

#### **Duane Arnold Derecho**

**PFHA Research Workshop - 2022** 

Matthew Leech Reliability and Risk Analyst Office of Nuclear Reactor Regulation Division of Risk Assessment



## **Overview**



- ✓ Re-cap of the event and its risk significance
- ✓ Description of the LIC-504
- ✓ Risk Insights and Sharing the Operating Experience (OE)



# **Re-cap of the Event**

- A Loss of Offsite Power Occurred and was not restored for 23 hours
  - The plant scrammed offline and shutdown safely, power was provided by their EDGs until offsite power was restored
  - Cooling towers were destroyed (non-safety)
  - Transmission towers knocked down and damage occurred to a standby transformer in the switchyard – complicated offsite power recovery
  - One FLEX building was damaged, but equipment inside remained functional.
  - Secondary containment was damaged.
- Hours later ESW was challenged by debris clogging the strainers, one train of ESW and it's EDG was declared INOP but still functional

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#### Risk Significance of DAEC event – Why was the risk so high?

Single unit site without the ability to crosstie power from another unit

No Station Blackout diesel

It took about 24 hours to restore offsite power

Ultimate Heat Sink and Service Water Intake were vulnerable to debris generated by derecho

Another insight was that the risk was significantly improved due to FLEX.



## LIC-504

- The NRC's LIC-504 process is a risk-informed decisionmaking process that the NRC uses for emerging issues.
- One of the recommendations from regional feedback of the DAEC event was that the NRC should evaluate the event for any generic implications to the nuclear fleet.
  - Is there a population of plants that could have unacceptable risk?
  - -Are there risk insights that would be useful to share?
- The NRC decided to perform a LIC-504 in October of 2020.



#### The LIC-504 Analysis vs the ASP

ASP

Conducted by Office of Research focuses on examining the risk from the specific event for the Duane Arnold Plant. LIC-504

Conducted by the office of Nuclear Reactor Regulation (NRR) examined several plants by running a similar scenario to the one Duane Arnold experienced during the derecho and examining the risk results.

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## LIC-504 in Two Main Steps

- The first step of the LIC-504 analysis is to determine if the risk from the issue warrants any immediate action:
  - Do any plants need to be shutdown immediately?
  - Are there any immediate compensatory actions or orders that need to be issued?
- The second step involves a more detailed analysis to assess the risk and develop recommendations.
- It's also used to formally document how the NRC arrives at a decision.



#### **Getting Started with the LIC-504**

- To get started the NRC took a population of plants that had the same generic traits as DAEC.
  - Single unit sites
  - No station blackout diesels
  - Potentially vulnerable ultimate heat sinks\*
- Plants were chosen to gain a representative look at the overall fleet vulnerability to a similar derecho using the characteristics identified as being risk significant from the event at DAEC.
- First step concluded that there was no immediate safety issue.



#### **Second Step of the LIC-504**

- Eight different plants were chosen for the analysis.
- They were a representative population of plants: PWR Westinghouse, PWR Combustion Engineering, BWR4 plants, and a BWR6.
- They were evaluated for the same conditions present during the DAEC derecho:
  - A weather-related loss of offsite power that was not recoverable for 24 hours
  - Challenge to the ESW system



## Second Step of the LIC-504 (Cont.)

- The second analysis differs from the first in that it was a more detailed analysis and designed to increase accuracy and reduce conservatism.
  - Provided credit for FLEX actions and equipment
  - More scrutiny and detail looked at each plants service water modeling
  - Lessons learned from the DAEC ASP analysis was applied to this phase of the analysis.



#### LIC-504 Risk Insights

- When the risk analysis for the LIC-504 was completed some common plant design attributes were found to have an impact on plant risk.
  - Plants with extra diesel generators not dependent on service water cooling had significant benefit
  - Plants that had the ability to bypass a degraded strainer had improved risk
  - Some plants have alternate cooling strategies to their diesel generators in case ESW isn't available (like fire protection water for instance) and that helps risk
  - Plants that have ESW traveling screens on an emergency power source that will still be available during a loss of offsite power have improved risk
  - FLEX equipment and strategies, demonstrated a significant safety benefit from this type of event



#### **LIC-504 Follow Up Actions**

Held a public webinar with the industry to discuss the ASP, the LIC-504 and the results. Issued internal OE communication with more information, including updated risk insights from the LIC-504.

Issued an Information Notice to share the OE, the results of the ASP & the LIC-504 & share the risk insights with the industry.



#### **References and Contact Info**

- Duane Arnold Derecho ASP Analysis: ML21056A382
- The Duane Arnold Energy Center LIC-504 recommendations: <u>ML21078A127</u>
- Information Notice 2021-03: <u>ML21139A091</u>

Matthew Leech – Risk Analyst <u>Matthew.leech@nrc.gov</u> (301) 415-8312

