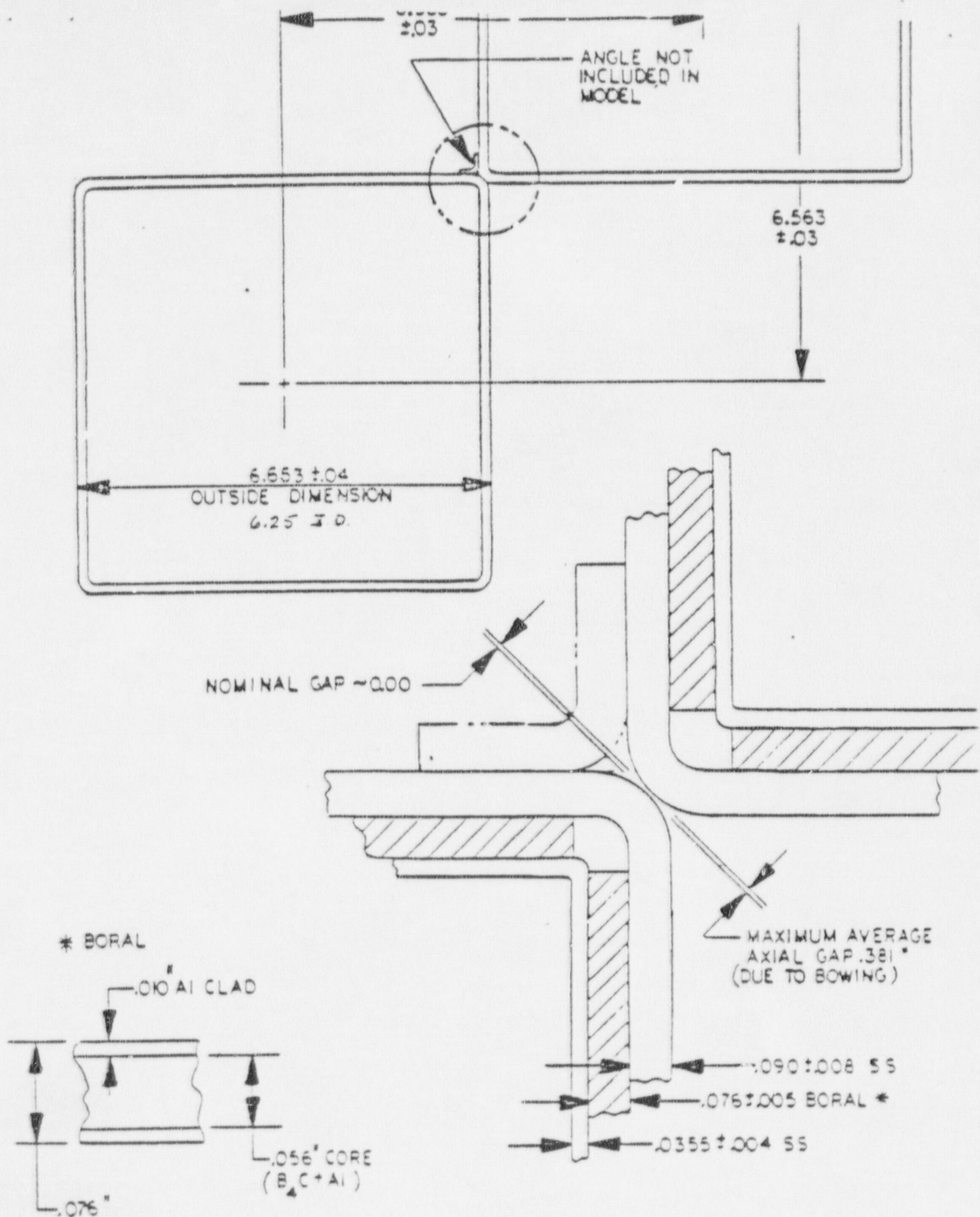
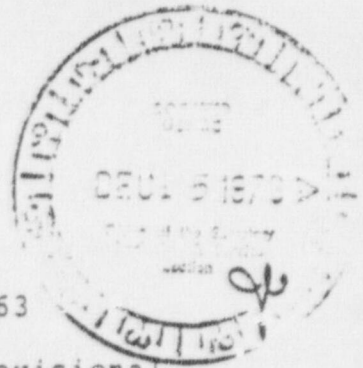


FIGURE 2
 STORAGE CELL DIMENSIONS

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION



In the Matter of)
NORTHERN STATES POWER COMPANY) DOCKET NO. 50-263
)
Monticello Nuclear Generating) Violation of Provisional
Plant, Unit 1) Operating License No. DPR-22
) (Modification and Installation
) of Defective Spent Fuel Storage
) Racks)

MEMORANDUM AND ORDER

On April 14, 1978, the Commission issued an amendment to Provisional Operating License No. DPR-22, authorizing an increase in the spent fuel storage capacity at the Monticello Nuclear Generating Facility. The Minnesota Pollution Control Agency ("MPCA") had been a party to that proceeding, but had participated in a joint motion to terminate the Licensing Board proceeding which was granted by the Licensing Board on February 27, 1978.

