

Onsite Emergency Response Capabilities

Regulatory Basis to Address Nuclear Regulatory
Commission Near-Term Task Force
Recommendation 8

October 1, 2013

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Executive Summary

As a result of the events at the Fukushima Dai-ichi Nuclear Power Plant in 2011, the U.S. Nuclear Regulatory Commission (NRC) Near-Term Task Force (NTTF) created a series of recommendations intended to outline a path to increased readiness of nuclear power plants to respond to severe accidents. In its report, “Recommendations for Enhancing Reactor Safety in the 21st Century: The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident” (Agencywide Documents Access and Management System (ADAMS) Accession No. ML111861807) the NTTF proposed developing additional requirements to strengthen and integrate licensees’ onsite emergency response capabilities. Specifically, this proposal, called Recommendation 8 in the NTTF report, identified four areas of focus for onsite emergency response: accident mitigating procedures, command and control structures, training and qualification programs, and severe accident exercises. In response to the NTTF report, the NRC staff developed SECY-11-0137, “Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned” (ADAMS Accession No. ML11269A204). The NRC staff recommended issuing an Advance Notice of Proposed Rulemaking (ANPR) to initiate regulatory action to address NTTF Recommendation 8. Following Commission approval of the staff’s recommendation, the NRC issued the ANPR on April 18, 2012, as the first step in the rulemaking process. After receiving stakeholder comments in response to the ANPR, the NRC drafted this regulatory basis with the goals of identifying any regulatory deficiencies in the area of onsite emergency response capabilities and developing a revised regulatory approach.

Through the preparation of this regulatory basis, the NRC has identified a lack of regulatory requirements in the areas of severe accident management guidelines (SAMGs) and supporting procedures. Further, the NRC has determined that accident mitigating strategies are scattered throughout several sets of procedures that have been developed through separate initiatives with minimal integration of the procedures to ensure cohesion, usability and effectiveness. In addition to a lack of regulatory requirements for the procedures themselves, no regulatory requirements exist for the training and qualification of personnel who would implement the procedures, for severe accident exercises, or to define the roles, responsibilities and clear lines of decision-making authority (i.e., command and control structures) required to respond to severe accidents.

In this regulatory basis, the NRC staff recommends developing a proposed rule that would require integrated accident mitigating procedures and associated severe accident exercises, identify requirements for a severe accident command and control organization, and amend current rules for training to include requirements related to severe accidents. This regulatory basis also provides preliminary rule language with the intent that it be further developed through the proposed rule phase of the rulemaking process.

1. Introduction

As a result of the accidents at Fukushima Dai-ichi, the NRC has initiated a rulemaking effort to determine the need for additional regulations in the area of onsite emergency response capabilities. This effort is intended to study the current regulatory framework associated with various aspects of severe accident mitigation, including procedures and guidelines, command and control, training and qualifications, and exercises. The purpose of this regulatory basis is to identify any deficiencies in the current regulations, determine how additional requirements may address these deficiencies, provide options for changes to the regulations, and analyze the potential impacts of these changes.

2. Background

On March 11, 2011, a magnitude 9.0 earthquake struck off the coast of the Japanese island of Honshu. The earthquake precipitated a large tsunami that is estimated to have exceeded 14 meters (45 feet) in height at the Fukushima Dai-ichi Nuclear Power Plant site (hereinafter referred to as the site or the facility). The earthquake and tsunami produced widespread devastation across northeastern Japan resulting in approximately 25,000 people dead or missing, displacing tens of thousands of people, and significantly impacting the infrastructure and industry in the northeastern coastal areas of Japan. At the time of the earthquake, Fukushima Dai-ichi Units 1, 2, and 3 were in operation. Units 4, 5, and 6 had been shut down for routine refueling and maintenance activities, and the Unit 4 reactor fuel had been offloaded to the Unit 4 spent fuel pool.

As a result of the earthquake, the three operating units at the site automatically shut down, and offsite power was lost to the entire facility. The emergency diesel generators started at all six units, providing alternating current (AC) electrical power to critical systems; overall, the facility response to the seismic event appears to have been normal. Approximately 40 minutes after shutdown of the operating units, the first large tsunami wave inundated the site, followed by multiple additional waves. The tsunami resulted in extensive damage to site facilities and a complete loss of AC electrical power at Units 1 through 5, a condition known as station blackout (SBO). One diesel generator remained functional on Unit 6. Despite the actions of the operators following the earthquake and tsunami, cooling was lost to the fuel in the Unit 1 reactor after several hours, in the Unit 2 reactor after about 70 hours, and in the Unit 3 reactor after about 36 hours, resulting in damage to the nuclear fuel shortly after the loss of cooling.

2.1 *NTTF Recommendation 8*

In the days following the Fukushima Dai-ichi nuclear accident, the NRC Chairman directed the NRC staff to establish a senior-level agency task force to conduct a methodical and systematic review of the NRC's processes and regulations to determine whether, in light of the events in Japan, the agency should make additional improvements to its regulatory system, and to make recommendations to the Commission for its policy direction. This direction was provided in a tasking memorandum dated March 23, 2011, from the NRC Chairman to the NRC Executive Director for Operations (COMGBJ-11-0002) (ADAMS Accession No. ML110950110). In its July 12, 2011, report, the NTTF provided its recommendations to the Commission.

Specifically, Recommendation 8 was presented by the NTTF as follows:

The Task Force recommends strengthening and integrating onsite emergency response capabilities such as EOPs [emergency operating procedures], SAMGs [severe accident management guidelines], and EDMGs [extensive damage mitigation guidelines].

The Task Force recommends that the Commission direct the staff to further enhance the current capabilities for onsite emergency actions in the following ways:

8.1 Order licensees to modify the EOP technical guidelines (required by Supplement 1, "Requirements for Emergency Response Capability," to NUREG-0737, issued January 1983 ([Generic Letter (GL)] 82-33), to (1) include EOPs, SAMGs, and EDMGs in an integrated manner, (2) specify clear command and control strategies for their implementation, and (3) stipulate appropriate qualification and training for those who make decisions during emergencies.

- The Task Force strongly advises that the NRC encourage plant owners groups to undertake this activity rather than have each licensee develop its own approach. In addition, the Task Force encourages the use of the established NRC practice of publishing [Regulatory Guides (RGs)] (rather than NUREGs, supplements to NUREGs, or GLs) for endorsing any acceptable approaches submitted by the industry.*

8.2 Modify Section 5.0, "Administrative Controls," of the Standard Technical Specifications for each operating reactor design to reference the approved EOP technical guidelines for that plant design.

8.3 Order licensees to modify each plant's technical specifications to conform to the above changes.

8.4 Initiate rulemaking to require more realistic, hands-on training and exercises on SAMGs and EDMGs for all staff expected to implement the strategies and those licensee staff expected to make decisions during emergencies, including emergency coordinators and emergency directors.

The staff requirements memorandum (SRM) for SECY-11-0093 (ADAMS Accession No. ML112310021), dated August 19, 2011, directed the NRC staff to identify and make "recommendations regarding any Task Force recommendations that can, and in the staff's judgment, should be implemented, in part or in whole, without unnecessary delay." In SECY-11-0124, "Recommended Actions To Be Taken Without Delay from the Near-Term Task Force Report" (ADAMS Accession No. ML11245A127), the NRC staff provided recommendations to the Commission on actions that, in the staff's judgment, should be initiated without unnecessary delay, and requested that the Commission provide direction for moving forward on these recommendations (subsequently referred to as "Tier 1" recommendations). The Commission approved the staff's proposed actions in the SRM for SECY-11-0124 (ADAMS Accession No. ML112911571), dated October 18, 2011.

