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GPU Nuclear Corporation
One Upper Pond Road
Parsippany, New Jersey 07054
201-316-7000
TELEX 136-482
Writer's Direct Dial Number:

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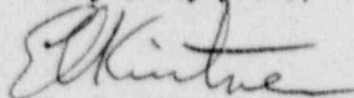
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U.S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: Project No. 669 Requests for Additional Information Relative
to Chapters 6, 9, and 11 of the ALWR Requirements Document

Reference: Letter, W. O. Long to E. E. Kintner, dated June 8, 1989

The attached is in response to the referenced letter. Please call
Gary Vine at EPRI if you have any questions.

Very truly yours,



E. E. Kintner
Chairman
ALWR Utility Steering Committee

/amm

Attachment

cc: ALWR Utility Steering Committee
ALWR Contractors
ALWR Staff
J. Taylor
K. Stahlkopf
T. Kenyon, NRC

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NRC Comment

1 In view of findings that external events such as fire may dominate risk, it is the staff's position that enhanced fire protection be provided for ALWRs. Safe (cold) shutdown should be achievable with all equipment in any single fire area rendered inoperable by fire, with no need for reentry into the fire area for repairs and operator actions. The control room may be excluded on the basis of the provision of an independent alternate shutdown capability. Inside containment, fire protection for redundant systems should ensure, to the extent practicable, that one division will be free of fire damage. Additionally, smoke, hot gases, and fire suppressants should not migrate to other fire areas to the extent that they could impact safe shutdown capability, including operator actions.

Please provide a discussion of the extent to which the Requirements Document is intended to be consistent with the above staff position. Also include a discussion of any criteria for separation between redundant shutdown systems within containment.

Response

The ALWR will comply with the provisions of NUREG 0800, Section 9.5.1 (which includes guidance to ensure that one division in-containment will be free from fire damage and that smoke, hot gases, etc., do not migrate to other fire areas to the extent that they could impact safe shutdown capability). This will be documented in an appendix to the Chapter 1 roll-up. In addition, enhanced fire protection provisions will be provided for the ALWR by revising Chapter 5, Section 2.3.2 and Chapter 9, Section 3.3.1.1 to eliminate provisions for separation by distance (20 feet) as an acceptable method for accomplishing separation of redundant safe shutdown systems, except inside containment where separation by distance will still be permitted. Fire barriers will be required to provide separation between

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redundant safe shutdown systems (except inside containments). Chapter 6, Section 2.3.3 further describes specific fire separation requirements to be provided by the plant arrangement.

NRC Comment

- 2 Chapter 6, Section 2.3.3.2 refers to the National Fire Protection Association (NFPA) Standard No. 803 as being the governing criteria for certain aspects of ALWR fire protection design. The staff has not endorsed NFPA 803 and does not recognize it as a suitable reference. The staff recommends the use of Branch Technical Position CMEB 9.5-1 contained in NUREG-0800 (SRP), Section 9.5.1, and supplementary guidance including Generic Letters 81-12 and 86-10. In the event you plan to take exception to the guidance of these documents, including any necessary to conform to the staff position cited in 1 above, you should identify the proposed exception. If this is beyond the scope of the Requirements Document, it will be necessary for the staff to "caveat" its safety evaluation report accordingly.

Response

The ALWR design and materials used will be in accordance with NUREG-0800, Section 9.5.1 and will also be consistent with the supplementary guidance provided in Generic Letters 81-12, Rev. 1, and 86-10. This will be documented in an appendix to Chapter 1 roll-up.

NRC Comment

- 3 Chapter 6, Section 2.3.3.4 provides general criteria related to the qualification of fire barriers. Please provide additional information as to how fire barriers as well as fire doors, fire dampers and penetration sealants will be qualified to withstand the effects of fire and fire suppressants. Specific concern by the staff

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is directed at (1) the ability of fire dampers to prevent the passage of smoke, (2) the capability of fire seals to withstand the effects of gaseous fire suppression system discharge and standing water and (3) the location and design of internal conduit seals.

Response

It is intended that the ALWR will conform with fire barrier qualification guidance in NUREG 0800, Section 9.5.1. This will be stated in an appendix to Chapter 1 of the roll-up. Details of qualification of fire barriers are outside the scope of the ALWR Requirements Document.

NRC Comment

- 4 Chapter 6, Section 2.3.3.10 indicates that oil filled transformers will preferably, but not necessarily, be located at least 50 feet from building walls. Describe any potential, known, instances where it may be necessary to locate these transformers less than 50 feet from exterior building walls which serve as a fire area boundary.

Response

There are no potential, known, instances where it may be necessary to locate oil-filled transformers less than 50 feet from exterior building walls which serve as fire area boundaries. However, during specific station designs it may become necessary. Where it becomes necessary the walls will have a 3-hour fire rating. We believe that this approach is consistent with NUREG 0800, Section 9.5.1.

