

November 15, 2002

Mr. David A. Lochbaum  
Nuclear Safety Engineer, Washington Office  
Union of Concerned Scientists  
1707 H Street NW, Suite 600  
Washington, DC 20006-3819

Dear Mr. Lochbaum:

This letter responds to your petition filed with Dr. William D. Travers, Executive Director for Operations, U.S. Nuclear Regulatory Commission (NRC or the Commission) pursuant to Section 2.206 of Title 10, *Code of Federal Regulations* (10 CFR 2.206), on March 11, 2002, as supplemented by letters dated March 21, March 22, and March 27, 2002 (the Petition). The March 21 and March 22, 2002, supplemental letters identified a number of additional petitioners and identified you as the point-of-contact between the petitioners and the NRC. In the Petition, you requested that the NRC immediately issue orders to the owners of all operating nuclear power plants to take two measures that would reduce the risk from sabotage of irradiated fuel:

- (1) The NRC should "impose a 72-hour limit for operation when the number of operable onsite alternating current power sources (i.e., emergency diesel generators) is one less than the number in the Technical Specification limiting condition for operation. This 72-hour limit would be applicable when the nuclear plant is in any mode of operation other than hot shutdown, cold shutdown, refueling, or defueled." Oconee Nuclear Station (Oconee) does not rely on emergency diesel generators (EDGs), but "equivalent protection for its emergency power supply" should be provided. The NRC should also "cease and desist issuing NOEDs [Notices of Enforcement Discretion] that allow nuclear reactors to operate for longer periods of time with broken emergency diesel generators." This requested action would apply to the facilities listed in Attachment 1 to your March 11, 2002, petition.
- (2) The NRC should "impose a minimum 24-hour time-to-boil for the spent fuel pool water. This limit would be applicable at all times." This requested action would apply to the facilities listed in Attachment 1 to your March 11, 2002, petition.

The Petition also requested that the NRC hold a public meeting to precede "the Petition Review Board (PRB) non-public meeting regarding this petition."

You met with the NRC's PRB on March 26, 2002, via telephone conference, to clarify the bases for the Petition. The transcript is available in the Agencywide Documents Access and Management System (ADAMS) for inspection at the Commission's Public Document Room (PDR) located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland, and is accessible electronically in ADAMS through the NRC Public Electronic Reading Room at <http://www.nrc.gov/reading-rm.html> (ADAMS Accession No. ML022670353). The transcript of the telephone conference is being treated as a supplement to the Petition. Persons who do not have access to ADAMS or who encounter problems in accessing documents located in

ADAMS should contact the NRC PDR reference staff by telephone at 1-800-397-4209, or locally at 301-415-4737, or by email at [pdr@nrc.gov](mailto:pdr@nrc.gov).

On May 8, 2002, the NRC staff acknowledged receiving the Petition, informed you that the Petition met the requirements for review under 10 CFR 2.206, and that the Petition had been referred to me for action and would be acted upon within a reasonable time. You were also informed in that letter that the PRB recommended, and I concurred, to not grant your request for immediate action.

The staff provided you with a copy of the proposed Director's Decision by letter dated September 4, 2002. You responded with comments by letter dated September 23, 2002. Your comments and the staff's response to them are enclosed with this correspondence.

As noted in the enclosed Director's Decision, the NRC staff has concluded that there is no need to restrict allowed outage times for EDGs to 72 hours or desist issuing NOEDs to extend the allowed outage time of EDGs. This conclusion was reached in response to item (1) above, which addresses concerns related to EDG out-of-service times. If, during an EDG outage during plant operation, sabotage to offsite power should occur, the availability of the remaining power sources is adequate to assure that the plant can be safely shut down and maintained in a safe shutdown condition, even if a station blackout should occur.

The NRC has partially granted the petitioners' request that action be taken to reduce the risk from sabotage of irradiated fuel as it relates to item (2) above, which addresses concerns raised by the petitioners regarding potential vulnerabilities associated with sabotage of the spent fuel pool (SFP) cooling capability. In this regard, additional measures are being implemented by the licensees in response to the February 25, 2002, Orders issued by the NRC concerning on-site security. In addition, the NRC staff has concluded that there is no need to restrict the heat load in the SFP by establishing a minimum time-to-boil of 24 hours from loss of forced SFP cooling. Should sabotage of the primary SFP cooling capability occur when there is a high heat load in the SFP, the availability of alternate SFP cooling assures protection of irradiated fuel stored in the SFP.

A copy of the enclosed Director's Decision will be filed with the Secretary of the Commission for the Commission to review in accordance with 10 CFR 2.206(c). As provided by this regulation, the decision will constitute the final action of the Commission 25 days after the date of the decision unless the Commission, on its own motion, institutes a review of the decision within that time. The documents cited in the enclosed decision are also available for inspection at the Commission's PDR, and electronically accessible in ADAMS through the NRC Public Electronic Reading Room at <http://www.nrc.gov/reading-rm.html>.

A copy of the notice of "Issuance of Director's Decision Under 10 CFR 2.206" that has been filed with the Office of the Federal Register for publication is also enclosed.

D. Lochbaum

-3-

We appreciate your efforts to bring these issues to the attention of the NRC. Please feel free to contact David H. Jaffe at 301-415-1439 to discuss any questions related to this Petition.

Sincerely,

*/RA/*

Samuel J. Collins, Director  
Office of Nuclear Reactor Regulation

- Enclosures:
1. Director's Decision 02-07
  2. Petitioners' Comments on  
Proposed Director's Decision
  3. Staff's Response to  
Petitioners' Comments
  4. *Federal Register* Notice

D. Lochbaum

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shutdown, cold shutdown, refueling, or defueled." Oconee Nuclear Station (Oconee) does not rely on emergency diesel generators (EDGs) but "equivalent protection for its emergency power supply" should be provided. Note that whenever EDGs are referred to in this Director's Decision, the reference is also applicable to Oconee's onsite emergency power supply. The NRC should also "cease and desist issuing NOEDs [Notices of Enforcement Discretion] that allow nuclear reactors to operate for longer periods of time with broken emergency diesel generators." This requested action would apply to the facilities listed in Attachment 1 to the March 11, 2002, petition.

