

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

June 22, 2015

NRC GENERIC LETTER 2015-01: TREATMENT OF NATURAL PHENOMENA HAZARDS
IN FUEL CYCLE FACILITIES

ADDRESSEES

All holders of, and applicants for, a specific source material license 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 10 CFR Part 70, Subpart H, "Additional Requirements for Certain Licensees Authorized to Possess a Critical Mass 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 compliance with regulatory requirements and applicable license conditions regarding the treatment of natural phenomena events in the facilities' integrated safety analysis (ISA)
- (2) to determine if additional NRC regulatory action is necessary to ensure that licensees comply with their licensing basis and existing NRC regulations

The NRC's regulations at 10 CFR 40.31(b) and 10 CFR 70.22(d) require addressees to submit a written response to this generic letter (GL) and, if necessary, take appropriate action in accordance with 10 CFR 70.62(a)(1) or applicable license requirements to demonstrate compliance with the performance requirements of 10 CFR 70.61 or with the conditions specified in the license. This GL requires no other action.

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. As a result, there was a loss of offsite and onsite electrical power systems.

On March 23, 2011, the NRC Chairman issued Tasking Memorandum COMGBJ-11-0002, "NRC Actions Following the Events in Japan" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML110820875). In it, the Chairman 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

ML14328A029

March 11, 2011, earthquake and tsunami at the Fukushima Dai-ichi nuclear power station. The NTTF was tasked to consider lessons learned from the event and to develop recommendations to improve the regulatory framework 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" (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, after conducting a systematic and methodical review of NRC processes and regulations, presented a set of recommendations 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 and improve mitigation and emergency preparedness at 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 applicable 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, 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 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 require, 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.

ML14328A029

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 their license application or license amendment requests. The ISA summaries provide a synopsis of the results of the ISA and licensees retain the ISA and supporting documentation onsite. The majority of 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) would 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. Beginning in December 2011, the staff conducted inspections of the ISAs on a sample basis in accordance with inspection program expectations to verify compliance with the new requirements in 10 CFR Part 70, Subpart H. Prior to these NRC inspections (further explanation 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, “Domestic Licensing of Source Material,” the NRC 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 sequence for which protective actions may be needed. The Honeywell Metropolis Works Facility and International Isotopes Fluorine Products Inc. completed ISAs, using methodologies, performance criteria, and staff guidance similar to 10 CFR Part 70 to evaluate relevant hazards and their associated accident sequences. The Honeywell and International Isotopes ISAs 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 temporary instruction in three phases. In the initial phase, the staff reviewed licensing documents, including the integrated 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 events 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 phenomena events and extended loss-of-power and loss-of-offsite-water scenarios. In the review of licensing basis events, the NRC considered the

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 requires licensees to identify performance deficiencies and to correct them with adequate compensatory measures.

following NPH: seismic, flooding, and high winds (caused by hurricanes or tornadoes). The NRC staff also evaluated onsite fires because seismic events may cause failure of plant equipment that leads to facility fires. The NRC staff gave particular attention to earthquakes and flooding because of recent events, such as the accident at the Fukushima Dai-ichi Nuclear Power Plant, and because of significant advancements in the state of knowledge of these hazards.

Based on NRC staff inspections of existing fuel cycle facilities using 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 licensees have not clearly documented the assumptions they used to develop their ISAs and other safety assessments. 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 regard 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 NRC 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 that are located in the central and eastern United States were built between 1950 and 1990. These facilities were built following 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 10 CFR Part 70, 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, the requirements of 10 CFR 70.61, and the requirements of 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 SSCs, 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.

² An unresolved item 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 noncited violations, violations, the use of enforcement discretion, etc.

DISCUSSION

As a result of the inspections, the staff is issuing this generic communication due to the generic applicability of the URIs across the nuclear fuel facility industry. The NRC will use the information requested to evaluate licensees' 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) has become available. As a result of this evolution and due in great part to the diversity of process, operations, and geographic locations, 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 10 CFR Part 70, Subpart H requirements. To date, the NRC has not undertaken a 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 fuel cycle facilities to prevent or mitigate the consequences of natural phenomena events, the staff is requesting information from the addressees to support a determination with regard to the proper evaluation of NPH 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 and for which prevention or mitigation measures may be needed. Failure to protect SSCs relied on for safety from natural phenomena with appropriate safety margins has the potential to result in common-cause failures that could lead to accidents that exceed the performance requirements of 10 CFR 70.61. In addition, consistent with the Commission's goals as reflected in the NRC Strategic Plan (NUREG-1614), the likelihood accidents that lead to inadvertent criticality or uncontrolled releases of licensed material to the environment is to be minimized. 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, license applications and ISAs 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 the impacts from natural phenomena events and other external events 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 from natural phenomena events and other external events. The assessment should indicate which events are considered not credible and the basis for that determination. It should also indicate which types of 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.

