



October 21, 2021

NG-21-0030
10 CFR 72.7

ATTN: Document Control Desk
Director, Division of Fuel Management
Office of Nuclear Material Safety and Safeguards
U. S. Nuclear Regulatory Commission
Rockville, MD 20852

Duane Arnold Energy Center
Docket Nos. 50-331, 72-32
Renewed Op. License No. DPR-49

Subject: Exemption Request for Failed Fuel Can Weight in a Certificate of Compliance 1004
Renewed Amendment 17 61BTH Type 2 Dry Shielded Canister

In accordance with 10 CFR 72.7, "Specific exemptions," NextEra Energy Duane Arnold, LLC (NEDA) is requesting NRC approval of a one-time exemption for the Duane Arnold Energy Center (DAEC) Independent Spent Fuel Storage Installation (ISFSI) from the requirements of 10 CFR 72.212(b)(2), (b)(3), (b)(4), (b)(5)(i), (b)(11), and 72.214. Specifically, the exemption request involves exceeding the weight limit of a failed fuel can (FFC), plus its contents, relative to the terms and conditions of NRC Certificate of Compliance (CoC) 1004, Renewed Amendment 17.

The regulations require, in part, compliance to the terms and conditions of CoC 1004. Contrary to this requirement, DAEC has identified a failed fuel assembly which weighs nominally 676 pounds and therefore, when stored with a modified FFC, exceeds the CoC Appendix B, Technical Specification (TS) Table 1-1t requirement that, "The total weight of each failed fuel can plus all its content shall be less than 705 lb."

The FFC is modified due to a bent bail handle which extends beyond the perimeter of the dry shielded canister (DSC) fuel compartment. The modified condition precludes lifting the FFC in the normal manner, which necessitates adding additional lifting hardware. That additional hardware is what causes the TS weight limit to be exceeded.

The FFC in question will be loaded within DSC No. 30, which is the final DSC in the near-term loading campaign, which is the final loading campaign for DAEC. DSC No. 30 will not contain 61 fuel assemblies. At least two fuel cells will be empty and therefore there is no concern with the overall DSC weight.

Pursuant to 10 CFR 72.7, Attachment 1 describes the need and justification for the issuance of an exemption, as well as the aspects of the proposed action being authorized by law, not endangering life or property or the common defense and security, and being otherwise in the public interest. Pursuant to 10 CFR 51.60, Attachment 1 also provides an environmental assessment.

NextEra Energy Duane Arnold, LLC

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Attachment 2 of this letter contains one new regulatory commitment.

Should you have any questions or require additional information, please contact J. Michael Davis, Licensing Manager at 319-851-7032.

Respectfully,

A handwritten signature in black ink, appearing to read "Paul Hansen for". The signature is written in a cursive, flowing style.

Paul Hansen
Decommissioning Director, Duane Arnold Energy Center
NextEra Energy Duane Arnold, LLC

Attachments: As Stated

cc: Administrator, Region III, USNRC
Project Manager, DAEC, USNRC
Inspector, DAEC, USNRC

**10 CFR 72.7 Exemption Request
Duane Arnold Energy Center
Independent Spent Fuel Storage Installation**

1. Background

The CoC 1004 Standardized NUHOMS® System failed fuel can (FFC) consists of a liner with an integral bottom lid assembly and a removable top lid, designed to contain a failed fuel assembly and any associated fuel fragments/rubble to ensure assumptions made in the criticality analysis for the quantity and location of fuel rod material are maintained. The 61BTH Type 2 DSC, and the related basket structural analysis, was reviewed and approved as part of Amendment 10 to CoC 1004 and the FFC was added as approved content in Amendment 13 to CoC 1004.

A modified FFC is proposed to accommodate a damaged bail handle on a certain BWR failed fuel assembly that is to be loaded in the DAEC pool-off-load campaign. Typically, the bail handle allows for the lifting equipment to lower the failed fuel assembly into the FFC and disengage. The damaged bail handle still allows for the operators to load the fuel assembly into the FFC; however, the bail handle would come into contact with the top of a standard FFC liner before the fuel assembly came in contact with the bottom of the FFC.

The proposed FFC modification will provide the damaged bail handle adequate clearance during loading operations to lower the failed fuel assembly into place without interference from surrounding components, allowing the fuel assembly to be safely lowered into its final position using approved fuel handling devices (i.e., normal means). The modified FFC features a shortened FFC liner that is integrated with an over-sleeve which is welded to the FFC liner (see figure below). A removable lift handle is provided in the over-sleeve to move the loaded FFC into the designated cell of the DSC, and to retrieve the FFC and contents.

