

## **Project Manager Final Integrated Plan Checklist for Orders EA-12-049 and EA-12-051 Safety Evaluations**

### **General**

- Clearly state which version of Nuclear Energy Institute (NEI) 12-06 is being used. The North Anna Power Station, Units 1 and 2 (North Anna) Final Integrated Plan (FIP) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15149A143) lists NEI 12-06, Rev. 0 in the references, but does not clearly state that NEI 12-06 Rev. 0 (or Rev. 2) is being committed to. Include a clear statement in the FIP or transmittal letter.

### **Characterization of External Hazards (safety evaluation (SE) Section 3.5)** (North Anna FIP Section 2.6)

Staff Conclusion: The NRC staff concludes that the licensee has developed a characterization of external hazards that is consistent with NEI 12-06 guidance, as endorsed by Japan Lessons-Learned Directorate (JLD) Interim Staff Guidance (ISG)JLD-ISG-2012-01 [**or state an alternative**], and should adequately address the requirements of the order in regard to the characterization of external hazards.

Information needed to support conclusion:

- Briefly describe the applicability of each hazard to the site and provide a brief summary of the bounding parameters of each hazard. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.
- For flooding, state if there are any ground water in-leakage concerns that will require using FLEX equipment to remove ground water. The McGuire Nuclear Station, Units 1 and 2- FIP (ADAMS Accession No. ML15343A010) addresses this satisfactorily.
- If crediting separation criteria to show protection from tornados, discuss it. The Grand Gulf Nuclear Station, Unit 1 (Grand Gulf) FIP (ADAMS Accession No. ML16145A523) addresses this satisfactorily.

### **Seismic (SE Section 3.5.1)** (North Anna FIP Section 2.6.1)

- Describe the licensing basis seismic hazard (the safe shutdown earthquake (SSE), as described in the seismic hazard screening report (SHSR) or Updated Final Safety Analysis Report (UFSAR); no need to describe the Operating-Basis Earthquake. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.

Flooding (SE Section 3.5.2) (North Anna FIP Section 2.6.2)

- Describe the licensing basis flooding hazard, including local intense precipitation. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.
- State if there are any ground water in-leakage concerns that will require using FLEX equipment to remove ground water (even just using a FLEX generator to power a plant sump pump). See SE Section 3.5 above.

High Winds (SE Section 3.5.3) (North Anna FIP Section 2.6.3)

- Describe the licensing basis high wind hazards (hurricane and tornado, including tornado missiles). The St. Lucie Plant, Units 1 and 2 (St. Lucie) FIP (ADAMS Accession No. ML15351A009) addresses this satisfactorily.
- If the tornado missile hazard analysis is based on separation, describe how the separation distance was determined on a site-specific basis (this will be discussed in SE Section 3.6). The Grand Gulf FIP (ADAMS Accession No. ML16145A523) addresses this satisfactorily.
- The screening for high wind hazards associated with hurricanes should be accomplished by comparing the site location to NEI 12-06, Figure 7-1 (Figure 3-1 of U.S. NRC, "Technical Basis for Regulatory Guidance on Design Basis Hurricane Wind Speeds for Nuclear Power Plants," NUREG/CR-7005, December, 2009); if the resulting frequency of recurrence of hurricanes with wind speeds in excess of 130 mph exceeds 1E-6 per year, the site should address hazards due to extreme high winds associated with hurricanes using the current licensing basis for hurricanes. The Grand Gulf FIP (ADAMS Accession No. ML16145A523) addresses this satisfactorily.
- The screening for high wind hazard associated with tornadoes should be accomplished by comparing the site location to NEI 12-06, Figure 7-2, from U.S. NRC, "Tornado Climatology of the Contiguous United States," NUREG/CR-4461, Rev. 2, February 2007; if the recommended tornado design wind speed for a 1E-6/year probability exceeds 130 mph, the site should address hazards due to extreme high winds associated with tornadoes using the current licensing basis for tornadoes or Regulatory Guide 1.76, Rev. 1. Provide the latitude and longitude of the site. The R. E. Ginna Nuclear Power Plant (Ginna) FIP (ADAMS Accession No. ML16006A050) addresses this satisfactorily.

