



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

March 29, 2010

Mr. Christopher R. Costanzo  
Vice President  
Duane Arnold Energy Center  
3277 DAEC Road  
Palo, IA 52324-9785

SUBJECT: DUANE ARNOLD ENERGY CENTER – SAFETY EVALUATION RE: SPENT  
FUEL MANAGEMENT PROGRAM AND PRELIMINARY DECOMMISSIONING  
COST ESTIMATE (TAC NO. ME1148)

Dear Mr. Costanzo:

By letter dated February 19, 2009, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML090550968), FPL Energy Duane Arnold, LLC, the predecessor name of license holder NextEra Energy Duane Arnold, LLC, NextEra (the licensee), submitted "Irradiated Fuel Management Plan and Preliminary Decommissioning Cost Estimates for Duane Arnold Energy Center (DAEC)" for review and approval. By letters dated December 1, 2009, (ADAMS Accession No. ML093440059), and February 15, 2009, (ADAMS Accession No. ML100540021), NextEra transmitted supplemental information in support of the application.

Following review of the submittals, the Nuclear Regulatory Commission (NRC) staff finds that the NextEra's program for the long-term storage of spent fuel and the preliminary decommissioning cost estimate for DAEC is adequate and provides sufficient details associated with the funding mechanisms. The NRC staff, therefore, concludes that the DAEC spent fuel management program complies with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.54(bb), and approves the program on a preliminary basis. In addition, the NRC staff finds that the preliminary cost estimate for DAEC, pursuant to 10 CFR 50.75(f)(3), is reasonable.

The NRC staff notes that the spent fuel management program analysis is based on a reported Decommissioning Trust Fund (DTF) balance that can fluctuate over time. Should there be a material decline in the DTF balance, the NRC staff's analysis and preliminary findings may no longer be valid, and the licensee would be under an obligation, under 10 CFR 50.9, to update the DTF balance as well as update any changes in projected costs. The NRC staff would expect the licensee to update its spent fuel management program to address any adverse material changes, in conjunction with the filing of the licensee's required report on the status of its decommissioning funding.

C. Costanzo

- 2 -

If you have any questions regarding this letter, please contact me at (301) 415-3079.

Sincerely,

A handwritten signature in black ink that reads "Karl Feintuch". The signature is written in a cursive style with a large, prominent 'K' and 'F'.

Karl Feintuch, Project Manager  
Plant Licensing Branch III-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-331

Enclosure:  
Safety Evaluation

cc w/encl: Distribution via ListServ



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO SPENT FUEL MANAGEMENT PROGRAM AND

THE PRELIMINARY DECOMMISSIONING COST ESTIMATE

NEXTERA ENERGY DUANE ARNOLD, LLC

DUANE ARNOLD ENERGY CENTER

DOCKET NO. 50-331

1.0 INTRODUCTION

Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.54(bb), nuclear power plants that are within 5 years of expiration of their operating license must submit a spent fuel management and funding program to the Nuclear Regulatory Commission (NRC) for review and preliminary approval. The program should discuss the means by which the licensee intends to manage and provide funding for the management of spent fuel until the fuel is transferred to the Department of Energy (DOE) for permanent disposal. In the same time period, the licensee is also required by 10 CFR 50.75(f)(3) to submit a preliminary cost estimate, which includes an up-to-date assessment of the major factors that could affect the cost to decommission the reactor.

By letter dated February 19, 2009, (Agencywide Documents Access and Management System (ADAMS) Accession No. ML090550968), FPL Energy Duane Arnold, LLC, the predecessor name of license holder NextEra Energy Duane Arnold, LLC, NextEra (the licensee), submitted "Irradiated Fuel Management Plan and Preliminary Decommissioning Cost Estimates for Duane Arnold Energy Center (DAEC)" for review and approval. By letters dated December 1, 2009, (ADAMS Accession No. ML093440059), and February 15, 2009, (ADAMS Accession No. ML100540021), NextEra transmitted supplemental information in support of the application.

2.0 BACKGROUND

The DAEC is a nuclear powered electrical generating facility consisting of one boiling water reactor (BWR) located in Linn County, Iowa. The plant site comprises approximately 500 acres adjacent to the Cedar River approximately 2.5 miles northeast of the Village of Palo, Iowa.