In SECY-11-0137, "Prioritization of Recommended Actions to Be Taken in Response to Fukushima Lessons Learned" (ADAMS Accession No. ML11269A204), the NRC staff requested that the Commission approve the staff's prioritization of the NTTF recommendations. In SECY-11-0137 the NRC staff determined that licensee procedures and guidelines already existed for severe accidents and are available for operator use, therefore no imminent hazard was identified. The NRC staff also recommended that the regulatory actions to issue orders in Recommendation 8.1 be changed to follow the standard rulemaking process. This would allow for appropriate stakeholder involvement consistent with the NRC rulemaking process. The staff outlined the recommended actions for addressing Recommendation 8 through SECY-11-0137 as follows in the Enclosure to SECY-11-0137, "Staff Assessment and Prioritization of NTTF Recommendations" (ADAMS Accession No. ML11272A203):

Staff Recommendations

The staff recommends that the NRC, as a near-term action, undertake regulatory action to resolve NTTF Recommendations 8.1, 8.2, 8.3 and 8.4:

- 1. Issue an advanced notice of proposed rulemaking (ANPR) to engage stakeholders in rulemaking activities associated with the methodology for integration of onsite emergency response processes, procedures, training and exercises.*
- 2. Interact with stakeholders to inform the modification of EOP generic technical guidelines to include guidance for SAMGs and EDMGs in an integrated manner and to clarify command and control issues as appropriate.*

In the SRM for SECY-11-0137 (ADAMS Accession No. ML113490055), dated December 15, 2011, the Commission approved the staff's proposed prioritization of the NTTF recommendations and supported action on the Tier 1 recommendations, subject to the direction in the SRM. With respect to regulatory action regarding onsite emergency response capabilities, the Commission directed the NRC staff to initiate a rulemaking on NTTF Recommendation 8 in the form of an ANPR. The ANPR was published on April 18, 2012 (ADAMS Accession No. ML12058A062), and the comments received were considered in the development of this regulatory basis. A list of external stakeholder comments received during the ANPR comment period is provided in Appendix B.

2.2 Related Petitions for Rulemaking

The NTTF report provided a specific proposal for onsite emergency actions that was subsequently supported by the National Resources Defense Council (NRDC) in a petition for rulemaking (PRM), PRM-50-102 (76 FR 58165; September 20, 2011), as a way to address licensee training and exercises. In connection with NTTF Recommendation 8.4, "Onsite emergency actions," the NRDC requested in its petition that the NRC "institute a rulemaking proceeding applicable to nuclear facilities licensed under 10 C.F.R. 50, 52, and other applicable regulations to require more realistic, hands-on training and exercises on Severe Accident Mitigation [*sic*] Guidelines (SAMGs) and Extreme [*sic*] Damage Mitigation Guidelines (EDMGs) for licensee staff expected to implement the strategies and those licensee staff expected to make decisions during emergencies, including emergency coordinators and emergency directors." The Commission has established a process for addressing a number of the recommendations in the NTTF report, and the NRC determined that the issues raised in PRM-

50-102 are appropriate for consideration and will be considered in this Recommendation 8 rulemaking. Persons interested in the NRC's actions on PRM-50-102 may follow the NRC's activities at www.regulations.gov by searching on Docket ID NRC-2012-0031.

3. Problem Statement

Following the analysis of the events at Fukushima Dai-ichi and review of the current regulations associated with accident mitigation, the NRC staff identified areas for improvement in the current regulatory approach. This section provides background on the current regulatory framework, a review of the regulatory concerns, and identification of the specific deficiencies in the current requirements.

3.1 Background on Current Regulatory Framework

Onsite emergency response capabilities currently rely on strategies and guidance developed through separate initiatives and lack a comprehensive strategy to address events as they progress beyond design basis assumptions. As it stands, three separate sets of procedures/guidance would be utilized by a licensee to respond to a large scale event similar to that experienced at Fukushima Dai-ichi: Emergency Operating Procedures (EOPs), Severe Accident Management Guidelines (SAMGs), and Extensive Damage Mitigation Guidelines (EDMGs). In addition to the existing procedures, supporting guidelines are being developed by the industry to provide guidance for the new capabilities being developed through the other NTF recommendation efforts. These procedures and guidelines were developed separately and are associated with varying levels of regulatory requirements and industry commitments for the procedures themselves and the associated training, drills, and exercises that are intended to ensure that the procedures can be effectively implemented.

The EOPs were designed to restore and maintain safety functions and place the plant in a safe shutdown condition. The EOPs are required by Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," and are included in the administrative control sections of licensee's technical specifications. The training requirements for EOPs are primarily contained within 10 CFR Part 55, "Operators' Licenses." Licensed operators are required to show sufficient knowledge of the EOPs on an initial written examination, in accordance with 10 CFR 55.41 (Reactor Operators) or 10 CFR 55.43 (Senior Reactor Operators) and the ability to implement the EOPs through an initial operating test that meets the requirements of 10 CFR 55.45. Licensed operators are required to continuously demonstrate that they have maintained their knowledge of the EOPs through the requalification program required by 10 CFR 55.59.

The SAMGs were developed as a voluntary industry initiative in response to Generic Letter 88-20, Supplement 2, "Accident Management Strategies for Consideration in the Individual Plant Examination Process," dated April 4, 1990 (ADAMS Accession No. ML031200551). The SAMGs provide guidance to operators and accident management staff in the event of an accident that progresses beyond the scope of the EOPs. There is currently no regulatory requirement for licensees to develop, maintain, train for, or exercise SAMGs. Shortly after the events at Fukushima Dai-ichi, the NRC conducted an inspection of the industry's implementation of SAMGs through Temporary Instruction (TI)-2515-184 "Availability and Readiness Inspection of Severe Accident Mitigation Guidelines (SAMGs)." The results from the inspection confirmed that all licensees have developed SAMGs; however, it was determined that the procedural control and training requirements for SAMGs vary throughout the industry.

Following the terrorist events of September 11, 2001, the NRC ordered licensees to develop and implement specific guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities using existing or readily-available resources that can be effectively implemented under the circumstances associated with loss of large areas of the plant due to explosions or fire. These extensive damage mitigation requirements were subsequently imposed as license conditions for individual licensees and then made generically applicable to licensees under 10 CFR 50.54(hh)(2) through the Power Reactor Security Requirements final rule (74 FR 13926; March 27, 2009). As a result, EDMGs were developed to provide guidance to operating crews and accident management staff on the implementation of the strategies developed to address these loss of large area events.

3.2 What Specifically is the Regulatory Problem?

The procedures and guidance documents associated with severe accident mitigation have been developed via separate initiatives. Consequently, not all accident mitigating procedures are required by regulation. Additional procedures will need to be written to support the implementation of strategies developed through the NTF recommendation initiatives. The development of a growing number of accident mitigating procedures lacks consistent oversight to ensure that they are developed in a way that promotes a comprehensive, coherent, and integrated strategy for response to severe accidents. Further, there are no current regulatory requirements for command and control structure, training, and exercises in the area of severe accident mitigation.

3.3 What Aspects of the Current Framework are Deficient?

The current regulatory framework for accident mitigating procedures is limited to procedures for design basis accidents, some beyond design basis accidents, and requirements for development of strategies to combat large area fires and explosions. Training requirements are primarily focused on licensed operators and their ability to implement EOPs. Exercise requirements are centered on demonstrating the ability to implement the licensee's emergency plan and security plans and are not designed to develop the ability for licensees to implement severe accident mitigation strategies. Requirements for all aspects of severe accident mitigation, including procedures, training, and exercises, have primarily been left to the industry for development, implementation, and oversight. The NRC inspection results for TI 2515/184, "Availability and Readiness Inspection of Severe Accident Management Guidelines (SAMGs)" (ADAMS Accession No. ML11115A053), highlighted that, while most SAMGs are written to a common standard from the nuclear power industry owners groups (i.e., industry organizations with representatives from the various nuclear plant owners that provide industry oversight for various plant designs), the training, exercise, and procedural control aspects of licensees' individual severe accident programs varies throughout the industry. Through analysis of the events at Fukushima Dai-ichi, current regulations and guidance, industry commitments, and public comments, the NRC has identified the following regulatory deficiencies:

1. Accident mitigating procedures (EOPs, SAMGs, EDMGs, and supporting guidelines) were developed via separate initiatives. There is no regulatory requirement for a comprehensive strategy that ensures that these procedures work together as an integrated approach for responding to an event that progresses past design basis assumptions.
2. SAMGs and additional supporting guidelines are not required by NRC regulations. SAMGs exist as an industry commitment, and the supporting guidelines are in the development process.