- (2) The NRC should "impose a minimum 24-hour time-to-boil for the spent fuel pool water. This limit would be applicable at all times." This requested action would apply to the facilities listed in Attachment 1 to the March 11, 2002, petition.

As a basis for the requests described above, the Petitioners cite the need to reduce the risk from sabotage of irradiated fuel.

The Petitioners also requested that the NRC hold a public meeting "to precede the Petition Review Board (PRB) non-public meeting regarding this petition."

On March 26, 2002, in lieu of a public meeting, the Petitioners accepted and participated in a telephone conference (teleconference) with the NRC's PRB to discuss the Petition. The transcript of the teleconference is being treated as a supplement to the Petition. After the teleconference, the PRB discussed the Petition. The PRB considered the contributions of the Petitioners to the teleconference in deciding whether to grant the requests for immediate action and in setting the schedule for the review of the Petition. The PRB concluded that the Petition satisfied the criteria for review under Title 10 of the *Code of Federal Regulations* (10 CFR) Section 2.206.

By an acknowledgment letter dated May 8, 2002, the NRC staff formally notified the Petitioners that the Petition met the criteria for review under 10 CFR 2.206, and that the NRC staff

would act on the request within a reasonable time. The acknowledgment letter further provided the bases for the NRC's denial of the Petitioners' request for immediate action.

The staff provided the Petitioners with a copy of the proposed Director's Decision by letter dated September 4, 2002. The Petitioners responded with comments by letter dated September 23, 2002. The comments on the proposed Director's Decision and the staff's response to them are addressed in Enclosure No. 2 and No. 3 to the November 15, 2002, letter to Mr. David A. Lochbaum, Union of Concerned Scientists.

The Petition is available for inspection in the NRC's Agencywide Documents Access and Management System (ADAMS) at the Commission's Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland. Publicly available records are also accessible from the ADAMS Public Electronic Reading Room on the NRC Web site (<http://www.nrc.gov/reading-rm/adams.html>). The transcript of the March 26, 2002, teleconference has been assigned Accession Number ML022670353. Persons who do not have access to ADAMS or have problems in accessing the documents located in ADAMS should contact the NRC PDR reference staff at 1-800-397-4209 or 301-415-4737 or by e-mail to [pdrc@nrc.gov](mailto:pdrc@nrc.gov).

## II. Discussion

The Petitioners request that the NRC take specific measures to reduce the risk from sabotage of irradiated fuel, is part of the larger issue of protecting our Nation's nuclear power plants from terrorism. In this regard, long before the tragic events of September 11, 2001, the Commission had recognized the need for strict safeguards and security measures at these facilities. When Congress first authorized the civilian use of atomic power through the Atomic Energy Act of 1954 (the Act), it recognized that public health and safety must be protected. The Act gave the Atomic Energy Commission (predecessor of the NRC) the responsibility and authority to determine the requirements, including rules governing security, that are necessary to promote

common defense and security and to protect the health and safety of the public when commercial nuclear power plant licenses are issued.

The regulations for protecting all nuclear power plants are provided in 10 CFR Part 73, "Physical Protection of Plants and Materials." These rules represent an important cornerstone of the NRC's regulatory oversight responsibilities. In particular, the regulations include detailed, specific requirements designed to protect nuclear power plants against acts of radiological sabotage, and protect safeguards and classified information against unauthorized release.

To provide high assurance that the operation of a nuclear power plant does not constitute an unreasonable risk to public health and safety, licensees are required to implement the NRC's safeguards and security regulations described in 10 CFR 73.55, "Requirements for physical protection of licensed activities in nuclear power reactors against radiological sabotage."

Specifically, licensees are to design a physical protection system to provide the following means of protection against the design-basis threat (DBT) of radiological sabotage:

1. maintain a well-equipped and highly trained physical security organization
2. install physical barriers to protect vital equipment
3. implement access requirements to control all points of personnel and vehicle access into a protected area. These requirements include the identification and search of individuals and vehicles for firearms, explosives, and incendiary devices
4. install detection, surveillance, and alarm systems with the capability to detect unauthorized penetrations into protected areas
5. ensure that all guards and armed response individuals have the ability to communicate with a continuously manned alarm station
6. establish effective testing and maintenance programs to verify that all physical barriers, detection, and alarm systems are capable of meeting NRC requirements

7. provide a safeguards contingency plan to respond to threats, thefts, and radiological sabotage related to the nuclear facility

#### Security Organization

All operating nuclear power plant licensees are required to establish and maintain a site security organization. Such site security organizations include the designated managers, guard force, and personnel for checking worker backgrounds and issuing badges, as well as detailed access control and response procedures. To become a member of the security organization at a nuclear power plant, an individual must meet several stringent requirements, including satisfactory performance of qualification and requalification training. Specifically, 10 CFR 73.55(b)(4) expressly states that "licensee[s] may not permit an individual to act as a guard, watchman, armed response person, or other member of the security organization unless the individual has been trained, equipped, and qualified to perform each assigned security job duty" in accordance with NRC-established criteria for security personnel. Furthermore, each licensee shall establish, maintain, and follow an NRC-approved training and qualifications plan outlining the processes by which guards, watchmen, armed response persons, and other members of the security organization will be selected, trained, equipped, tested, and qualified to ensure that these individuals meet NRC requirements. These qualifications include specific requirements to demonstrate competence in the use of assigned weapons. In addition, guards, watchmen, armed response persons, and other members of the security organization are subject to the NRC's medical examination, physical fitness, and fitness-for-duty requirements. These security organizational requirements exist to implement the defense-in-depth philosophy for safeguarding vital plant areas, and are designed to help provide an effective deterrence against potential terrorist activities directed at nuclear power plants.

### Access Authorization and Control

To ensure that only authorized individuals are able to enter vital and other protected areas of a nuclear plant, licensees are required to implement and maintain access authorization and control programs. The objective of these programs is to provide high assurance that individuals who are allowed unescorted access to a nuclear power plant are trustworthy and reliable, and do not constitute an unreasonable risk to public health and safety including the potential to commit radiological sabotage. To achieve this objective, NRC regulations require licensees to: (1) perform background checks on workers who are granted unescorted access to the plant; (2) implement a picture badge identification system to identify those persons who are authorized to enter specific plant areas; (3) search personnel, packages, and vehicles entering the protected area; (4) search for firearms and explosives; (5) monitor entry into identified areas of the plant; and (6) maintain a detection and alarm system.

