

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
WASHINGTON, DC 20555-0001

NRC GENERIC LETTER 20xx-xx: TREATMENT OF NATURAL PHENOMENA HAZARDS
IN FUEL CYCLE FACILITIES

ADDRESSEES

All holders of and applicants for a specific source material license or construction permit for large quantities of uranium hexafluoride under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 40, "Domestic Licensing of Source Material."

All holders of and applicants for a fuel cycle facility license or construction permit subject to Subpart H of 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material."

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this letter for two purposes:

- (1) to request addressees to submit information to demonstrate if compliance is being maintained with the regulatory requirements and applicable license conditions regarding the treatment of natural phenomena events in the facilities' safety assessments; and
- (2) to determine if additional NRC regulatory action is necessary to ensure that licensees are in compliance with their current licensing basis and existing NRC regulations.

Under 10 CFR 40.31(b) and 10 CFR 70.22(d), addressees are required to submit a written response to this generic letter (GL). No other action is required under this GL.

BACKGROUND

On March 11, 2011, the Tohoku–Taiheiyou–Oki earthquake occurred near the east coast of Honshu, Japan. This magnitude 9.0 earthquake and the subsequent tsunami caused significant damage to at least four of the six units of the Fukushima Dai-ichi nuclear power station and, as a result, there was a loss of offsite and onsite electrical power systems.

On March 23, 2011, the Chairman, via Tasking Memorandum – COMGBJ-11-0002, "NRC Actions Following the Events in Japan," directed the NRC's Executive Director for Operations to establish the NRC Near-Term Task Force (NTTF) to evaluate available technical and operational information from the events in Japan following the March 11, 2011, earthquake and tsunami at the Fukushima Daiichi nuclear power station. The NTTF was tasked to consider lessons learned from the event and to develop recommendations to improve the regulatory systems for reactors in the United States and their applicability to NRC licensed facilities other than power reactors.

On March 31, 2011, the NRC staff issued Information Notice (IN) 2011-08, "Tohoku–Taiheiyou–Oki Earthquake Effects on Japanese Nuclear Power Plants—for Fuel Cycle Facilities,"

(Agencywide Documents Access and Management System (ADAMS) Accession No. ML110830824) to inform addressees of the potential challenges associated with preventing or mitigating the effects of natural phenomena events. IN 2011-08 recommended that addressees review the information for applicability to their facilities and consider actions, as appropriate, to ensure that features and preparations necessary to withstand or respond to severe external events from natural phenomena (e.g., earthquakes, tsunamis, floods, tornadoes, and hurricanes) are reasonable and consistent with regulatory requirements.

On July 12, 2011, in light of the accident at the Fukushima Dai-ichi Nuclear Power Plant, the NTTF presented a set of recommendations as a result of a systematic and methodical review of NRC processes and regulations applicable to nuclear power reactors in the United States (ADAMS Accession No. ML111861807). The NTTF recommendations are intended to clarify and strengthen the regulatory framework for protection against natural disasters, mitigation and emergency preparedness of nuclear power reactors in the United States.

The NRC staff performed a systematic evaluation and inspection of selected fuel cycle facilities, in light of the lessons learned from the accident at the Fukushima Dai-ichi Nuclear Power Plant, to confirm that licensees were in compliance with regulatory requirements and license conditions; and to evaluate their readiness to address natural phenomena hazards (NPH) events and other licensing bases events related to NPH. The staff's assessment considered the NTTF recommendations to determine whether additional regulatory actions by the NRC are warranted. This assessment included consideration of new seismic hazard information from the U.S. Geological Survey (USGS) for the central and eastern United States which was the subject of an NRC generic communication to fuel facilities in IN 2010-19, "Updated Probabilistic Seismic Hazard Estimates in Central Eastern United States" (ADAMS Accession No. ML102160735).

