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September 7, 1978

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The Honorable Muriel Humphrey
United States Senate
Washington, D. C. 20510

Dear Senator Humphrey:

I am pleased to respond to your request for information related to the Nuclear Regulatory Commission's recent issuance of exemptions for operating Boiling Water Reactor (BWR) facilities with the Mark I containment system design.

The enclosure to this letter contains detailed responses to the assertions presented in the June 22, 1978 letter to you from Messrs. Pollard and Cubie. These responses are organized somewhat differently than the sequence in which the assertions were presented in order to provide background information in a more orderly fashion.

Briefly, in December 1977 the staff published the Safety Evaluation Report of a short-term assessment which was performed to verify that licensed BWR facilities with the Mark I containment system design can continue to operate safely while a methodical, comprehensive long-term assessment of newly identified suppression pool hydrodynamic loads is being conducted. For the purpose of this short-term assessment, the NRC staff determined that a factor of safety of at least two for the weakest element in the containment system would be sufficient to assure that the containment would remain functional in the unlikely event of a postulated loss-of-coolant accident. Since the Commission regulations require a greater margin of safety, the staff determined that an exemption from the regulations (10 CFR Part 50, Appendix A, Criterion 50) would be necessary for each Mark I BWR facility until the completion of the long-term program. The completion of the long-term program is scheduled for December 1980 at which time the margin of safety required by the regulations for each Mark I BWR facility will be restored.

The NRC staff is authorized to grant exemptions, in accordance with the provisions for the delegation of authority set forth in 10 CFR Part 1 and the NRC Manual, from specific requirements of the Commission's regulations. In exercising this authority, the NRC staff must make a determination that the granting of the exemption will not endanger the health

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and safety of the public. Although the Commission was periodically briefed on the technical issues related to the Mark I containment short-term assessment, the issuance of the Mark I exemptions was not specifically discussed in advance with the Commission. As a result of the concerns raised regarding the issuance of the Mark I exemptions, the NRC staff will advise the Commission of all future exemptions to 10 CFR Part 50.

I trust that this information will be responsive to your request. If I can provide further assistance to you in this regard, please contact me.

Sincerely,

Joseph M. Hendrie
Chairman

Enclosures:
1. Discussion of the Specific Points Presented in the Union of Concerned Scientists' Letter
2. UCS letter dated 6/22/78

ENCLOSURE

DISCUSSION OF THE SPECIFIC POINTS PRESENTED

IN THE UNION OF CONCERNED SCIENTISTS' LETTER

1. Safety of Continued Operation of Licensed BWR Facilities With the Mark I Containment System (Response to Allegations on Page 1 of the UCS letter)

Background

The design objective of the Mark I containment system is to condense the steam released during a postulated loss of coolant accident (LOCA), to limit the release of the fission products associated with such an accident to the reactor building (the secondary containment), and to serve as a source of water for the Emergency Core Cooling Systems. The Mark I containment system design is utilized in twenty-five Boiling Water Reactor (BWR) facilities. Of these, twenty-two are currently licensed for operation and three are under construction.

In 1974, during large-scale testing of an advanced design pressure-suppression containment (Mark III) for BWRs, and during in-plant testing of the Mark I containments, new suppression pool hydrodynamic loads were identified which had not explicitly been included in the original Mark I containment design basis. These additional loads result from dynamic effects of drywell air and steam being rapidly forced into the suppression pool (torus) during a postulated LOCA and from suppression pool response to safety relief valve (SRV) operation generally associated with plant transient operating conditions. Since these new hydrodynamic loads had not been explicitly considered in the original design of the Mark I containment, the NRC staff determined that a detailed re-evaluation of the Mark I containment system was required.

In February and April 1975, the NRC transmitted letters to all utilities owning BWR facilities with the Mark I containment system design requesting that they review their plant designs to determine whether the newly identified load information would affect the structural adequacy of their containments. The February 1975 letters reflected NRC concerns about the dynamic loads from SRV discharges, while the April 1975 letters indicated the need to evaluate the containment response to the newly identified dynamic loads associated with a postulated design basis LOCA event.

