SAFETY EVALUATION REPORT BY THE

OFFICE OF NUCLEAR SECURITY AND INCIDENT RESPONSE

RELATED TO ZION NUCLEAR POWER STATION, UNITS 1 AND 2

DEFUELED STATION EMERGENCY PLAN LICENSE AMENDMENT

DOCKET NOS. 50-295, 50-304 and 72-1037

1. INTRODUCTION

Zion*Solutions*, LLC (Zion*Solutions,* the licensee) is the holder of Facility Operating License Nos. DPR-39 and DPR-48, which authorize the licensee to possess and store spent nuclear fuel and greater-than-class C (GTCC) radioactive waste at the Zion Nuclear Power Station (ZNPS), Units 1 and 2. The license, pursuant to the Atomic Energy Act of 1954 and Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, allows ZNPS to possess spent nuclear fuel at the permanently shutdown and defueled ZNPS facility. In a letter dated April 13, 1999 (Reference 1), ZNPS informed the U.S. Nuclear Regulatory Commission (NRC) that ZNPS had permanently ceased power operations, transferred fuel from the reactor to the spent fuel pool (SFP), and began to develop detailed plans to decommission the facility.

By letter dated January 7, 2016 (Reference 2), and as supplemented by letters dated June 22, 2016 (Reference 3), and December 1, 2016 (Reference 17), Zion*Solutions* proposed changes to the ZNPS Defueled Station Emergency Plan (DSEP) and Permanently Defueled Emergency Action Level (EAL) Bases Document to reflect all spent fuel being transferred to an independent spent fuel storage installation (ISFSI) at the site. The new emergency plan would be titled, “Zion Station ISFSI Emergency Plan” (ZS ISFSI EP)

Zion*Solutions* provided a draft Revision 0 to the ZS ISFSI EP for the staff’s review in letter dated January 7, 2016 (Reference 2) and based on staff’s review, it was later revised in letter dated June 22, 2016 (Reference 3). The major changes from the current ZNPS DSEP to the draft Revision 0 to the ZS ISFSI EP in Zion*Solutions*’ request are: removal of non-ISFSI related emergency event types; transfer responsibility for implementing the emergency plan to ISFSI Management, a revision to the emergency response organization (ERO) to reflect a potential event impacting spent fuel stored in ISFSI at the site, and the revision of EALs for the permanently defueled nuclear power plant to reflect the removal of spent fuel from the SFP to an onsite ISFSI.

The supplements dated June 22, 2016, and December 1, 2016, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the Nuclear Regulatory Commission (NRC or the Commission) staff’s original proposed no significant hazards consideration determination as published in the Federal Register (FR) on March 1, 2016 (81 FR 10683).

2. REGULATORY EVALUATION

This safety evaluation addresses the impact of the proposed changes from the current ZNPS DSEP to Revision 0 of the ZS ISFSI EP. The regulatory requirements, as exempted and guidance on which the NRC based its acceptance are as follows:

2.1 Regulations

- 10 CFR 50.47(b)(1) states, in part: "... each principal response organization has staff to respond and to augment its initial response on a continuous basis;"

- 10 CFR 50.47(b)(2) states, in part: "... adequate staffing to provide initial facility accident response in key functional areas is maintained at all times, timely augmentation of response capabilities is available ...;"

- 10 CFR 50.47(b)(4) states, in part: "A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee…;"

- 10 CFR 50, Appendix E, Section IV, Part A, "Organization," states, in part: "The organization for coping with radiological emergencies shall be described, including definition of authorities, responsibilities, and duties of individuals assigned to the licensee's emergency organization…;"

- 10 CFR 72.32(a)(3) states: "A classification system for classifying accidents as 'Alerts';" and

- 10 CFR 72.32(a)(7) states, in part: "A brief description of the responsibilities of licensee personnel should an accident occur…."

2.2 Guidance

- Revision 1 to NUREG-0654/FEMA-REP-1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants" (Reference 4), provides a common reference and guidance source for nuclear facility licenses to develop radiological emergency response plans.

- Office of Nuclear Security and Incident Response/Division of Preparedness and Response (NSIR/DPR) Interim Staff Guidance (ISG) – 2, "Emergency Planning Exemption Requests for Decommissioning Nuclear Power Plants" (Reference 5), provides guidance for the review of permanently defueled emergency plans for power reactor sites undergoing decommissioning.

- Office of Nuclear Materials Safety and Safeguards/Spent Fuel Project Office (NMSS/SFPO) ISG – 16, "Emergency Planning" (Reference 6), provides emergency plan review guidance applicable to facilities licensed pursuant to the regulatory requirements found at 10 CFR Part 72.

