



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

October 18, 2017

Mr. Dean Curtland  
NextEra Energy  
Duane Arnold Energy Center  
3277 DAEC Road  
Palo, IA 52324-9785

SUBJECT: DUANE ARNOLD ENERGY CENTER - ISSUANCE OF AMENDMENT TO  
MODIFY THE PLUME EXPOSURE PATHWAY EMERGENCY PLANNING ZONE  
BOUNDARY (CAC NO. MF9573)

Dear Mr. Curtland:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 301 to Renewed Facility Operating License No. DPR-49 for the Duane Arnold Energy Center.

The amendment revises the Duane Arnold Energy Center (DAEC) Plume Exposure Pathway Emergency Planning Zone (EPZ) in its Emergency Preparedness Plan. The DAEC Evacuation Time Estimates Study has also been revised to encompass the changes to the DAEC Plume Exposure Pathway EPZ boundary.

A copy of the Safety Evaluation is also enclosed. A Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

A handwritten signature in black ink, appearing to read "Chawla".

Mahesh L. Chawla, Project Manager  
Plant Licensing Branch III  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-331

Enclosures:

1. Amendment No. 301 to DPR-49
2. Safety Evaluation

cc: Listserv



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

NEXTERA ENERGY DUANE ARNOLD, LLC

DOCKET NO. 50-331

DUANE ARNOLD ENERGY CENTER

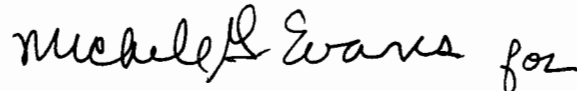
AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 301  
License No. DPR-49

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by NextEra Energy Duane Arnold, LLC dated March 31, 2017, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, by Amendment No. 301, Renewed Facility Operating License No. DPR-49 is hereby amended to authorize revision to the Emergency Planning Zone in the Duane Arnold Energy Center Emergency Preparedness Plan, as set forth in the application submitted on March 31, 2017, by NextEra Energy Duane Arnold, LLC, and as evaluated in the NRC staff's safety evaluation for this amendment.
3. This license amendment is effective as of its date of issuance and shall be implemented within 180 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

A handwritten signature in black ink that reads "Michelle Evans for". The signature is written in a cursive style.

Brian E. Holian, Acting Director  
Office of Nuclear Reactor Regulation

Date of Issuance: October 18, 2017



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 301 TO

RENEWED FACILITY OPERATING LICENSE NO. DPR-49

NEXTERA ENERGY DUANE ARNOLD, LLC

DUANE ARNOLD ENERGY CENTER

DOCKET NO. 50-331

1.0 INTRODUCTION

By letter dated March 31, 2017 (Reference 1), NextEra Energy Duane Arnold, LLC (the licensee) submitted changes in accordance with Section 50.90, "Application for amendment of license, construction permit, or early site permit," and Section 50.54(q), "Emergency plans," of Title 10 of the *Code of Federal Regulations* (10 CFR) to the Duane Arnold Energy Center (DAEC) Emergency Plan for U.S. Nuclear Regulatory Commission (NRC) approval prior to implementation. The proposed changes would modify the DAEC Plume Exposure Pathway Emergency Planning Zone (EPZ) boundary. The DAEC Evacuation Time Estimates (ETE) Study has also been revised to encompass the changes proposed to the DAEC Plume Exposure Pathway EPZ boundary.

2.0 REGULATORY EVALUATION

2.1 Regulatory Requirements

Section 50.47(b)(5) of 10 CFR states:

Procedures have been established for notification, by the licensee, of State and local response organizations and for notification of emergency personnel by all organizations; the content of initial and followup messages to response organizations and the public has been established; and means to provide early notification and clear instruction to the populace within the plume exposure pathway Emergency Planning Zone have been established.

Section 50.47(b)(9) of 10 CFR states:

Adequate methods, systems, and equipment for assessing and monitoring actual or potential offsite consequences of a radiological emergency condition are in use.

Section 50.47(b)(10) of 10 CFR states, in part:

A range of protective actions has been developed for the plume exposure pathway EPZ for emergency workers and the public. In developing this range of actions, consideration has been given to evacuation, sheltering, and, as a supplement to these, the prophylactic use of potassium iodide (KI), as appropriate. Evacuation time estimates have been developed by applicants and licensees. Licensees shall update the evacuation time estimates on a periodic basis. Guidelines for the choice of protective actions during an emergency, consistent with Federal guidance, are developed and in place. . . .