As a result of the above-mentioned inquiries by the NRC and recognizing that the additional evaluation effort would be very similar for all Mark I BWR plants, all affected utilities formed an "ad hoc" Mark I Owners Group and GE was contracted as the Group's lead technical organization. The objectives of the Group were to determine the magnitude and significance of these dynamic loads as quickly as possible and to identify courses of action needed to resolve any outstanding safety concerns. In early 1975, the Mark I Owners Group proposed to divide this task into two programs: a Short Term Program (STP) to be completed in early 1977 and a Long Term Program (LTP) presently scheduled for completion in 1979.

The objectives of the STP were (1) to examine the containment system of each BWR facility with the Mark I containment design to verify that it would maintain its integrity and functional capability when subjected to the most probable loads induced by a postulated design basis (LOCA); and (2) to verify that licensed Mark I BWR facilities may continue to operate safely, without undue risk to the health and safety of the public, while a methodical, comprehensive Long Term Program (LTP) is conducted. The NRC staff determined that, for the most probable loads considered in the STP, "maintenance of containment integrity and function" would be adequately assured if a safety factor to failure of at least two were demonstrated to exist for the weakest structural or mechanical component in the Mark I containment system. The objectives of the LTP are (1) to establish design basis (conservative) loads that are appropriate for the anticipated life (40 years) of each Mark I BWR facility, and (2) to restore the original intended design safety margins for each Mark I containment system.

During the STP review, whenever the structural safety margins were found to be less than a factor of two at an operating Mark I BWR facility, the safety margins were required to be increased. One of the methods used to accomplish this was to maintain a differential pressure of at least one pound per square inch between the drywell and the suppression chamber (torus) during reactor operation. This mode of operation, which began to be used in February, 1976, would have the effect of reducing the hydrodynamic loads associated with the highly unlikely postulated LOCA. This condition remains in effect for those facilities where the licensees have taken credit for the load mitigating effects of such operation in the plant unique analysis of their torus support system. In addition, during the course of the STP review, several utilities have performed modifications to their containment system to provide additional design safety margin.

Basis for Continued Operation of Licensed BWR Mark I Facilities

The NRC has completed its review of the generic Mark I containment Short Term Program (STP) conducted by the Mark I Owners Group and the associated plant-unique information provided by the licensees of operating Mark I BWR facilities. The results of this review are documented in the staff's "Mark I Containment Short Term Program Safety Evaluation Report," NUREG-0408, December 1977.

Based upon its review, the NRC has concluded that licensed Mark I BWR facilities can continue to operate safely, without undue risk to the health and safety of the public, during an interim period of approximately two years while a methodical, comprehensive LTP evaluation is conducted. This conclusion was based on the determination that: (1) the magnitude and character of each of the hydrodynamic loads resulting from a postulated design basis loss-of-coolant accident (LOCA) have been adequately defined for use in the STP structural assessment of the Mark I containment system, and (2) for the most probable loads induced by a postulated design basis LOCA, a safety factor of at least two exists for the weakest structural or mechanical component in the containment system for each operating Mark I BWR facility.

Issuance of Exemptions for Operating Mark I BWR Facilities

Although the structural and mechanical components of the containment system for each operating Mark I BWR facility meet the STP structural acceptance criteria (i.e., a safety factor of at least two), certain components in each facility's containment system do not meet the American Society of Mechanical Engineers (ASME) Code allowable stress limits. The NRC regulations reference the ASME code. Consequently, the NRC staff concluded that the demonstrated safety margin of the containment systems for operating Mark I BWR facilities does not provide "sufficient margin" as prescribed in General Design Criterion (GDC) 50, "Containment Design Basis," of Appendix A to 10 CFR Part 50 and, therefore, is not sufficient for long term reactor operation.