3. Licensees are not required to clearly identify roles, responsibilities and lines of decision-making authority (i.e., command and control structures) or processes for transferring responsibilities and authorities as conditions change in severe accident scenarios.
4. The NRC's regulations do not identify the training and qualifications necessary for key personnel relied upon to implement severe accident mitigating strategies.
5. Current regulations governing exercises do not require licensees to demonstrate implementation of all the procedures groups designed to address beyond design basis events during exercises.

Accident Mitigating Procedures Integration

For events similar to those experienced at Fukushima Dai-ichi, operators and accident management staff would rely on procedures and guidance from all of the accident mitigation procedure groups to protect public health and safety. However, licensees need to develop a complete understanding of how these procedures would work together to ensure that the guidance provided to licensee personnel is coherent and comprehensive. Essential to this objective is the elimination of any gaps in the guidance that is intended to protect public health and safety during a beyond design basis event. Currently, no regulatory requirement ensures that procedures are developed in an integrated manner with clear transitions between the various guidelines and procedures to support human performance under anticipated conditions of use.

Regulatory Requirements for SAMGs and Additional Supporting Guidelines

Some accident mitigating guidelines, specifically SAMGs and supporting guidelines, are not required by NRC regulations. The lack of a regulatory requirement for these guidelines allows for potential inconsistencies in the way licensees maintain, and implement their procedures. Further, any deficiencies noted in the content or procedural control of these guidance documents are not currently subject to enforcement. The NNTF recommended that the industry take the lead in the development of the revised generic SAMGs. During a public meeting on February 15, 2012 (ADAMS Accession No. ML12073A283), the industry owners groups presented a plan to upgrade the guidelines based on lessons learned from Fukushima Dai-ichi and additional analysis and testing conducted by the industry since the guidelines were originally developed in the early 1990s. However, without a regulatory requirement, the NRC would not be able to ensure that all licensees' SAMGs are written, maintained, and implemented in accordance with these standards.

Command and Control for Severe Accidents and Large Scale Events

An important aspect of a licensee's ability to respond to a large-scale event is the existence of a strategy in place that clearly defines the command and control function and how it evolves as the severity of an event increases beyond a facility's design basis. Successfully developing step-by-step procedural guidance for every potential accident condition that could occur past a plant's design basis is not a plausible expectation. Therefore, it is important that organizations establish sufficient expertise to support the ability of the organizations to make timely decisions and respond effectively to unforeseen events. Additionally, with the new strategies being developed to address beyond design basis events, it is essential that the command and control strategy is designed to match these new capabilities. The extent of the coordination necessary to implement EOPs, SAMGs, EDMGs, and additional guidelines in response to a severe accident or large scale event would require a robust and clearly defined command and control structure.

Licensees have command and control structures for severe accidents through their existing operations program and subsequently through the emergency response organizations (EROs). These organizations are designed to implement the EOPs, emergency plan and SAMGs in the event of a severe accident. However, with the addition of EDMGs and the strategies developed in response to NNTF Recommendations 4.1 and 4.2, concerning station blackout mitigation strategies, effective command and control strategies for the additional capabilities must be developed. With the additional capabilities resulting from the post-Fukushima efforts possibly extending to offsite locations, additional coordination would be required for the logistics associated with implementing these capabilities and could require more extensive communications and coordination with offsite entities. Whether the current command and control alignments are capable of handling this additional capacity must be determined to provide confidence that the strategies can be effectively implemented. Licensee command and control structures also need to be developed to ensure that roles and responsibilities are defined for a multi-unit event, including at plants with multiple units of varying nuclear steam supply system (NSSS) designs.

Additionally, standardization between the various reactor technologies should exist regarding the identification of the final decisionmaking authority during the implementation of SAMGs and supporting guidelines. It is important that the final decisionmaking authority be clearly identified by a licensee's command and control structure, and some level of standardization throughout the industry would be beneficial. Each command and control strategy will have unique aspects resulting from the individual accident mitigation plans; however, a standard industry approach to command and control for severe accidents would support a common understanding by the NRC and allow for support from industry resources, if necessary.

An additional, specific aspect of command and control relates to how firefighting procedures and strategies are implemented concurrently with the integrated accident management procedures. For the purposes of accident mitigation, the effects of plant fires are currently addressed within the symptom-based accident mitigating procedures as these procedures are designed to restore safety functions using available equipment. As fires eliminate the available plant equipment, the accident mitigating procedures are designed to direct operators to alternate strategies for restoring safety functions. However, licensees should develop a clear understanding of how they will implement firefighting procedures during beyond design basis conditions. Certain firefighting strategies exist at some facilities that may be intended for design basis conditions and may not be appropriate for implementation during a severe accident or beyond design basis event.

No regulatory requirement exists for licensees to establish a command and control strategy and clearly identify the decisionmaking authority for severe accidents and beyond design basis conditions. To ensure that the new capabilities can be implemented effectively and that there is a final decisionmaking authority identified for severe accidents and beyond design basis conditions, a regulatory requirement in this area should be considered as part of this rulemaking effort.

Training and Qualification of Key Personnel

The NRC has no regulatory requirements for training and qualifying personnel who would be responsible for implementing SAMGs, EDMGs, and supporting guidelines. In the same way that EOPs rely on highly trained licensed operators to execute the procedures, several key personnel will be relied upon to implement the EDMGs, SAMGs, and supporting guidelines.

Licensees must adequately train and qualify these personnel for their positions. The extent of the training and qualification programs could be determined through a systems approach to training in accordance with 10 CFR 50.120.

A training plan for severe accidents would need to identify the training and qualification requirements for all personnel relied upon to implement the integrated response to severe accidents. Requirements for personnel with ultimate decisionmaking authority should be developed to ensure that leadership has sufficient technical understanding and command and control ability to make timely and informed decisions during a severe accident.

In addition to personnel with ultimate decisionmaking authority, selected engineering staff would be expected to be trained on accident mitigation strategies and be able to provide expertise on individual safety functions and the equipment available to restore the safety functions. Further expertise and training in the areas of instrumentation and reactor engineering would likely be required. Non-licensed operators, maintenance and radiation protection personnel, and other technicians who will be relied upon to implement the strategies contained in the EDMGs and supporting guidelines should receive training and associated qualifications according to the roles they would be expected to fulfill.

Exercises

Current exercise requirements do not require licensees to conduct drills or exercises that would necessitate the implementation of all accident mitigating procedures in an integrated manner. In order to validate the adequacy of procedures, evaluate key personnel in their accident mitigation roles, and determine the overall effectiveness of a licensee's onsite accident management capabilities, the NRC needs to develop additional drill or exercise requirements to test these capabilities initially and on a periodic basis.

3.4 What are the Relevant Lessons Learned from Fukushima Dai-ichi?

The events at Fukushima Dai-ichi highlighted the need to have in place plans for beyond design basis accidents. Operators and engineers at Fukushima Dai-ichi used their equivalent processes to EOPs and SAMGs during the extended station blackout event; however, they did not have an equivalent process to the EDMGs, supporting guidelines, or the associated equipment that these guidelines are written to employ. While EDMGs have been developed, and are already required by 10 CFR 50.54(hh)(2), SAMGs have no regulatory requirement and supporting guidelines are still being developed. Operators and engineers responding to an event similar to that at Fukushima Dai-ichi would rely upon all four sets of these procedures.

As capabilities are enhanced in response to the accident at Fukushima Dai-ichi, the new capabilities need to be matched with new procedures and upgraded guidelines. An effort to ensure that the upgraded technical guidelines for SAMGs, supporting guidelines, and existing EOPs and EDMGs work together in an integrated fashion is an important factor in ensuring that the overall collection of procedural guidance becomes the optimal strategy for protection of public health and safety.

In addition to the lessons learned from Fukushima Dai-ichi, additional analysis conducted by the NRC has highlighted the importance of accident mitigating procedures in responding to a beyond design basis event. The State-of-the-Art Reactor Consequence Analysis (ADAMS Accession No. ML120250406) pilot study used advanced modeling to determine the public health consequences of severe accidents at two specific facilities. Each accident was modeled

twice; once assuming the accident progressed unmitigated and again assuming that mitigation (including use of EOPs, SAMGs, and EDMGs) was successfully implemented. The results confirmed that time would be available to implement the accident mitigating procedures, and that, if successfully implemented, the accident mitigating procedures and guidelines would be effective in preventing core damage or significantly reducing radiological releases. Further, the analysis determined that implementation of the additional equipment associated with EDMGs would be especially helpful in counteracting station blackout scenarios. These results further substantiate the need for a regulatory requirement in the area of severe accident mitigating procedures.