Worker background checks include an investigation to verify an individual's true identity and to develop information concerning the individual's employment, education, and credit history; military service; and character and reputation, including a psychological assessment, to evaluate trustworthiness and reliability. The checks also include a criminal history check conducted via fingerprint cards submitted to the Federal Bureau of Investigation (FBI). These requirements are designed to prevent unauthorized access of persons, vehicles, and materials into protected areas, and to ensure that only persons who are deemed trustworthy are authorized to have unescorted access to vital plant equipment.

### Protection of Vital Equipment

Paragraph (a)(1) of 10 CFR 73.1 defines the DBT from which vital areas must be protected. The regulation requires licensees to assume that potential terrorists have the following characteristics:

1. are dedicated and well-trained (including military training and skills)
2. have inside assistance, which may include a knowledgeable individual who attempts to participate in a passive role (e.g., provide information), an active role (e.g., facilitate entrance and exit, disable alarms and communications, participate in violent attack), or both
3. possess suitable weapons, up to and including hand-held automatic weapons, equipped with silencers and having effective long-range accuracy
4. possess hand-carried equipment, including incapacitating agents and explosives for use as tools of entry or for otherwise destroying reactor, facility, transporter, or container integrity, or features of the safeguards system
5. have a four-wheel drive land vehicle available for transporting personnel and their hand-carried equipment to the proximity of vital areas

NRC regulations in 10 CFR 73.1(a)(1)(iii) also require licensees to protect against a four-wheel drive land vehicle bomb. To safeguard a nuclear plant against this threat, 10 CFR 73.55 requires all licensees to: (1) establish vehicle control measures, including vehicle barriers, to protect against the use of a land vehicle as a means of transportation to gain unauthorized proximity to vital areas; and (2) develop a process to use alternative measures for protection against a land vehicle bomb (i.e., for those licensees with a particularly difficult site configuration). The alternative measures must provide substantial protection against a land vehicle bomb and must be supported by a licensee analysis.

In summary, Congress understood the inherent need for strict security measures at commercial nuclear power plants, and NRC regulations have ensured that these are among the most hardened and secure industrial facilities in our nation. The many layers of protection offered by robust plant design features, including sophisticated surveillance equipment, a professional

security force, and regulatory oversight, are effective deterrents against potential terrorist activities that would target equipment vital to nuclear safety.

#### NRC Response to the September 11, 2001, Terrorist Attacks

When the events of September 11, 2001, unfolded, U.S. nuclear power plants already possessed a strong capability to prevent and respond to many types of terrorist acts that could be directed at them. In addition, the NRC took other immediate actions and advised all nuclear power plants to go to the highest level of security, which they promptly did. The NRC also issued more than 30 threat advisories to address specific concerns or vulnerabilities in the aftermath of September 11. In addition, NRC security specialists performed numerous onsite physical security vulnerability assessments at licensed facilities to evaluate the effectiveness of the enhanced security measures that were put into place. To this day, all nuclear power plant facilities remain at a heightened security level.

The NRC has taken appropriate steps to promote common defense and security, and to protect the health and safety of the public, since the unprecedented events of September 11, 2001. For example, the NRC quickly recognized the need to reexamine basic assumptions underlying the current civilian nuclear facility security and safeguards programs. Chairman Richard A. Meserve, with the full support of the rest of the Commission, directed the staff to undertake a comprehensive review of the NRC's safeguards and security programs. The comprehensive review takes advantage of insights gained by the NRC in consultation with the Office of Homeland Security, FBI, Department of Transportation, Department of Energy, and others. This cooperation further allows the NRC to keep abreast of the current threat environment, and communicate its actions to other Federal agencies to ensure an appropriate response to security concerns throughout the nation's entire critical energy infrastructure.

In light of the current threat environment, the Commission concluded that specific security measures, including those outlined in threat advisories and voluntarily implemented by nuclear power plant licensees, should be embodied in an Order consistent with the NRC's established regulatory framework. On February 25, 2002, the NRC issued Orders to all operating power reactor licensees to require certain interim compensatory measures (ICMs) for security be taken beyond that called for by current regulations. These requirements will remain in effect pending notification from the Commission that a significant change in the threat environment has occurred, or until the Commission determines that other changes are needed following the comprehensive review of current safeguards and security programs. The Orders were effective immediately upon issuance. For the most part, the Orders formalized a series of steps that nuclear power plant licensees had been advised to take by the NRC in the aftermath of the terrorist attacks on September 11, 2001; however, the Commission included certain additional security enhancements in the Orders. Details of certain new security requirements cannot be made public, but some of the specific measures implemented by the licensees in response to the advisories and ICMs included increased patrols, augmented security forces and capabilities, additional security posts, installation of additional physical barriers, vehicle checks at greater stand-off distances, enhanced coordination with law enforcement and military authorities, and more restrictive site access controls for all personnel. The Orders also required that licensees provide a schedule for their implementation of the ICMs, and that all ICMs be implemented by August 31, 2002. Based on the NRC staff's review of the responses to the reporting requirements of the Order, the staff believes that licensees have taken adequate measures to comply with the requirements of the Order by the required date of August 31, 2002. The staff is currently verifying that licensees are in compliance with the ICMs by conducting independent inspections at all licensee sites. These independent inspections consist of

an audit that will be completed by December 2002, and a more detailed inspection that will be conducted through 2003.

If the NRC identifies a significant vulnerability during the ongoing review, the staff will impose additional physical protection, material control, or other requirements, as appropriate. The NRC will continue to assist the Office of Homeland Security and other Federal agencies to evaluate threats beyond the response capabilities of NRC licensees. As part of this effort, on April 7, 2002, the Office of Nuclear Security and Incident Response (NSIR) was established to improve the timeliness and consistency of communications among NRC's employees and with NRC's external stakeholders. The new office also integrates NRC management of classified and sensitive safeguards information and secure communication facilities.

