POLICY ISSUE
(Notation Vote)

December 13, 2013 SECY-13-0135

FOR: The Commissioners

FROM: Mark A. Satorius
Executive Director for Operations

SUBJECT: DENIAL OF PETITION FOR RULEMAKING REQUESTING AMENDMENTS REGARDING EMERGENCY PLANNING ZONE SIZE (PRM-50-104)

PURPOSE:

To obtain Commission approval to publish the enclosed *Federal Register* notice (FRN) (Enclosure 1) denying a petition for rulemaking (PRM) submitted by Mr. Michael Mariotte on behalf of the Nuclear Information and Resource Service (NIRS or the petitioner) (Enclosure 2). This paper does not address any new commitments or resource implications.

BACKGROUND:

The petitioner filed with the Commission a petition for rulemaking (PRM-50-104) on February 15, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12048B004). The petitioner requests that the Commission amend its regulations in Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR) to expand existing emergency planning zones (EPZ) around nuclear power plants, create a new EPZ, and require the incorporation of concurrent natural disasters in the required periodic emergency plan drills. A notice of acceptance, docketing, and request for public comments was published in the *Federal Register* on April 30, 2012 (77 FR 25375). The comment period closed on July 16, 2012. The NRC received 5,993 comment submissions, 5,953 of which supported the petition and 40 opposed the petition.

DISCUSSION:

Petition:

The petitioner argues that real-world experience from the accidents at Chernobyl and Fukushima Dai-ichi demands larger EPZs because those accidents were more severe and

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affected a much larger geographical area than provided for in the NRC's regulations. The petitioner states that the current EPZ size is based on outdated studies and believes that ad hoc expansion may not be adequate. The NRC staff reviewed the petition and identified the following positions taken by the petitioner that require NRC consideration and response:

1. Expand EPZs because, in the event of a nuclear accident, the need for protective actions beyond 10 miles and 50 miles is highly likely.
2. Expand EPZs because the basis for the 10-mile EPZ is flawed.
3. Expand EPZs because the NRC urged U.S. citizens within 50 miles of the Fukushima Dai-ichi Nuclear Power Plant to evacuate.
4. There has been little change to emergency planning regulations in 30 years.
5. Expand EPZs because ad hoc expansion beyond 10 miles will not be adequate.
6. Expand EPZs because current planning is inadequate for increased populations around many U.S. nuclear power plants.
7. Expand EPZs because the U.S. reactor fleet is aging and more vulnerable to the occurrence of accidents.
8. Expand EPZs because risk from spent fuel pools is too high.
9. Emergency planning regulations must be strengthened because there are significant concerns related to pressure suppression containments.
10. Expand EPZs because expansion is supported by the current improved understanding of the health effects of radiation.
11. Expand EPZs because radiation does not stop at an EPZ boundary.
12. Expand EPZs because current regulations do not provide adequate protection. Amending the regulations as requested in the petition would more likely provide adequate protection.
13. Require EP exercises to include a regionally-relevant initiating or concurrent natural disaster because natural disasters can challenge nuclear safety systems.
14. Require EP exercises to include a regionally-relevant initiating or concurrent natural disaster because natural disasters may affect communications during emergency response.

Each of these positions is addressed separately in the enclosed FRN.

NRC Evaluation of Petition Requests:

The NRC's regulations in 10 CFR Part 50 require two EPZs around each nuclear power plant. The 10-mile zone establishes the area in which exposure from a radiological release would likely occur and protective actions such as sheltering in place or evacuation would be appropriate. The 50-mile zone is the ingestion exposure pathway EPZ, where human exposure to radionuclides would likely result from ingestion of contaminated food, milk, or surface water. Nuclear power plant licensees; Federal, State, and local governments; and offsite response organizations perform comprehensive planning for these zones and routinely test and evaluate these plans through full participation exercises. The licensee develops the onsite emergency plan for NRC review. The State and local governments develop and maintain the offsite emergency plans, which are evaluated by the Federal Emergency Management Agency. Through coordination of their emergency plans, the licensee and State and local governments establish the EPZ for the respective site.

The NRC staff concludes that the current size of EPZs is appropriate for existing reactors and that emergency plans will provide an adequate level of protection of the public health and safety in the event of an accident at a nuclear power plant. The current EPZs provide for a comprehensive emergency planning framework that would allow expansion of the response efforts beyond the designated distances should events warrant such an expansion.

The NRC concludes that emergency actions could be successfully carried out beyond the 10-mile EPZ for several reasons. The 10-mile emergency planning basis establishes an infrastructure similar to that used by other offsite response organizations, such as police and fire departments. The infrastructure consists of emergency organizations, communications capabilities, training, and equipment that can be used in the event of an accident at a facility. Coordination is enhanced by the practice of having offsite response organizations, which include local, State, and Federal responders, participate in training exercises with the licensee.