The modified FFC protrudes above the top of the basket and extends into the top grid assembly (TGA). The interface between the modified FFC and TGA requires a modification in the TGA to accommodate the FFC over-sleeve. The modification includes an extra set of plates on the corner of the TGA (within the quadrant that lies between 270° and 0°) to accommodate the modified FFC.

The DSC basket support ring is modified by removing a three-inch section of the ring at the perimeter cell location of the FFC to provide adequate clearance for the modified FFC to clear the support ring.

Technical Specification Table 1-1t requires that the total weight of each failed fuel can plus all its content be less than 705 lb. In considering this weight limit, the removable lift handle is not included in the combined weight since it is removed after the FFC is loaded in the DSC. The weight of the modified FFC includes the liner, the bottom cover assembly, the top cap assembly, and the over-sleeve. The failed fuel assembly to be loaded in the FFC is fuel designation GE3 with a nominal weight of 676 lb. (including the fuel channel). The total weight of the FFC plus contents exceeds the 705 lb. weight limit of the TS.

The FFC and TGA modifications described here will be evaluated pursuant to 10 CFR 72.48, but the necessity to load the nominally 676 lb. fuel assembly into the modified FFC exceeds the

TS requirement to be less than 705 lb. and therefore an exemption is needed to load an FFC and its contents up to 800 lbs.

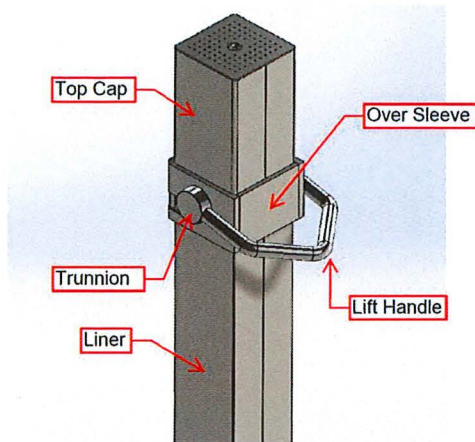


Figure: Modified FFC

2. Request for Exemption

In accordance with 10 CFR 72.7, "Specific exemptions," NextEra Energy Duane Arnold, LLC (NEDA) is requesting NRC approval of a one-time exemption for DSC No. 30, from the following requirements of 10 CFR Part 72, due to an inability to comply with the terms and conditions of CoC 1004 Renewed Amendment 17:

- 72.212(b)(2)
- 72.212(b)(3)
- 72.212(b)(4)
- 72.212(b)(5)(i)
- 72.212(b)(11)
- 72.214

These requirements all involve conforming to, or complying with, the terms, conditions, and specifications of a CoC or an amended CoC.

Specifically, the exemption request involves approval to exceed the weight limit of a failed fuel can (FFC), plus its contents, relative to the terms, conditions, and specifications of CoC 1004, Renewed Amendment 17. NEDA has identified a failed fuel assembly which weighs nominally 676 pounds and when stored with a modified FFC, exceeds the CoC Appendix B, Technical Specification (TS) Table 1-1t requirement that, "The total weight of each failed fuel can plus all its content shall be less than 705 lb."

NEDA hereby commits that at least two other fuel cells in DSC No. 30 will remain empty, and requests approval that the failed fuel can in question, plus all its contents, may weigh up to 800 lbs., as described in Attachment 2.

3. Technical Analysis

The 61BTH Type 2 DSC is designed to transfer the decay heat from the fuel to the canister body via the basket and ultimately to the ambient via either the HSM in storage mode or the TC in the transfer mode. The FFC is protected by the basket fuel compartment tubes and its only design functions are to contain the failed fuel and allow its retrieval from the basket fuel compartment under normal and off-normal conditions.

a. Thermal Design Function

As the thermal material properties and heat loads remain the same as those described in the CoC 1004 updated final safety analysis report (UFSAR) Revision 20, the overall basket temperature distribution and the thermal gradients are not affected by the proposed exemption. Therefore, the thermal design functions of the 61BTH Type 2 DSC and basket described in the UFSAR remain unaffected by this change.

b. Radiation Shielding Design Function

The proposed modification to the FFC for lifting adds additional material. The addition of materials around the FFC liner provides improved shielding effectiveness. Therefore, the shielding design function of the 61BTH Type 2 DSC and basket described in the UFSAR are not adversely affected by this change.

c. Confinement Design Function

Although its design function is to contain the failed fuel, the FFC does not constitute a confinement boundary. Therefore, the confinement design function of the 61BTH Type 2 DSC described in the UFSAR remains unaffected by this change.

d. Criticality Design Function

The FFC performs a criticality design function to contain a failed fuel assembly and any associated fuel fragments/rubble within the designated storage compartment in the 61BTH Type 2 basket, ensuring that assumptions made in the criticality analysis for the quantity and location of fuel contents are maintained. The proposed exemption only affects the weight of the FFC plus contents and not the ability of the FFC to contain the failed fuel. Therefore, the criticality design function of the 61BTH Type 2 DSC and basket described in the UFSAR remains unaffected by this change.

e. Structural Design Function

The increase in the total weight of the FFC plus its content from 705 lb. to 800 lb. has a limited impact on the structural evaluation of the basket assembly since only the weight of the FFC liner impacts the basket structural evaluation.