- Nuclear Energy Institute (NEI) document NEI 99-01, Revision 6, "Development of Emergency Action Levels for Non-Passive Reactors" (Reference 7), endorsed by the NRC in a letter dated March 28, 2013 (Reference 8), as generic (non-plant-specific) EAL scheme development guidance.

3. TECHNICAL EVALUATION

The NRC staff has reviewed the licensee's regulatory and technical analyses in support of its proposed changes from the current ZNPS DSEP to Revision 0 of the ZS ISFSI EP, as described in Zion*Solutions*' license amendment request and subsequent letter. The staff's technical evaluation is detailed below.

3.1 Background

In a letter dated April 13, 1999 (Reference 1), Commonwealth Edison Company (ComEd), the former licensee, informed the NRC that ZNPS had permanently ceased power operations, removed fuel from the reactor to the SFP, and began to develop detailed plans to decommission the facility. ComEd also requested approval of a DSEP and an exemption from certain regulations in 10 CFR 50.47, "Emergency plans," for ZNPS. In a letter dated August 31, 1999 (Reference 9), the NRC approved the DSEP for ZNPS and issued an exemption from certain requirements of 10 CFR Part 50 for ZNPS to discontinue offsite emergency planning activities and to reduce the scope of onsite emergency planning. The staff concluded that an exemption was acceptable in view of the greatly reduced offsite radiological consequences associated with the permanently shut down and defueled condition of the facility. The staff found that the postulated dose to the general public from any reasonably conceivable accident would not exceed the U.S. Environmental Protection Agency (EPA) Protective Action Guides (PAGs) beyond the ISFSI Controlled Area Boundary.

On November 23, 2011, the NRC issued a final rule (76 Federal Register (FR) 72560) (EP Final Rule) modifying or adding certain emergency planning requirements in Section 50.47, Section 50.54, "Conditions of licenses," and Appendix E to Part 50, "Emergency Planning and Preparedness for Production and Utilization Facilities." The EP Final Rule imposed these new and revised requirements on all Part 50 licensed facilities, including those which had submitted written certifications under 10 CFR 50.82, "Termination of license," of the permanent cessation of operation and removal of fuel from the reactor vessel. On June 20, 2012 (Reference 10), Zion*Solutions,* the current licensee*,* submitted a request for exemption from the requirements in the EP Final Rule. In a letter dated March 30, 2015 (Reference 11), the NRC issued exemptions from certain emergency planning requirements associated with the EP Final Rule to Zion*Solutions*. The NRC based these exemptions in large part on the findings supporting the August 31, 1999, exemptions, in particular, the low likelihood of any credible accident resulting in radiological releases requiring offsite protective measures.

In a letter dated May 27, 2014 (Reference 12), Zion*Solutions* requested exemption from certain standards of 10 CFR 50.47 and specific requirements of Appendix E to 10 CFR Part 50 for the ZNPS DSEP. The exemptions were based on alignment with new NRC guidance for review of exemptions for decommissioning reactors in final development (NSIR/DPR-ISG-02) and recently approved exemptions at other sites undergoing decommissioning. The May 27, 2014 submission also included Revision 16 of the DSEP for NRC approval.

Revision 16 of the DSEP was approved on May 14, 2015 (Reference 13). In a letter dated July 20, 2015 (Reference 14), the NRC approved the exemption request.

In a letter dated January 12, 2015 (Reference 15), Zion*Solutions* notified the NRC that as of that date, all of the spent fuel at the ZNPS had been transferred to the ISFSI at the site.

The current ZNPS DSEP continues to meet the emergency planning requirements contained in 10 CFR Part 50 applicable to the permanently shut down and defueled facility.

3.2 Proposed Changes

The major changes from the current ZNPS DSEP to the proposed Revision 0 to the ZS ISFSI EP include: removal of non-ISFSI related emergency event types; transfer responsibility for implementing the emergency plan to ISFSI Management, a revision to the ERO to reflect a potential event impacting spent fuel stored in ISFSI at the site, and removal of EALs for the permanently defueled nuclear power plant to reflect the removal of spent fuel from the SFP to an onsite ISFSI.

3.3 Evaluation

The staff reviewed the changes from the current ZNPS DSEP to the proposed Revision 0 to the ZS ISFSI EP, including the licensee's evaluation of the changes, to verify that the emergency plan, as changed, continues to meet the standards contained in 10 CFR 47(b) and the requirements of Appendix E to 10 CFR Part 50, as exempted, applicable to the approved 10 CFR Part 50 emergency plan for the long-term defueled conditions. A review was also performed to ensure the revised emergency plan would be consistent with the requirements of 10 CFR Part 72.32, "Emergency Plan," for an ISFSI not located on the site of an operating nuclear power reactor.