In addition, State and local response agencies have improved their incident response plans and guidance following the events of September 11, 2001. The Department of Homeland Security has issued guidance for Federal, State, and local response to emergencies which includes the National Response Framework, the National Incident Management System, and the Incident Command System. These guidance documents present a framework for use during an emergency that is scalable, flexible, and allows for an adaptable coordinating structure. The development and implementation of the National Incident Management System and Incident Command System under the National Response Framework enhances State and local response capabilities through uniform and logical management of response resources to facilitate prompt and effective protective measures for all populations that may be affected.

The NRC has examined the accident at Fukushima Dai-ichi for lessons learned and established bases for its decisions related to EPZs. As explained in SECY-11-0093, “Near-Term Report and Recommendations for Agency Actions Following the Events in Japan,” dated July 12, 2011 (ADAMS Accession No. ML11186A950), a senior level agency task force studied the basis for the current EPZs and did not recommend expansion of the EPZs. In SECY-12-0095, “Tier 3 Program Plans and 6-Month Update in Response to Lessons Learned from Japan’s March 11, 2011, Great Tohoku Earthquake and Subsequent Tsunami,” dated July 13, 2012 (ADAMS Accession No. ML12208A210), the NRC staff determined that the existing basis for the EPZ size remains valid (including for multi-unit events). However, there are plans to further study the potential health effects for the released radioactivity from the Fukushima Dai-ichi site. The United Nations Scientific Committee on the Effects of Atomic Radiation is preparing a scientific report to assess the radiation doses and associated effects on health and the environment. Also, the Fukushima Prefecture launched the Fukushima Health Management Survey to investigate long-term low-dose radiation exposure caused by the accident. The survey attempts to estimate radiation exposure from the accident and more detailed dose assessments by recreating the whereabouts of every Fukushima prefecture resident for the four month period beginning with the March 11th nuclear accident. The stated primary purposes of this survey are to monitor the long-term health of residents, promote their future well-being, and confirm whether long-term low-dose radiation exposure has health effects. The NRC staff will continue to monitor the results of these efforts and their potential implications regarding the U.S. regulatory approach to emergency planning around nuclear power plants, including the EPZ size. In addition, the NRC is conducting a Level 3 probabilistic risk assessment to gain a better understanding of potential radiological effects of postulated accident sequences including sites with multiple units. If these research activities indicate that changes need to be made to the

existing emergency preparedness regulations, the NRC will commence a rulemaking effort to make those changes. However, at this time, the NRC does not find that an expansion of the EPZ is necessary based on the positions presented in the petition.

The majority of nuclear power plant licensees currently incorporate natural disasters into their drill and exercise scenarios to help them prepare for natural disasters that could coincide with a reactor emergency. All NRC-licensed sites in the United States have emergency action levels in their radiological emergency plans that include protective actions related to aspects of natural disasters. Moreover, current activities being undertaken by the NRC staff for the Near-Term Task Force recommendations resulting from the Fukushima Dai-ichi event are addressing the issue of additional requirements, including training and drills, for a beyond-design-basis event, such as a natural disaster (Order EA-12-049, "Order Modifying Licenses with regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated March 12, 2012 (ADAMS Accession No. ML12054A736)). The requirement in the order for licensees to perform a drill for an event that originates from a beyond-design-basis external event and leads to a multi-unit prolonged station blackout involves licensees planning, preparing, and practicing for these unlikely natural events.

On a separate but related topic, the NRC staff has discussed the development of a scalable, dose-based, consequence-oriented emergency planning framework, including EPZs, in SECY-11-0152, "Development of an Emergency Planning and Preparedness Framework for Small Modular Reactors," dated October 28, 2011 (ADAMS Accession No. ML112570439). The NRC staff provided an update on this topic in a memorandum to the Commission, "Current Status of the Source Term and Emergency Preparedness Policy Issues for Small Modular Reactors," dated May 30, 2013 (ADAMS Accession No. ML13107A052). The NRC staff plans to continue to work with external stakeholders on this topic, but will not go further in proposing new policy or guidance for specific changes to emergency planning requirements for small modular reactors absent specific proposals from an applicant or other stakeholder.

STAKEHOLDER COMMENTS:

The NRC received 5,993 comment submissions on the petition: 5,942 were from individuals; 36 were from State or local government emergency management agencies or radiation control organizations; 10 were from environmental, nuclear, or energy oriented citizen activity groups; 3 were from local governments; and 2 were from organizations associated with the nuclear power industry. Of the 5,942 comment submissions from individuals, 5,702 were form letters. Overall, 5,953 comment submissions supported the petition, and 40 comment submissions opposed the petition.

RECOMMENDATION:

The NRC staff has reviewed the petition and the public comments and recommends that the Commission deny the petition for the reasons summarized in this document and further described in the FRN. The NRC staff does not find that the petitioner provides a sufficient basis for changing the existing regulations. The NRC staff recommends denying the petition because the NRC staff concludes that the current size of the EPZs is appropriate for existing reactors and proposed new reactors and that emergency plans will provide an adequate level of protection of the public health and safety in the event of an accident at a nuclear power plant. The current EPZs provide for a comprehensive emergency planning framework that would allow expansion of the response efforts beyond the designated distances should events warrant such an expansion.

The NRC staff requests the Commission's approval to publish the FRN denying PRM-50-104.