NRC Comment

- 5 Chapter 6, Section 2.3.3.12 indicates that the design of personnel escape routes will incorporate life safety considerations. To what

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extent is it intended that the design of fire exits conform to the guidelines of the Life Safety Code (NFPA 101)?

Response

During the roll-up phase for Chapter 6, Section 2.3.3.12 will be revised to require fire exits to be provided in accordance with NFPA 101, Chapter 5.

NRC Comment

- 6 Chapter 6, Section 2.3.3.13 requires floor drains and gas seals as necessary to preclude flooding and loss of gas suppressant in event of actuation of fire suppression systems. Please identify design requirements intended to preclude or mitigate the inadvertent actuation of automatic fire suppression systems. The staff's specific concern centers on deluge and wet pipe sprinkler systems and CO₂ systems.

Response

Chapter 9, Section 3.4.1 specifies the use of preaction sprinkler systems, i.e., wet or deluge systems will not be used when undesirable consequences of inadvertent operation are high. Chapter 9, Section 3.4.8 specifies careful consideration of factors in the selection and location of detectors which could cause false actuations of automatic fire suppression systems. Chapter 9, Section 3.4.10 requires that the effects of fire protection agents on plant components be considered in the design of equipment and selection of agent. Chapter 9, Section 3.4.9.1 specifies that there be no automatic fire suppression in control room and underfloor areas in order to avoid risks to personnel in that area. Chapter 9, Section 3.4.5 requires that the use of Halon and CO₂ be minimized, partly to avoid potential inadvertent actuations.

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NRC Comment

- 7 Chapter 6, Section 2.3.9.2 specifies 50 feet separation between storage containers of combustible gas and buildings containing safety-related equipment. Please identify the basis for selection of the 50-foot distance criterion. How does this relate to industry standards?

Response

The 50 foot separation between combustible gas storage containers and buildings containing safety-related equipment is a representative value based on NFPA 30 and NFPA 50A.

NRC Comment

- 8 Chapter 6, Section 2.4.2.2 states that aligned, vertical hatchways will be provided for equipment lifts and staging areas will be provided.
- (a) How will hatchways be protected to conform with the criterion to design fire barriers to have a 3-hour fire resistance rating?
- (b) Will staging areas be protected by an automatic sprinkler system to reflect the normal increase in combustible loading prior to outages? If not, provide the basis for your decision.

Response

- (a) While detailed design of the hatchways to meet 3-hour fire resistance ratings, when in place, is outside the scope of the ALWR Requirements Document, the entire barrier including hatchways will require a 3-hour fire resistance rating.

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- (b) Chapter 9, Section 3.2.1.1 requires that the fire protection system be designed, installed and tested in accordance with NUREG 0800, Section 9.5.1. This includes a provision for a fire hazard analysis. The fire hazard analysis as described in NUREG 0800, Section 9.5.1 is to specifically address potential in situ and transient fire hazards. The fire protection provided will be what is appropriate for the expected combustible loading.

NRC Comment

- 9 Chapter 6, Section 4.2.5 specifies requirements for HVAC systems arrangements. Unless provided elsewhere in the Requirements Document, please identify fire protection features to be provided for HVAC systems. The staff's specific interest centers on automatic fire detection and suppression systems internal to the system, and interlocks between the fire protection systems and the fan motor controls.

Response

The requirements for fire protection in the HVAC system contained in NUREG 0800, Section 9.5.1 and NFPA Standards, such as NFPA 90A, will be followed. As indicated in NUREG 0800, Section 9.5.1, during the preparation of the fire hazard analysis, consideration will be given to the installation of automatic suppression systems as a means of limiting smoke and ending heat generation.

NRC Comment

- 10 Chapter 6, Section 4.6.5 provides arrangement requirements for the control complex. Is it your intention to comply with Position 7.b of SRP Section 9.5.1 to provide 1-hour fire resistance protection between the control room and peripheral rooms?

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Response

During the roll-up phase for Chapter 6, Section 2.3.3.14 will be revised to require that peripheral rooms in the control room complex be separated from the control room by noncombustible construction with a fire resistance rating of 1 hour.

NRC Comment

- 11 Chapter 9, Section 1.4.3 discusses the risk of cable fires in the control room underfloor and ceiling spaces and indicates that manual fire suppression would be used to extinguish a fire in these areas. What specific fire protection features will be provided for combustible concealed spaces such as the above? If water as a fire fighting medium is not anticipated (due, for example, to the lack of drains) and fixed gaseous fire suppression systems are not proposed, how will fires be extinguished in such areas? (Note: At least one facility has provided fixed piping in a control room underfloor area to enable the discharge from manual fire extinguishers to reach remote areas.)