Regulatory Framework for Fuel Facilities and Treatment of Natural Phenomena Hazards

For facilities regulated under 10 CFR Part 70, Subpart H, "Additional Requirements for Certain Licensees Authorized To Possess a Critical Mass of Special Nuclear Material," the NRC staff reviewed information to verify that the licensees were in compliance with applicable license conditions and the regulations contained in 10 CFR Part 70 Subpart H. Specifically, the NRC staff review looked at licensee compliance with the regulations in 10 CFR 70.62(c)(1), which requires, in part, that each licensee shall conduct and maintain an integrated safety analysis (ISA) that is of appropriate detail for the complexity of the process that identifies, among other things, "potential accident sequences caused by process deviations or other events internal to the facility and credible external events, including natural phenomena." The regulations in 10 CFR 70.62(c)(1), also requires in part, identification of the consequence and the likelihood of occurrence of each potential accident sequence, and the methods used to determine the consequences and likelihoods. The ISA is one of three elements of a safety program established and maintained by a licensee to demonstrate compliance with the performance requirements of 10 CFR 70.61. In addition, 10 CFR 70.22 (i) provides criteria for the fuel facility emergency planning.

For new facilities or new processes at existing facilities, 10 CFR 70.64(a), "Baseline design criteria," requires in part, that the design must provide for adequate protection against natural phenomena with consideration of the most severe documented historical events for the site.

The NRC staff reviewed the ISA summaries that licensees submitted to the NRC with the license application or license amendment requests. The ISA summaries provide a synopsis of the results of the ISA and are retained at the facilities sites. The licensees of existing fuel cycle

facilities completed their ISA after Subpart H of 10 CFR Part 70 was promulgated¹ in September 2000. The ISA, in general, postulated that structures, systems and components (SSCs) will remain intact during credible seismic events and, in some cases, concluded that a high radiological or chemical consequence was highly unlikely based on the assumption that the SSCs will adequately perform their safety functions during the NPH event. The staff conducted inspections of the ISAs on a sample basis in accordance with the inspection program expectations to verify compliance with the new Subpart H to 10 CFR Part 70 requirements. Prior to recent NRC inspections (further explained in the next section), the NRC had not conducted systematic inspections of the ISAs with respect to NPH.

For facilities regulated under 10 CFR Part 40, the staff reviewed information to verify that the licensees were in compliance with applicable license conditions and the regulations in 10 CFR 40.31(j)(1)(ii), which requires, in part, an emergency plan for responding to the radiological hazards of an accidental release of source material and to any associated chemical hazards directly incident thereto, and to 10 CFR 40.31(j)(3)(ii), which requires identification of each type of accident sequences for which protective actions may be needed. The Honeywell Metropolis Works Facility and International Isotopes Fluorine Products Inc. completed an ISA, using methodologies, performance criteria, and staff guidance similar to 10 CFR Part 70 to evaluate relevant hazards and their associated accident sequences. Honeywell and International Isotopes ISA are captured in their licensing bases.

Inspection Results

From December 2011 through May 2012, the NRC staff conducted inspection activities in accordance with Temporary Instruction (TI) 2600/015 "Evaluation of Licensee Strategies for the Prevention and/or Mitigation of Emergencies at Fuel Facilities" ADAMS Accession No. ML12286A284). The NRC completed the TI in three phases. In the initial phase, the staff reviewed licensing documents, including the safety assessments and emergency plans. The second phase consisted of NRC inspectors evaluating licensee accident prevention measures and emergency actions through onsite evaluations that focused on credible natural phenomena and loss of utilities that support onsite systems (e.g. electricity and water). The third phase involved assessing whether a licensee's strategies and equipment were effective to prevent and/or mitigate emergencies during selected beyond licensing basis natural events and extended loss of power and loss of offsite water scenarios. In the review of licensing basis events, the NRC considered the following NPH: seismic, flooding, and high winds (caused by hurricanes or tornadoes). The NRC also evaluated onsite fires because seismic events may cause facility fires as a result of failures of plant equipment. Particular attention was given to earthquakes and flooding because of recent events and significant advancements in the state of knowledge of these hazards.