The enclosed letter for signature by the Secretary of the Commission (Enclosure 3) informs the petitioner of the Commission's decision to deny PRM-50-104. The NRC staff will inform the appropriate congressional committees.

COORDINATION:

The Office of the General Counsel has reviewed this package and has no legal objection to the denial of this petition.

/RA/

Mark A. Satorius
Executive Director
for Operations

Enclosures:
1. *Federal Register* Notice
2. NIRS Petition
3. Letter to the Petitioner

[7590-01-P]

NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

[Docket Nos. PRM-50-104; NRC-2012-0046]

Emergency Planning Zones

AGENCY: Nuclear Regulatory Commission.

ACTION: Petition for rulemaking; denial.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is denying a petition for rulemaking (PRM), dated February 15, 2012, which was filed with the NRC by Michael Mariotte on behalf of the Nuclear Information and Resource Service (NIRS or the petitioner) and 37 co-petitioners. The petitioner requested that the NRC amend its regulations that govern domestic licensing of production and utilization facilities to expand existing emergency planning zones (EPZ) around nuclear power plants, create a new EPZ, and require the incorporation of concurrent natural disasters in the required periodic emergency plan drills. The NRC is denying the petition because the NRC concludes that the current size of the emergency planning zones is appropriate for existing reactors and that emergency plans will provide an adequate level of protection of the public health and safety in the event of an accident at a nuclear power plant. The current EPZs provide for a comprehensive emergency planning framework that would allow expansion of the response efforts beyond the designated distances should events warrant such an expansion.

DATES: The docket for the petition for rulemaking, PRM-50-104, is closed on **[INSERT DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**.

ADDRESSES: Please refer to Docket ID NRC-2012-0046 when contacting the NRC about the availability of information for this petition. You may access publicly-available information related to this petition by any of the following methods:

- **Federal Rulemaking Web Site:** Go to http://www.regulations.gov and search on Docket ID NRC-2012-0046. Address questions about NRC dockets to Carol Gallagher; telephone: 301-287-3422; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual listed in the FOR FURTHER INFORMATION CONTACT section of this document.
- **The NRC's Agencywide Documents Access and Management System (ADAMS):** You may access publicly available documents online in the NRC Library at http://www.nrc.gov/reading-rm.html. To begin the search, select "ADAMS Public Documents" and then select "Begin Web-Based ADAMS Search." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdf.resource@nrc.gov. The ADAMS accession number for each document referenced in this document (if that document is available in ADAMS) is provided the first time that a document is referenced. In addition, for the convenience of the reader, the ADAMS accession numbers are provided in a table in Section IV of this document, Availability of Documents.
- **The NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

FOR FURTHER INFORMATION CONTACT: Daniel Doyle, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-3748; e-mail: Daniel.Doyle@nrc.gov.

SUPPLEMENTARY INFORMATION:

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I. The Petition

On February 15, 2012, the NIRS filed a petition for rulemaking. The petition was docketed by the NRC and assigned Docket No. PRM-50-104 (ADAMS Accession No. ML12048B004). On April 30, 2012, the NRC published in the *Federal Register* a notice of receipt and request for public comment for PRM-50-104 (77 FR 25375). The public comment period closed on July 16, 2012. For more information regarding the public comments received, see Section II, Public Comments on the Petition, of this document.

The petitioner requested that the NRC amend § 50.47, "Emergency Plans," of Title 10 of the *Code of Federal Regulations* (10 CFR) and appendix E, "Emergency Planning and Preparedness for Production and Utilization Facilities," to 10 CFR part 50, "Domestic Licensing of Production and Utilization Facilities," and include the modifications in 10 CFR part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." Specifically, the petitioner requested that the NRC: (1) expand the plume exposure pathway EPZ radius from a 10-mile radius to a 25-mile radius; (2) establish a new 50-mile radius emergency response zone, with more limited requirements than the plume exposure pathway EPZ; (3) expand the ingestion pathway EPZ radius from a 50-mile radius to a 100-mile radius; and (4) require nuclear power plant licensees' emergency plans be "tested to encompass initiating and/or concurrent natural

disasters that may affect both accident progression and evacuation conduct." The petitioner asserted that "the requested amendments are essential for the protection of public health and safety in light of the real-world experience of the Chernobyl and Fukushima disasters, which were more severe and affected a much larger geographical area than provided for in NRC regulations."

The petitioner stated that "[t]he NRC should amend 10 C.F.R. 50.47(c)(2) to create a three-tiered emergency planning zone…." The petitioner's three-tiered EPZ included a 25-mile plume exposure pathway EPZ, 50-mile emergency response zone, and 100-mile ingestion exposure pathway zone. The following paragraphs provide the petitioner's proposed revisions to 10 CFR 50.47(c)(2).

25-Mile Plume Exposure Pathway EPZ

The petitioner proposed the following revision to 10 CFR 50.47(c)(2) with regards to the plume exposure pathway EPZ:

> A Plume Exposure Pathway zone shall consist of an area about 25 miles (40 km) in radius. Within this zone, detailed plans must be developed to provide prompt and effective evacuation and other appropriate protective measures, including conducting of biannual full-scale emergency evacuation drills. Sirens will be installed within this zone to alert the population of the need for evacuation. Transportation for elderly, prison and school populations shall be provided within this zone. Emergency shelters shall be located outside of the 25-mile zone.