Response

The risk of cable fires in the ALWR control room underfloor and ceiling spaces will be minimized by reducing the amount of cable in the space. Possible approaches are discussed in the rationale for paragraph 3.4.9.1. During the roll-up phase for Chapter 9, Paragraph 3.4.9.1 will be revised to require access for use of manual fire extinguishers to reach any portions of the underfloor or ceiling spaces containing any significant fire load.

NRC Comment

- 12 Chapter 9, Section 3.2.2 requires an expanded fire hazards analysis. Discuss the approach to be taken to characterize the fire hazards

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within each fire zone. Much effort has been spent in the past to quantify the fire loading (e.g., BTU/sq.ft.). The staff considers the value of this approach to be limited and recommends that alternative approaches be explored.

Response

The fire hazard analyses requirements contained in NUREG 0800, Section 9.5.1 will be followed. The approach for characterizing fire hazards in fire zones in the fire hazards analysis involves a level of detail which is beyond the scope of the ALWR Requirements Document.

IRRC Comment

- 13 Chapter 9, Section 3.3.1.1 provides, in order of preference, the methods of providing separation of redundant equipment for protection of safe shutdown capability. One method is 20-foot spatial separation. For applications outside of primary containment, the staff does not consider spatial separation to be acceptable. Under what circumstance would it not be appropriate and feasible to provide 3-hour fire barrier separation?

Response

During the roll-up phase of Chapter 9, Section 3.3.1.1 will be modified to delete 20-foot separation as an acceptable option outside of primary containment. NUREG 0800, Section 9.5.1 allows the use of 1-hour barriers with fire detection and fire suppression or 3-hour barriers. Chapter 9, Section 3.3.1.1 will retain these provisions as requirements. Specification of the circumstances where a 1-hour barrier with fire detection and suppression is used instead of a 3-hour fire barrier is outside the scope of the Requirements Document.

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NRC Comment

- 14 Chapter 9, Section 3.3.3 identifies applications requiring automatic sprinkler systems and references NFPA 13 for the sprinkler system design. The Standard offers no guidance on compensatory design measures to be taken where sprinkler head are obstructed. Discuss requirements to be applied to ALWRs to ensure unobstructed sprinkler coverage.

Response

As noted in the NRC Comment, Chapter 9, Section 3.3.3 references NFPA 13. Since NFPA 13 requirements do not allow obstructed sprinkler heads, the Requirements Document addresses the basic NRC concern. Any special compensatory design measures would be considered during the detailed design phase. Such design details are beyond the scope of the Requirements Document.

NRC Comment

- 15 Chapter 9, Section 3.4.5 indicates the possible use of Halon and carbon dioxide fixed flooding systems in ALWRs.
- (a) In view of the recent international agreements on the phase-out of chlorofluorocarbons, will Halon continue to be considered as a fire suppressant?
 - (b) Provide a discussion of design features to be used to assure personnel safety in areas protected by CO₂ systems.

Response

- (a) Halon will continue to be considered as a fire suppressant option for ALWR's at this time. If development of substitute fire suppressants are successful or Halon becomes unavailable,

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revisions will be made. As required in Chapter 9, paragraph 3.4.5.1, the use of Halon and CO₂ shall be minimized in the ALWR design.

- (b) Personnel safety in areas protected by CO₂ will include requirements contained in NFPA 12. These include warning signs, predischage alarms, predischage delays and lock-out switches. NUREG 0800, Section 9.5.1, requires the use of NFPA 12. It will be stated in the Chapter 1 roll-up that the ALWR will conform to NUREG 0800, Section 9.5.1.

NRC Comment

- 16 Chapter 9, Section 3.4.8 discusses the selection of fire detectors. How will the issue of smoke stratification be dealt with in the design of smoke detection systems in areas with high ceilings? What design features are being considered to ease maintenance and surveillance of fire detectors?

Response

Smoke detectors below the level of the ceiling to detect smoke stratification will be considered in spaces with high ceilings. This requirement is contained in NFPA 72E which is specified for use by NUREG 0800, Section 9.5.1.

The primary feature being considered to ease maintenance and surveillance of fire detectors is to locate the detectors such that they are accessible. This is required in Chapter 9, Section 3.4.8.1.

NRC Comment

- 17 Chapter 9, Section 3.4.12.1 requires an automatic foam sprinkling system with hose reels and CO₂ or Halon fire extinguishers in diesel

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generator areas. Provide the basis for the selection of foam for these areas, in view of the potential for equipment damage.

Response

Automatic foam sprinkling is the most effective agent for the primary hazard in the diesel generator area, diesel fuel. The use of a preaction system with automatic sprinklers will limit foam sprinkling to those sprinkler heads which have opened because of a fire event. This feature will limit sprinkling to the area of the fire and limit any equipment damage. The foam sprinkling is considered more reliable over the long run than CO₂ and Halon because it avoids problems with reflash and the difficulties in maintaining the area boundaries gas tight. Foam is better than water because it reduces the amount of water needed for fire suppression.