The Petitioners' concerns also extend beyond the limits of the protected areas of individual nuclear power sites. The electric power grid, as the Petitioners note, is virtually unprotected. However, although the electric power grid has in the past been disrupted by natural and man-made events, the grid has proven to be a reliable source of offsite power for safety functions associated with nuclear power facilities.

With regard to the Petitioners' request to impose a 72-hour limit for operation with less than the limiting condition for operation (LCO)-required EDGs, General Design Criterion (GDC) 17, "Electric power systems," of Appendix A to 10 CFR Part 50 states, in part, that nuclear power plants have onsite and offsite electric power systems to permit the functioning of structures, systems, and components that are important to safety. The onsite system is required to have sufficient independence, redundancy, and testability to perform its safety function, assuming a single failure. The offsite power system is required to be supplied by two physically independent circuits that are designed and located so as to minimize, to the extent practical, the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions. In addition, GDC-17

requires provisions to minimize the probability of losing electric power from the remaining electric power supplies as a result of a loss of power from the unit, the offsite transmission network, or the onsite power supplies.

GDC-18, "Inspection and testing of electric power systems," requires that electric power systems that are important to safety be designed to permit appropriate, periodic inspection and testing. Pursuant to 10 CFR 50.36, "Technical specifications," a licensee's Technical Specifications (TSs) must establish LCOs, which include remedial actions to be taken when the LCO is not met. The remedial action is typically to shut down the reactor within some period of time; historically known as the allowed outage time (AOT), but currently called the completion time (CT) in the TSs at most plants. In addition, 10 CFR 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," requires that preventive maintenance activities not reduce the overall availability of the systems, structures, and components. Regulatory Guide (RG) 1.93, "Availability of Electric Power Sources," provides guidance with respect to operating restrictions (i.e., AOTs) if the number of available alternating current (ac) sources is less than that required by the TS LCOs. This guide prescribes a maximum AOT of 72 hours for an inoperable ac source. In the case of EDGs, these AOTs have been extended to up to 14 days for some licensees by considering the impact on overall plant risk and determining that the change in risk due to the extended AOT is acceptable (these AOT extensions are examples of "risk-informed" licensing actions).

During the teleconference of March 26, 2002, with the Petitioners, but prior to the decision of the PRB to accept the Petition, the Petitioners clarified that the first measure, limiting the EDG AOT to 72 hours, was intended to minimize the threat to reactor safety by sabotage or terrorist activities by limiting how long the EDGs could be out of service (OOS) when the reactor was operating. The Petitioners also clarified during the teleconference that, in their opinion, the NRC Office of Nuclear Regulatory Research's (RES's) final report on the regulatory effectiveness of 10

CFR 50.63,<sup>1</sup> "Loss of all alternating current power" (the station blackout (SBO) rule), seemed to refute the industry statement that it was safer at many plants to perform the EDG extended maintenance during power operations rather than during an outage, and the Petitioners stated that they had considered this finding when they developed the Petition.

The Petitioners cited the September 11, 2001, terrorist attacks as demonstrating the capability of terrorists to carry out coordinated attacks on American soil and stated that the transmission lines and substations that constitute the electrical grid for a nuclear power plant are virtually unprotected targets for terrorists. The Petitioners also stated that the switchyard at a nuclear power plant is a relatively softer target than the nuclear plant itself and concluded that there is no reason to consider the normal supply of ac power to nuclear power plants (i.e., the normal offsite ac power sources) resistant to or immune from terrorist attacks.

If a terrorist attack succeeds in disabling these normal offsite power sources, the emergency ac power sources (e.g., onsite EDGs) must function to prevent an SBO event. The Petitioners recognized that these EDGs are located behind security fences and protected by armed security guards so that it would be hard for terrorists to attack these sources of emergency ac power. However, the Petitioners raised a concern about the potential for the EDGs to not be functional (i.e., unavailable due to maintenance) if the normal offsite power sources are disabled by a terrorist attack. The Petitioners stated that the longer an EDG is OOS, the higher the likelihood a successful terrorist attack against the electrical grid could cascade to an SBO and eventually result in reactor core damage. The Petitioners stated that reimposing a maximum AOT of 72 hours for EDGs would reduce risk by preventing the removal of EDGs for long periods of maintenance.

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<sup>1</sup> William S. Raughley, Office of Nuclear Reactor Research, U.S. Nuclear Regulatory Commission, "Final Report: Regulatory Effectiveness of the Station Blackout Rule," August 15, 2000, referred to herein as the "NRC RES Report."

The Petitioners concluded that, since little can be done quickly to provide better protection of the electrical grid, the NRC should swiftly reimpose the 72-hour LCO on all onsite emergency power supplies to increase the likelihood that they will be available to provide power to safety equipment in the event of a successful terrorist attack against the electrical grid and, thus, reduce the risk of SBO and reactor core damage. The Petitioners recognized that this issue did not apply to those operating reactors that already have a TS containing the 72-hour CT or AOT for an inoperable EDG.

The Petitioners identified the following facts as their bases for the requested actions:

1. Removing EDGs from service would increase the risk from SBO events. Citing the NRC RES Report, the Petitioners stated that plants that committed to a 0.975 minimum individual target reliability for their EDGs were having difficulty achieving their goal when maintenance OOS (MOOS) was incorporated into the reliability calculation.
2. The Petitioners, citing the NRC RES Report, asserted that a decrease in EDG reliability of 0.025 could increase the SBO core damage frequency (CDF) by  $1.0E-5$ /reactor-year or more for some plants. The Petitioners further asserted that the EDG reliability reduction is a function of the plant's capacity factor because the LCO only applies when the plant is running, and that the EDG reliability reduction could be even larger when plants have a lower annual capacity factor. These assertions were used to support the conclusion that allowing EDG extended AOTs increased SBO CDF and reduced EDG reliability to a level where the safety benefits of the SBO rule are negated.
3. NOEDs that allow nuclear reactors to operate for longer times undermine the increase in safety gained by reimposing the 72-hour limit.
4. The Petitioners requested that NRC provide an equivalent protection for Oconee since this plant does not rely on EDGs for its emergency ac power supply.