4. Discussion

The NTF report identified four areas for regulatory attention in the area of onsite emergency response capabilities: Procedure Integration, Command and Control, Training and Qualification, and Exercises. This section is intended to clarify how new or revised regulations would address the regulatory deficiencies identified in section 3.

4.1 Procedure Integration

Establishing additional regulatory requirements for onsite emergency response capabilities would require licensees to establish a comprehensive strategy for severe accident mitigation that involves all accident mitigating procedures in an integrated framework. In the event of a large scale accident similar to the accident at Fukushima Dai-ichi, licensees would be prepared with a set of procedures and guidance documents that have been designed to work together to implement the best strategy for preventing or mitigating core damage and limiting radiological release. Conditions that require transition from one set of procedures to another would be clearly identified. When necessary, EOPs and SAMGs would reference options in the EDMGs or supporting guidelines to aid in the restoration of key safety functions. For the additional capabilities developed through other NTF recommendations, licensees would have clear procedural guidance for the implementation of these strategies contained within the supporting guidelines. With the new regulatory requirement, inspections could be conducted to evaluate the effectiveness of licensees' integrated accident mitigating strategies.

It is important to distinguish, for the purposes of this Regulatory Basis, the fundamental difference between procedures and guidelines. Procedures, for example the EOPs, are step-by-step instructions that operators and plant staff are expected to follow. Procedures are written as sequential instructions for performing a task or addressing plant conditions. When implementing procedures, each step is performed as prescribed with rare exceptions. However, guidelines, such as SAMGs, provide general strategies that should be addressed while operating the plant or addressing an adverse condition. Guidance documents do not provide a prescribed set of operating instructions and are not necessarily followed in a step-by-step manner. Within guidelines, operators and accident management staff have the latitude to respond as necessary to unpredictable and dynamic situations. During beyond design basis conditions, guidance documents would be used to focus the attention and actions of the operators and accident management staff on the most important threats to safety and provide high-level strategies for addressing plant conditions.

While consideration was given to requiring a complete overhaul of the accident mitigation procedures, with newly developed design basis accidents and a redesigned set of integrated guidance, this approach was not determined to be the optimal solution in terms of safety for two reasons. First, the development of a new procedural approach would sacrifice over 25 years of

training, exercises, and operating experience associated with the current EOPs. The NRC is interested in maintaining this knowledge and experience as an integral part of a licensee's accident mitigation capability. The EOPs have been validated through extensive simulator exercises, training and evaluations associated with operator licensing initial and requalification training. Further, the EOPs, as currently designed, have been essential and effective in the response to actual plant emergencies throughout the industry. The NRC considers the validation of the EOPs through exercises and actual events as an important reason to maintain the current EOP structure and technical content. Second, the NRC has identified a goal of this rulemaking effort to be ensuring that a licensee's ability to implement EOPs is not significantly affected by the new requirements. Requiring an expansion of the current scope for the EOPs to include beyond design basis and severe accidents, with the corresponding effect on licensed operator qualifications, has the potential to shift focus away from the training and experience provided for the traditional EOPs and the events they cover that have a higher probability of occurrence. Although the NRC has determined that new threats should be addressed, the NRC has also decided that the primary focus of a licensee's onsite accident management capability should remain on the current set of EOPs.

In addition to EOPs, SAMGs, EDMGs, and supporting guidelines, licensees should analyze their procedures for emergencies when plant conditions are in the shutdown and cooled-down modes of operation where EOPs no longer apply to ensure that procedures for these situations fit into the integrated accident mitigation strategy. Industry owners groups should consider development of technical guidelines for accident management in these modes of operation.

During an accident, firefighting strategies may be implemented concurrently with the integrated accident management procedures/guidelines during an emergency. An effort should be made to ensure that there are no major conflicts between firefighting strategies and the integrated accident management procedures/guidelines for beyond design basis conditions and severe accidents.

With the development of a rule for accident mitigating procedures, an accompanying guidance document would serve as the means to identify the high level attributes, including human factors considerations, which should be included in the integrated set of procedures. The guidance would be developed, in coordination with the industry, to provide an acceptable methodology for meeting the newly developed requirements.

4.2 Requirements for SAMGs and Additional Supporting Guidance

The guidance contained in the SAMGs would no longer be an industry voluntary commitment, but instead a regulatory requirement. With the new requirement, inspections could be conducted to verify that the content of a licensee's SAMGs match the industry standards developed by the owners groups as endorsed by the NRC. In addition to SAMGs, the newly developed support procedures would be required, and therefore available to be the subject of NRC enforcement.

The NTF report strongly encouraged that the industry owners groups take the lead in development of the revised SAMGs. In addition to improvements to the SAMGs for reactor accident conditions, licensees should be required to develop additional procedural guidance in the form of SAMGs or supporting guidelines for responding to spent fuel pool emergencies.

The NRC did not approve EDMGs on a plant-by-plant basis and similarly does not intend to require prior approval of SAMGs and supporting guidelines by requiring individual licensees to

submit their revised procedures to the NRC. As part of the rulemaking process, the staff would expect to evaluate the high level attributes that the accident mitigation procedures should be designed to achieve and determine whether these attributes should be specified as requirements or guidelines. The NRC will have the option perform reviews of the industry owners groups revised SAMG technical guidelines and to perform follow-on inspections to determine the effectiveness of overall accident mitigation strategies developed by individual licensees. In addition to inspection of the procedures and guidelines, NRC observance of their implementation in severe accident mitigation exercises would provide important insight into the effectiveness of a licensee's approach. This approach, largely performance-based, will allow for inspectors to determine the effectiveness of the integrated strategies on a plant-by-plant basis.

4.3 Command and Control

With the expansion of the scope of accident mitigating procedures to include the new supporting guidelines, licensees would be required to ensure that their emergency response command and control structures are capable of responding to multi-unit severe accidents and large scale events. A regulatory requirement that addresses command and control for severe accidents would be designed to ensure that licensees are structured to be able to respond to multi-unit severe accidents and large scale events and have the capacity to implement their procedures, including the additional capabilities developed in response to the events at Fukushima Dai-ichi. The NRC staff is concerned that the current command and control structure may not be robust enough to support the logistics required to implement strategies that are being developed through other NTF recommendation efforts. Industry representatives have suggested that regional centers could be used as a common source of emergency response equipment. Significant logistics would be required to access these additional resources during an actual accident. Licensee command and control structures should be analyzed to determine whether additional emergency response command structure would be required to manage the necessary logistics. Consideration should be given to including fleet-level command and control into the individual licensee command and control strategies, if they will be relied upon during a severe accident.

Command and control structures should be able to clearly identify who has the ultimate authority for making decisions associated with the accident mitigation procedures. After reviewing the current status of SAMGs throughout the industry, the NRC has noticed that the decisionmaking authority during severe accidents varies among the different reactor technologies. Westinghouse SAMGs transfer decisionmaking authority to the TSC during severe accidents, while Combustion Engineering SAMGs retain the decisionmaking authority within the control room. Decisionmaking authority in boiling water reactor SAMGs varies from plant to plant. The NRC believes the decisionmaking authority position should be standardized throughout the industry to support a common understanding by the NRC and to allow for support from industry resources, if necessary.

An additional challenge that must be considered when examining licensee command and control organizations is their capability for responding to a multi-unit event, especially at sites with multiple units of varying technologies. Roles and responsibilities should be clearly defined to ensure organizations are established to handle beyond design basis events. Decisionmaking authority will need to be clearly identified for the varying NSSS designs and consideration should be given to including fleet-level decision making authorities if they will be relied upon during a severe accident.