ML14328A029

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 Institute (NEI) and industry to discuss industry-proposed actions to address these URIs. By letter dated October 12, 2012, "Treatment of NPH in the Integrated Safety Analysis" (ADAMS Accession No. ML12296A036), NEI provided the background and industry's basis for the fuel facilities' current analyses of NPH in their ISAs. 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 discussed the status of the initiatives for the evaluation of lessons from the Fukushima Dai-ichi 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.

This GL was published as a draft for public comment in the Federal Register on August 8, 2014 (79 FR 46472). Additional details regarding the comments received and the NRC staff's responses to comments are provided later in this GL under "*FEDERAL REGISTER NOTIFICATION.*"

APPLICABLE REGULATORY REQUIREMENTS

- 10 CFR 40.31(j)(1)(ii)
- 10 CFR 40.31(j)(3)(ii), "Types of accidents"
- 10 CFR 40.32(c)
- 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"
- 10 CFR 70.65(b)
- 10 CFR 70.76(a)-(d), "Backfitting"

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 NPH in the context of a license application and ISA.

REQUESTED ACTIONS

The NRC requests that all addressees take the following actions:

- (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” in evaluating natural phenomena events in the ISA 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 the following information:
 - 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 to 10 CFR Part 70, Subpart H requirements, submit a description of the results of the ISA review used to comply with 10 CFR 70.62(c). This requested documentation should have identified the characteristics of the licensing and design basis natural phenomena events applicable to the site. Additionally, the documentation should have evaluated possible changes in the methodology, likelihood, and severity of natural phenomena events with those used in the original design, evaluation, and licensing of the facility.
 - d. Submit for staff review a summary of the results of any facility assessments or walk downs, if performed, 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 10 CFR 70.64(a)(2) may reference sections of their license application and/or ISA summaries as a response to applicable requested actions.

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 the agency should modify or revoke a facility license or take other action. Therefore, the NRC requires addressees to respond as described below.

ML14328A029

Within 90 days of the date of this GL, the NRC requires each addressee 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 and estimated completion dates.

Addressees must submit the required written response, signed under oath or affirmation, 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 the Region II Regional Administrator.

REASONS FOR INFORMATION REQUEST

The NRC is requesting this information because after a review of operating fuel cycle facilities documentation and inspections, the NRC staff was unable to validate that the facilities were in compliance with their licensing basis for NPH. 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 Part 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 would not constitute backfitting under 10 CFR 70.76 because 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.

Any errors, omissions or failures to properly address applicable NRC requirements in ISA summaries, the underlying ISAs, and information necessary to support the ISA (required to be developed and maintained by various provisions in Part 70), must be addressed and reflected in the updated ISAs and ISA summaries required by 10 CFR 70.62. Therefore, such information developed to address any fuel cycle licensee's omissions or errors in documenting compliance with applicable NRC requirements on natural hazards, which is the subject of this GL, is a pre-existing regulatory obligation of the licensees. Any activities which a fuel cycle facility licensee must undertake to comply with 10 CFR 70.62 do not constitute backfitting.

FEDERAL REGISTER NOTIFICATION

A notice of opportunity for public comment on this GL was published in the *Federal Register* on August 8, 2014 (79 FR 46472). Comments were received from Stephen McDuffie (ADAMS Accession No. ML14281A266) and the Nuclear Energy Institute (ADAMS Accession No. ML14316A411). The NRC staff considered all comments that were received. The NRC staff's evaluation of the comments is publicly available through the NRC's ADAMS Accession No. ML14328A036.

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 GL contains information collection requirements that are subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). These information collections were approved by the Office of Management and Budget, approval number 3150-0225.

The burden to the public for these mandatory information collections is estimated to average 56 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of these information collections, including suggestions for reducing the burden, to the FOIA, Privacy and Information Collections Branch (T-5 F53), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to INFCOLLECTS.RESOURCE@NRC.GOV; and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0225), Office of Management and Budget, Washington, DC 20503.

PUBLIC PROTECTION NOTIFICATION

The NRC may not conduct or sponsor, and a person is not required to respond to, a request for information or an information collection 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 project manager.

/RA/

Marissa G. Bailey, Director
Division of Fuel Cycle Safety, Safeguards,
and Environmental Review
Office of Nuclear Material Safety
and Safeguards

Contact: Jonathan Marcano, NMSS
301-415-6731

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Marissa G. Bailey, Director **/RA/**
Division of Fuel Cycle Safety, Safeguards,
and Environmental Review
Office of Nuclear Material Safety
and Safeguards

Contact: Jonathan Marcano, NMSS
301-415-6731

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