NRC Comment

18 Chapter 9, Section 8.2.1.1.4 addresses ventilation duct penetration requirements for fire barriers and allows the limited use of duct wrap.

- (a) Under what conditions would duct wrap be considered?
- (b) How will the operability of safety-related equipment in areas served by the ducts be assured when air flow through ductwork is interrupted due to closure of fire dampers? (How will it be assured that fire area boundaries and individual HVAC system configurations are compatible with redundant safe shutdown capability requirements?)

Response

- (a) As a result of further consideration of the conditions in which duct wrap should be used for ventilation system penetration

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openings, Chapter 9, Section 8.2.1.1.4, will be revised to delete the reference use of duct wrap or other material.

- (b) Specific details of how the operability of safety-related equipment in areas served by the ducts will be assured when air flow through duct work is interrupted due to closure of the fire dampers is beyond the scope of the Requirements Document. However, a general requirement will be added to Chapter 9 which requires that the design of fire area boundaries and individual HVAC system configurations be compatible with the capability for redundant safe shutdown.

NRC Comment

- 19 Chapter 11, Section 2.6.4 provides requirements for cable raceways. However, there is no discussion of interfaces with penetration seals. Where cables penetrate fire barriers, has the potential for loss of fire seal integrity in the event of cable tray collapse due to fire been considered?

Response

During the roll-up phase of Chapter 11, Section 2.6.4 will be revised to require that designers assure that seals at locations where cables penetrate fire barriers remain effective should cable trays collapse from fire effects. Chapter 10 will reference the Chapter 11 requirements so that it is clear that I&C cable penetrations of fire barriers must meet the same requirements.

NRC Comment

- 20 Chapter 11, Section 2.8 provides requirements relating to integration of power distribution systems with building design. It is not clear whether there will be locations where bus ducts penetrate fire

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barriers. If there are such locations, how will the bus duct penetrations be designed to satisfy a 3-hour fire rating?

Response

Only the isolated phase bus is expected to require air cooling in the ALWR design. The isolated phase bus will pass through the turbine building wall and connect to oil-filled transformers located a minimum of fifty feet away from the building. A fire hazard analysis of non-safety areas required by ALWR Chapter 9, paragraph 3.3.2.1 will assess the adequacy of the turbine building wall to protect the equipment within the building from a fire outside. It is not expected that a 3-hour fire rating of the bus duct penetration will be required.

NRC Comment

21 Chapter 11, Section 8.5.2 requires 8-hour battery powered emergency lighting in applications outside the control room. Would this include any high radiation areas or outdoor areas? Existing plants have had difficulties with such installations.

Response

Consistent with the ALWR plant safety objectives and the guidance of NUREG 0800, Section 9.5.1, eight-hour self-contained battery-operated emergency lighting units will be provided in all areas needed for operation of safe shutdown equipment and in access routes thereto. Similar lighting units with at least one and one-half hour battery capacity are also expected to be installed in other areas of the plant to ensure personnel safety and property protection in accordance with the requirements of the Life Safety Code and the National Electric Code. (Compliance with NUREG 0800, Section 9.5.1, the Life Safety Code (NEPA 101) and the National Electric Code will

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be documented in Chapter 1.) Whether this would include any high radiation areas or outdoor areas is not addressed in the Requirements Document. However, it is expected that although some units may be installed in outdoor areas, few, if any, will be located in high radiation areas.

NRC Comment

22 None of the chapters of the Requirements Document describe design features associated with fire brigade equipment and training areas (e.g., hose houses and smoke houses). Should these features be considered within the scope of the Requirements Document effort?

Response

Hose houses and smoke houses are considered to be outside the scope of the ALWR Requirement Document

NRC Comment

23 The Requirements Document does not require that fire protection equipment and hardware be tested and approved by an independent test authority (e.g., U.L. or F.M.). Should such a requirement be included?

Response

A specific requirement concerning use of hardware tested and approved by an independent test authority is not required. Chapter 1 requires that the ALWR design be based on a list of industry codes and standards, one of which is NFPA standards. NFPA standards require that equipment or materials used be included on a list published by an organization acceptable to the authority having jurisdiction.

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NRC Comment

- 24 Provide a description of how security hardware on fire doors will be installed so as not to compromise the fire rating of the door.

Response

Describing how security hardware on fire doors will be installed so as not to compromise the fire rating of the door is considered to be detailed engineering instruction which is beyond the scope of the ALWR Requirements Document.

NRC Comment

- 25 What are the design details of the local fire alarm system? (Or is this to be covered in Chapter 10?)

Response

Design details of the local alarm system are considered to be outside the scope of the ALWR Requirements Document. The fire alarms will be in accordance with NUREG 0800, Section 9.5.1 and NFPA standards.