Section 50.47(c)(2) of 10 CFR states, in part:

Generally, the plume exposure pathway EPZ for nuclear power plants shall consist of an area about 10 miles (16 km [kilometers]) in radius and the ingestion pathway EPZ shall consist of an area about 50 miles (80 km) in radius. The exact size and configuration of the EPZs surrounding a particular nuclear power reactor shall be determined in relation to local emergency response needs and capabilities as they are affected by such conditions as demography, topography, land characteristics, access routes, and jurisdictional boundaries.

Section IV.B.1 of Appendix E to 10 CFR Part 50 states, in part:

The means to be used for determining the magnitude of, and for continually assessing the impact of, the release of radioactive materials shall be described, including emergency action levels that are to be used as criteria for determining the need for notification and participation of local and State agencies, the Commission, and other Federal agencies, and the emergency action levels that are to be used for determining when and what type of protective measures should be considered within and outside the site boundary to protect health and safety.

Section IV.3 of Appendix E to 10 CFR Part 50 states, in part:

Nuclear power reactor licensees shall use NRC approved evacuation time estimates (ETEs) and updates to the ETEs in the formulation of protective action recommendations. . . .

## 2.2 Guidance

Regulatory Guide 1.101, Revision 2, "Emergency Planning and Preparedness for Nuclear Power Reactors" (Reference 2), provides guidance on methods acceptable to the NRC staff for implementing specific parts of the NRC's regulations.

Revision 1 of NUREG-0654/FEMA-REP-1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants" (Reference 3), provides a planning basis and specific acceptance criteria, including those addressing the plume exposure pathway EPZ, to meet the requirements of 10 CFR 50.47(b) and 10 CFR Part 50, Appendix E.

Section I.D.2 of NUREG-0654/FEMA-REP-1, states, in part:

The choice of the size of the Emergency Planning Zones represents a judgment on the extent of detailed planning which must be performed to assure an adequate response base. Although the radius for the EPZ implies a circular area, the actual shape would depend upon the characteristics of a particular site.

Table 1, "Guidance on Size of the Emergency Planning Zone," in Section I.D of NUREG-0654/FEMA-REP-1, further states, in part:

Judgment should be used in adopting this distance [the 10-mile radius for the plume exposure pathway] based upon considerations of local conditions such as demography, topography, land characteristics, access routes, and local jurisdictional boundaries.

Section III, "Recommended Planning Basis," of NUREG-0396, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants" (Reference 4), states, in part:

It is expected that judgment of the planner will be used in determining the precise size and shape of the EPZs considering local conditions such as demography, topography and land use characteristics, access routes, jurisdictional boundaries, and arrangements with the nuclear facility operator for notification and response assistance.

NUREG/CR-7002, "Criteria for Development of Evacuation Time Estimate Studies (Reference 5), provides detailed information and guidance for the developing or updating an ETE study for the plume exposure pathway EPZ.

### 3.0 TECHNICAL EVALUATION

The NRC staff has reviewed the licensee's technical analysis in support of the proposed DAEC Emergency Plan changes. The NRC staff's technical evaluation is detailed below.

#### 3.1 Background

The licensee states that the revision to the plume exposure pathway EPZ boundary was proposed by Linn County, Iowa, and the State of Iowa. The proposed changes to the DAEC Emergency Plan revise the DAEC Plume Exposure Pathway EPZ boundary for an area beyond the 10-mile required plume exposure pathway EPZ. Specifically, the proposed change would modify Subarea 24 of the DAEC Plume Exposure Pathway EPZ by designating U.S. Highway 30 as its southern boundary.

The licensee states that currently there is a tract within the DAEC Plume Exposure Pathway EPZ Subarea 24 that is to the south of U.S. Highway 30. Otherwise, the entire DAEC Plume Exposure Pathway EPZ in Subarea 24 is to the north of U.S. Highway 30, which is a four lane, divided highway located within Linn County, Iowa. While changing the southern boundary to Highway 30 will decrease the size of the EPZ slightly, it will enhance local law enforcement's ability to evacuate the effected population as well as improve their ability to control access back into the evacuated areas.

The licensee states that the proposed plume exposure pathway EPZ boundary change also requires that a new ETE study be performed for the DAEC host counties of Linn and Benton, Iowa. The licensee concludes that the proposed change to Subarea 24 will make the overall DAEC Plume Exposure Pathway EPZ boundary more consistent with the existing roads, easier to implement, and easier for the public to understand.