The nuclear system includes a single-cycle General Electric BWR producing steam for direct use in the steam turbine. The nuclear steam supply system and the turbine-generator were furnished by GE. The balance of plant was designed and constructed by Bechtel Power Corporation (Bechtel) as architect, engineer and constructor.

Enclosure

The unit was originally designed, and licensed for a steady-state core power of 1658 megawatts thermal (MWt), although the plant Technical Specifications restricted operation to a rated power of 1593 MWt. In 1985, the Technical Specifications were amended to allow the DAEC to operate at a power level of 1658 MWt. Then, in 2001, the rated power level was increased again to 1912 MWt. The operating license expires on February 21, 2014.

Spent fuel assemblies are stored in the spent fuel storage racks in the fuel pool or may, after decay, be transferred to the independent spent fuel storage installation (ISFSI) for interim onsite storage. The DAEC has been authorized by the NRC to store 2829 fuel assemblies in the spent fuel pool. There is an ISFSI on site that houses 10 CFR 72 licensed spent fuel storage systems that can provide interim on-site storage of spent fuel, high-level radioactive waste, and reactor-related greater than Class C waste.

### 3.0 REGULATORY REQUIREMENTS AND CRITERIA

#### 3.1 Regulatory Requirement (10 CFR 50.54(bb))

Pursuant to 10 CFR 50.54(bb), "For nuclear power reactors licensed by the NRC, the licensee shall, within 2 years following permanent cessation of operation of the reactor or 5 years before expiration of the reactor operating license, whichever occurs first, submit written notification to the Commission for its review and preliminary approval of the program by which the licensee intends to manage and provide funding for the management of all irradiated fuel at the reactor following permanent cessation of operation of the reactor until title to the irradiated fuel and possession of the fuel is transferred to the Secretary of Energy for its ultimate disposal in a repository...."

##### 3.1.1 Criteria to Support the 10 CFR 50.54(bb) Review

For the NRC staff to evaluate and provide preliminary approval of the spent fuel management and funding program, the submittal should include:

- Estimated cost to isolate the spent fuel pool and fuel handling systems. For the decontamination (DECON) option, the cost to isolate the spent fuel pool and fuel handling systems may be considered part of the preparation for DECON;
- Estimated cost to construct an ISFSI or a combination of wet/dry storage;
- Estimated annual cost for the operation of the selected option (wet or dry storage or a combination of the two) until the DOE takes possession of the fuel;
- Estimated cost for the preparation, packaging, and shipping of the fuel to the DOE;
- Estimated cost to decommission the spent fuel storage facility; and
- Brief discussion of the selected storage method or methods, and the estimated time for these activities.

### 3.2 Regulatory Requirement (10 CFR 50.75(f)(3) and (f)(5))

Section 10 CFR 50.75(f)(3) requires that a licensee "...shall at or about 5 years prior to the projected end of operations submit a preliminary decommissioning cost estimate [herein referred to as the preliminary cost estimate] which includes an up-to-date assessment of the major factors that could affect the cost to decommission...." Section 50.75(f)(5) requires a licensee to include plans to adjust decommissioning funding levels to demonstrate a reasonable level of financial assurance, if necessary, in the preliminary cost estimate.

#### 3.2.1 Criteria to Support the 10 CFR 50.75(f)(3) Review

NUREG-1713, entitled "Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors" Section C1 provides additional guidance on the information that is to be addressed in the preliminary cost estimate. The principal factors to be addressed are:

- Decommissioning option/method anticipated;
- Potential for known or suspected contamination of the facility or site;
- Low-level radioactive waste (LLW) disposition plan;
- Preliminary schedule of decommissioning activities; and
- Any other factors that could significantly affect the cost to decommission.

The cost estimate should provide costs for each of the following:

- Pre-decommissioning engineering and planning - decommissioning engineering and planning prior to completion of reactor defueling;
- Reactor deactivation - deactivation and radiological decontamination of plant systems to place the reactor into a safe, permanent shutdown condition;
- Safe storage - safe storage monitoring of the facility until dismantlement begins (if storage or monitoring of spent fuel is included in the cost estimate, it should be shown separately);
- Dismantlement - radiological decontamination and dismantlement of systems and structures required for license termination (if demolition of uncontaminated structures and site restoration activities are included in the cost estimate, they should be shown separately); and
- LLW disposition - LLW packaging, transportation, vendor processing, and disposal.