In addition to implementation of the accident mitigating procedures and guidelines, operators and accident management staff may be faced with other complicating factors. Specifically, command and control organizations should be prepared to implement firefighting strategies concurrently with the accident mitigating procedures and guidelines. A clear hierarchy of procedures should be developed between accident mitigating procedures and firefighting strategies. To the extent feasible, firefighting procedures and guidelines should be studied to understand where there may be conflicts with beyond design basis accident mitigating guidelines. It should be made clear to the command and control organization, through guidance and training, how the firefighting strategies are to be implemented during beyond design basis conditions. If there are opportunities to resolve any conflicts between current firefighting strategies and the integrated accident mitigating procedures and guidelines for beyond design basis conditions, action should be taken so that command and control organizations have a clearer understanding of how to implement both sets of guidance concurrently.

Corresponding NRC guidance documents developed in conjunction with this rulemaking effort would provide the key functions that a command and control structure should be designed to accomplish. The effectiveness of these command and control structures would be a key parameter for evaluation during the performance of severe accident mitigation exercises. Inspections of the emergency exercises and the guidance documents used to outline the command and control strategy could be conducted to ensure that the command and control framework is adequate for the entire scope covered by the integrated accident mitigation strategy. Also largely performance-based, this regulatory approach would be designed to ensure that individual licensees are best aligned to implement their newly developed capabilities.

4.4 *Training and Qualification of Key Personnel*

The NRC has determined that the primary focus of the training programs should continue to be on developing the knowledge and abilities of licensed operators to implement the EOPs. However, some training requirements will need to be developed to ensure that the licensees have the capability to implement the other accident mitigating procedures should the unlikely event of a beyond design basis accident occur. Training and qualification programs would be developed for key personnel relied upon to implement SAMGs, EDMGs, and supporting guidelines.

Training and qualification requirements for accident management staff would be developed through a systems approach to training as defined in 10 CFR 55.4 and in accordance with 10 CFR 50.120. With the understanding of the required knowledge, licensees would develop training and qualification requirements to ensure selected personnel possess the knowledge and experience required to successfully implement accident mitigating strategies.

The NRC staff believes that a specific qualification should be developed for personnel with ultimate decisionmaking authority during implementation of the SAMGs, EDMGs, and supporting guidelines. The decision maker (e.g., emergency director or TSC director) needs to be designated. The regulatory requirements for this specific qualification should be made after further consultation with external stakeholders; however, they could potentially include a requirement for a senior reactor operator (SRO) license (active or current), previous SRO license, or an SRO Certification, and evaluated on-the-job performance as the lead decision-maker in a severe accident exercise. This qualification plan should contain an element for requalification training and proficiency to ensure that the ultimate decision-makers for a severe

accident maintain the necessary knowledge and skill to be able to lead an organization in accident mitigation in the event of a severe accident or large scale event.

The NRC staff considers that additional knowledge and abilities should be required of licensed operators in the area of accident mitigation procedures. Currently, the NRC does not require licensed operators to demonstrate knowledge of licensee strategies for severe accident mitigation. Although examining initial license applicants in the area of severe accidents during the operating test in the simulator is not practical due to the limited time and current three-person crew format, knowledge requirements for the written examination and Job Performance Measures (JPMs) should be considered during the next revision to the knowledge and abilities catalogs for licensed operators. Additionally, severe accident mitigation procedures should be considered for coverage by licensed operator requalification programs.

The staff also believes that appropriate training should be established for other licensee personnel, such as non-licensed operators, health physics staff, and maintenance personnel who would be called upon to perform unfamiliar tasks, potentially in challenging environments. Although it is undesirable to simulate some of the conditions in which tasks may be performed, practice performing the types of tasks that would be necessary under conditions that simulate at least some potential performance shaping factors (e.g., working in the dark with headlamps) would enhance the likelihood of effective performance.

Inspections could be conducted to ensure that the new regulatory requirements are being met. Through observance of exercises, the NRC could make these determinations concerning the effectiveness of a licensee's training program.

4.5 Exercises

With the intention to rely upon a performance-based approach for regulations associated with procedures, command and control, and training, a regulatory approach must provide a requirement for the means by which performance can be evaluated. Although inspections of procedures, command and control structures, and training programs can be conducted individually via administrative reviews, the true means with which to evaluate performance of a licensee's onsite accident management capability is through drills and exercises. A performance-based approach is not viable without this opportunity to observe the implementation of the newly-developed strategies and capabilities. Specifically, classroom training and a table-top discussion, on their own, would not provide an adequate opportunity to observe a licensee's capability. While strategic, high-level decisionmaking could be observed through a table-top discussion, there are many more aspects to an accident mitigation strategy that would go unobserved without a realistic exercise, i.e. field activities including onsite equipment mobilization and operation, command and control capability, real-time decisionmaking and resource allocation, communication systems, effective simulation of environmental and radiological field conditions, and simulated firefighting response. The staff recognizes that a combination of full scale exercises and part-task simulations, walk throughs and/or table top discussions may be an effective means of achieving the objectives of an exercise program. However, the staff notes that there are limitations in the extent to which licensees can realistically and safely simulate beyond design basis accidents and the associated conditions under which some actions may need to be performed. As a result, the rulemaking may need to explore complementary methods for gaining reasonable assurance that licensees have established a capability for effective integrated use of their accident mitigation procedures and guidelines.

The NRC does not anticipate that this rulemaking effort would require increasing the capability of control room simulators to specifically model the condition of a reactor core during a severe accident. However, where the capability currently exists, simulators should be utilized to achieve key parameters (those values that correspond to decision points during SAMG implementation) to meet realistic values during a severe accident. Furthermore, simulator fidelity should be maintained in accordance with 10 CFR 55.46 as any additional equipment developed through NTTF Recommendation 4 is installed in the reference plant and is utilized to support plant systems. As additional accident monitoring instrumentation is developed, the simulator will be updated as required to maintain fidelity in accordance with 10 CFR 55.46 (as applicable to the design of the reference plant). Exercises will utilize the capabilities of licensees' plant reference simulators to simulate severe accident conditions as much as the simulator modeling permits. Consideration should be given to the anticipated reliability of the accident monitoring instrumentation relative to the instrument's environment during the simulated containment conditions. Parameters that are essential to the implementation of SAMGs should be simulated, to the extent possible during severe accident exercises, using the plant reference simulator.

5. Rulemaking Options

After analyzing the lessons learned from Fukushima Dai-ichi, identifying regulatory deficiencies, and reviewing comments from the industry and public (see Appendix B), the NRC considered the following options for this rulemaking effort.

5.1 Option 1: New Accident Mitigating Procedures Rulemaking with Amendments to Training and Exercise Requirements

Option 1 would develop new regulatory requirements to address the current procedure deficiencies and amend the current regulatory framework covering training and exercises. Individual components of this rulemaking effort would likely include:

1. Development of an accident mitigating procedures rule that identifies requirements for the following:
 - Integrated accident mitigating strategy consisting of EOPs, SAMGs, EDMGs, additional accident mitigation guidelines, emergency procedures for operation in modes not covered by EOPs, and guidelines for mitigating spent fuel pool accidents.
 - Command and control necessary to implement the procedures during a multi-unit event.
 - Qualification requirements for the accident mitigation ultimate decision-maker.
2. Amendment to 10 CFR 50.120 to include requirements for training of key personnel relied upon to implement accident mitigating procedures.
3. Amendment to NRC regulations to require that drills or exercises be routinely conducted to examine a licensee's capacity for implementing the accident mitigating procedures in response to a beyond design basis accident scenario. An initial validation exercise would be required, followed by routine exercises not to exceed a specific periodicity.

4. Amendment to 10 CFR 55.41, 55.43 and 55.45 to add SAMG knowledge requirements to the initial operator licensing written examination and JPMs, as well as the scope of requalification.

5.2 Option 2: Comprehensive Onsite Emergency Capabilities Rule

A second option would be to write a new, all-encompassing onsite emergency response capability rule that includes all requirements for procedures, training, and exercises. Although comprehensive and potentially more straightforward for the purposes of severe accident mitigation regulation, this option would not take advantage of the regulatory framework that has already been developed for training and exercise programs.