On July 13, 2016, a pre-submittal call was held with the licensee to discuss the proposed changes to the DAEC Plume Exposure Pathway EPZ, including the basis for the proposed EPZ change, the proposed ETE study update, impact on the existing alert and notification system, and the licensee outreach and alignment with impacted offsite response organizations of the proposed EPZ change (Reference 6). Representatives from Federal Emergency Management Agency (FEMA) Headquarters and Region 7, Iowa Homeland Security and Emergency Management Department (HSEMD), Iowa Department of Public Health, and the counties of Linn and Benton participated in discussions via a conference bridge.

By application dated March 31, 2017 (Reference 1), the licensee formally submitted changes to the DAEC Emergency Plan NRC approval prior to implementation. The "Duane Arnold Energy Center Development of Evacuation Time Estimates for Revised EPZ Boundary," dated March 9, 2017 (Reference 7), was submitted by the licensee, as part of the application to support the NRC staff's evaluation of the proposed change to the DAEC Plume Exposure Pathway EPZ.

The proposed changes to the DAEC Plume Exposure Pathway EPZ are supported by the State of Iowa, as documented by letter dated June 27, 2016 (Attachment 5 in the Enclosure of the application dated March 31, 2017). Furthermore, the proposed changes to the DAEC Plume Exposure Pathway EPZ were reviewed and approved by FEMA by letters dated July 14, 2016, and August 11, 2016 (Attachment 6 in the Enclosure of the application dated March 31, 2017).

### 3.2 NRC Staff Evaluation

In considering the proposed changes to the dimensions of the DAEC Plume Exposure Pathway EPZ, as described in the DAEC Emergency Plan, the NRC staff considered:

- General consideration for the exact size and configuration of the EPZ, as required by 10 CFR 50.47(c)(2);
- The revised evacuation time estimates required by 10 CFR 50.47(b)(10) and Section IV.3 of Appendix E to 10 CFR Part 50;
- The public notification requirements of 10 CFR 50(b)(5);
- The ability to assess and monitor the consequences of an actual or potential radiological release, as required by 10 CFR 50.47(b)(9) and Section IV.B.1 of Appendix E to 10 CFR Part 50; and
- The impact on the ability of the licensee to perform the protective actions recommendation (PAR) functions required by 10 CFR 50.47(b)(10);

The licensee provided the following evaluation of the proposed changes and its impacts:

*Removal of the additional areas within the EPZ Subarea 24*

The proposed change is considered by Linn County, the State of Iowa Homeland Security and Emergency Management Department (HSEMD) and DAEC as an improvement to the current DAEC Emergency Plan for the following reasons:

1. Improved ability to feed vehicles onto major evacuation routes, and improved ability of law enforcement to control access to the DAEC Plume Exposure Pathway EPZ

U.S. Highway 30 has greater vehicle capacity to move more people out of an evacuated area than 76<sup>th</sup> Avenue Southwest (SW), and is considered a safer roadway for evacuation as it provides no two-way directional conflicts for traffic. U.S. Highway 30 also provides better access control and a safer location for law enforcement than 75<sup>th</sup> Avenue SW.

2. Improved evacuation messaging

The simplification of the DAEC Plume Exposure Pathway EPZ will help ensure clear and consistent communications with county and state emergency management agencies when determining actions to protect the health and safety of the public. Additionally, this simplification helps ensure that the public understands what area is covered by the protective actions they are being advised to take.

3. Avoid splitting of the College Community School District and Kirkwood Community College Campuses into DAEC Plume Exposure Pathway EPZ and non-EPZ areas

The proposed new EPZ boundary, using U.S. Highway 30 as the southern border for Subarea 24, would remove the entire College Community School District Campus from the DAEC Plume Exposure Pathway EPZ. Therefore, the children and staff would not be subject to relocation under the guidance of the radiological emergency preparedness (REP) Plan. Similarly, with the proposed modification, the entire Kirkwood Community College Campus would be placed outside of the DAEC Plume Exposure Pathway EPZ boundary, simplifying the college's response to PARs made by offsite governmental officials.

The licensee further provides that the proposed changes will provide a more effective plume exposure pathway EPZ boundary for the protection of the health and safety of the public. The proposed changes are supported by the Linn County Emergency Management Commission, the (Cedar Rapids) College Community School District, and Kirkwood Community College.

The NRC staff's review of the proposed changes concludes that the changes were developed using the guidance in Section III of NUREG-0396 (Reference 4) based upon considerations of local conditions, such as demography, topography and land use characteristics, access routes, jurisdictional boundaries, and arrangements with the nuclear facility operator for notification and response assistance.