The petitioner asserted that the expansion of the plume exposure pathway EPZ from a 10-mile radius to a 25-mile radius "would provide no new requirements other than expansion of the EPZ."

50-Mile Emergency Response Zone

The petitioner proposed the following revision to 10 CFR 50.47(c)(2) with regards to an emergency response zone:

> The [emergency response zone] shall be about 50 miles in radius. Within this 50 mile zone, the licensee must identify evacuation routes for all residents within this zone and annually provide information to all residents within this zone about these routes and which they are supposed to take in the event of an emergency. The licensee must make basic pre-arrangements for potential transport of disabled/hospital/prison populations. Emergency centers for the public currently located less than 25 miles out shall be relocated to 25 miles or further out. Information shall be made available to the public within this zone through television, internet and radio alerts, text message notices, and other appropriate means of public communication.

The petitioner noted that this revision "would require measures be carried out between the new 25 mile Plume Exposure Pathway EPZ and a new Emergency Response Zone of about a 50 mile radius." The petitioner stated that the plume exposure pathway EPZ emergency evacuation requirements and biannual exercises are not required in the emergency response zone. The petitioner further stated "this new zone would provide a modest level of pre-planning that would enable rapid expansion of the 25 mile zone when necessary. Information regarding evacuation such as identification of evacuation routes and locations of emergency shelters in the event of a large-scale disaster would be identified and would be provided to members of the public annually, and a limited number of other pre-arrangements would be made."

100-Mile Ingestion Exposure Pathway Zone

The petitioner proposed the following revision to 10 CFR 50.47(c)(2) with regards to the ingestion pathway EPZ:

> The ingestion pathway EPZ shall be about 100 miles in radius. In the event of a radioactive release, the deposition of radionuclides on crops, other vegetation, bodies of surface water and ground surfaces can occur. Measures will be implemented to protect the public from eating and drinking food and water that may be contaminated. Information shall be made available to the public within this zone through television and radio alerts, text message notices, and other appropriate means of public communication.

The petitioner stated that "[t]he current Ingestion Exposure Pathway Zone exists to protect food, water and anything intended for human consumption within 50 miles of a nuclear power plant." The petitioner further stated "[g]iven that radiation can, and does, have far-

reaching effects on food on a large radius, the Ingestion Pathway EPZ should be expanded."

Drills and Exercises

The petitioner proposed amending 10 CFR 50.47(b)(14) with regards to drills and exercises by adding:

> Within the emergency evacuation zone full scale drills and exercises will be conducted on a biannual basis. Every other exercise and drill shall include a scenario involving an initiating or concurrent regionally-appropriate natural disaster.

II. Public Comments on the Petition

The NRC received a total of 5,993 comment submissions, 5,953 in support of the petition and 40 opposing it. There were 5,942 submissions from individuals of whom 5,940 supported the petition and 2 opposed it. Of the 5,942 submissions from individuals, 5,702 were form letters. Of the 5,702 form letters, 2,421 expressed support for the petition and 3,281 requested co-petitioner status. One of the form letters requesting co-petitioner status had 1,839 signatures. Ten submissions were from environmental, nuclear, or energy oriented citizen activist groups. All 10 supported the petition. Two submissions were received from organizations associated with the nuclear power industry. Both submissions opposed the petition. Thirty-six submissions were received from State or local government emergency management agencies or radiation control organizations. All 36 submissions opposed the petition. Three submissions were received from local governments. All 3 supported the petition.

The NRC has prepared a comment response document to demonstrate how all comments were considered and to respond to the issues identified in the comments. The NRC's comment response document is available in ADAMS under Accession No. ML13109A523.

The NRC identified 14 separate issues raised by the petition and public comments. Issues 1 through 12 contain arguments for expanding the EPZs. Issues 13 and 14 concern requirements for exercises that include a regionally-relevant initiating or concurrent natural disaster. Each issue and accompanying rationale is fully discussed and evaluated in this document, followed by NRC's response.

Many comments were considered to be out-of-scope because they did not address the merits of the petition for rulemaking. These comments are not discussed in this document but are addressed in the NRC's comment response document.

Issue 1. Expand EPZs because, in the event of a nuclear accident, the need for protective actions beyond 10 miles and 50 miles is highly likely.

One rationale used to support the petitioner's argument that EPZs must be expanded is that protective actions beyond 10 miles and 50 miles are highly likely in the event of a nuclear accident as demonstrated by the real-world experience from the accidents at the Chernobyl Nuclear Power Station (Chernobyl) and the Fukushima Dai-ichi Nuclear Power Plant (Fukushima Dai-ichi). The petitioner stated that these accidents "were more severe and affected a much larger geographical area than provided for in NRC regulations."