5.3 Option 3: Expanded Industry Commitments with NRC Guidance Documents

A third option for addressing the deficiencies is to rely on regulatory guidance documents and generic communications with corresponding industry commitments. This option would not be a change from the current regulatory approach, with the exception that supporting guidelines would be added to the industry's commitments. Additional guidance documents could be utilized to establish guiding principles for the procedures, training programs, and exercises. However, this option would not provide the opportunity for NRC inspection of the newly developed accident mitigating procedures, training programs, or drills and exercises because NRC inspectors would not have any regulatory requirements upon which to base their inspection findings. Additionally, industry commitments can be changed without prior NRC approval; therefore, there is no certainty that any industry committed approach would be permanent. For an extended discussion of the various options considered other than rulemaking, see Appendix A, Rulemaking Alternatives.

5.4 Option 4: New Accident Mitigating Procedures Rulemaking with Expanded Industry Commitments for Training and Exercises

The final option is to use any combination of the first and third options. The NRC could write a rule for the procedures themselves and then rely on guidance documents and industry commitments to ensure that the industry develops an adequate command and control structure and training and exercise program to support the procedures. This option would allow for inspections and enforcement of the procedures; however, training programs and exercises would be left to the industry to evaluate for effectiveness.

6. Impact Analysis

6.1 Relationship to Other NTF Recommendations

NTTF Recommendations 4.1 and 4.2 – Station Blackout (SBO) and 10 CFR 50.54 (hh)(2) Equipment (Mitigating Strategies)

The strategies developed in response to NTF Recommendations 4.1 and 4.2 would need corresponding implementation procedures. As the SBO requirements and additional mitigating strategies are developed, it will become important to ensure that the critical aspects to these strategies are included in the guidance documents that support the onsite emergency response

capability rule. Considerable coordination will be required to ensure that these two rulemaking efforts work together to develop a comprehensive and consistent set of requirements.

NTTF Recommendation 7.1 – Spent Fuel Pool (SFP) Instrumentation

As requirements are developed to ensure that licensees have the capability to monitor SFP level during an accident, accident mitigation procedures would need to be revised. As SAMGs and supporting guidelines are revised to include SFP accidents, new procedural transitions and decision points should be developed with this new capability in mind.

NTTF Recommendation 9.3 – Staffing, Communications, and Periodic Training and Exercises

As accident mitigating procedures and command and control strategies are developed, licensees would need to evaluate their staffing plans, and the NRC would need to review these evaluations. Communication with the NRC staff implementing Recommendation 9.3 will be essential to ensure that the NRC's review of the staffing analyses is conducted with an understanding of the procedures and command and control strategies that are being developed.

NTTF Recommendation 10.2 – Command and Control Structure and Qualifications for Beyond Design Basis Events

The NRC anticipates that the guidance contained in NTTF Recommendation 10.2 would be partially addressed by the rulemaking process associated with NTTF Recommendation 8. Requirements for command and control strategy for the purposes of accident mitigation will be developed through the Recommendation 8 effort. Specific aspects relating to the requirements for an ultimate decisionmaker for the purposes of accident mitigation will be identified. However, any changes to the command and control strategies for offsite activities associated with the emergency plan will be addressed through Recommendations 9 and 10.

NTTF Tier 3 (Advisory Committee on Reactor Safeguards Recommendation 2) – Accident Monitoring Instrumentation

As requirements for additional severe accident instrumentation are developed, these new instruments would need to be incorporated into accident mitigation procedures. As control rooms are fitted with new instrumentation, associated plant reference simulators would need to ensure simulator fidelity in accordance with 10 CFR 55.46 (as applicable to the design of the reference plant).

6.2 Impact on Licensees

Considering that SAMGs have already been developed in accordance with industry standards developed by the owners groups, the direct impact on individual licensees as a result of establishing a regulatory requirement for SAMGs should be manageable. Although some upgrades would be required to the SAMGs based on the revisions to the technical guidelines, the majority of the research effort would be completed by the Electric Power Research Institute (EPRI) and the industry owners groups. Individual licensees would feel the impact when developing the integrated strategy for accident mitigation. Each licensee would be responsible for implementing changes to the SAMGs, developing the additional supporting guidelines specific to its plant, and analyzing its approach to ensure that it is integrated, coherent, and comprehensive. In its response to questions presented in the ANPR, the Nuclear Energy

Institute (NEI) estimated that a comprehensive investment of \$16 million would be required for the generation of a new Technical Basis Report, generic guidelines, and plant-specific procedures.

As previously discussed, a significant amount of effort would be associated with any added requirements for training as a result of the events at Fukushima Dai-ichi. While the focus of operator licensing programs should continue to be on successful implementation of the EOPs, additional training and exercise requirements would need to be developed to support the overall integrated strategy for severe accident mitigation. These additional training requirements should be balanced to not significantly affect training departments' capacity to execute operator initial and requalification training programs, and to ensure that knowledge and abilities for key personnel relied upon to implement severe accident mitigation strategies, as identified through a systems approach to training, are addressed. The impact of additional training requirements would be heavily front-loaded as the majority of the effort would likely be in the development of the knowledge and abilities and the design of the training program. With an appropriately chosen periodicity for continuing training in this area, additional resources required for long-term training capacity for licensee training departments should be manageable. In its response to the draft regulatory basis, NEI estimated that a comprehensive investment of \$17 million (\$275,000 per site) would be required for the industry's currently forecasted training plan development and implementation. Additionally, the industry estimates per-site training costs of \$250,000 per year if the changes presented in this regulatory basis are included in future regulations.

The periodicity of exercises/drills that implement the newly developed strategies should be carefully chosen to ensure that resources normally devoted to training and exercises/drills on design basis events would not be significantly affected. As mentioned previously, there would be limited benefit, on its own, to a table-top discussion of strategies developed to address a large-scale, complicated event requiring action from all aspects of an organization. The exercises/drills associated with this rulemaking effort would require a realistic, real-time scenario to ensure that the strategies that have been developed can be successfully implemented. Any effort to minimize the impact on licensees, operationally and financially, should therefore be centered on choosing an appropriate periodicity and developing a variety of smaller scale evaluations, such as part-task simulations, walk throughs and other approaches that can be used to sample performance effectiveness between full-scale exercises. Although these new capabilities should be developed, licensees must also maintain their current capabilities in the response to the more likely accident scenarios currently addressed by the EOPs. Based on comments on the draft regulatory basis, the industry estimates a cost of \$250,000 per severe accident drill. This equates to approximately \$2 million per year for the industry.

6.3 *Applicability*

An onsite emergency response capability rule would be intended for all holders of or applicants for an operating license under 10 CFR Part 50, except those Part 50 licensees who have 1) permanently ceased operations, 2) certified that fuel has been permanently removed from the reactor vessel, and 3) removed all fuel from the spent fuel pool. An onsite emergency response capability rule would also be intended for all holders of or applicants for a combined license under 10 CFR Part 52.

Assuming that any future rule language maintains a performance-based approach, the options presented by this regulatory basis document would maintain applicability to new reactor designs and those facilities with combined licenses. As with the established industry owners' groups,

technical guidelines for the integrated accident mitigation strategy would be expected to be developed by the industry.

6.4 Backfitting and Issue Finality

If the NRC staff pursues Options 1, 2, or 4, as described in section 5 above, the staff would need to develop the information necessary to address applicable backfitting requirements in 10 CFR Chapter I, including applicable issue finality provisions in Part 52, in developing any proposed rule. These three options would involve rulemakings that could require existing and future holders of nuclear power reactor operating licenses under Part 50 and combined licenses under Part 52 to: have SAMGs that meet criteria specified in the regulations; develop procedures to integrate EOPs, SAMGs, EDMGs, and additional supporting guidelines; create and maintain the command and control structure necessary to implement the procedures; and enhance training and exercise/drill requirements to incorporate the new accident mitigating procedures. Option 3, involving guidance documents and licensee commitments, would not constitute backfitting as defined in 10 CFR 50.109 nor would it be inconsistent with any of the issue finality provisions in 10 CFR Part 52.

A final rule under Options 1, 2, or 4, if applied to existing holders of nuclear power reactor operating licenses under Part 50, would likely constitute backfitting as defined in 10 CFR 50.109(a)(1). None of these options would appear to satisfy any of the exceptions from the requirement to conduct a backfit analysis. Therefore, the NRC staff would need to perform a backfit analysis to determine whether the applicable option would result in a substantial increase in the overall protection of the public health and safety or the common defense and security and determine that the costs of implementing that option would be justified in view of this increased protection.