3.3.1 *Removal of emergency actions not related to the ISFSI*

The emergencies addressed in the proposed ZS ISFSI EP are related to only the dry cask storage of spent nuclear fuel at the onsite ISFSI, which includes off-normal, accident, natural phenomena and hypothetical events, and consequences as presented in the NAC International Modular, Advanced Generation, Nuclear All-purpose Storage System Final Safety Analysis Report (MAGNASTOR FSAR) (Reference 16).

The proposed ZS ISFSI EP provides that the licensee's analyses of the radiological impact of potential accidents at the ISFSI conclude that any releases beyond the ISFSI Controlled Area Boundary are expected to be less than the EPA PAG exposure levels. The Controlled Area, as defined in 10 CFR 72.3, "Definitions," means the area immediately surrounding an ISFSI for which the licensee exercises authority over its use and within which ISFSI operations are performed.

Zion*Solutions*' provides that with the completion of all major decommissioning activities at the ZNPS, the bounding accident described in the ZNPS Defueled Safety Analysis Report Chapter 5, "Accident Analysis," which postulates the failure of a High Integrity Container containing dewatered radioactive demineralizer resin generated during decommissioning activities, was removed from the proposed ZS ISFSI EP.

The initiation conditions (ICs) for emergency classification listed in the table below are being deleted from the currently approved DSEP and EAL Basis Document for the ZNPS. The ICs being deleted are associated only with a decommissioning nuclear power plant site with spent fuel stored in the SFP and are no longer applicable to ZNPS due to the advanced state of decommissioning in which spent fuel has been removed from the SFP to the onsite ISFSI.

INITIATION CONDITIONS TO BE DELETED	
ALERT	UNUSUAL EVENT
PD-AA1 Station release of airborne radioactivity to the environment greater than 200 times the ODCM/RETS for ≥ 15 minutes	PD-AU1 Station release of airborne radioactivity to the environment greater than 2 times the ODCM/RETS for greater than 2 times the ODCM/RETS for 60 minutes or longer
	PD-AU2 UNPLANNED Rise in Radiation Levels
PD-HA3 Other conditions exist which in the judgement of the Emergency Director warrant declaration of an ALERT	PD-HU3 Other conditions exist which in the judgement of the Emergency Director warrant declaration of an UNUSUAL EVENT

The following ICs being retained are consistent with the NRC endorsed guidance for the onsite ISFSI-Only storage of the spent fuel as described in Section 1.3 and Section 8 of NEI 99-01, Revision 6. ICs associated with the ISFSI remain unchanged from those previously approved by the NRC staff.

INITIATION CONDITION RETAINED FOR ONSITE ISFSI
ALERT
E-HU1, Damage to a loaded cask CONFINEMENT BOUNDARY
PD-HU1, Confirmed SECURITY CONDITION or threat
PD-HU3, Other conditions exist which in the judgment of the Emergency Director warrant declaration of an ALERT at the ISFSI

Because of the very low risk of consequences to public health and safety resulting from the postulated accidents related to the ZNPS ISFSI, no potential emergencies are classified as higher than an Alert, in accordance with the requirements of 10 CFR Part 50, Appendix E, Section IV.C.1, as exempted. Classification of emergencies as no higher than an Alert also maintains consistency with the regulations in 10 CFR 72.32(3), “Classification of Accidents.”

Based on the staff’s review of the ZS ISFSI EP and EAL Basis Document as described above, the staff concludes that the planning standard of 10 CFR 50.47(b)(4), as exempted, related to the emergency classification system for emergency response is addressed in an acceptable manner, considering the permanently shut down and defueled status of the facility and the relocation of the spent fuel to the ISFSI.

3.3.2 *Revised emergency response organization*

The Defueled ERO has been renamed simply the Emergency Response Organization (ERO). The On-Shift ERO consists of the ISFSI Shift Supervisor (ISS), acting as the Emergency Director. The position of the On-Shift Radiation Technician has been deleted from the on shift ERO, and the Radiation Protection Director has been eliminated as part of minimum staffing for the augmented ERO. Radiological support for the Emergency Director is still expected to be available within four hours of the augmented ERO being activated. The Emergency Director has no additional actions or responsibilities due to the elimination of these positions.

The Emergency Director may elect to utilize any employees or contract personnel that may be on site at the time of the emergency with the exception of ISFSI personnel, unless the emergency involves an ISFSI Security Contingency Event.