Some commenters agreed and called for the NRC to make the emergency planning (EP) regulations more realistic given that actual evacuations beyond 10 miles and food interdiction efforts beyond 50 miles took place after the accidents at Chernobyl and Fukushima Dai-ichi.

Two emergency management agencies stated that Chernobyl should not be used as an example to justify revising EP regulations because the design of the Chernobyl facility is not used in the United States.

The Nuclear Energy Institute disagreed that Chernobyl should be used as an example to justify revising the EP regulations because "the [p]etition presents no new insights into the Chernobyl accident that should cause the Commission to modify the conclusions reached in the

[*Citizens Task Force of Chapel Hill, et al.*, 32 NRC 281 (1990)] decision or NUREG-1251 ['Implications of the Accident at Chernobyl for Safety Regulation of Commercial Nuclear Power Plants in the United States,' dated April 30, 1989 (ADAMS Accession Nos. ML082030501 and ML082030502)]."

NRC Response to Issue 1

The NRC disagrees with the petitioner's assertions on this issue. The current EPZs provide a comprehensive EP framework that would allow for expansion of the response efforts beyond the designated distances should the events warrant such an expansion.

As specified in 10 CFR 50.47(c)(2), two EPZs are established around each nuclear power plant. The technical basis for the EPZs is provided in NUREG-0396, EPA-520/1-78-016, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants," dated December 1978 (ADAMS Accession No. ML051390356). The first zone, the plume exposure pathway EPZ, establishes an area of approximately 10 miles in radius. Within the plume exposure pathway EPZ, detailed planning is required for the recommendation and implementation of protective actions such as sheltering in place or evacuation. The ingestion pathway EPZ has a radius of approximately 50 miles from the plant. Within this EPZ, detailed planning is required to address the potential need to interdict foodstuffs to prevent human exposure from ingestion of contaminated food and surface water.

The NRC remains confident that the emergency preparedness programs in support of nuclear power plants provide an adequate level of protection of the public health and safety and that appropriate protective actions can and will be taken in the event of a radiological event at an existing nuclear power plant. The NRC routinely inspects nuclear power plant licensees' EP programs to ensure compliance with regulations and biennially inspects a demonstration exercise that integrates the response of offsite and onsite organizations, including the licensee

and State and local authorities. The Federal Emergency Management Agency (FEMA) evaluates the offsite response in these exercises to ensure the State and local responders (i.e., offsite response organizations (ORO)) are capable of timely protective action decisionmaking and implementation. Public meetings are held at the conclusion of biennial exercises to discuss the adequacy of response with stakeholders. This oversight process includes additional inspection activities and reporting of performance indicator data for onsite EP that provide the NRC with oversight of EP programs between biennial exercises.

The NRC has studied the efficacy of evacuations implemented by OROs within the United States (NUREG/CR-6864, "Identification and Analysis of Factors Affecting Emergency Evacuations," dated January 2005 (ADAMS Accession Nos. ML050250245 and ML050250219) and NUREG/CR-6981, "Assessment of Emergency Response Planning and Implementation for Large Scale Evacuations," dated October 31, 2008 (ADAMS Accession No. ML082960499)). The NRC examined more than 250 large public evacuations and concluded that all of them were successful in saving lives (except for the response to Hurricane Rita in 2005). The evacuations studied had resulted from technical hazards, malevolent acts, and natural disasters. A few of these evacuations took place within nuclear power plant EPZs; most were successfully accomplished without the aid of NRC regulatory oversight. During the study period, a large and successful evacuation took place approximately every 3 weeks. Many of these evacuations moved people much farther than the 10 miles of an EPZ. For example, evacuations in support of hurricane response involve the dislocation of large numbers of people and travel distances of several miles. The information available to the NRC supports the conclusion that OROs are well able to protect the public they are responsible for without additional regulatory requirements from the NRC.

The required planning within the plume exposure pathway EPZ is found in 10 CFR 50.47 and appendix E to 10 CFR part 50. This planning is designed to provide effective response to a radiological emergency that has the potential to develop rapidly. The need for protective actions

beyond the 10-mile EPZ would generally develop more slowly. Protective actions to provide adequate protection beyond the plume exposure pathway EPZ can be implemented using ORO normal and robust response processes (as demonstrated by the previously mentioned studies). Moreover, the NRC emergency classification scheme required by 10 CFR 50.47(b)(4) is anticipatory, and thus is designed for offsite protective action to begin before a radiological release. This would cause protective actions to begin rapidly within the 10-mile EPZ and provide time for consideration of actions beyond this EPZ should the accident progression indicate the need. Although accidents that include rapid releases are very unlikely, as demonstrated by the accidents at Three Mile Island Nuclear Station, Unit 2 (Three Mile Island) and Fukushima Dai-ichi, protective action guidance has been provided to address such scenarios (Supplement 3 to NUREG-0654, "Guidance for Protective Action Strategies," dated November 20, 2011 (ADAMS Accession No. ML113010596)).