However, since (1) Mark I BWR containment systems still retain adequate margin under present conditions to preclude failure under LOCA-related hydrodynamic suppression pool loads and thus provide reasonable assurance of no undue risk to the health and safety of the public, (2) the objective of the LTP, i.e., to restore the originally intended design safety margins for each Mark I containment system, is acceptable, (3) the Mark I Owners Program Action Plan for the LTP is reasonably designed to satisfy the LTP objective and (4) there appeared to be no safety problem or public interest consideration

favoring restriction of the operation of Mark I BWR facilities, the Director, Division of Operating Reactors, on February 28, 1978, granted the licensees of operating Mark I BWR facilities exemptions from GDC-50, with respect to LOCA-related hydrodynamic suppression pool loads, for an interim period until completion of the LTP (approximately two years). These exemptions provide for continued operation under the conditions specified in NUREG-0408 and under any resulting Technical Specification requirements.

2. Authorization for Issuance of Exemptions (Response to Allegations Number 2 and 3 on Page 1 and 2 of the UCS letter)

10 CFR Part 1 of the Commission's regulations, published July 18, 1977 (42 FR 36797), sets forth the Commission's Statement of Organization and General Information. As specified in Section 1.2 of 10 CFR Part 1, "Sources of Additional Information," the definitive statement of the NRC's organization, policies, procedures, assignments of responsibility and delegations of authority are set forth in the NRC Manual.

As specified in NRC Manual Chapter 0123, "Organization and Functions of the Office of Nuclear Reactor Regulation," of the U.S. Nuclear Regulatory Commission Manual, the Commission has delegated to the Director of the Office of Nuclear Reactor Regulation and to the Directors of the Division of Operating Reactors and the Division of Project Management within the Office of Nuclear Reactor Regulation, the authority to, consistent with the NRC regulations, grant exemptions from NRC regulations or impose special conditions on licensees of utilization and production facilities other than fuel reprocessing and isotropic enrichment plants. (Similar delegations are contained in other chapters of the NRC Manual for other NRC Offices.)

The exemptions granted in connection with the Mark I Short Term Program review were granted in accordance with this delegated authority by the Director of the Division of Operating Reactors, after consultation with and concurrence by the Acting Director of the Office of Nuclear Reactor Regulation.

Over the past two years, the Commission has been briefed on the technical issues related to the Mark I Containment Short Term Program (STP) reassessment and has been provided status reports on the staff's progress in resolving these technical issues. These discussions have included an outline of the approach towards resolution of the Mark I STP. The issuance of the Mark I exemptions, however, was not specifically discussed in advance with the Commission because it was believed by the staff to be an administrative action following the general approach previously set forth to the Commission. After the exemptions were brought to the attention of the Commission, the Commission discussed the basis for the staff's actions with the staff at at open meeting held on May 30, 1978. As a result of this meeting, the Commission requested that all future exemptions and waivers to 10 CFR Part 50, "Licensing of Production and Utilization Facilities," issued by the staff be reported to the Commission.

3. NRC Staff Management Review of Exemptions (Response to Allegation Number 5 on Page 2 of the UCS letter)

As outlined in the response to Item 2, authority for granting exemptions from the Commission's regulations has been delegated to the Director of the Office of Nuclear Reactor Regulation and the Directors of the Division of Operating Reactors and the Division of Project Management within that Office.

The Directors of the Division of Operating Reactors and the Division of Project Management review and sign all exemptions issued by their respective offices. In addition, the Director of the Office of Nuclear Reactor Regulation reviews and concurs in all exemptions from the Commission's regulations for licensees of utilization and production facilities other than fuel reprocessing and isotopic enrichment plants.

4. Public Notice in the Federal Register of the Issuance of Exemptions (Response to Allegation Number 4 on Page 2 of the UCS letter)

For some time, it has been the practice of the Office of Nuclear Reactor Regulation to provide public notice in the Federal Register of the issuance of exemptions from the requirements of the Commission's Regulations which are issued by that Office.

In some instances, the exemption may be associated with another licensing action, e.g., license issuance, a license amendment. In these cases, the notice of the license issuance or the notice of the license amendment will contain information relating to any associated exemptions.