For an "Alert" emergency classification involving radiological consequences, or at the discretion of the Emergency Director, on-call support personnel are notified and expected to be able to provide support to the Emergency Director within four hours of activation of the augmented ERO. The augmenting personnel may provide support to the Emergency Director to assess radiological conditions, provide technical support, support maintenance and repair activities, develop plans to implement corrective actions, and assist with recovery actions.

Based on the staff's review of the ZS ISFSI EP as described above, the staff concludes that the planning standard of 10 CFR 50.47(b)(2) pertaining to the onsite emergency organization for emergency response is addressed in an acceptable manner, considering the permanently shut down and defueled status of the facility and the relocation of the spent fuel to the ISFSI.

3.3.3 *Elimination of the Technical Support Center*

3.3.4 The proposed ZS ISFSI EP deletes the reference to an optional Elimination of the Technical Support Center (TSC) mentioned in the current DSEP. Due to the small staff expected to respond to accidents requiring emergency classification, a TSC is not required for an ISFSI. The requirement for Zion*Solutions*' to have a TSC was removed in an exemption dated July 20, 2015 (Reference 14).

Emergency conditions would be managed by the Emergency Director at the Emergency Response Facility (ERF), currently designated as the ISFSI Monitoring Building. The licensee states that the ERF provides sufficient space to accommodate personnel and has communications systems and other necessary equipment, including first aid supplies.

Based on the staff's review of the ZS ISFSI EP as described above, the staff concludes that the planning standard of 10 CFR 50.47(b)(8), as exempted, pertaining to the emergency facilities and equipment for emergency response is addressed in an acceptable manner, considering the permanently shut down and defueled status of the facility and the relocation of the spent fuel to the ISFSI.

3.3.4 *Designation of Responsibility for Maintaining Emergency Preparedness*

The proposed ZS ISFSI EP designates the ISFSI Manager as the individual with the responsibility for maintaining emergency preparedness, including the development and maintenance of the emergency plan and it's implementing procedures. The current ZNPS DSEP states that the Emergency Preparedness Manager has overall responsibility for maintaining emergency preparedness, and is responsible for listed tasks including the development and maintenance of the emergency plan, and supporting implementing procedures.

No responsibilities or tasks have been eliminated by these changes. The ZS ISFSI EP continues to describe training for the Zion*Solutions* personnel with responsibility for maintaining emergency preparedness.

Based on the staff's review of the ZS ISFSI EP as described above, the staff concludes that the planning standard of 10 CFR 50.47(b)(16) pertaining to the emergency plan development and review is addressed in an acceptable manner considering the permanently shut down and defueled status of the facility and the relocation of the spent fuel to the ISFSI.

4.0 ENVIRONMENTAL CONSIDERATION

As required by section 51.21 of Title 10 of the *Code of Federal Regulations* (10 CFR), the NRC performed an environmental assessment with respect to the proposed license amendment. The NRC determined that the proposed action will not have a significant effect on the quality of the human environment because amending the licenses to revise the ZNPS Defueled Station Emergency Plan to reflect the transfer of all spent nuclear fuel to a dry cask independent spent fuel storage installation (ISFSI) will not result in any significant radiological or non-radiological environmental impacts. Accordingly, on the basis of the environmental assessment the NRC has determined that a finding of no significant impact is appropriate. Based on that determination, no environmental impact statement is required for the proposed action. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration (81 FR 10683; March 1, 2016), and there has been no public comment on such finding.

5.0 STATE CONSULTATION

On October 6, 2016, the staff consulted with the Illinois State official, Ms. Kay Foster, regarding the proposed change to the ZNPS Defueled Station Emergency Plan to reflect the transfer of all spent nuclear fuel to a dry cask ISFSI. The state official had no comments on the amendment.

6.0 CONCLUSION

The NRC staff finds that the proposed Revision 0 of the ZS ISFSI EP meets the standards in 10 CFR 50.47(b) and the requirements in Appendix E of 10 CFR Part 50, as exempted, and will continue to provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. In addition, the staff concludes that the revised emergency plan is consistent with the emergency planning requirements contained in 10 CFR 72.32(a) for an ISFSI not located on the site of an operating reactor. Therefore, the NRC staff concludes that Revision 0 to the ZS ISFSI EP, proposed in the licensee's letter dated June 22, 2016, is acceptable.