The current basket analysis evaluates a three-inch cross section of the basket with all compartments loaded with 705 lb. fuel assemblies, as discussed in UFSAR Section T.3.6.1.3.1. This load is applied as a pressure on the fuel compartment plates. Based on Section T.3.7.4.3.3 of the UFSAR, the pressure (p) is calculated as:

$$\begin{aligned} \text{Pressure, } p &= \frac{\text{Fuel assembly wt.}}{(\text{Panel span} \times \text{Panel Length})} \\ &= 0.6911 \text{ psi} \end{aligned}$$

where:

Fuel Assembly wt = 705 lb.
Panel span = 6.22"
Panel length = 164"

The maximum fuel assembly weight at DAEC is 676 lb. and the FFC liner weight is 35 lb. (based on 22 gauge thick liner per UFSAR Dwg NUH61BTH-72-1105). If the FFC is loaded with the heaviest fuel assembly, the resulting pressure on the fuel compartment plates from the fuel assembly and the FFC liner using the same approach is 0.6970 psi.

The increase in the pressure within the fuel compartment with the FFC is about 0.9%. This small increase is compensated by the fact that only one FFC will be loaded in DAEC DSC No. 30 and other fuel assemblies are less than the analyzed weight of 705 lbs. This reduces the load on the basket assembly by 1,740 lb. (= (705 lb. – 676 lb.) x 60 Assemblies).

In addition, DAEC commits that at least two other fuel cells within the basket assembly will remain empty, to increase the available margin. This will further reduce the load on the basket assembly by about 1410 lb. resulting in a net reduction of about 3,150 lb. when combined with the lower maximum fuel assembly weight.

A review of the stress intensity plots for the bounding load cases for normal and accident conditions (see UFSAR Figure T.3.6-19 for handling/transfer load, Figure T.3.6-31 for storage load and Figure UFSAR Figure T.3.7-54 for the bounding side drop) shows that the maximum stresses within the basket assembly occur away from the compartments where the FFC can be loaded.

Table 1 presents a summary of the maximum stresses for the bounding normal and accident load cases from the UFSAR. Considering the large reduction in the load on the basket assembly as discussed above, and that the maximum stresses are away from the FFC location, the results presented within the UFSAR remain bounding for DSC No. 30.

Table 1: Summary of Maximum Stresses for 61BTH Type 2 DSC

Load Case	UFSAR Reference	Max. Stress (ksi)	Allowable Stress (ksi)	Stress Ratio
Normal Handling/Transfer Conditions, Basket, P _m +P _b , 2g Axial, Vert., Trans	Item C, Section T.3.6.1.3.3	21.49	23.4	0.92
Normal Handling/Transfer Conditions, SST Rails, P _m +P _b , 2g Axial, Vert., Trans	Item C, Section T.3.6.1.3.3	22.21	23.4	0.95
Standard Seismic, Basket, P _m +P _b , 2g Axial, Vert., Trans	Item E, Section T.3.6.1.3.4	26.88	35.1	0.77
Standard Seismic, SST Rails, P _m +P _b , 2g Axial, Vert., Trans	Item E, Section T.3.6.1.3.4	24.97	35.1	0.71
161.5° Side Drop Impact on one Transfer cask Support rail, Basket, P _m +P _b	Table T.3.7-6	32.85	56.97	0.58
161.5° Side Drop Impact on one Transfer cask Support rail, Rail, P _m +P _b	Table T.3.7-6	45.95	56.97	0.81

4. Basis for Approval

In accordance with 10 CFR 72.7, the NRC may, upon application by any interested person or upon its own initiative, grant such exemptions from the requirements of the regulations in this part as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest.

a. Authorized by Law

The NRC issued 10 CFR 72.7 under the authority granted to it under Section 133 of the Nuclear Waste Policy Act of 1982, as amended, 42 U.S.C. § 10153. Section 72.7 allows the NRC to grant exemptions from the requirements of 10 CFR Part 72. Granting the proposed exemption provides adequate protection to public health and safety, and the environment. As described below, the proposed exemption will not endanger life or property, or the common defense and security, and is otherwise in the public interest. Therefore, the exemption is authorized by law.

b. Will not Endanger Life or Property or the Common Defense and Security

DAEC has verified that loading of the modified failed fuel can, with a failed fuel assembly, with combined weight exceeding the 705 lb. limit up to 800 lb., would not impact the structural, thermal, shielding, criticality, or confinement design functions of the loaded DSC, as described in the Technical Analysis section above.

