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

March 10, 2021

Mr. Don Moul
Executive Vice President, Nuclear
Division, and Chief Nuclear Officer
Florida Power & Light Company
Mail Stop: EX/JB
700 Universe Boulevard
Juno Beach, FL 33408

SUBJECT: TRANSMITTAL OF FINAL DUANE ARNOLD ENERGY CENTER ACCIDENT SEQUENCE PRECURSOR REPORT (LICENSEE EVENT REPORT 331-2020-001-01)

Dear Mr. Moul:

By letter dated September 30, 2020 (Agencywide Documents Access and Management System [ADAMS] Accession No. ML20283A373), Duane Arnold Energy Center (DAEC) submitted licensee event report (LER) 331-2020-001, "Notice of Unusual Event and Unit Trip Due to Loss of Offsite Power Due to High Winds," to the U.S. Nuclear Regulatory Commission (NRC) staff pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.73, "Licensee Event Report System." The results of the NRC staff's accident sequence precursor (ASP) analysis are provided in the enclosure to this letter.

The preliminary DAEC ASP analysis resulted in a mean conditional core damage probability (CCDP) greater than or equal to 1×10^{-4} and, therefore, was transmitted to the licensee on December 15, 2020, to allow for a 60-day formal review in accordance with Regulatory Issue Summary 2006-24, "Revised Review and Transmittal Process for Accident Sequence Precursor Analyses." The licensee provided comments on February 9, 2021. These comments are summarized, along with the Office of Nuclear Regulatory Research (RES) responses, in Appendix D of the final ASP analysis report. A brief summary of the final DAEC ASP analysis, including the results, is provided below.

Loss of Offsite Power Caused by High Winds during Derecho. This event is documented in LER 331-2020-001 and NRC inspection report 05000331/2020003.

Executive Summary. On August 10, 2020, severe thunderstorms and high winds in the vicinity of DAEC caused a grid perturbation that resulted in an automatic start of both the emergency diesel generators (EDGs). The EDGs did not immediately energize their respective safety buses because offsite power remained available. However, approximately 14 minutes later, a loss of offsite power (LOOP) occurred that resulted in a reactor trip. The output breakers for both EDGs automatically closed to reenergize the safety buses. The licensee declared an Unusual Event. All control rods successfully inserted. Reactor inventory control was maintained by reactor core isolation cooling (RCIC) and the safety relief valves were used to remove decay heat to the torus.

The high winds resulted in minor damage to the reactor, turbine, and FLEX buildings, along with more severe damage to the nonsafety-related cooling towers. The licensee later determined that, although damaged, secondary containment remained functional throughout the event and, if challenged, would have prevented a radiological release to the environment. However, when tested, the vacuum drawn in secondary containment by the standby gas treatment system was slightly below the technical specification (TS) limit.

In addition, the high winds resulted in increased debris loading to the essential service water (ESW) system, which caused clogging of the train 'B' strainer and subsequent decrease of the ESW flow to 300 gpm to EDG 'B'. Operators successfully bypassed the strainer. The train 'A' strainer was also challenged due to debris during the event; however, the differential pressure across the strainer reached a maximum of 11 psid, which is below the limit of 15 psid and, therefore, did not require the strainer to be bypassed. Although the operators declared EDG 'B' inoperable according to TS, it did not experience any problems due to the use of unstrained ESW and ran successfully throughout the event. Operators restored offsite power to the safety buses approximately 25 hours after the LOOP occurred.

This ASP analysis reveals that the most likely core damage sequence is a weather-related LOOP initiating event and the subsequent (postulated) failure of both EDGs resulting in a station blackout (SBO), with the postulated failures of both high-pressure coolant injection and RCIC, as well as the inability of operators to recover alternating current power within 30 minutes. This accident sequence accounts for approximately 35 percent of the total CCDP for this event. Although the mean CCDP of 8×10^{-4} for this event was high, the risk of core damage was mitigated because defense-in-depth and plant-wide safety margins were maintained.

FLEX mitigation strategies were credited in this analysis and significantly affected the results. Specifically, removing the mitigation capabilities of the FLEX strategies would have resulted in a CCDP approximately a factor of 10 higher for this event. Throughout the NRC staff's review of this event, the analysis assumptions and results were systematically reviewed to identify necessary standardized plant analysis risk (SPAR) model changes that were implemented to realistically represent the event and expected plant response. In addition, analysis results were also used to identify key sources of uncertainty.

The overall risk for this event was significantly impacted by the SBO scenarios. The risk associated with the SBO scenarios is particularly high for this plant because DAEC has only two safety-related EDGs and the inability to crosstie safety-related buses from another unit as it is a single unit site.

Summary of Analysis Results. The final mean CCDP for this operational event is 8×10^{-4}.

If you have any questions regarding this analysis of the staff's conclusions, please contact me at 301-415-3178, or via email at Marlayna.Doell@nrc.gov.

Sincerely,

Marlayna Doell

Marlayna V. Doell, Project Manager
Reactor Decommissioning Branch
Division of Decommissioning, Uranium Recovery
and Waste Programs
Office of Nuclear Material Safety and Safeguards

Docket No.: 50-331

Enclosure:
Final Accident Sequence Precursor Analysis – Duane Arnold Energy Center, Loss of Offsite Power Caused by High Winds during Derecho (LER 331-2020-001) – Precursor

cc: Duane Arnold Listserv

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OFFICE	NMSS/DUWP/RDB/PM*	RES/DRA/PRB*	NMSS/DUWP/RDB/PM*
NAME	MDoell	CHunter	MDoell
DATE	3/8/2021	3/6/2021	3/10/2021

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ENCLOSURE

FINAL ACCIDENT SEQUENCE PRECURSOR ANALYSIS –
DUANE ARNOLD ENERGY CENTER, LOSS OF OFFSITE POWER CAUSED BY
HIGH WINDS DURING DERECHO (LER 331-2020-001) – PRECURSOR

NEXTERA ENERGY DUANE ARNOLD, LLC

DUANE ARNOLD ENERGY CENTER

DOCKET NO. 50-331