Based on NRC staff inspections of existing fuel cycle facilities utilizing TI 2600/015, the NRC determined that the evaluated facilities had established programs, procedures, and equipment to respond to licensing basis events involving fire, flooding, and loss of utilities. However, the NRC staff was not able to fully assess the capabilities of those facilities to adequately mitigate the consequences of credible natural phenomena events. Based on information obtained from the inspection activities, the NRC staff identified that the assumptions used by licensees in

¹ Refer to 10 CFR 70.62 (c)(3) which requires, in part, that existing licensees submit for NRC approval, by April 2001 a plan that describes the ISA approach; and by October 2004, or in accordance with the approved plan, a completed ISA. It also required licensees to identify performance deficiencies and to correct them with adequate compensatory measures.

developing the ISA and other safety assessments are not clearly described and documented. The NRC primarily attributed this to the lack of available facility design information and significant variations in the level of detail and rigor of implementation in the facility safety assessments with regards to the treatment of natural phenomena events. Therefore, the NRC inspectors were unable to verify that these facilities were in compliance with their licensing basis and regulatory requirements. The staff could not confirm that the evaluated licensees had fully considered all credible external events (accident sequences) involving process deviations or other events internal to the facility (e.g., consequential explosions, spills, and fires resulting from the natural phenomena event). These accident sequences could potentially result in radiological/chemical consequences to workers, the public, or the environment.

For example, many operating fuel cycle facilities regulated under 10 CFR Part 70, located in the central and eastern United States, were built between 1950 and 1990. These facilities were built under building codes with limited seismic design considerations, or building codes that have since been updated with more stringent seismic and other natural phenomena requirements. In addition, at the time when many licensees completed the safety assessments for the facilities to comply with the requirements of Subpart H, seismic design provisions had undergone profound changes that were incorporated in building codes in areas of seismic hazard, seismic design detailing requirements and performance of structures.

Under TI 2600/15, NRC inspectors found, in a number of facilities, insufficient supporting documentation to justify the assumption that the SSCs will adequately perform under a postulated NPH event. The lack of supporting documentation raises questions about the validity of the licensee's assumptions for the performance of the SSCs. The NRC inspectors opened unresolved items² (URIs) to further assess whether the evaluated licensees are in compliance with license conditions, and the requirements of 10 CFR 70.61 and 10 CFR 70.62(c), regarding NPH accident sequences. Nevertheless, the staff believes at this time, that for all the facilities inspected, due to consideration of inherent seismic capacity in buildings, radiological/chemical source terms and existing safety programs in place (i.e. items relied on for safety), the facilities are adequate to protect public health and safety.

DISCUSSION

As a result of the inspections, the staff is issuing this generic communication due to the generic applicability of the URI's across the nuclear fuel facility industry. The NRC will use the information requested to evaluate licensee's compliance with NRC rules and regulations or relevant license conditions. Current NRC regulations require the evaluation of site hazards including natural phenomena events. However, knowledge of seismic design has evolved over time as new information regarding site hazards and expected structural performance (ductility concepts) have become available. As a result, the licensing basis, design, and level of protection differ among the existing operating fuel cycle facilities, depending on when the facility was constructed and what assumptions were used in the facilities ISAs developed to comply with the new Part 70 Subpart H requirements. To date, the NRC has not undertaken a

² An URI involves an issue that requires more information to determine whether a violation has occurred. The NRC dispositions all potential violations according to the NRC Enforcement Policy (ADAMS Accession No. ML13228A199), which includes non-cited violations, violations, the use of enforcement discretion, etc.

comprehensive evaluation of the licensing basis for existing fuel cycle facilities as it relates to natural phenomena events.

In an effort to fully assess the capabilities of these facilities to prevent or mitigate the consequences of natural phenomena events, the staff is requesting information in this GL from the addressees to support a determination with regards to the proper evaluation of natural phenomena hazards impacts at the fuel cycle facilities. If not properly evaluated, severe natural phenomena may lead to a progression of events, such as fires, explosions, and chemical releases, that could lead to accidents not previously considered in the facilities assessment for which prevention or mitigation measures may be needed. Failure to protect systems, structures and components relied on for safety from natural phenomena with appropriate safety margins has the potential to result in common-cause failures. In addition, consistent with the Commission's goals as reflected in the NRC Strategic Plan (NUREG-1614), accidents that lead to inadvertent criticality or uncontrolled releases of licensed material to the environment are to be avoided. Therefore, the prevention and mitigation of such accidents, while ensuring that emergency preparedness is considered, are vital aspects that need further NRC review.