7.0 REFERENCES

1. Letter from Zion Nuclear Power Station to U.S. Nuclear Regulatory Commission, "Request for Approval of Defuel Station Emergency Plan and Exemption from Certain Sections of 10 CFR 50.47, 'Emergency Plans,' for the Zion Nuclear Power Station," dated April 13, 1999, (Agencywide Documents Access and Management System (ADAMS) Legacy No. 9904220148).

2. Letter from Zion*Solutions*, LLC to U.S. Nuclear Regulatory Commission, "Zion, Units 1 and 2-License Amendment Request for Proposed Revision to the Defueled Station Emergency Plan" dated January 7, 2016 (ADAMS Accession No. ML16008B080).

3. Letter from Zion*Solutions*, LLC to U.S. Nuclear Regulatory Commission "Zion Nuclear Power Station Units 1 and 2-Response to Request for Additional Information for Proposed Revision to Defueled Station Emergency Plan," dated June 22, 2016 (ADAMS Accession No. ML16176A208),

4. U.S. Nuclear Regulatory Commission and Federal Emergency Management Agency, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," NUREG-0654/FEMA-REP-1, dated November 1980 (ADAMS Accession No. ML040420012).

5. U.S. Nuclear Regulatory Commission NSIR/DPR-ISG-02, Interim Staff Guidance "Emergency Planning Exemption Requests for Decommissioning Nuclear Power Plants," dated May 2015 (ADAMS Accession No. ML14106A057).

6. U.S. Nuclear Regulatory Commission Spent Fuel Project Office Interim Staff Guidance – 16, "Emergency Planning," dated June 14, 2000 (ADAMS Accession No. ML003724570).

7. Nuclear Energy Institute (NEI) 99-01, Revision 6, "Methodology for Development of Emergency Action Levels," November 2012 (ADAMS Accession No. ML12326A805).

8. Letter from U.S. Nuclear Regulatory Commission to the Nuclear Energy Institute, "Technical Evaluation for the Endorsement of NEI 99-01, Revision 6," dated March 28, 2013 (ADAMS Accession No. ML12346A463).

9. Letter from U.S. Nuclear Regulatory Commission to Zion Nuclear Power Station, "Request for Approval of Defueled Station Emergency Plan and Exemption from Certain Requirements of 10 CFR 50.47, 'Emergency Plans' – Zion Nuclear Power Station, Unit Nos. 1 and 2 (TAC Nos. MA5253 and MA5254)," dated August 31, 1999 (ADAMS Legacy No. 9909070087).

10. Letter from Zion Nuclear Power Station to U.S. Nuclear Regulatory Commission, "Request for Exemption to Revised Emergency Planning Rule," dated June 20, 2012 (ADAMS Accession No. ML12173A316).

11. Letter from U.S. Nuclear Regulatory Commission to J. Sauger Zion Nuclear Power Station, Units 1 and 2, "Request for Exemption from Certain Requirements of the Final Rule for Enhancements to Emergency Preparedness Regulations (TAC Nos J00439 and J00440)," dated March 30, 2015 (ADAMS Accession No. ML14272A310).

12. Letter from Zion Nuclear Power Station to U.S. Nuclear Regulatory Commission, "License Amendment Request for Proposed Revision to Defueled Station Emergency Plan and Request for Exemption from Certain Requirements of 10 CFR 50.47, and 10 CFR 50, Appendix E," dated May 27, 2014 (ADAMS Accession No. ML14148A295).

13. Letter from U.S. Nuclear Regulatory Commission to Zion Nuclear Power Station, Units 1 and 2 "Safety Evaluation Report for Defueled Station Emergency Plan License Amendments for Zion Units 1 and 2," dated May 14,2015 (ADAMS Accession No. ML15092A423).

14. Letter from U.S. Nuclear Regulatory Commission to Zion Nuclear Power Station, Units 1 and 2, "Request for Exemption from Emergency Preparedness Requirements (TAC Nos. J52992 and J52993)," dated July 20, 2015 (ADAMS Accession No. ML15140A534).

15. Letter from Zion*Solutions*, LLC to U.S. Nuclear Regulatory Commission, "Request to Rescind NRC Orders," dated January 12, 2015 (ADAMS Accession No. ML15014A062).

16. Letter from U.S. Nuclear Regulatory Commission to A.L. Patko Re: "Certificate of Compliance No. 1031 for the NAC International, Inc. Magnastor Cask System," dated February 4, 2009, (ADAMS Accession No. ML090350509).

17. Letter from Zion*Solutions*, LLC to U.S. Nuclear Regulatory Commission, "Request for Issueance of Zion Nuclear Power Station Emergency Plan" dated December 1, 2016 (ADAMS Accession No. ML16337A357).

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