The NRC disagrees with the petition's contention that the accident at Fukushima Dai-ichi is a basis for expansion of the EPZ. The development of protective action recommendations by the Japanese Government, including expansion of evacuations out to 20 km (12 miles) from the plant, supported effective and timely evacuation to minimize the impact of the radiological releases on public health and safety. Subsequent decisions by the Japanese Government to evacuate selected areas based on potential long-term exposures are also similar to the U.S. strategy to expand protective actions during an event when conditions warrant an expansion.

The NRC is studying the accident to identify improvement areas applicable to the United States. Following the earthquake and tsunami at Fukushima Dai-ichi in March 2011, the NRC established a task force referred to as the Near-Term Task Force (NTTF). The NTTF conducted a systematic and methodical review of the NRC's regulations and processes to determine if the agency should make safety improvements in light of the events in Japan. The NTTF issued its report (the NTTF report) on July 12, 2011, "Recommendations for Enhancing Reactor Safety in the 21st Century, The Near-Term Task Force Review of Insights from the

Fukushima Dai-ichi Accident" (ADAMS Accession No. ML111861807). On July 19, 2011, the NTTF presented its findings to the five Commissioners (the Commission) of the NRC and proposed improvements in multiple areas, including emergency preparedness. The NTTF considered the existing planning structure, including the 10-mile plume exposure pathway and 50-mile ingestion pathway emergency planning zones, and found no basis to recommend a change to the size of the EPZs.

However, as information emerged about the events surrounding the protective actions implemented following the accident at Fukushima Dai-ichi, the NRC staff determined that the insights from the accident response should be evaluated to identify potential enhancements to NRC regulations and guidance. In SECY-11-0137, "Prioritization of Recommended Actions to Be Taken in Response to Fukushima Lessons Learned," dated October 3, 2011 (ADAMS Accession No. ML11272A111), the NRC staff recommended that evaluating the basis of the EPZ size warranted further consideration. In response to the Commission's Staff Requirements Memorandum (SRM) for SECY-11-0137, the NRC staff produced SECY-12-0095, "Tier 3 Program Plans and 6-Month Update in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Subsequent Tsunami," dated July 13, 2012 (ADAMS Accession No. ML12208A210), in which the NRC staff determined that the existing basis for the EPZ size remains valid (including for multi-unit events).

The Commission concludes that the current size of EPZs helps to provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency at an existing nuclear power plant. In addition, as part of previously-approved research efforts, the NRC plans a long-term action involving EPZs. The NRC staff will use insights from the current full-scope site Level 3 Probabilistic Risk Assessment (PRA) project as well as information obtained from the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) assessment to inform the evaluation of the potential impacts that a multi-unit event may have on an EPZ. The UNSCEAR is preparing a scientific report to

assess the radiation doses and associated effects on health and the environment. Also, the Fukushima Prefecture launched the Fukushima Health Management Survey to investigate long-term low-dose radiation exposure caused by the accident. The survey attempts to estimate radiation exposure from the accident and more detailed dose assessments by recreating the whereabouts of every Fukushima prefecture resident for the four month period beginning with the March 11th nuclear accident. The stated primary purposes of this survey are to monitor the long-term health of residents, promote their future well-being, and confirm whether long-term low-dose radiation exposure has health effects. If these research activities indicate that changes need to be made to the existing EP regulations, the NRC will commence a rulemaking effort to make those changes.

Issue 2. Expand EPZs because the basis for the 10-mile EPZ is flawed.

Another reason given in the petition in support of expanding the EPZs is that the basis for the 10-mile EPZ is flawed. The petitioner stated that "[t]he NRC's existing emergency planning regulations…are based primarily on experience gained by the Three Mile Island accident and on NRC reactor safety studies conducted from the 1950s through the 1970s (for example, WASH-1400 and NUREG-1150) and are encapsulated in NUREG-0396." The petitioner stated that these studies are now outdated.

The petitioner stated that "[s]tudies currently and previously relied upon to justify the existing 10-mile [EPZ]…are based on assumptions of reactor and fuel pool accident risk and accident progression and consequences that are significantly underestimated based on real-world experience and more recent understanding of the risks of radiation…."

The petitioner stated that computer models, simulations, and evaluations of projected scenarios are not a substitute for actual, "real-world experience."

The Nuclear Energy Institute and the Conference of Radiation Control Program Directors disagreed with the petitioner that the basis for the 10-mile EPZ is flawed and asserted that, on

the contrary, the current EPZs provide a substantial margin of conservatism. They argued that this view is supported by the events at Fukushima Dai-ichi, the State-of-the-Art Reactor Consequence Analyses (SOARCA) study, and an American Society of Mechanical Engineers Task Force report. The Nuclear Energy Institute stated that EPZs are pragmatic tools intended to provide dose savings and reduce early severe health effects, and they are still appropriate. The Nuclear Energy Institute noted that in NUREG-0396, the sizes of EPZs were based on a consideration of a full spectrum of postulated accidents and accident consequences including very severe accidents, such as the Fukushima Dai-ichi accident. The Nuclear Energy Institute argued that the petitioner mischaracterized the EPZ assumptions, the SOARCA study, the damage to the spent fuel pools at Fukushima Dai-ichi, and U.S. nuclear power plant performance. The Nuclear Energy Institute disagreed with the premises in the petition that the Fukushima Dai-ichi accident demonstrated that severe accidents are more likely than any government previously estimated and that their effects are more widespread than previously understood.