Snow, Ice, and Extreme Cold (SE Section 3.5.4) (North Anna FIP Section 2.6.4)

- Describe the licensing basis for snow, ice, and low temperature hazard. Characterization of the hazard may include inches of snowfall, historical minimum temperature experienced on site, or the design-basis values from the UFSAR. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.
- Provide the latitude and longitude of the site and compare it to NEI 12-06, Figure 8-2. The Ginna FIP (ADAMS Accession No. ML16006A050) addresses this satisfactorily.

Extreme Heat (SE Section 3.5.5) (North Anna FIP Section 2.6.5)

- Describe the licensing basis for extreme heat. Characterization of the hazard may include historical maximum temperature experienced on site, or the design-basis values from the UFSAR. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.

**Planned Protection of FLEX Equipment (SE Section 3.6) (North Anna FIP Section 2.7)**

Staff Conclusion: Based on this evaluation, the NRC staff concludes that the licensee has developed guidance that, if implemented appropriately, should protect the FLEX equipment during a beyond-design-basis external event (BDBEE) consistent with NEI 12-06 guidance, as endorsed by JLD-ISG-2012-01[or state an alternative], and should adequately address the requirements of the order. Based on the number of portable FLEX pumps, FLEX DGs, and support equipment identified in the FIP and during the audit review, the NRC staff finds that, if implemented appropriately, the licensee's FLEX strategies include a sufficient number of portable FLEX pumps, FLEX DGs, and equipment for RCS makeup and boration, spent fuel pool (SFP) makeup, and maintaining containment consistent with the N+1 recommendation in Section 3.2.2.16 of NEI 12-06.

Information needed to support conclusion:

- Describe the protection strategy for all FLEX equipment. Include specifics regarding each hazard. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.
- If using a FLEX storage building, describe the criterion it is designed for as it relates to FLEX (be specific for each hazard regarding the overall design criteria, especially seismic and high winds/missiles). The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.
- If seismic design is in accordance with American Society of Civil Engineers E 7-10, demonstrate why the FLEX equipment will remain deployable following the appropriate seismic event. The Grand Gulf FIP (ADAMS Accession No. ML16145A523) addresses this satisfactorily. Potential justification includes:
  - Evaluate the building to the appropriate hazard (SSE or reevaluated seismic hazard GMRS) and demonstrate acceptable performance to support the strategies.
  - Sites of overall low seismicity may be able to show that, compared to the SSE, there is another load case (most likely extreme wind loading) which governs the building design.
  - Sites which rely heavily on pre-staged FLEX equipment in other protected buildings may be able to show that the equipment stored in the FLEX building is not essential for the strategies to succeed following a seismic event.

- Also, state whether the potential for soil liquefaction at the building location has been evaluated if the soil conditions are different from the evaluation performed for the original site construction. The Donald C. Cook Nuclear Plant, Units 1 and 2 (DC Cook) FIP (ADAMS Accession No. ML15280A023) addresses this satisfactorily.
- For the storage building identify whether the doors can be opened upon a loss of site ac power and whether the equipment inside is restrained, as appropriate, for seismic interactions. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily
- If equipment is pre-installed or stored in an existing building explain how it remains deployable for all applicable hazards. The Ginna FIP (ADAMS Accession No. ML16006A050) addresses this satisfactorily.
- Identify, by name, what major pieces of FLEX equipment are stored in the FLEX building(s) and/or any alternate location(s). The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.

Reliability of FLEX Equipment (SE Section 3.6.2) (North Anna FIP Section 2.18.6)

- Describe the FLEX equipment that will receive protection with detail sufficient to conclude that the N+1 criteria is met, or describe any alternatives with justification. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.