A final rule under Options 1, 2, or 4, if applied to existing holders of combined licenses under Part 52, might require justification under the applicable issue finality provisions of 10 CFR 52.63, 52.83, or 52.98 (and any applicable issue finality provisions in a referenced design certification rule).

6.5 Implementation Plan and Development of Supporting Guidance

The development of a procedural approach for the new strategies is largely dependent on the new capabilities resulting from other NTTF recommendation efforts. While efforts will certainly be conducted in parallel, the procedures cannot be finalized until the coping strategies have been developed and the requirements for additional capabilities have been agreed upon. For this reason, the NRC is ensuring that the onsite emergency response capability rulemaking effort is closely coordinated with the other related NTTF recommendations. An important part of the success of this rulemaking effort will be ensuring that the new strategies and capabilities developed through these other efforts are finalized prior to integration into the procedural approach to severe accident mitigation.

To provide guidance for the industry on an approved approach for meeting the requirements of a new rule, the NRC staff plans to work with the industry to create supporting draft guidance, most likely in the form of a Regulatory Guide, concurrent with the development of the proposed rule. The NRC anticipates that new technical guidelines will be developed by industry owners' groups, and NEI will submit an industry-recommended approach to the rulemaking simultaneously with this rulemaking effort. The NRC staff intends to evaluate the approach developed by the industry when developing the draft Regulatory Guide. In addition to the input provided by the industry, the NRC staff will formally respond to public comments received during

the proposed rule phase of the rulemaking to ensure that all stakeholders have input into the rulemaking process and the development of the corresponding draft Regulatory Guide. The NRC's goal is to develop a final rule that efficiently and effectively addresses all regulatory deficiencies, with adequate supporting guidance, and utilizes all stakeholder input.

7. Conclusion

The NRC staff finds that a continued rulemaking effort is warranted in the area of onsite emergency response capability. The analysis of regulatory deficiencies in this area identified opportunities for regulatory improvement that would further reduce the risk to public health and safety in the event of an accident similar in scale to that experienced at Fukushima Dai-ichi. The staff proposes to continue the rulemaking effort with Option 1 from Section 5.1 of this report. Option 1 would establish new requirements within the existing framework for training and exercise/drill programs and develop a procedures rule that establishes requirements for all accident mitigating procedures and associated command and control structures.

Appendix A: Rulemaking Alternatives

In seeking to address the regulatory deficiencies associated with onsite emergency response capabilities, the NRC staff considered several alternatives in addition to rulemaking, including the following: (1) issuance of a generic communication; (2) issuance of additional regulatory guidance documents; (3) development of inspection modules; (4) revision of enforcement guidance; and (5) issuance of orders. After considering each option, the staff determined that each of these alternatives, without rulemaking, would be inappropriate to address the Commission's intent and direction, as described below.

Issue Generic Communications (Regulatory Issue Summary, Generic Letter, or Bulletin)

The NRC considered using Generic Communications in the form of a Regulatory Issue Summary, Generic Letter, or Bulletin to address the concerns identified in this Regulatory Basis. The NRC staff determined that this course of action would not accomplish the goal of developing a regulatory requirement for accident mitigating procedures, training, and exercises/drills. By establishing regulatory requirements, the NRC can ensure that certain minimum standards for procedures, training, and exercises/drills are achieved by licensees through NRC inspections and, when necessary, enforcement actions to better protect the public health and safety.

Issue additional regulatory guidance documents

The NRC considered using a stand-alone Regulatory Guide to address the concerns identified in this Regulatory Basis. Regulatory Guides provide guidance for the industry; however they are not requirements. Therefore, the use of a stand-alone Regulatory Guide would not accomplish the goal of developing a regulatory requirement for accident mitigating procedures, training, and exercises/drills. The NRC staff anticipates that a draft Regulatory Guide will be developed to accompany the proposed rule for onsite emergency response capabilities.

Development of inspection modules

The NRC considered developing additional inspection modules to address the concerns identified in this Regulatory Basis. However, without a regulatory requirement for SAMGs and accident mitigation training and exercises/drills, there would be no regulatory basis for enforcement during an inspection. The NRC staff anticipates that inspection modules will be developed to inspect the programs that licensees implement to comply with the new onsite emergency response capability rulemaking.

Revision of enforcement guidance

The NRC considered developing additional enforcement guidance to address the concerns identified in this Regulatory Basis. However, without a regulatory requirement for SAMGs and accident mitigation training and exercises/drills, there would be no regulatory basis for enforcement during an inspection on these programs.

Issue Orders

The NRC considered issuing a Commission Order prior to developing an onsite emergency response capability rule. However, in SECY-11-0137, "Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned," the NRC staff recommended to the Commission that the normal rulemaking process be used to develop the new requirements. Utilizing the standard rulemaking process will allow for development of a rule that considers external stakeholder input and is responsive to the efforts of other NTTF recommendations.

Appendix B: Stakeholder Involvement

Stakeholder Involvement

The NRC staff involved stakeholders in developing this regulatory basis in a number of ways. First, the staff requested input from the public through an Advance Notice of Proposed Rulemaking (ANPR), which presented a series of questions to the public for its consideration and response, and published a draft regulatory basis for public comment.

Second, the NRC staff held public meetings on February 15, 2012, May 23, 2012, November 7, 2012, and January 31, 2013, to discuss issues associated with Recommendation 8. The meetings attracted members of the public and representatives from NEI, EPRI, and the industry owners groups. The meeting summaries (ADAMS Accession Nos. ML12073A283, ML12165A627, ML12339A110, and ML13052A686, respectively) describe the meeting topics and discussions. In addition, on February 6, 2013, the NRC staff presented the draft regulatory basis to the Advisory Committee on Reactor Safeguards (ACRS), Plant Operations and Fire Protection Subcommittee. The ACRS meeting transcript can be found at ADAMS Accession No. ML13063A403.

Public Comments

The NRC received 18 comments from stakeholders through the ANPR process. Comments 1 through 17 were evaluated during the development of this regulatory basis. Comment 18 was submitted many months after the ANPR comment deadline and was not considered in the development of this document.

Comment No.	ADAMS No.	Commenter Affiliation	Commenter Name
1	ML12111A050	Private Citizen	James Hines
2	ML12114A316	Private Citizen	Ronald Crews
3	ML12116A318	Private Citizen	Randall Smith
4	ML12136A219	Private Citizen	George Lapinsky
5	ML12164A203	Private Citizen	Richard Wilson
6	ML12167A289	Foundation for Resilient Societies	William Harris
7	ML12174A053	Private Citizen (additional comments that include the papers referenced in Comment 5)	Richard Wilson
8	ML12167A237	Korea Hydro Nuclear Power Co.	Moon-Hak Jee
9	ML12171A005	Decommissioning Plant Coalition	Michael Callahan
10	ML12171A210	Private Citizen	George Vayssier
11	ML12171A407	Citizens Environmental Coalition	Barbara Warren
12	ML12172A265	Nuclear Energy Institute (NEI)	Anthony Pietrangelo
13	ML12172A283	Enercon Services, Inc	Jay Maisler
14	ML12173A128	PWR Owners Group	N. Jack Stringfellow
15	ML12179A309	Exelon Generation Co	Michael Jesse
16	ML12181A309	Connecticut Yankee Atomic Power Co	Jim Lenois
17	ML12181A311	Yankee Atomic Electric Co	Robert Mitchell
18	ML12249A002	Private Citizen	Mark Leyse

The NRC received the following 7 comments from stakeholders on the draft regulatory basis:

Comment No.	ADAMS No.	Commenter Affiliation	Commenter Name
1	ML13052A001	Professional Reactor Operator Society (PROS)	Casey Pfeiffer
2	ML13053A329	PWR Owners Group	N. Jack Stringfellow
3	ML13053A328	Private Citizen	George Vayssier
4	ML13058A020	Decommissioning Plant Coalition	Michael Callahan
5	ML13058A021	Entergy	Bryan Ford
6	ML13079A822	Nuclear Energy Institute (NEI)	Anthony Pietrangelo
7	ML13081A302	STARS Alliance	Scott Bauer

As this rulemaking effort continues, the next opportunity for public comment will be during the proposed rule phase. During the proposed rule phase, the NRC will solicit input from stakeholders on the draft rule language and supporting guidance for onsite emergency response capabilities.