The CoC 1004 Renewed Amendment 17 Technical Specifications allow failed fuel in nearly all DSC designs. While all DSCs have a limit on Maximum Initial Uranium Content per fuel

assembly, only about half retain this limit on FFC weight plus the weight of the contents, with the most recently added DSCs having had the requirement removed.

Additionally, NEDA commits that at least two other cells in DAEC DSC No. 30 will remain empty, so the overall DSC weight with this FFC will remain within the UFSAR assumptions.

Based on this, the proposed exemption does not endanger life or property or the common defense and security.

c. Otherwise in the Public Interest

The exemption will be in the public interest in that it will allow for the timely storage of spent nuclear fuel at DAEC while minimizing radiological risks and will help maintain the schedule for transitioning the spent fuel from the pool to the dry storage facility, which is the lowest risk option.

5. Environmental Consideration

The potential environmental impact of using the Standardized NUHOMS® System was initially analyzed in the environmental assessment for the final rule to add the system to the list of approved spent fuel storage casks in 10 CFR 72.214 (59 FR 65898). The environmental assessment for the December 22, 1994, final rule concluded that there would be no significant environmental impact to adding the Standardized NUHOMS® System, and therefore, the NRC issued a finding of no significant impact, which was validated through issuance of Renewed Amendment 17 to the Certificate of Compliance on June 7, 2021.

The environmental impacts of the proposed exemption will not have an adverse impact to the environment, nor do they change assumptions in the previous environmental assessment. Therefore, the proposed action does not require any federal permits, licenses, approvals, or other entitlements.

a. Environmental Impacts of the Proposed Action

The DAEC ISFSI is a radiologically controlled Protected Area with limited access and is located inside the DAEC Owner Controlled Area. The area considered for potential environmental impact as a result of this exemption request is the area in and surrounding the ISFSI.

The interaction of a loaded 61BTH Type 2 DSC, within a horizontal storage module, with the environment is through the thermal, shielding, and confinement design functions for the NUHOMS® system. This change has no impact on the DSC heat load, the DSC radioactive source terms, or the confinement boundary components.

There are no gaseous, liquid or solid effluents (radiological or non-radiological), radiological exposures (worker or member of the public) or land disturbances associated with the proposed action.

Therefore, approval of the requested exemption to allow one DSC fuel cell to store an FFC with a failed fuel assembly, with combined weight over the weight limit, with at least two other cells empty, has no impact on the environment.

b. Adverse Environmental Effects Which Cannot be Avoided Should the Exemption be Approved

As noted previously, there are no environmental impacts associated with approval of this exemption. Therefore, there are no adverse environmental effects which cannot be avoided should the exemption request be approved.

c. Alternatives to the Proposed Action

NEDA has considered two (2) alternatives to the proposed exemption request, as follows:

1. Request that the CoC holder for CoC 1004 apply for Amendment 18 to allow the increased weight of the failed fuel canister and contents, while leaving other cells empty.
2. Dismantle the failed fuel assembly and place into separate failed fuel cans within a DSC.

d. Environmental Effects of the Alternatives to the Proposed Action

The environmental impacts of processing a change to the weight requirements for an FFC and its contents through the amendment process would not allow NEDA to complete emptying of the spent fuel pool on schedule by April 2022, which is one of the major decommissioning activities outlined in the PSDAR. Emptying of the spent fuel pool allows for termination of spent fuel pool operation and reduces overall risk during decommissioning. This delay would also result in additional costs.

The environmental impact of dismantling the failed fuel assembly and placing portions of the FA in multiple FFCs would result in increased costs, increased risk, an occupational radiological dose greater than the projected dose in the event of approval of this exemption, and the generation of additional radiological waste.

e. Conclusion and Status of Compliance

As a result of the environmental assessment, NEDA concludes that the proposed action, which will allow NEDA to load a failed fuel assembly in a failed fuel can, within a DAEC DSC No. 30 fuel cell, where the combined weight of the failed fuel assembly plus the failed fuel can exceeds the 705 pound limit, while leaving at least two other DSC fuel cells empty, is in the public interest in that it avoids the adverse environmental, radiological, and financial effects associated with the alternatives to the proposed action.

List of Regulatory Commitments

This table identifies actions discussed in this letter for which NEDA commits to perform. Any other actions discussed in this submittal are described for the NRC's information and are **not** commitments.

COMMITMENT	TYPE (Check One)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
At least two (2) fuel cells in DAEC DSC No. 30 will remain empty.		X	