With regard to the Petitioners' request to establish a minimum time-to-boil to 24 hours for spent fuel pools (SFPs), the primary mode of storage at this time is in the spent fuel storage pools located at the sites of nuclear power reactors. GDC-61, "Fuel storage and handling and radioactivity control," requires the following:

The fuel storage and handling, radioactive waste, and other systems which may contain radioactivity shall be designed to assure adequate safety under normal and postulated accident conditions. These systems shall be designed (1) with a capability to permit appropriate periodic inspection and testing of components important to safety, (2) with suitable shielding for radiation protection, (3) with appropriate containment, confinement, and filtering systems, (4) with a residual heat removal capability having reliability and testability that reflects the importance to safety of decay heat and other residual heat removal, and (5) to prevent significant reduction in fuel storage coolant inventory under accident conditions.

The requirements of GDC-61 are reflected in the design of SFPs, which are substantial concrete structures typically lined with welded steel plates, and the design of the associated auxiliary systems. SFPs have dedicated cooling systems that remove the spent fuel decay heat and maintain the water level in the pool to provide adequate radiation shielding. Heat exchangers, which remove the decay heat from the SFP, utilize cooling water whose source may be outside the plant. In addition to these dedicated systems, SFPs typically are designed to use auxiliary sources of cooling, such as residual heat removal systems, and may be capable of utilizing one or more water sources for cooling (e.g., fire water system) in the event of an emergency. SFPs are typically instrumented to alert plant operators to low pool level or high pool temperature conditions. In the event that SFP cooling is lost, boiling in the SFP would be expected to occur, absent corrective measures,<sup>2</sup> within hours or days, depending upon the heat load in the SFP.

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<sup>2</sup> Reactor operators utilizing established procedures can respond to a wide range of potential failures to prevent or mitigate SFP boiling.

### III. Evaluation

#### Petitioners' First Concern

The Petitioners are concerned that a terrorist attack on the electric power grid will result in a loss of offsite power (LOOP), resulting in the need for the EDGs to function to prevent an SBO event. The Petitioners are concerned that the longer the EDGs are OOS, the greater the risk there will be of an SBO, resulting in reactor core damage.

#### NRC Response

Because transmission lines, substations, and switchyards are vulnerable to weather-related events, each nuclear power plant is designed to have an emergency power system to enable the plant to withstand a LOOP, as specified by either GDC-17 or equivalent requirements in the plant licensing basis. These specifications recognize that offsite power systems are not designed as safety-related (Class 1E) systems. Consequently, most licensees rely on onsite redundant Class 1E EDGs to provide this emergency ac power source.

GDC-17 requires, in part, that the onsite power supplies and electric distribution systems have sufficient independence, redundancy, and testability to perform their safety functions, assuming a single failure. The redundant Class 1E EDGs, switchgear, load centers, and motor control centers must also be located in separate rooms of seismic Category I buildings to protect them against the effects of natural phenomena and missiles. In addition, 10 CFR 50.63 requires that all nuclear power plants have the capability to withstand a loss of all ac power for an established period. As a result of the SBO rule, all licensees have established SBO coping and recovery procedures, implemented any necessary modifications to cope with an SBO, and ensured they have the capability to cope with an SBO for 4 or 8 hours, depending on a number of site-specific parameters. One of the factors used to arrive at coping capability is EDG reliability. To

provide additional SBO coping capability, some licensees installed an alternate ac (Aac) power source, such as a non-Class 1E diesel generator.

Although the NRC has granted some licensees AOT extensions (typically ranging from 7 to 14 days for the total AOT) for their EDGs, the licensees use the extensions primarily to perform infrequent (i.e., once every 18 or 24 months), manufacturer-recommended inspections and preventive or corrective maintenance activities that cannot be accomplished during the 72-hour AOT; only half of this AOT is used in most cases. These recommended inspections and maintenance activities are intended to improve EDG reliability (i.e., increase the likelihood that the EDG will function throughout its required operational period). Performing tests and maintenance at power also improves EDG availability during shutdown (i.e., increases the likelihood that the EDG will be available to operate when required).

The NRC staff reviews each risk-informed EDG AOT extension request from both deterministic and probabilistic risk assessment (PRA) perspectives in accordance with the following guidance:

1. RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," and Standard Review Plan (SRP) Section 16.1
2. RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," and SRP Chapter 19.

From a deterministic perspective, the staff considers whether (1) the current regulations and applicable requirements will continue to be met, (2) the extended EDG AOT will reduce entries into the LCO and thereby reduce the number of EDG starts required for major EDG maintenance activities, (3) an available Aac source (i.e., an extra power source such as a diesel generator) or excess power capacity from the existing EDGs supplied through bus cross-ties could be temporarily used to compensate for an EDG in an extended AOT, and (4) the licensee will take compensatory

measures during an extended EDG AOT to ensure the likelihood that the remaining sources of power will be available and will minimize the potential for creating an SBO. In addition, the staff verifies that the plant's TSs allow only one EDG to be tested or taken OOS at a time and that the current TSs establish controls to ensure that, in the event an EDG is inoperable, the redundant systems that rely on the remaining EDG are verified to be operable. These required compensatory actions are intended to minimize the probability that a LOOP event will result in a complete loss of safety function of critical systems for the period during which one of the EDGs is inoperable.

From a PRA perspective, each request to extend an EDG AOT is reviewed on a plant-specific basis and approved only if the licensee can provide acceptable justification in terms of risk (i.e., CDF and large early release frequency (LERF)), as described in RG 1.177 and RG 1.174. In conducting this review, the staff considers the capability and availability of all ac power sources (including non-safety-related equipment), the plant-specific performance history of the EDGs, and the impact of implementing the proposed extended EDG AOT. In addition, the NRC staff expects that licensees have implemented a risk management program in accordance with the requirements of the maintenance rule (specifically, 10 CFR 50.65(a)(4)) to ensure that, during the extended EDG outage, a proceduralized risk-informed process is in place to assess and manage the overall impact on plant risk of entering the LCO action statement for planned maintenance activities. This expectation is to ensure that the design assumptions and margins in the original design basis are not unacceptably degraded.