Appendix C: Preliminary Proposed Rulemaking Language

NOTE: The NRC is making this preliminary proposed rule language available to the public to solicit public comments and provide preparatory material for an upcoming public meeting. The release of the preliminary proposed rule language will facilitate discussions at the public meeting. This language does not represent a final NRC staff position, nor has it been reviewed by the Commission. Therefore, the preliminary proposed rule language may undergo significant revision during the rulemaking process. Italicized text represents proposed revisions to existing regulatory language.

10 CFR 50.54 Conditions of licenses

* * * * *

(ii)

- (1) Each licensee must develop an integrated strategy for beyond design-basis event response and severe accident mitigation that consists of the following sets of procedures and guidance documents:
 - (i) Emergency Operating Procedures (EOPs)
 - (ii) Severe Accident Management Guidelines (SAMGs)
 - (iii) Guidance developed to meet requirements of § 50.54(hh)(2).
 - (iv) Additional guidelines developed to support EOPs and SAMGs.
 - (v) Emergency procedures for operation in modes not covered by EOPs.
 - (vi) Guidance for responding to spent fuel pool emergencies.

- (2) Each licensee must develop and define a command and control strategy for severe accidents, including multiple unit accidents, that establishes the necessary organizational structure for implementation of the strategies developed in accordance with 10 CFR 50.54(ii)(1). This command and control strategy must identify qualification requirements for a position with ultimate decisionmaking authority during implementation of SAMGs, EDMGs, and supporting guidelines.

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10 CFR 50.120 Training and qualification of nuclear power plant personnel

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(b) Requirements

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- (2)(x) Accident management personnel responsible for implementation of beyond design basis and severe accident mitigation strategies developed in accordance with § 50.54(ii)(1).

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10 CFR 50 – Domestic Licensing of Production and Utilization Facilities

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[Section to be determined]

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At a periodicity not to exceed [TBD] years, each nuclear power reactor licensee must conduct drills or exercises that provide the opportunity for the licensee to demonstrate proficiency in the key skills necessary to respond to a severe accident scenario. Each nuclear power plant licensee must demonstrate its implementation of strategies, procedures and guidance developed under § 50.54(ii)(1). These licensees must use drills or exercises to test the adequacy of emergency equipment, communication networks, and command and control organizations and ensure that onsite emergency response personnel are familiar with their duties.

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10 CFR 55.41 Written examination: Operators

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(b)(10) Administrative, normal, abnormal, emergency, *and severe accident* procedures for the facility.

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10 CFR 55.43 Written examination: Senior operators

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(b)(5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, emergency, *and severe accident* situations.

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10 CFR 55.45 Operating Tests

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(a)(6) Perform control manipulations required to obtain desired operating results during normal, abnormal, emergency, *and severe accident* situations.

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Appendix D: Other Regulatory Considerations

Environmental Analysis

During the proposed rule phase, the proposed rule language will be analyzed for its potential effects on the environment. The NRC does not anticipate that a rule in the area of onsite emergency response capabilities will have any negative impact on the environment.

Impact on State, Local, or Tribal Governments

The recommended rulemaking could potentially affect state and local government resources due to the additional requirement to conduct a severe accident exercise on a periodic basis to be determined. However, it is unlikely that any drill or exercise that meets the requirement for severe accident exercises would require participation by state and local governments. Future rule language in the area of severe accident exercises will provide licensees flexibility in exercise conduct such that state and local resource needs would be minimal.

Impact on the NRC

A new rule in the area of onsite emergency response capabilities would require inspection resources from the regional NRC staffs to support follow-on inspections of licensee programs associated with accident mitigating procedures, training, and exercises/drills. The expansion of requirements for exercises/drills would require additional hours from resident inspectors, regional inspectors, and potential emergency response organizations at the regional offices.

Appendix E: List of Acronyms

ACRS	Advisory Committee on Reactor Safeguards
CFR	Code of Federal Regulations
EDMGs	Extensive Damage Mitigating Guidelines
EOPs	Emergency Operating Procedures
EPRI	Electric Power Research Institute
ERO	Emergency Response Organization
FR	Federal Register
GL	Generic Letter
JPM	Job Performance Measure
NRC	Nuclear Regulatory Commission
NEI	Nuclear Energy Institute
NSSS	Nuclear Steam Supply System
NUREG/CR	Publications Prepared by the NRC or its contractors
PRM	Petition of Rulemaking
RG	Regulatory Guide
SAMGs	Severe Accident Management Guidelines
SECY	Office of the Secretary
SFP	Spent Fuel Pool
SRM	Staff Requirements Memorandum
SRO	Senior Reactor Operator
TI	Temporary Instruction
TSC	Technical Support Center

Appendix F: References

Date	Document	ADAMS Accession Number/ <i>Federal Register</i> Citation
April 4, 1990	Generic Letter 88-20, Supplement 2, "Accident Management Strategies for Consideration in the Individual Plant Examination Process"	ML031200551
August 28, 2007	Appendix A to Part 50—General Design Criteria for Nuclear Power Plants	72 FR 49505
August 28, 2007	Final Rule: Licenses, Certifications, and Approvals for Nuclear Power Plants	72 FR 49352
March 27, 2009	Final Rule: Power Reactor Security Requirements	74 FR 13969
March 23, 2011	Memorandum from Chairman Jaczko on Tasking Memorandum-COMGBJ-11-0002 - NRC Actions Following the Events in Japan	ML110950110
April 29, 2011	TI 2515/184, "Availability and Readiness Inspection of Severe Accident Management Guidelines (SAMGs)."	ML11115A053
May 26, 2011	Completion of TI 2515/184, "Availability and Readiness Inspection of Severe Accident Mitigation Guidelines (SAMGs)," at Region IV Reactor Facilities.	ML111470264
May 27, 2011	Region I Completion of TI-184, "Availability and Readiness Inspection of Severe Accident Mitigation Guidelines (SAMGs)."	ML111470361
June 1, 2011	Completion of TI 2515/184, "Availability and Readiness Inspection of Severe Accident Management Guidelines (SAMGs)" at Region III Sites - Revision.	ML111520396
June 2, 2011	Completion of TI 184, "Availability and Readiness Inspection of Severe Accident Mitigation Guidelines (SAMGs)" at Region II Facilities - Revision	ML111530328

Date	Document	ADAMS Accession Number/<i>Federal Register</i> Citation
July 12, 2011	SECY-11-0093 - The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident	ML111861807
August 19, 2011	SRM-SECY-11-0093 - Near-Term Report and Recommendations for Agency Actions Following the Events in Japan	ML112310021
September 9, 2011	SECY-11-0124, "Recommended Actions to be Taken Without Delay from the Near-Term Task Force Report."	ML11245A127 ML11245A144 (Enclosure)
October 3, 2011	SECY-11-0137, "Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned."	ML11269A204 ML11272A203 (Enclosure)
October 18, 2011	Staff Requirements Memorandum– SECY-11-0124 – Recommended Actions to be Taken Without Delay From The Near-Term Task Force Report	ML112911571
July 26, 2011	Natural Resources Defense Council, Inc.'s Petition For Rulemaking to Require More Realistic Training on Severe Accident Mitigation Guidelines (PRM 50-102)	ML11216A242
Sept 14, 2011	Letter to Geoffrey H. Fettus, Natural Resources Defense Council, Inc. from Annette Vietti-Cook, In Regards to the NRC Will Not Be Instituting a Public Comment Period for PRM-50-97, PRM-50-98, PRM-50-99, PRM-50-100, PRM-50-101, and PRM-50-102.	ML112700269
November 30, 2011	INPO-11-005, Special Report on the Nuclear Accident at the Fukushima Daiichi Nuclear Power Station	ML11347A454
December 15, 2011	Staff Requirements Memorandum– SECY-11-0137 – Prioritization of Recommended Actions to be Taken in Response to the Fukushima Lessons Learned	ML113490055
April 18, 2012	Advance Notice of Proposed Rulemaking – Onsite Emergency Response Capabilities	ML12058A062
January 8, 2013	Draft Regulatory Basis – Onsite Emergency Response Capabilities	ML12332A325

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