As described above, the license application and safety evaluations should consider natural phenomena events (e.g., tornadoes, hurricanes, and earthquakes) and other external events with a sufficient level of detail to characterize and assess their impact on facility safety. The assessment should identify the licensing assumptions and the design bases for the structures and equipment credited for prevention or mitigation of the consequences to the facility for these types of events. The assessment should indicate which events are considered not credible and the basis for that determination. It should also indicate which events could occur without adversely impacting safety. In addition, compliance with the regulatory requirements to prevent or mitigate the consequences of NPH events may require that facilities be prepared, or possess equipment, that limits the consequences affecting public health and worker radiological and chemical safety in the context of multiple challenges and degraded or disabled emergency resources. The degradations could include long-term loss of functions, such as offsite power, onsite emergency power, offsite water supply, other offsite services, and transportation to access offsite resources.

As the state of knowledge of NPHs has evolved significantly since the licensing of many fuel cycle facilities, and given the demonstrated experiences from the Fukushima Dai-ichi nuclear power station accident and separately, updated seismic hazards information from the USGS for the central and eastern United States, it is necessary to confirm the appropriateness of the magnitude and likelihood of hazards assumed for fuel cycle facilities and the licensees' ability to protect against those hazards. Fuel cycle facilities safety programs have been, and should continue to be, an evolving safety program supported by new scientific information, technologies and methods for evaluation. As new information and analytical techniques are developed, safety standards need to be reviewed, evaluated, and changed, as necessary, to ensure that they continue to address the NRC's requirements to provide reasonable assurance of adequate protection of public health and safety.

In developing this GL, the staff had multiple interactions with stakeholders to discuss the basis for issuance of a generic communication. On August 21, 2012, the NRC staff held a public meeting with the Nuclear Energy Industry (NEI) and industry to discuss industry-proposed actions to address these URIs. By letter dated October 12, 2012, (ADAMS Accession No. ML12296A036), "Treatment of Natural Phenomena Hazards in the Integrated Safety Analysis," NEI provided the background and industry's basis for the fuel facilities' current analyses of

natural phenomena hazards in their ISA. The NRC staff considered the information in NEI's letter during the development of this GL.

On April 11, 2013, the NRC staff held a Category 2 public meeting with the industry in Atlanta, Georgia, to discuss the status of several regulatory initiatives involving the fuel cycle industry, including the URIs regarding the treatment of hazards from natural phenomena events. The meeting summary can be found under ADAMS Accession No. ML13113A251. On June 11, 2013, during the NRC's Fuel Cycle Information Exchange, the staff provided a presentation discussing the status of the initiatives for the evaluation of lessons from the Fukushima Daiichi accident at fuel cycle facilities. The staff presentation (ADAMS Accession No. ML13168A057), was part of a panel discussion on post-Fukushima issues that included stakeholders direct interaction with staff on topics related to the treatment of NPH.

APPLICABLE REGULATORY REQUIREMENTS

- 10 CFR 40.31(j)(1)(ii)
- 10 CFR 40.31(j)(3)(ii), "Types of accidents"
- 10 CFR 40.32 (b)
- 10 CFR 70.22(i)
- 10 CFR 70.22(f)
- 10 CFR 70.61(a)-(e)
- 10 CFR 70.62(c), "Integrated safety analysis"
- 10 CFR 70.64(a)(2), "Natural phenomena hazards"

The staff provides additional guidance on the regulatory acceptance criteria for the review of a license application and ISA in NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," and NUREG-1513, "Integrated Safety Analysis Guidance Document."

Appendix D to Chapter 3 of NUREG-1520 provides additional guidance for addressing accident sequences that may result from natural phenomena hazards in the context of a license application and ISA.