The staff's response to the facts identified by the Petitioners as their bases for the requested action is presented below:

1. Primarily based on the NRC RES Report, the Petitioners stated that removing the EDGs from service for extended maintenance during at-power conditions would increase the risk from SBO events. The staff notes that the NRC RES Report did not explicitly address EDG

extended maintenance during shutdown operations or the risk tradeoffs between shutdown and full-power operations associated with performing this maintenance. With the extended AOTs, the EDG extended maintenance outages will occur during full-power operations, which may lower the overall plant risk profile as compared to performing this maintenance during shutdown operations. This will clearly be the case for licensees that have an additional available source (i.e., Aac or temporary diesel generator) during the extended EDG maintenance outage, since the full-power operational risk profile for these licensees would be essentially unaffected by the outage, as well as eliminating this risk contributor during shutdown operations. Based on the above, there may be a small increase in risk from SBO events during at-power conditions due to the EDG extended maintenance (depending on the specific measures taken by the licensee). However, there will be a reduction in risk from SBO events during shutdown, and this may reduce the overall plant risk profile.

The Petitioners also stated that the NRC RES Report indicated that plants that had committed to a 0.975 minimum individual target reliability for their EDGs were having difficulty achieving a 0.975 goal when MOOS was factored into the reliability calculation. However, the staff notes that the EDG reliability values for determining the coping duration for an SBO event did not include the contribution from MOOS. The selected target EDG reliability values for each nuclear power plant were established for plant-specific coping analysis in accordance with the requirements of the SBO rule. The EDG reliability performance criteria or goals selected for implementing the requirements of the SBO rule are tracked by each licensee in accordance with the requirements of 10 CFR 50.65. In addition, the maintenance rule requires licensees to monitor the unavailability of the EDGs due to maintenance against established goals to ensure that acceptable EDG unavailability

is maintained. If the EDGs do not meet their preestablished reliability and unavailability performance criteria for a plant, the licensee must take the appropriate actions specified by 10 CFR 50.65(a)(1), including increased management attention and goal setting, to restore EDG performance to an acceptable level. The maintenance rule requires licensees to evaluate these goals at least once per refueling cycle. In addition, the NRC monitors EDG unavailabilities of all plants through its Reactor Oversight Process to ensure that all licensees take appropriate actions if these goals are not met. Also, during the review of AOT extensions, the staff ensures that the licensees who request an EDG AOT extension meet their individual EDG target reliability goals in accordance with the SBO rule. Thus, existing requirements and regulations ensure that the EDG-established reliability and unavailability are maintained.

2. The staff agrees with the Petitioners that if MOOS is included in the EDG reliability calculations, the calculated EDG reliability will decrease when an EDG is taken OOS for maintenance, and this reliability reduction could be even larger when plants have a lower annual capacity factor. However, the purpose of licensee requests for EDG AOTs is to perform the infrequent maintenance needed to improve the overall reliability of the EDGs and increase the availability of the EDGs during shutdown operations. Extending the EDG AOT for infrequently performed maintenance during plant operation also decreases the time pressure to complete the maintenance and, thus, may reduce the likelihood of human error during maintenance, further increasing EDG reliability. As stated above, the staff agrees that EDG reliability calculations performed to determine the coping duration for an SBO did not include the contribution from MOOS; however, the staff expects that the maintenance rule implementation will assure that the reliability of EDGs is maintained as expected.

Therefore, the maintenance rule will ensure that coping capabilities for SBO remains the same.

Licensee requests for extended EDG AOTs are reviewed and approved on a plant-specific basis only if they can be shown to be acceptable, as described in RG 1.177 and RG 1.174. In conducting this review, the staff may consider the capability and availability of all ac power sources (including non-safety-related equipment), the plant-specific performance of the EDGs, and the impact of implementing the proposed extended EDG AOT. The increase in CDF due to the implementation of a 14-day AOT for EDGs is typically estimated to be less than  $1.0E-6$ /yr based upon plant-specific models. This represents a very small increase in CDF, well within the RG 1.174 acceptance guidelines, and is an order of magnitude less than the value, based upon a generic model, the Petitioners cited from the NRC RES Report. Thus, these very small increases in CDF and/or LERF during plant operation, which do not include the benefits achieved by removing this maintenance activity from shutdown operations, are not eroding the safety benefits achieved by the SBO rule. Further, based on the quarterly data reported by licensees in accordance with the Reactor Oversight Process, the industry average EDG unavailability is about 1.5 percent (90 hours/yr), which indicates that the EDG unavailability during plant operation is reasonably well controlled by the licensees. Also, the staff notes that Nuclear Energy Institute (NEI) report 99-02, Revision 2, "Regulatory Assessment Performance Indicator Guideline," which was endorsed by the NRC in Regulatory Issue Summary 2001-25, "NEI 99-02, Revision 2, Voluntary Submission of Performance Indicator Data," allows licensees to exclude unavailability hours for planned EDG overhauls, provided the licensees demonstrate, using the criteria of RG 1.177, that the increased risk to the plant due to the

EDG AOT extension is small. The staff recognizes that planned maintenance activities carried out during extended AOTs can have a net benefit by reducing unplanned unavailable hours to ensure that the EDGs are available when required.

3. The Petitioners requested that the NRC cease and desist issuing NOEDs that allow nuclear reactors to operate for longer times, and to reimpose the 72-hour LCO with an EDG unavailable. Accepting the Petitioners' request to limit EDG AOTs to 72 hours would potentially increase the likelihood of an SBO by requiring a nuclear power plant to undergo a transition to shutdown with an EDG unavailable whenever there is insufficient time to complete the required maintenance or repair of an EDG. The staff notes that the NRC RES Report cited by the Petitioners also states that "plant shutdown with one or more offsite or onsite power supplies unavailable could exacerbate the grid condition or remove redundant sources to operate decay heat removal systems, increasing the likelihood of an SBO." The NRC RES Report further suggests that, instead of potentially increasing the likelihood of an SBO event by requiring a transition to shutdown for the extended unavailability of one or more offsite or onsite power supplies, licensees take "an alternate approach, such as assuring the immediate availability of coping systems, reducing power, or assuring availability of adequate electric grid reserves." The potential for creating an SBO event by requiring a plant to transition to shutdown with an EDG unavailable is one factor considered, along with the plant conditions and the implications of allowing the plant to remain at power, in determining the appropriateness of issuing an NOED. As part of the NOED process, the NRC requires that licensees provide the safety basis for the request, including an evaluation of the safety significance and potential consequences of the proposed course of action. This evaluation should include at least a qualitative risk assessment using both risk insights and informed judgments, as appropriate. Therefore, it is prudent and appropriate for the

staff to continue to follow the existing guidance (i.e., NRC Inspection Manual, Part 9900, "Technical Guidance") for determining when it is appropriate to issue an NOED on a case-by-case basis.