Based on the NRC staff's review of the proposed new EPZ boundary, the staff concludes that it meets the regulations of 10 CFR 50.47(c)(2) as it "shall be determined in relation to local emergency response needs and capabilities as they are affected by such conditions as



demography, topography, land characteristics, access routes, and jurisdictional boundaries.” This conclusion is supported by FEMA’s determination of acceptability in its letter to the NRC dated August 11, 2016 (Attachment 6 in the Enclosure of the letter dated March 31, 2017) (Reference 1).

#### *Revised ETE Study*

The proposed change to the DAEC Emergency Plan is to designate U.S. Highway 30 as the southern boundary of DAEC Plume Exposure Pathway EPZ Subarea 24 in southwest Cedar Rapids, Linn County, Iowa, replacing the smaller 76<sup>th</sup> Avenue SW located farther to the south. The EPZ locations under consideration for removal from the emergency plan are all beyond the 10-mile radius from the DAEC site. In support of the reduction of the plume exposure pathway EPZ, the licensee provided an updated ETE report (Reference 7), to remove the additional areas within the EPZ Subarea 24.

The licensee states that based on a comparison of the updated 2017 ETE study to the previous 2012 ETE review (Reference 8), the impacts were as follows:

1. When considered independently of other changes, the proposed alteration of the EPZ Subarea 24 boundary would have the effect of reducing the ETE for the full EPZ by up to 35 minutes at the 90<sup>th</sup> percentile and up to 1 hour and 10 minutes at the 100<sup>th</sup> percentile. This would be because approximately 9,000 less vehicles would be evacuating from Subarea 24.
2. The 2-mile and 5-mile regions, and the keyholes comprised of the 2-mile region and downwind sectors to 5 miles, would not be significantly impacted (ETE changes of 5 minutes or less), as the changes considered by the 2017 ETE study identified above, are primarily well beyond the 5-mile radius from the DAEC site.
3. Overall, the ETE for the full EPZ and for the keyholes comprised of the 2-mile region and downwind sectors to the EPZ boundary (10 miles and beyond) were found to have increased since the 2012 ETE study. The increase was up to 55 minutes at the 90<sup>th</sup> percentile and 1 hour and 55 minutes at the 100<sup>th</sup> percentile for wind directions, which blow over the City of Cedar Rapids. The increase in ETE was the direct result of the consideration of bottlenecks beyond the original study area of 15 miles, as well [as] increases in population and evacuating vehicles within the study area.

Section IV.3.3 of the Statements of Consideration to the 2011 Emergency Preparedness Final Rule, “Enhancements to Emergency Preparedness Regulations (10 CFR Part 50 and 52)” (Reference 9) states, in part:

The NRC will review the ETE analyses for completeness using NUREG/CR-7002, “Criteria for Development of Evacuation Time Estimate Studies,” the NRC guidance on ETE development issued with the final rule. . . . The NRC will not approve ETE updates but will review them for completeness.

The NRC staff performed a completeness review of the updated 2017 ETE report, which incorporated the changes based on the revised EPZ boundary, against the guidance provided in NUREG/CR-7002 (Reference 5). The updated 2017 ETE report was found to have been developed consistent with the guidance in NUREG/CR-7002, in accordance with 10 CFR Part 50, Appendix E.IV.3, in support of the removal of the additional areas within the EPZ

Subarea 24 and provides the basis for protective action recommendations consistent with 10 CFR 50.47(b)(10). The updated 2017 ETE report remains subject to future NRC inspection in its entirety.

#### *Emergency Alert Notification System Design Report Evaluation*

The licensee states that no sirens will be added or removed from the system, or otherwise altered. While sirens 24-E and 24-F are located within the area to be removed from the EPZ, their siren coverage will be maintained as both sirens provide overlapping coverage in the remaining area of Subarea 24 within the proposed DAEC Plume Exposure Pathway EPZ.

As there were no proposed changes made to the sirens located within the areas, the NRC staff concludes that the proposed changes continue to meet the requirements of 10 CFR 50.47(b)(5) to provide early notification and clear instructions to the populace within the plume exposure pathway EPZ.

#### *Emergency Dose Assessment and Protective Actions Recommendations*

The licensee states that there will be no change to PARs made by DAEC to offsite governmental officials due to this proposed plume exposure pathway EPZ boundary change. DAEC provides PARs during emergency events, which are typically based upon dose projections at the site boundary and at 2, 5, 10, and greater than 10 miles out from the plant. The DAEC dose projection methodology contains the ability to provide dose assessment from DAEC out to 50 miles. Therefore, the methodology for determination of PARs will not change. What will change, is that any PAR, which would impact Subarea 24 (i.e., evacuation or shelter in place), will apply to a smaller Subarea 24.