One State Department of Environment recommended denying the petition because “the Petition provides no new information that suggests the need to change the current planning basis, or warrants a change to the size of the existing Emergency Planning Zones.”

NRC Response to Issue 2

The NRC disagrees, in large part, with the petitioner’s assertions on this issue. The NRC agrees that the technical basis for the EPZ dates from studies conducted in the 1970s, but the petition brought forward no technical issues to substantiate flaws in the technical basis. The NRC would tend to agree that there is real-world experience that contributes information relevant to EPZ efficacy, as will be discussed. Studies have been conducted that contribute to NRC confidence in the current EPZ basis to ensure adequate protection of public health and

safety. The original basis and studies that support the current EPZ basis are described in this section.

The technical basis for the plume exposure pathway EPZ and ingestion exposure pathway EPZ are provided in NUREG-0396. This NUREG-0396 analyzes a spectrum of potential nuclear plant accidents and determines the size of EPZs in which detailed planning would be appropriate for the protection of public health and safety. The task force that developed NUREG-0396 considered several possible rationales for establishing the size of the EPZs, including risk, cost effectiveness, and the accident consequence spectrum. After reviewing these alternatives, the task force concluded that the objective of emergency response plans should be to provide dose savings for a spectrum of accidents that could produce offsite doses in excess of the U.S. Environmental Protection Agency (EPA) Protective Action Guides (PAG), EPA-400-R-92-001, "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," dated May 1992 (http://www.epa.gov/radiation/docs/er/400-r-92-001.pdf). This rationale established bounds for the area in which detailed planning would be required as a defense-in-depth measure. In a 1979 policy statement (44 FR 61123; October 23, 1979), the Commission endorsed NUREG-0396, including an assumption that the planning conducted for 10 miles would provide a substantial basis for expansion of protective actions beyond the EPZ should it ever be necessary. All U.S. nuclear power plants currently have approved emergency plans that include EPZs in compliance with the regulations found in 10 CFR 50.47(c)(2).

The accidents considered in developing guidance and subsequent requirements for the EPZ included rapidly progressing severe accidents that were more threatening to public health than the Fukushima Dai-ichi accident. The WASH-1400 (NUREG-75/014), "Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants," dated October 1975 (ADAMS Accession No. ML072350618), estimated that a severe accident could progress to a large radiological release in as little as 2 hours (in the boiling water reactor (BWR) case). Such accidents were considered unlikely, but emergency preparedness is a defense-in-

depth measure required due to the potential of severe but unlikely accidents. The accident at Fukushima Dai-ichi developed much more slowly than the rapidly developing accidents that form the basis for the current size of the EPZ. In Japan, adequate time was available to evacuate the public at risk and to expand beyond the planning zone as necessary before large radiological releases occurred. The study used to develop the EPZ is more conservative than the Fukushima Dai-ichi accident with regards to the time available to evacuate within the EPZ and beyond.

The NRC has conducted more recent studies that are useful for evaluating the adequacy of the plume exposure pathway EPZ. In NUREG/CR-6864, the NRC examined large evacuations in the United States between 1990 and 2003 to gain a fuller understanding of the dynamics involved in those types of events. This project found that large-scale evacuations of greater than 1,000 people occurred during the study period approximately every 3 weeks in the United States. The study concluded that these evacuations proceeded efficiently and effectively in terms of evacuee health and safety, security, and issues related to coordination, decisionmaking, and emergency response. The study showed that State and local authorities have a robust capability to effectively evacuate the public in response to life threatening emergencies. Many of the evacuations studied were implemented in an ad hoc manner by competent local officials without the need for Federal assistance or pre-conceived lines on a map.

In NUREG-1935, “State-of-the-Art Reactor Consequence Analyses (SOARCA) Report,” dated November 30, 2012 (ADAMS Accession Nos. ML12332A057 and ML12332A058), hypothetical evacuations within EPZs and beyond were evaluated in response to a series of selected accident scenarios for two U.S. nuclear power plants: the Peach Bottom Atomic Power Station in Pennsylvania (Peach Bottom) and the Surry Power Station in Virginia (Surry). Peach Bottom is generally representative of U.S. operating reactors using the General Electric BWR design with a Mark I containment. Surry is generally representative of U.S. operating reactors

using the Westinghouse pressurized water reactor (PWR) design with a large, dry (subatmospheric) containment.

The SOARCA project evaluated plant improvements and changes not reflected in earlier NRC publications. The project included system improvements, improvements in training and emergency procedures, offsite emergency response, and security-related improvements, as well as plant changes such as power uprates and higher core burnup. The project used state-of-the-art computer modeling with the MELCOR code for accident progression analyses and the MELCOR Accident Consequence Code System, Version 2 (MACCS2), for offsite consequence analyses.