4. The staff has reviewed the TSs for Oconee and has determined that the time limitations in the Oconee TSs related to the emergency ac power sources are equivalent to the TSs of other plants having the 72-hour EDG AOT. Therefore, consistent with the Petitioners' statement that those operating reactors that already have a 72-hour EDG AOT do not need to address this issue, the staff has determined that this issue also does not apply to Oconee.

Based on the above rationale, the staff denies the Petitioners' request. Thus, the staff will not reduce previously-approved requests to extend EDG AOTs and will continue to follow the existing regulatory guidance (i.e., RG 1.177 and RG 1.174) in evaluating future licensee risk-informed requests to extend EDG AOTs. In addition, the staff will continue to perform deterministic assessments and follow the guidance (i.e., NRC Inspection Manual, Part 9900) for determining, on a case-by-case basis, when it is appropriate to issue an NOED.

#### Petitioners' Second Concern

The Petitioners seek to reduce the risk of damage to irradiated fuel in the SFP due to sabotage. The Petitioners are concerned that terrorist actions outside a nuclear power plant fence could disrupt offsite power and/or the water intake system for cooling water, resulting in a loss of SFP cooling. Restricting the time-to-boil to a minimum of 24 hours reduces the likelihood that terrorist actions will result in damage to irradiated fuel in the SFP and release of radioactivity to the environment.

NRC Response

The basis of the Petitioners' request is that a longer time-to-boil would provide additional time for plant workers to restore forced cooling to the SFP or provide makeup water to maintain adequate coolant inventory. When forced cooling systems have been running, the minimum time-to-boil is usually several hours after a loss of forced cooling. The unambiguous nature of sabotage that results in a loss of cooling ensures the prompt identification of the problem. Additionally, operating experience indicates that even hidden initiators of a loss of cooling would most likely be identified before the onset of pool boiling. If cooling cannot be promptly restored, the remaining time would likely be adequate to align one of the diverse makeup water sources to maintain normal coolant inventory.

Existing design features and capabilities already provide sufficient time for plant workers to restore forced cooling and/or provide makeup water. All plants have makeup sources independent of the intake structure (e.g., the primary makeup water) and power (e.g., the diesel fire pump), and sites with spray ponds or air-cooled diesel generators have makeup (and often forced cooling) capability independent of facilities outside the protected area. The normal coolant inventory provides at least an additional 20 hours before evaporative loss of the coolant would result in radiation levels that would preclude access to the areas adjacent to the SFP.<sup>3</sup> Short-term evaporative cooling can generally be accommodated with no adverse effects on essential systems. Furthermore, given the large water inventory in the SFP and the relatively straightforward and multiple means of providing makeup to the SFP, there would be only modest safety benefit from

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<sup>3</sup> In cases where direct operator access to the SFP area is required for remedial actions, habitability concerns due to elevated temperature, humidity, and radiation levels could occur sooner than 20 hours, depending upon the heat-up rate of the SFP. Specialized protective equipment such as heat-resistant suits and respirators can effectively extend the time during which direct access to the SFP can be maintained.

keeping the fuel in the reactor pressure vessel instead of in the SFP while waiting for the 24-hour minimum time-to-boil point to pass.

The safety of the stored fuel is also considered by each licensee from a security perspective. Security contingency measures to address radiological sabotage events during a radiological sabotage attack are documented by each licensee in its site security plan. The NRC inspects the capability of licensees to carryout these contingency measures. The NRC's comprehensive safeguards and security program reevaluation includes the consideration of potential consequences of terrorist attacks on SFPs. The Commission continues to evaluate the need for additional interim compensatory measures to augment the enhanced security put in place after September 11, 2001.

To the extent that additional measures are being implemented by the licensees in response to the February 25, 2002, Orders, the NRC has partially granted the Petitioners' request that action be taken to reduce the risk from sabotage of irradiated fuel.

#### IV. Conclusion

The Petitioners' first request is to "impose a 72-hour limit for operation when the number of operable onsite alternating current power sources (i.e., emergency diesel generators) is one less than the number in the Technical Specification limiting condition for operation. This 72-hour limit would be applicable when the nuclear plant is in any mode of operation other than hot shutdown, cold shutdown, refueling, or defueled." Oconee does not rely on EDGs, but "equivalent protection for its emergency power supply" should be provided. The NRC should also "cease and desist issuing NOEDs that allow nuclear reactors to operate for longer periods of time with broken emergency diesel generators." These requests are denied. For the reasons discussed above, the NRC staff concludes that the actions requested are not necessary. Specifically, the staff concludes that the NRC's reviews performed for plant-specific license amendments to extend AOTs for EDGs

are appropriate and are consistent with existing staff guidance (i.e., RG 1.174 and RG 1.177, and SRP Section 16.1 and Chapter 19) in considering deterministic, traditional engineering factors, and probabilistic risk factors. Thus, the denial of the Petitioners request is based upon the robustness of the plants' electrical design and improvements in plant security noted previously. Further, the staff concludes that the existing staff guidance (i.e., NRC Inspection Manual, Part 9900) for determining, on a case-by-case basis, when an NOED should be issued, is appropriate and the staff will continue to consider the potential benefit and risk of unnecessary shutdowns that could result in an SBO event by requiring a plant to transition to shutdown with an EDG unavailable, as well as the plant conditions and the implications of allowing the plant to remain at power.

The Petitioners' second request is that the NRC "impose a minimum 24-hour time-to-boil for the spent fuel pool water. This limit would be applicable at all times." This request is partially granted by staff actions already taken. However, for the reasons discussed above, the NRC staff concludes that the actions specifically requested by the Petitioners are not necessary. Specifically, SFPs have adequate alternate sources of cooling such that spent fuel cooling and radiation shielding can be maintained during interruption of normal, forced SFP cooling. To the extent that additional measures are being implemented by the licensees, however, in response to the February 25, 2002, Orders, the NRC has partially granted the Petitioners' request that action be taken to reduce the risk from sabotage of irradiated fuel.