REQUESTED ACTIONS

The NRC requests that all addressees take the following actions and provide documentation on:

- (1) Within 90 days of the date of this letter, all addressees are requested to:
 - a. Submit the definitions of "unlikely," "highly unlikely," and "credible" for natural phenomena events such as earthquakes, tornadoes, tornado missile impacts, floods, hurricanes, and other wind storms.
 - b. Submit a description of the licensee's safety assessment for the licensing and design basis natural phenomena events, including:
 - i. likelihood and severity of the natural phenomena events, such as earthquakes, tornadoes, floods, hurricanes, and other wind storms

- ii. accident sequences as a result of natural phenomena event impacts to facility structures and internal components
 - iii. assessment of the consequences for the accident sequences from item ii that result in intermediate and/or high consequence events
 - iv. items relied on for safety to prevent or mitigate the consequences of the events from items ii and iii.
- c. For facilities subject 10 CFR Part 70 Subpart H requirements, submit a description of the results of the ISA review, used to comply with 10 CFR Part 70.62(c), identifying the characteristics of the licensing and design basis natural phenomena events applicable to the site that evaluates possible changes in the methodology, likelihood and severity of natural phenomena events with those used in the original design/evaluation of the facility.
 - d. Submit for staff review a summary of the results of any facility walk downs or assessments to identify and address degraded, nonconforming, or unanalyzed conditions that can affect the performance of the facility under natural phenomena and have available for NRC inspection the documentation of the qualifications of the team.

Note: Licensees or facilities subject to § 70.64(a)(2) may reference sections of their license application and/or ISA summaries as a response to applicable requested actions.

- (2) If an addressee identifies that a change in the facility safety assessment for natural phenomena hazards is needed, the addressee is requested to submit a plan for NRC staff review within 180 days of the date of this letter, that considers:
 - a. The evaluation basis for natural phenomena hazard events.
 - b. A review of safety margins to determine inherent conservatism in the design or as-built condition of the facility, as well as accident progression to verify if the current state or design of the facility can compensate for the increased hazard.
 - c. Structures, systems, and components or items relied on for safety to protect workers and the public from intermediate and high consequence events.
 - d. Description of administrative provisions, including maintenance, periodic testing and inspection program, and emergency procedures and preparedness, to prevent and mitigate the consequences of natural phenomena events.
 - e. Proposed modifications to the facility systems structures and components and a schedule with an estimate of completion of the proposed modifications.

If an addressee cannot meet the requested response date, the addressee must provide a response within 30 days of the date of this GL and describe the alternative course of action that it proposes to take, including the basis of the acceptability of the proposed alternative course of action and estimated completion dates.

REQUIRED RESPONSE

In accordance with 10 CFR 40.31(b) and 10 CFR 70.22(d) the Commission may require further statements to determine if a facility license should be modified or revoked, or if other action should be taken. Therefore, addressees are required to respond as described below.

Within 90 days of the date of this GL, each addressee is required to submit a written response consistent with the requested actions and information. If an addressee cannot meet the requested response date, the addressee shall provide a response within 30 days of the date of this GL. In either case, each addressee must address in its response any alternative course of action that it proposes to take, including the basis for the acceptability of the proposed alternative course of action.

The required written response, signed under oath or affirmation, must be submitted to the NRC, ATTN: Document Control Desk, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, in accordance with 10 CFR 70.5, "Communications." In addition, addressees must submit a copy of the response to Regional II administrator.

REASONS FOR INFORMATION REQUEST

The NRC is requesting this information because a review of operating fuel cycle facilities and NRC inspections were unable to validate that the facilities were in compliance with their licensing basis for natural phenomenon hazards. The inspections found that many operating fuel cycle facilities lacked facility design information, that there were significant variations in the level of detail and rigor in the facility ISAs, that the assumptions used in developing the safety analysis were not clearly described, and that some supporting analyses were limited or missing.

BACKFIT DISCUSSION

This GL is addressed to applicants for and holders of specific source licenses issued under 10 CFR Parts 40, and applicants for and holders of special nuclear materials licenses for fuel cycle facilities under 10 CFR Part 70.