## 4.0 EVALUATION

### 4.1 Evaluation of the Program to Manage and Provide Funding for all Irradiated Fuel

As required by 10 CFR 50.54(bb), the DAEC estimated the costs associated with the long-term management of spent fuel at \$278.2 million (note: all dollar values identified in this evaluation

are in 2008 dollars). The licensee estimates that the spent fuel pool will remain operational for an estimated minimum of 5 years to allow the initial storage of the fresh core, as well as the most recent fuel cycles following shutdown to cool before transfer to an ISFSI. After shut down, the first 8 months will be used for isolation of the spent fuel pool and supporting fuel handling systems at a total estimated cost of \$1.3 million. The next period has an estimated duration of approximately 5 years and a total estimated cost of approximately \$129.7 million, which includes transferring the fuel to the ISFSI. Following this period, the fuel will be stored in the ISFSI until the fuel transfer to the DOE. The licensee estimated completion of the fuel transfer to the DOE in 2054, and estimated the total annual cost associated with dry storage for the period from 2020 to 2054 at \$140.0 million. The licensee stated that, following transfer of the fuel to the DOE, the ISFSI will be decontaminated and dismantled, and that will take approximately 12-15 months at an estimated cost of \$7.3 million.

The licensee reaffirmed the commitment to seek license renewal for DAEC. If DAEC ceases operation in 2014, the licensee has committed to comply with existing licensing requirements, including the operation and maintenance of the systems and structures needed to support continued operation of the spent fuel pool.

The NRC staff finds the spent fuel management program estimates to be reasonable, based on a cost comparison with similar decommissioning reactors, while acknowledging that there are large uncertainties and potential site-specific variances.

As of March 30, 2009, the NextEra Energy Duane Arnold, LLC, and The United States Government reached a Settlement Agreement (included in the FPL submittal NG-10-0067, February 15, 2010) concerning Department of Energy's breach of its contract to accept and dispose of spent fuel and high-level waste for there DAEC and the FPL and NextEra Energy Resources nuclear fleet. DOE has agreed to reimburse NextEra for all "allowable costs," which are "those costs incurred by NextEra for managing and storing Spent Nuclear Fuel/High Level Waste which were foreseeable in the event of DOE's Delay, and that NextEra would not have incurred but for, and which are directly related to, DOE's Delay in performance of its acceptance obligations under the Contracts." In the DAEC supplemental submittal dated February 15, 2010, DAEC has committed to provide an initial supplement to the spent fuel program of \$52.0 million to fund ongoing spent fuel expenses if license renewal is not granted.

In summary, the DEAC estimated that the total costs associated with the long-term management of spent fuel will be \$278.2 million. This estimate is based on the transfer of fuel to DOE to be completed in 2054, with decommissioning of the ISFSI to be completed in 2056. The spent fuel management and funding program estimated the cost for the storage, security, and insurance to store the fuel, the cost to purchase, load, and transfer the fuel storage canisters, as well as the decommissioning cost of the ISFSI. With the DAEC commitment to provide an initial supplement to the spent fuel program of \$52.0 million to fund on going spent fuel expenses while waiting for the reimbursements from the Federal Government, the NRC staff concludes that the licensee's spent fuel management program for DAEC complies with 10 CFR 50.54(bb), and approves the spent fuel program on a preliminary basis.

#### 4.2 Evaluation of the Preliminary Decommissioning Cost Estimate

The licensee estimated the total decommissioning cost of DAEC to be approximately \$578.3 million in 2008 dollars. The DAEC has selected the safe storage (SAFSTOR) option. The licensee has elected to use the SAFSTOR option with decommissioning to be completed in 2074. The fuel will be required to remain in the spent fuel pool to decrease the heat loading before transferring the fuel to the ISFSI.

Prior to starting the detailed review of the cost estimate, the NRC staff reviewed the estimate to confirm the supporting systems/structures necessary to support the safe operation had been identified in the estimate. The validity of the cost estimate is based on a reasonable estimate of the cost to decommission the supporting systems and structures, as well as confirming that all of the major equipment necessary to support operation was included.