In the case of the issuance of the Mark I exemptions, notices of issuance of the exemptions were published in the Federal Register (43 FR 13105-13118, March 29, 1978), for each of the facilities which were granted exemptions subsequent to the issuance of the actual exemptions. When the exemptions were transmitted to each licensee, a sample Federal Register Notice was included. Copies of the exemption and sample Federal Register Notice were simultaneously transmitted to all of those interested parties who routinely receive correspondence concerning licensing actions on a specific plant. The basis for the exemption specifies that, although the containment design does not satisfy the requirements of Section III of the ASME Boiler and Pressure Vessel Code, the safety factor to failure of at least two is sufficient to preclude failure and thus provide reasonable assurance of no undue risk to the health and safety of the public. In light of the above and in the absence of any significant environmental impact associated with the issuance of the exemptions, the NRC staff determined that prior notice of the issuance of these exemptions was not required. This determination was consistent with normal staff practice.

5. Response to Contention that the Program of the Vendor (General Electric Company) and the Licensees to Upgrade the Mark I Containment System is Inherently Biased (Response to Allegation on Page 2 of the UCS letter)

Background

In accordance with the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974, the Nuclear Regulatory Commission is responsible for ensuring that the operation of licensed reactor facilities is in accordance with the Commission's regulations and that such operation does not present an undue risk to the health and safety of the public.

The NRC establishes safety criteria, sets special requirements for many aspects of reactor design and operation, and ensures compliance with these criteria and requirements by independent audit. While these activities play a vital role in ensuring safe plant operation, they are not a substitute for licensee safety reviews. The licensees bear a heavy responsibility for ensuring that their licensed facilities are utilized safely.

As was the case for the Mark I Containment Short Term Program (STP), licensees of Mark I BWR facilities will be required to provide documentation of the adequacy of the generic Long Term Program (LTP) results and the application of such results to their facilities. In accordance with the Commission's regulations, licensees will be required to affirm in writing that the information presented in such documentation is valid. The Commission is authorized to impose a range of sanctions including, as appropriate, civil penalties or suspension or revocation of the license to operate a facility, if material false statements are made in documents presented by licensees to the Commission or to its staff.

The staff, as part of its continuing review, has assessed the adequacy of the basic information, analytical techniques and assumptions proposed by the vendor and licensees for the LTP review and, during the course of this review, has indicated the need for modification of certain review techniques or assumptions proposed. The staff also checks certain calculations to assure that the results are reasonable.

Mark I Containment Long Term Program

During the course of its review of the STP, the NRC staff developed requirements for the conduct of the LTP to assure that its intended objectives will be met in a manner which is acceptable to the NRC staff. During July and August 1976, the Mark I Owners Group made

several presentations to the NRC staff on the proposed content and schedule for completion of the LTP. Much of this information was subsequently documented in the "Mark I Containment Program Action Plan" submitted to the NRC staff on October 29, 1976. As a result of the NRC staff comments and questions on this document, the Mark I Owners Group revised several of the proposed LTP tasks and objectives.

These revisions were discussed with the NRC staff in meetings held in February 1977 and are documented in Revision 1 to the "Mark I Containment Program Action Plan" which was submitted to the NRC staff on February 11, 1977. All subsequent revisions to the "Mark 1 Containment Program Action Plan" have been discussed with the NRC staff.

The staff has reviewed the "Mark I Containment Program Action Plan" and has determined that it is reasonably designed to provide resolution of the issues raised during the STP and to meet the objectives of the LTP.

Throughout the performance of the LTP, frequent meetings have been and will continue to be held between the Mark I Owners Group and the NRC staff. The development of the details of the structural acceptance criteria for the LTP has been accomplished through a series of working meetings between the NRC staff and the representatives of the Mark I Owners Group, both of which contain internationally known experts in the fields of structural and mechanical engineering. The progress of the LTP is also discussed in periodic meetings with the Commission's Advisory Committee on Reactor Safeguards. In addition, the Mark I Owners Group submits status reports to the NRC staff to document the progress of the LTP work on at least a monthly basis.

As was the case with the STP, the NRC staff and its consultants will perform a comprehensive independent review of the generic LTP results and of the applications of these results to the plant-unique structural analyses performed for each Mark I BWR facility. In addition, the NRC has sponsored several testing and analytical programs to provide independent confirmatory load definition and structural response information for use in its evaluation of the results of the Mark I Owners LTP.

The NRC staff will continue to closely follow the progress of the LTP to assure that it is being properly executed and that appropriate actions are taken in a timely manner.