**Planned Deployment of FLEX Equipment (SE Section 3.7) (North Anna FIP Section 2.8)**

Staff Conclusion: The NRC staff concludes that the licensee has developed guidance that, if implemented appropriately, should allow deploying the FLEX equipment following a BDBEE consistent with NEI 12-06 guidance, as endorsed by JLD-ISG-2012-01 [**or state an alternative**], and should adequately address the requirements of the order.

Information needed to support conclusion:

- Describe the plans for deployment of FLEX equipment from the FLEX storage locations following a BDBEE. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily, though more figure clarity would be helpful.
- Discuss the vehicles used to deploy FLEX equipment and to clear the paths. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.
- Discuss removal of debris or snow from the transport path. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.
- Discuss the impact of flooding or soil liquefaction on transport paths. The DC Cook FIP (ADAMS Accession No. ML15280A023) addresses this satisfactorily.

- Discuss how the FLEX pumps/hoses will be positioned to get water from the ultimate heat sink (UHS). The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.
- Discuss the strategy to access the UHS through ice or frazil ice. The DC Cook FIP (ADAMS Accession No. ML15280A023) addresses this satisfactorily.

Discuss the mechanical connection points for FLEX equipment and how access is available through seismically robust structures and is not affected by flooding. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.

- Discuss the electrical connection points for FLEX equipment and how access is available through seismically robust structures and is not affected by flooding. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.

#### Accessibility and Lighting (SE Section 3.7.4) (North Anna FIP Section 2.13)

- Discuss the results of the lighting assessment conducted to determine lighting necessary to support the FLEX strategies. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.
- Describe the lighting expected to be available for BDBEE conditions (fixed or portable). The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.
- As applicable, also discuss portable light fixtures stored in the FLEX storage facility, or light fixtures located on the FLEX pumps and generators. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.

#### Access to Protected and Vital Areas (SE Section 3.7.5) (North Anna FIP Section 2.8.2)

- Provide a short description of how operators will be able to access areas of the plant needed for the strategy that may normally require alternating current (ac) power for access. However, avoid including detail that would be considered security-related information, where possible. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.
- State how vehicular access to the protected area is accomplished without ac power. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.

**Considerations in Using Offsite Resources (SE Section 3.8)** (North Anna FIP Section 2.10)

Staff Conclusion: The NRC staff concludes that the licensee has developed guidance that, if implemented appropriately, should allow utilization of offsite resources following a BDBEE consistent with NEI 12-06 guidance, as endorsed by JLD-ISG-2012-01 [**or state an alternative**], and should adequately address the requirements of the order.

Information needed to support conclusion:

- State that a Strategic Alliance of FLEX Emergency Response (SAFER) Plan has been developed and implemented. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.
- Describe the location and deployment strategies for the applicable staging areas. The DC Cook FIP (ADAMS Accession No. ML15280A023) addresses this satisfactorily.
- Identify whether flooding or seismic events have been considered in the receipt of offsite resources. The DC Cook FIP (ADAMS Accession No. ML15280A023) addresses this satisfactorily.
- Discuss the use of helicopters as applicable in the plan. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.
- Ensure that the latest SAFER Plan is available for review on the eportal. North Anna has the latest SAFER plan on the eportal.

**Shutdown and Refueling Analyses (SE Section 3.11)** (North Anna FIP Section 2.16)

Staff Conclusion: Based on the licensee's incorporation of the use of FLEX equipment in the shutdown risk process and procedures, the NRC staff concludes that the licensee has developed guidance that if implemented appropriately should maintain or restore core cooling, SFP cooling, and containment following a BDBEE in shutdown and refueling modes consistent with NEI 12-06 guidance, as endorsed by JLD-ISG-2012-01 [**or state an alternative**], and should adequately address the requirements of the order.

Information needed to support conclusion:

- Identify whether the NRC-approved Shutdown Risk White paper is being incorporated into the FLEX program (ADAMS Accession Nos. ML13273A514 and ML13267A382, respectively). The North Anna FIP (ML15149A143) addresses this satisfactorily.
- Include a short description of how that will be achieved at the site. North Anna has a good overall discussion, but no mention of shutdown risk procedure enhancements for FLEX (a key aspect of the white paper). The DC Cook FIP (ADAMS Accession No. ML15280A023) addresses this satisfactorily.