The licensee has divided the estimated total cost of \$578.3 million (NRC minimum decommissioning cost is \$503.8 million) into the following principal categories/activities: SAFSTOR planning; SAFSTOR post-shutdown modifications and preparations; SAFSTOR preparation during spent fuel operations; completion of SAFSTOR preparations; dormancy and dry spent fuel storage, decommissioning planning during SAFSTOR; dismantlement and site preparations; major component removal; and site decontamination. The duration of the SAFSTOR period is estimated to be approximately 60 years.

The Energy Solutions cost estimate developed for DAEC and included in the licensee's submittal dated February 15, 2010, identified contingency factors for the major activities that range from 13 percent to as high as 98 percent for an activity. The NRC staff also reviewed Appendix A - F which identified the systems and structures requiring cleanup, identified spent fuel shipping estimated dates, provided detailed project schedules, listed the annual cash flows, and provided a detailed break out of the annual cash flows. The NRC staff concluded that the supporting components, projected schedules and supporting costs were consistent with other cost estimates and in a reasonable range.

The NRC staff also recognized that a significant uncertainty exists regarding the low-level waste disposal cost since Barnwell no longer accepts waste from Non-Atlantic Compact members. The NRC staff concluded that the waste volume estimates were in a reasonable range. Energy Solutions's cost estimate stated that no known areas of contaminated soil were identified and therefore, no soil or groundwater remediation was included since none was needed.

For disposal cost estimating purposes, the disposal rate is reasonable based on the mix of waste and the available disposal options. However, when new disposal facilities become available, or if the South Carolina disposal site reopens to members outside its compact, disposal rates will likely be significantly higher. In addition, the Decommissioning Trust Fund (DTF) balance could be subject to decline, at least in the short run. If there is change in the DTF balance that materially impacts the licensee's cost analysis, or if new disposal rates are significantly higher, given these considerations, the licensee would be under an obligation under 10 CFR 50.9 to update any changes in the projected cost or available funds.

The NRC staff finds the preliminary cost estimate to decommission DAEC is not unreasonable. The NRC staff also recognizes that the DAEC site specific cost estimate of approximately \$578.3 million is greater than the NRC minimum amount of \$503.8 million.

## 5.0 CONCLUSION

The NRC staff finds that the licensee's program for the long-term storage of spent fuel and the preliminary cost estimate for Entergy are adequate and provide sufficient details associated with the funding mechanisms. The NRC staff therefore concludes that the licensee's spent fuel management program for DAEC complies with 10 CFR 50.54(bb) and approves the program on a preliminary basis. In addition, the NRC staff finds that the preliminary cost estimate for DAEC complies with the requirements of 10 CFR 50.75(f)(3), and the staff finds that the preliminary cost estimate for DAEC is not unreasonable.

However, if there are changes in the DTF balance that materially impact the licensee's cost analysis, or if new disposal rates are significantly higher, given these considerations, the licensee would be under an obligation under 10 CFR 50.9 to update any changes in projected cost, or available funds.

Principal Contributor: Clayton L. Pittiglio

Date: March 29, 2010



C. Costanzo

- 2 -

If you have any questions regarding this letter, please contact me at (301) 415-3079.

Sincerely,

**/RA/**

Karl Feintuch, Project Manager  
Plant Licensing Branch III-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-331

Enclosure:  
Safety Evaluation

cc w/encl: Distribution via ListServ

**DISTRIBUTION:**

PUBLIC	LPL3-1 r/f	RidsNrrDorIDpr Resource	RidsNrrDorLpl3-1 Resource
RidsAcrsAcnw_MailCTR Resource		RidsNrrLABTully Resource	RidsOgcRp Resource
RidsNrrDirsltsb Resource		RidsRgn3MailCenter Resource	CPittiglio, NRR
RidsNrrPMDuaneArnold Resource			

ADAMS ACCESSION NO.: ML100770505

\*NLO with changes

OFFICE	NRR/LPL3-1/ PM	NRR/LPL3-1/ LA	NRR/PFAB/BC	OGC	NRR/LPL3-1/ BC
NAME	KFeintuch	BTully	RCarlson	SUttal *	RPascarelli /TBeltz for
DATE	03/24/10	03/23/10	03/24/10	03/26/10	03/29/10

OFFICIAL RECORD COPY