6. Discussion of Commissioner Gilinsky's Comment Concerning Potential for Erosion of Safety Margins (Response to Allegation Number 1 on Page 1 of the UCS letter)

The general concern expressed by Commissioner Gilinsky is quite valid. As described below, the NRC staff carefully considers these concerns both in its criteria for licensing nuclear power plants and in its review of new information as it becomes available in order to ensure that such margins of safety do not erode to an unacceptable degree.

The primary goals of the NRC in its regulation of nuclear power plants are to assure the health and safety of the public and the protection of the environment. These goals are achieved by means of a system of rules, regulations and regulatory guides coupled with a comprehensive licensing review and inspection process which encompasses all significant safety and environmental factors.

In achieving its goals the NRC is guided by a safety philosophy, termed the "defense-in-depth" approach or concept, which acknowledges the fact that no single step can be made totally error-free and relies instead upon multiple lines of defense to provide the necessary level of safety. Thus, the concept is based on the assumption that all defects will not be eliminated and that men will make errors and materials will fail, despite our best efforts to the contrary.

Quite simply, the defense-in-depth concept requires that three levels of safety be incorporated into the design of nuclear power plants.

(1) Design and build plants conservatively so that they will operate reliably without failures that could lead to accidents.

(2) Anticipate abnormalities and design back-up systems that will compensate automatically for the failure of essential equipment.

(3) Design multiple back-ups to provide additional margins to protect the public in the event of the occurrence of very unlikely accidents.

To assure that the defense-in-depth concept is fully implemented through conformance to the NRC's rules and regulations and the consideration of NRC's regulatory guidance, the NRC staff conducts thorough and comprehensive safety reviews of all license applications and conducts inspections during plant design, construction, testing and operation. In addition, an independent review of each application for a license is conducted by the Advisory Committee on Reactor Safeguards (ACRS).

The acceptance criteria and procedures for the NRC's safety reviews of applications for nuclear power plant licenses are provided in 224 Standard Review Plans containing over 1,400 pages. These Standard Review Plans provide a detailed statement of the NRC staff's safety requirements and were developed to improve the quality and uniformity of staff reviews and to provide a stabilizing effect on staff requirements.

The implementation of the Standard Review Plans does not, however, relieve the NRC staff from its responsibility to continuously evaluate the safety requirements utilized in its reviews against new information as it becomes available. This responsibility for evaluating the significance of new information is, of course, of immediate importance in continuously assuring the safety of operating reactors.

Information related to the safety of nuclear power plants comes from a variety of sources, including experience from operating reactors, results from ongoing research, NRC staff and ACRS safety reviews, vendor, architect/engineer and utility design reviews, and members of the public. Each time a new concern or safety issue is identified from one or more of these sources, the need for immediate action to assure safe plant operation is assessed. This assessment includes consideration of the generic implications of the issue as well as the impact that the new information may have on the overall "defense-in-depth" provided for the affected facilities.

In some cases, immediate action is taken to assure adequate safety margins are maintained e.g., the derating of boiling water reactors as a result of the channel box wear problem in 1975. In other cases, interim measures, such as modifications to operating procedures or increased equipment surveillance, may be sufficient to allow further study of the issue prior to making licensing decisions. In most cases, however, the initial assessment indicates that immediate licensing actions or changes in licensing criteria are not necessary. This is because the Commission's standards and regulations as implemented through the licensing process ensure that large margins of safety are incorporated in the plant design. Nonetheless, further study is often proposed to assess the need to restore safety margins, to assure that, over the long term, safety margins are not eroded by an accumulation of individual minor matters and even to enhance long-term safety performance. In some cases, the further study may be a short-term effort resulting in the relatively rapid development of a generic solution for implementation on operating plants or in the licensing process. When longer term studies are appropriate, the issue is included in NRR's program for the resolution of generic issues and assigned to a priority category

based on its judged importance. (The Mark I Containment Short and Long Term Programs were assigned to the highest priority category). As indicated above, such issues are included in the NRC program only after the staff has made an initial assessment for individual plants and has made a determination that the safety significance of the issue permits continued operation or licensing actions while the longer term generic review is underway.