Subsequent to issuance of the license amendment, as evidenced by an internal memorandum of the Commission Staff, the replacement spent fuel storage racks supplied by the vendor to the Licensee have been discovered to be defective, resulting in unanticipated corrosion and swelling of certain cavity walls in the racks. Four racks have been installed and modified by the Licensee, following consultation with the Commission Staff, and the Licensee intends to install nine additional modified racks in the near future, all without obtaining an amendment to its provisional operating license.

On December 8th, 1978, the MPCA filed a motion with the Commission pursuant to 10 C.F.R. §2.730, seeking an immediately effective order prohibiting the further installation of spent fuel

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storage racks at the Monticello facility. That pleading by the MPCA also requested the institution of a proceeding to review the modification of the defective racks and included the MPCA's petition for leave to intervene in such a proceeding. These requests, motion, and petition have suggested a reasonable and appropriate method for the Commission's review of the defective rack issue in the orderly fashion contemplated by the Commission's rules of procedure.

Upon consideration of the aforementioned filing, the Commission finds that there is a substantial likelihood that the MPCA will prevail on the merits of its claim that a license amendment is required prior to the modification and installation of the defective racks. The Commission further finds that a failure to issue an immediately effective order as requested by the MPCA may result in irreparable injury to the public in the event that Commission review leads to a conclusion that further modification and/or replacement of the defective racks is required. For that reason, the public health, safety, and interest require that the requested order be made effective immediately.

Therefore, in accordance with the Commission's authority under 10 C.F.R. §§2.204 and 2.730, the motion of the MPCA is granted. The Licensee is hereby ordered to cease and desist from the further installation of any spent fuel storage racks at its Monticello Nuclear Generating Facility pending further order by

this Commission.

IT IS SO ORDERED.

FOR THE NUCLEAR REGULATORY
COMMISSION

Issued at Bethesda, Maryland,
this ____ day of December, 1978.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION



In the Matter of)
NORTHERN STATES POWER COMPANY) DOCKET NO. 50-263
)
Monticello Nuclear Generating) Violation of Provisional
Plant, Unit 1) Operating License No. DPR-22
) (Modification and Installation
) of Defective Spent Fuel Storage
) Racks)

NOTICE OF APPEARANCES

Notice is hereby given that the undersigned attorneys herewith enter appearances in the above-captioned matter. In accordance with §2.713(a), 10 C.F.R. Part 2, the following information is provided:

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TELEPHONE: (612) 296-7703

NAME OF PARTY: Minnesota Pollution Control Agency

ADMISSIONS: Supreme Court of the State of Minnesota

United States District Court for the District of
Minnesota

United States Court of Appeals for the District
of Columbia Circuit

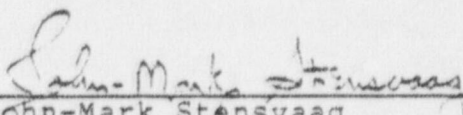
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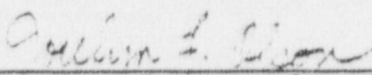
TELEPHONE: (612) 296-7343

NAME OF PARTY: Minnesota Pollution Control Agency

ADMISSIONS: Supreme Court of the State of Minnesota
Supreme Court of the State of Iowa
United States District Court for the District of
Minnesota
United States Court of Appeals for the District
of Columbia Circuit



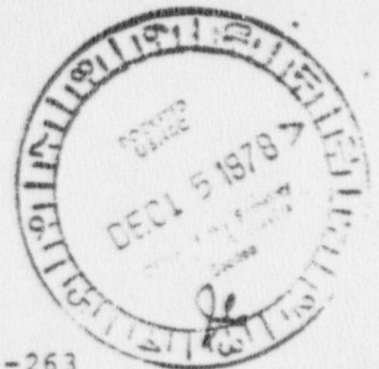
John-Mark Stensvaag
Special Assistant
Attorney General



Jocelyn Furtwangler Olson
Special Assistant
Attorney General

Dated: December 8, 1978

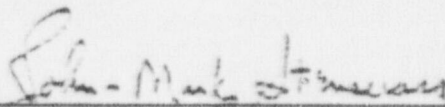
UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION



In the Matter of)
NORTHERN STATES POWER COMPANY) DOCKET NO. 50-263
)
Monticello Nuclear Generating) Violation of Provisional
Plant, Unit 1) Operating License No. DPR-22
) (Modification and Installation
) of Defective Spent Fuel Storage
) Racks)

CERTIFICATE OF SERVICE

I hereby certify that copies of the "Request and Motion for Order Prohibiting the Installation of Defective Spent Fuel Storage Racks in Violation of Provisional Operating License, Request to Institute a Proceeding, and Petition for Leave to Intervene," the "Notice of Appearances," and the proposed "Memorandum and Order" were served, according to the attached Service List, by deposit in the United States mail, postage prepaid, this 8th day of December, 1978.



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