As the proposed changes do not alter the DAEC emergency dose assessment and PAR methodologies, the NRC staff concludes that the proposed changes continue to meet the requirements of Section 50.47(b)(9) and Section 50.47(b)(10) of 10 CFR and Appendix E Section IV.B.1 to 10 CFR Part 50 for adequate methods, systems, and equipment for assessing and monitoring actual or potential offsite consequences of a radiological emergency condition, and 10 CFR 50.47(b)(10) for a range of protective actions that have been developed for the plume exposure pathway EPZ for emergency workers and the public.

Based on the criteria above and the current support of the implementing governmental authority (Linn County) for the proposed DAEC Plume Exposure Pathway EPZ boundary change, as well as FEMA's evaluation that offsite REP plans will continue to provide reasonable assurance of public health and safety, the NRC staff finds that the proposed removal of the areas within the EPZ Subarea 24 is acceptable.

#### **4.0 STATE CONSULTATION**

In accordance with the Commission's regulations, the NRC staff notified the State of Iowa official of the proposed issuance of the amendment on July 27, 2017. The State official had no comments.

#### **5.0 ENVIRONMENTAL CONSIDERATIONS**

Pursuant to 10 CFR 51.21, 51.32, and 51.35, an environmental assessment and finding of no significant impact was published in the *Federal Register* on October 5, 2017 (82 FR 46541).

Accordingly, based upon the environmental assessment, the Commission has determined that issuance of this amendment will not have a significant effect on the quality of the human environment.

## 6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

## 7.0 REFERENCES

1. Curtland, D., NextEra Energy Duane Arnold, letter to U.S. Nuclear Regulatory Commission, "License Amendment Request (TSCR-165), Revision to Emergency Planning Zone in the Duane Arnold Energy Center Emergency Plan," dated March 31, 2017 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML17102B194).
2. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.101, Revision 2, "Emergency Planning and Preparedness for Nuclear Power Reactors," dated October 31, 1981 (ADAMS Accession No. ML090440294).
3. U.S. Nuclear Regulatory Commission and Federal Emergency Management Agency, NUREG-0654/FEMA-REP-1, Revision 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," dated November 1980 (ADAMS Accession No. ML040420012).
4. U.S. Nuclear Regulatory Commission, NUREG-0396, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants," dated December 1978 (ADAMS Accession No. ML051390356).
5. Sandia National Laboratories, NUREG/CR-7002, "Criteria for Development of Evacuation Time Estimate Studies," dated November 2011 (ADAMS Accession No. ML113010515).
6. Chawla, M., U.S. Nuclear Regulatory Commission, letter to NextEra Duane Arnold, LLC, "Summary of July 13, 2016, Pre-Application Teleconference with NextEra Energy Duane Arnold, LLC, for License Amendment Request for Change in Duane Arnold Energy Center Emergency Planning Zone Boundary Beyond 10 Mile Zone (CAC No. MF8014)," dated July 21, 2016 (ADAMS Accession No. ML16201A310).

7. KLD Engineering, P.C., "Duane Arnold Energy Center Development of Evacuation Time Estimates for Revised EPZ Boundary," Final Report, Revision 0, dated March 9, 2017 (ADAMS Accession No. ML17102B193).
8. KLD Engineering, P.C., "Duane Arnold Energy Center Development of Evacuation Time Estimates," dated December 2012 (ADAMS Accession No. ML13002A335).
9. U.S. Nuclear Regulatory Commission, Final Rule: "Enhancements to Emergency Preparedness Regulations" (10 CFR Part 50 and 10 CFR Part 52), published in the *Federal Register* on November 23, 2011 (76 FR 72560).

Principal Contributor: M. Norris, NSIR

Date: October 18, 2017

SUBJECT: DUANE ARNOLD ENERGY CENTER - ISSUANCE OF AMENDMENT TO  
 MODIFY THE PLUME EXPOSURE PATHWAY EMERGENCY PLANNING ZONE  
 BOUNDARY (CAC NO. MF9573) DATED OCTOBER 18, 2017

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**\*SE via memorandum**

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DATE	08/16/17	08/17/17	07/11/17	08/15/17
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DATE	10/10/17	10/11/17	10/18/17	10/18/17

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