As provided in 10 CFR 2.206(c), a Director's Decision will be filed with the Secretary of the Commission for the Commission to review. As provided for by this regulation, the decision will constitute the final action of the Commission 25 days after the date of the decision unless the Commission, on its own motion, institutes a review of the decision within that time.

D. Lochbaum

-26-

Dated at Rockville, Maryland, this 15th day of November, 2002.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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Samuel J. Collins, Director  
Office of Nuclear Reactor Regulation

U.S. NUCLEAR REGULATORY COMMISSION

NOTICE OF ISSUANCE OF DIRECTOR'S DECISION UNDER 10 CFR 2.206

Notice is hereby given that the Director, Office of Nuclear Reactor Regulation, has issued a Director's Decision with regard to a petition dated March 11, 2002, and supplements dated March 21, 22, and 27, 2002 (the Petition), submitted by Mr. David A. Lochbaum, a Nuclear Safety Engineer in the Washington, D.C. Office of the Union of Concerned Scientists (UCS), and the co-petitioners identified in the petition supplements dated March 21 and March 22, 2002 (the Petitioners). The Petitioners have requested that the U.S. Nuclear Regulatory Commission (NRC or the Commission) take action with regard to the nuclear power facilities listed in Attachment 1 to the Petition (multiple nuclear power facilities). The Petitioners request that the NRC immediately issue Orders to the owners of all operating nuclear power plants to take measures that will reduce the risk from sabotage of irradiated fuel. Specifically, those measures are:

- (1) The NRC should "impose a 72-hour limit for operation when the number of operable onsite alternating current power sources (i.e., emergency diesel generators) is one less than the number in the Technical Specification limiting condition for operation. This 72-hour limit would be applicable when the nuclear plant is in any mode of operation other than hot shutdown, cold shutdown, refueling, or defueled." Oconee Nuclear Station does not rely on emergency diesel generators, but "equivalent protection for its emergency power supply" should be provided. The NRC should also "cease and desist issuing NOEDs [Notices of Enforcement Discretion] that allow nuclear reactors to operate for longer periods of time with broken emergency diesel generators." This requested action would apply to the facilities listed in Attachment 1 to the Petition.

(2) The NRC should “impose a minimum 24-hour time-to-boil for the spent fuel pool water. This limit would be applicable at all times.” This requested action would apply to the facilities listed in Attachment 1 to the Petition.

The Petition also requested that the NRC hold a public meeting to precede “the Petition Review Board (PRB) non-public meeting regarding this petition” and assign “someone other than the Director of NRR [Office of Nuclear Reactor Regulation] to be responsible for our petition. The Deputy Executive Director for Reactor Programs or the Deputy Director of NRR would be acceptable to UCS.”

As the basis for the Petition, the Petitioners cite the need to reduce the risk from sabotage of irradiated fuel.

On March 26, 2002, in lieu of a public meeting, the Petitioners accepted and participated in a telephone conference (teleconference) with the NRC's PRB to discuss the Petition. The transcript of the teleconference was considered as a supplement to the Petition. After the teleconference, the PRB discussed the Petition. The PRB considered the contributions of the Petitioners to the teleconference in deciding on the requests for immediate action and in setting the schedule for the review of the Petition. The PRB concluded that the Petition satisfied the criteria for review under Title 10 of the *Code of Federal Regulations* (10 CFR) Subsection 2.206.

By letter dated May 8, 2002, the NRC staff acknowledged receiving the Petition, informed the Petitioners that the Petition met the requirements for review under 10 CFR 2.206, and the Petition had been referred to the Director of NRR for action and would be acted upon within a reasonable time. The petitioners were also informed in that letter that the NRC staff declined to grant the Petitioners' request for immediate action.

The NRC sent a copy of the proposed Director's Decision to the Petitioners for comment by letter dated September 4, 2002. The Petitioners responded with comments by letter dated

September 23, 2002. The Petitioners' comments and the NRC staff responses to the comments are addressed in Enclosure No. 2 and No. 3 to the November 15, 2002, letter to Mr. David A. Lochbaum, Union of Concerned Scientists.

The Director, NRR, concluded that the information contained in the Petition does not warrant NRC staff action to: "Impose a 72-hour limit for operation when the number of operable onsite alternating current power sources (i.e., emergency diesel generators) is one less than the number in the Technical Specification limiting condition for operation" during plant operation. In addition, the Director, NRR, concluded that the information contained in the Petition does not warrant NRC staff action to "cease and desist issuing NOEDs that allow nuclear reactors to operate for longer periods of time with broken emergency diesel generators." These requests are denied.

With regard to the Petitioners' second request, that the NRC "impose a minimum 24-hour time-to-boil for the spent fuel pool water. This limit would be applicable at all times," the Director, NRR, has concluded that this request is partially granted by staff actions already taken. However, for the reasons discussed in the Director's Decision, the NRC staff concludes that the actions specifically requested by the Petitioners are not necessary. The reasons for these decisions are explained in the Director's Decision pursuant to 10 CFR 2.206 (DD-02-07), the complete text of which is available in the Agencywide Documents Access and Management System (ADAMS) for inspection in the Commission's Public Document Room (PDR) located at One White Flint North, 11555 Rockville Pike (first floor), Rockville, Maryland, and electronically accessible in ADAMS through the NRC Public Electronic Reading Room at <http://www.nrc.gov/reading-rm.html> (ADAMS Accession No. ML022800647). Persons who do not have access to ADAMS or who encounter problems in accessing documents located in ADAMS should contact the NRC PDR reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by email to [pdrc@nrc.gov](mailto:pdrc@nrc.gov).

A copy of the Director's Decision will be filed with the Secretary of the Commission for the Commission's review in accordance with 10 CFR 2.206 of the Commission's regulations. As provided for by this regulation, the Director's Decision will constitute the final action of the Commission 25 days after the date of the decision, unless the Commission, on its own motion, institutes a review of the Director's Decision in that time.

Dated at Rockville, Maryland, this 15th day of November, 2002

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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Samuel J. Collins, Director  
Office of Nuclear Reactor Regulation