



JAN 19 2011

Serial: HNP-10-125  
10 CFR 50.12

U. S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1  
DOCKET NO. 50-400/RENEWED LICENSE NO. NPF-63  
REQUEST FOR EXEMPTION IN ACCORDANCE WITH  
10 CFR 50.12 REGARDING USE OF M5™ ALLOY IN FUEL ROD CLADDING

Ladies and Gentlemen:

In accordance with the provisions of the Code of Federal Regulations, Title 10, Part 50.12, Carolina Power and Light Company, also known as Progress Energy Carolinas Inc. (PEC), requests an exemption from the requirements of 10 CFR 50.46 and 10 CFR 50, Appendix K, to allow the use of M5™ alloy fuel rod cladding at the Harris Nuclear Plant (HNP).

HNP requests approval of the proposed exemption by January 2012, to allow for loading of M5™ cladding fuel assemblies into the core during refueling outage 17, currently scheduled for spring 2012. A License Amendment Request, which is also required to use M5™ cladding, is being submitted via a separate letter (HNP-10-124).

This document contains no regulatory commitments.

Please refer any questions regarding this submittal to Mr. John Caves, Supervisor – Licensing/Regulatory Programs, at (919) 362-3137.

Sincerely,

A handwritten signature in black ink that reads "J. Warner".

John C. Warner  
Manager, Support Services  
Harris Nuclear Plant

JCW/kab

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Enclosure: 10 CFR 50.46 and 10 CFR 50 Appendix K Exemption Request

cc: Mr. J. D. Austin, NRC Sr. Resident Inspector, HNP  
Mrs. B. L. Mozafari, NRC Project Manager, HNP  
Mr. L. A. Reyes, NRC Regional Administrator, Region II

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10 CFR 50.46 AND 10 CFR 50 APPENDIX K EXEMPTION REQUEST  
REGARDING USE OF ALLOY M5™ FOR FUEL CLADDING

In accordance with 10 CFR 50.12, *Specific Exemptions*, Carolina Power and Light Company (CP&L), doing business as Progress Energy Carolinas Inc. (PEC), requests exemption for the Shearon Harris Nuclear Power Plant, Unit 1 (HNP), from the requirements of 10 CFR 50.46, *Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors*, and 10 CFR 50, Appendix K, *ECCS Evaluation Models*. These exemption requests are related to the proposed use of the M5™ advanced zirconium alloy for HNP fuel rod cladding.

The M5™ alloy does not conform to the specifications for either zircaloy or ZIRLO, both of which are explicitly identified as required fuel rod cladding material in 10 CFR 50.46, section (a)(1)(i). Additionally, since Appendix K to 10 CFR 50 presumes the use of zircaloy or ZIRLO fuel cladding when doing calculations for energy release, cladding oxidation, and hydrogen generation after a postulated loss-of-coolant accident (LOCA), an exemption is required for the use of M5™ fuel rod cladding.

10 CFR 50.12 states that the Commission may grant an exemption from requirements contained in 10 CFR 50 provided that: 1) the exemption is authorized by law, 2) the exemption will not present an undue risk to public health and safety, 3) the exemption is consistent with the common defense and security, and 4) special circumstances, as defined in 10 CFR 50.12(a)(2) are present. The requested exemptions to allow the use of an advanced zirconium alloy other than zircaloy or ZIRLO for fuel cladding material for reloads at HNP satisfy these requirements as described below.

1. The requested exemption is authorized by law.

Transition to an alternate, but equivalent, fuel product is not precluded by law. The fuel that will be irradiated at HNP contains cladding material that does not conform to the cladding material designations explicitly defined in 10 CFR 50.46 and implicitly included in 10 CFR 50, Appendix K. However, the criteria of these sections will continue to be satisfied for the operation of the HNP core containing M5™ fuel rod cladding. This exemption would allow the use of M5™ advanced alloy, in lieu of zircaloy or ZIRLO, for fuel rod cladding in fuel assemblies at HNP. As stated above, 10 CFR 50.12 allows the NRC to grant exemptions from the requirements of 10 CFR 50.46 and Appendix K to 10 CFR 50. Therefore, the exemption is authorized by law.

2. The requested exemption does not present an undue risk to the public health and safety.

Topical report BAW-10227(P)(A), *Evaluation of Advanced Cladding and Structural Material (M5™) in PWR Reactor Fuel*, approved by the NRC by letter dated February 4, 2000, provides a licensing basis for the use of M5™ advanced cladding and structural material. In the Safety Evaluation for BAW-10227, the NRC staff concluded that the M5™ properties and mechanical design methodology are acceptable for fuel reload licensing

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applications. The accident analyses discussed in BAW-10227 confirm that operation of the plant with M5™ fuel rod cladding material does not increase the probability of occurrence or the consequences of an accident. Topical report BAW-10227 also confirms that no new or different type of accident will be initiated that could pose a risk to public health and safety. In addition, appropriate safety analyses will be performed to demonstrate that this fuel type does not present an undue risk to the public health and safety. PEC, in conjunction with AREVA, plans to utilize NRC approved methods for the reload design process for HNP reload cores containing M5™ fuel rod cladding.

3. The requested exemption will not endanger the common defense and security.

The M5™ fuel rod cladding is similar in design to zircaloy, the current cladding material used at HNP. BAW-10227 confirms that design requirements and criteria for shipping and handling of M5™ are the same as those for zircaloy. The change in cladding material will not require any changes with the security and control of special nuclear material. PEC plans to continue to handle and control the special nuclear material in this fuel product in accordance with approved procedures. M5™ fuel rod cladding will not endanger the common defense and security.

4. Special circumstances are present which necessitate the request of an exemption to the regulations of 10 CFR 50.46 and 10 CFR 50 Appendix K.

Since 10 CFR 50.46 and 10 CFR 50 Appendix K do not explicitly allow the use of M5™ fuel rod cladding material, it is necessary to request an exemption to the regulations. The underlying purpose of 10 CFR 50.46 is to ensure that nuclear power facilities have adequately demonstrated the cooling performance of their Emergency Core Cooling System (ECCS). BAW-10227 demonstrates that the effectiveness of the ECCS will not be affected by a change from zircaloy fuel rod cladding to M5™ fuel rod cladding. Normal reload process will confirm that the safety analyses performed to support the use of this fuel type will remain applicable for the HNP core. Consequently, the use of the M5™ fuel cladding will not have a detrimental impact on the performance of the HNP core under LOCA conditions.

The underlying purpose of 10 CFR 50.46(b)(2) and (b)(3), and 10 CFR 50 Appendix K I.A.5 is to ensure that cladding oxidation and hydrogen generation are appropriately limited during a LOCA and conservatively accounted for in the ECCS evaluation model. Specifically, Appendix K requires that the Baker-Just equation be used in the ECCS evaluation model to determine the rate of energy release, cladding oxidation, and hydrogen generation. AREVA demonstrates in Appendix D of BAW-10227, that the Baker-Just model is conservative in all post-LOCA scenarios with respect to the use of the M5™ advanced alloy as a fuel rod cladding material.

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Therefore, the intent of 10 CFR 50.46 and 10 CFR 50, Appendix K will continue to be satisfied for the planned operation with AREVA M5™ fuel rod cladding. Issuance of an exemption from these regulations for the use of M5™ fuel rod cladding material in the HNP core will not compromise the safe operation of the reactor. Similar exemptions have been issued for other licensed reactors, including Palisades and Ft. Calhoun.