- Discuss the analysis which shows that following a full core offload to the SFP, how many hours are available to implement makeup before boil-off results in the water level in the SFP dropping far enough to uncover fuel assemblies. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.

**Procedures and Training (SE Section 3.12)** (North Anna FIP Sections 2.18.2 and 2.18.4)

Staff Conclusion: The NRC staff finds that the licensee has adequately addressed the procedures and training associated with FLEX. The procedures have been issued in accordance with NEI 12-06, Section 11.4, and a training program has been established and will be maintained in accordance with NEI 12-06, Section 11.6.

Information needed to support conclusion:

**Procedures (SE Section 3.12)** (North Anna FIP Section 2.18.2)

- Discuss how the operators will initiate use of the FSGs and how the FSGs interface with the plant procedure for loss of all ac power. The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.
- Discuss how plant procedures have been revised to respond to BDBEEs, including procedures that direct actions for expected flooding or hurricanes. The North Anna FIP looks adequate, but they are not crediting warning time, which is where we need this detail. The St. Lucie FIP (ADAMS Accession No. ML15351A009) addresses this satisfactorily.

**Training (SE Section 3.12.2)** (North Anna FIP Section 2.18.4)

- Describe the FLEX program training for plant groups such as the Emergency Response Organization (ERO), Security, Operations, Engineering, Mechanical Maintenance, and Electrical Maintenance. If utilized, include a statement that the training plan development was done in accordance with licensee procedures using the Systematic Approach to Training (SAT). The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.

**Maintenance and Testing of FLEX Equipment (SE Section 3.13)** (North Anna FIP Section 2.18.7)

Staff Conclusion: The NRC staff finds that the licensee has adequately addressed equipment maintenance and testing activities associated with FLEX equipment because a maintenance and testing program has been established in accordance with NEI 12-06, Section 11.5.

Information needed to support conclusion:

- Identify whether the plan includes the incorporation of the provisions of NEI letter to the NRC dated October 3, 2013, which included Electric Power Resource Institute Technical Report 3002000623, as endorsed by NRC letter dated October 7, 2013



(ADAMS Accession No. ML13276A224). The North Anna FIP (ADAMS Accession No. ML15149A143) addresses this satisfactorily.

**Alternatives to NEI 12-06 (SE Section 3.14)** (North Anna FIP Supplemental Letter ADAMS Accession No. [ML15194A060](#))

Staff Conclusion: In conclusion, the NRC staff finds that although the guidance of NEI 12-06 has not been met, if these alternatives are implemented as described by the licensee, they will meet the requirements of the order.

Information needed to support conclusion:

- Provide a listing of alternatives to NEI 12-06 along with a justification, if not provided elsewhere. It would be helpful to provide a comprehensive list in one location in the FIP. This section will vary based on which endorsed version of NEI 12-06 the FIP is written against. The Ginna FIP (ADAMS Accession No. ML16006A050) addresses this satisfactorily.
- If no alternatives to the revision of NEI 12-06 utilized, explicitly state this in the FIP.

The most frequent alternatives to NEI 12-06, Rev. 0, have been:

1. Not having a full N+1 set of hoses and cables (see ADAMS Accession No. ML15125A442).
2. Not having all three methods of adding water to each SFP (directly by hose; through a system pipe; and by spraying at least 250 gpm).
3. Not having two independent flow paths for the FLEX pump to provide core cooling, with at least one path in seismically robust structures.
4. Not having two independent ways of powering necessary equipment from the FLEX generators, with at least one path in seismically robust structures.
5. Having permanently installed FLEX equipment instead of portable.
6. Storing N+1 equipment in a non-robust building.
7. Not having a robust source of water at all times for core cooling and SFP makeup (taking credit for separation of tanks for tornado missile protection is an alternative).