The staff considers Commissioner Gilinsky's comments as an important reminder to assure, in connection with our review of the Mark I Containment systems, that (1) other considerations do not result in any further reduction in the overall design safety margins and (2) the design safety margins be restored promptly. We believe that the long term program presently in progress will achieve prompt restoration of the design safety margins.

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Incoming: Muriel Humphrey, USS
From: ~~Vice~~ Committee on Foreign Relations

To: Congressional Date 7/7/78
Subject: Re: ltr. from UCS, the NRC's waiver of NRC sfety requirements for some U.S. Nuclear power plants.

XXX ☐ Prepare reply for signature of:
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- ☐ Commissioner _____
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NRC 42 ACTION SLIP

MURIEL HUMPHREY
MINNESOTA

United States Senate

WASHINGTON, D.C. 20510

July 7, 1978

To: U.S. Nuclear Regulatory Commission
Office of Congressional Affairs
Washington D.C. 20555
Attn: Randy Pine

Enclosure From: Mr. Jim Cubie
and Mr. Robert Pollard
Union of Concerned Scientists
1208 Massachusetts Avenue
Cambridge, Massachusetts 02138

Re: The Nuclear Regulatory Commissions's waiver of NRC safety requirements for some U.S. nuclear power plants

I forward the attached for your consideration.

Your report in duplicate along with the return of the enclosure will be appreciated.

Sincerely,

Muriel Humphrey

Muriel Humphrey

Please address envelope only to the attention of: Jim Ingison

UNION OF CONCERNED SCIENTISTS

JUN 26 9 13 AM '78

June 22, 1978

The Honorable Muriel Humphrey
2113 Dirksen Building
1st and C Streets, N.E.
Washington, D. C. 20510

Dear Senator Humphrey:

For the past seven years, the Union of Concerned Scientists has been evaluating Federal regulatory programs governing the commercial nuclear power industry. We are writing to bring to your attention the fact that the Nuclear Regulatory Commission's staff, without Commission knowledge, has granted a sweeping waiver of NRC safety requirements for twenty U. S. nuclear plants, including one in your state.

In late February, the NRC staff permitted twenty boiling water reactors (BWRs) to continue to operate even though it was discovered that they do not meet one of NRC's basic safety requirements. Under the waiver, an important safety margin claimed when the plant was licensed was cut possibly in half. There are serious questions whether adequate safety margins exist as a result of this capricious staff action. At issue is the "containment" system for these plants. In the event of a nuclear accident, if this safety system does not work properly, radiation could be released which would cause large scale loss of life and illness and hundreds of millions or even billions of dollars in property damage.

Although this waiver in and of itself is disturbing, the following additional facts add to our concern:

1. NRC Commissioner Gilinsky stated on May 30, 1978 that "this isn't the only area where we make these kind of allowances. If you let each one of these things slip then your margins of safety do begin to erode."

2. Such sweeping waivers have been granted by the NRC staff without any action by the NRC Commission itself.

1381 018

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3. No public notice of the transfer of the safety responsibility from the Commission to the staff was ever published in the Federal Register.

4. Public notice of the waiver of safety regulations by the NRC staff is not customarily made in the Federal Register. (The NRC staff has stated, in response to Commission questioning, that they issue two or three waivers of the regulations each month!)

5. The second level NRC staff has been granting waivers with only oral concurrence of top NRC staff management.

In addition, the waiver of safety requirements is being granted until the General Electric Company which manufactures the BWR and the utilities which are operating them complete a series of tests on the reactor containment system. This is an inherent conflict of interest. If General Electric concludes that the matter cannot be corrected, it will be putting itself out of business. The longer the utilities delay any action on the upgrading of this system, the longer the health and safety of the public is jeopardized. G.E. is being permitted to test its own safety system even though Federal scientists have stated that G.E.'s reporting of data in past safety tests was "tremendously slanted."

We urge you to write the Nuclear Regulatory Commission expressing your concern about the nature and the manner in which these decisions have been made. If you have any questions, please contact us.

Sincerely yours,

Jim Cubie
Washington Counsel

Robert D. Pollard
Nuclear Safety Engineer