Applicants and licensees under Part 40 are not protected by any backfitting provisions. Therefore, no further consideration of backfitting is needed with respect to Part 40 applicants and licensees.

Applicants and licensees under Part 70 are protected by the backfitting provision in 10 CFR 70.76, "Backfitting." However, this GL, if finalized, would not constitute backfitting under § 70.76. First, this GL only asks addressees to provide information regarding their facilities' compliance with the existing applicable regulatory requirements as discussed in this GL. Information collection and reporting requirements are not subject to the purview of the Backfit Rule.

Second, the information requested in this GL concerns the content of ISAs and the supporting documentation for the ISAs with respect to natural phenomena hazards. Natural phenomena hazards were not a licensing requirement at the time of initial licensing, and, therefore, were not reviewed by the NRC at that time. The NRC required consideration of natural phenomena hazards as part of the September 2000 rulemaking adding Subpart H – which required the development of an ISA and the submission and NRC approval of an ISA Summary. See 10 CFR 70.66. The NRC's review and approval of the ISA Summaries did not involve a comprehensive review of the underlying ISAs, including the adequacy of either the ISAs' consideration of

natural phenomena hazards or the supporting documentation. Nor had the NRC staff conducted any prior methodological inspections of the implementation of the ISA approaches with respect to natural phenomena hazards. Therefore, even if the NRC were to require the Part 70 licensees who are subject to this GL to make changes to their facility based upon inadequate information in the ISA itself or supporting documentation, this would not be considered backfitting. This is because the NRC did not provide any prior approval or position with respect to the ISA and supporting documentation with respect to natural phenomena hazards (except to the extent that ISA information was directly expressed in the ISA Summary).

Assuming, however, that the NRC – as a result of information submitted by licensees in response to this GL – takes regulatory action requiring licensees to modify either their ISA Summaries, underlying ISAs, or to modify their facilities to comply with their approved ISA summaries with respect to natural phenomena hazards, and those modifications are considered to be backfitting, the NRC believes that such action would be necessary to ensure compliance with licensees' previously-approved ISA summaries and/or the performance requirements of 10 CFR § 70.61. Therefore, any NRC actions deemed to be backfitting would fall under the "compliance exceptions" in § 70.76(a)(4)(i) and/or (ii), which exempts the NRC from preparing a backfit analysis to support a backfitting action needed for compliance.

The NRC believes that the compliance exception may be properly invoked, because the NRC's action (and any modification of an ISA summary, ISA or the facility itself) would not be based on: (i) a new or different NRC position on the criteria or acceptance standards with respect to consideration of natural phenomena hazards; (ii) a new or different NRC position on the acceptability of any ISA summary with respect to consideration of natural phenomena hazards; (iii) a new or different NRC position on the ISA (summarized in the ISA Summary) or supporting documentation for the ISA with respect to consideration of natural phenomena hazards; or (iv) a new or different interpretation of the applicable NRC regulations in 10 CFR Part 70, Subpart H with respect to consideration of natural phenomena hazards.

FEDERAL REGISTER NOTIFICATION

The NRC will publish a notice of opportunity for public comment on this draft GL in the Federal Register.

CONGRESSIONAL REVIEW ACT

This GL is not a rule as defined in the Congressional Review Act (5 U.S.C. §§ 801-808).

PAPERWORK REDUCTION ACT STATEMENT

This Generic Letter contains information collection requirements covered by 10 CFR Parts 40 and 70 that the Office of Management and Budget (OMB) approved under OMB control numbers 3150-0020 and 3150-0009, respectively. The estimated time to comply with this information collection request is 56 hours per response.

PUBLIC PROTECTION NOTIFICATION

The NRC may neither conduct nor sponsor, and a person is not required to respond to, an information collection request or requirement unless the requesting document displays a currently valid OMB control number.

CONTACT

Please direct any questions about this matter to the technical contact listed below, or to the appropriate Office of Nuclear Material Safety and Safeguards (NMSS) project manager.

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