There were several BWR accident scenarios analyzed in SOARCA, but most of the analyses did not involve a 20-mile evacuation. One analysis was performed modeling immediate 16- and 20-mile evacuations. It showed no significant difference in risk to individuals when compared to analysis using the 10-mile EPZ. The weather patterns for the SOARCA analyses were neither advantageous nor disadvantageous in terms of risk to individuals. This was done to support the best estimate of the risk to the public. If worst-case weather or worst-case accidents had been chosen, it would have reduced the probability of the event; SOARCA attempted to identify the more important accident scenarios based on a frequency-of-occurrence perspective. This boundary condition allowed the study to analyze in detail the phenomena of these accidents. (A full scope probabilistic risk analysis is underway at the NRC to address a full range of accidents, including those less likely than the accidents analyzed in SOARCA.) The SOARCA analyses showed no early fatalities due to the slower-developing accidents and lower source terms than in previous analyses and illustrated the effectiveness of emergency preparedness when plans are implemented as written, approved, practiced and inspected. In fact, SOARCA analyzed accidents very similar to those at Fukushima Dai-ichi and estimated a much quicker core melt and containment failure than what happened at the real-world accident. Further, the latent cancer fatalities estimated in SOARCA are based upon a

worst-case assumption that all exposure, no matter how small, results in health effects. The majority of the latent cancer fatalities are due to the public being allowed to return to homes that are contaminated at levels below the EPA guidance. In effect, this exposure and postulated health consequences has nothing to do with the evacuation of the public, the size of the EPZ, or the Fukushima Dai-ichi accident.

The NRC will monitor the results of the UNSCEAR efforts and their potential implications regarding the U.S. regulatory approach to emergency planning around nuclear power plants, including the EPZ size. In addition, the NRC is conducting a full-scope site Level 3 PRA to gain a better understanding of potential radiological effects of postulated accident sequences including multi-unit sites. The NRC will use information obtained from the UNSCEAR assessment and insights from the full-scope site Level 3 PRA project to inform the evaluation of the potential impacts that a multi-unit event may have on the EPZ.

Issue 3. Expand EPZs because the NRC urged U.S. citizens within 50 miles of the Fukushima Dai-ichi Nuclear Power Plant to evacuate.

The petitioner noted that former NRC Chairman Gregory Jaczko urged Americans within 50 miles of Fukushima Dai-ichi to evacuate and that this recommendation was followed by a similar statement from the U.S. Department of State.

Several commenters stated that the call for evacuation out to 50 miles showed that the current 10-mile EPZ is outdated, inadequate, and not realistic.

One commenter called for the NRC to take into account the realities learned in Japan. The commenter pointed out that there are several major U.S. cities within 50 miles of reactors with containment designs that are similar to those at Fukushima Dai-ichi. Those cities include Chicago, Boston, Philadelphia, and Baltimore. The commenter asked if it would be possible to evacuate those cities.

One State emergency management agency disagreed with the petitioner and stated that the NRC order to evacuate U.S. citizens within 50 miles of Fukushima Dai-ichi has yet to be justified scientifically.

NRC Response to Issue 3

The NRC does not agree that the EPZ for U.S. nuclear power plants should be expanded based on the travel advisory issued to U.S. citizens in Japan as a result of the events at Fukushima Dai-ichi. Following the events at Fukushima Dai-ichi, the U.S. Department of State, in coordination with the NRC, the U.S. Department of Energy, and other technical experts in the U.S. Government, issued a travel warning, or advisory, to U.S. citizens within 50 miles of Fukushima Dai-ichi to evacuate the area or take shelter indoors if safe evacuation was not possible. The 50-mile travel advisory was made in the interest of protecting the health and safety of U.S. citizens in Japan based on the limited information available at that time and the rapidly evolving situation (U.S. Department of State Travel Warning, March 17, 2011, http://japan.usembassy.gov/e/acs/tacs-travel20110317.html). The U.S. Department of State routinely issues such recommendations (known as Travel Warnings) for many different types of events including civil unrest, terrorism, natural disasters, and technological accidents.

The decisionmaking environment that existed at the time was one in which the U.S. Government had limited and often conflicting information about the exact conditions of the reactors and spent fuel pools at Fukushima Dai-ichi. In its evaluation of the rapidly changing and unprecedented event, the NRC performed a series of dose calculations. This was a conservative calculation that considered the rapidly changing course of the events and the very real possibility that these events were going to continue to degrade. The assumptions used in these calculations were discussed in detail in a letter from the NRC to Senator James Webb on June 17, 2011 (ADAMS Accession No. ML11143A033). As a result of these calculations, the lack of information available at that time, the progression of events, and the uncertainty

regarding the plans to bring the situation under control, on March 16, 2011, the U.S. Department of State issued a prudent, conservative travel advisory for American citizens within a 50-mile range of Fukushima Dai-ichi. This was not an evacuation order in the sense of expected protective action decisionmaking within a U.S. nuclear power plant EPZ, but rather a warning to U.S. citizens that the local conditions were uncertain, the government authorities may not be able to assure their safety, and they should leave.

Regulatory requirements of 10 CFR part 50, NRC inspection practices, and data channels available to the NRC would provide a robust information stream regarding plant status and radiological releases during a reactor accident in the United States. The NRC maintains two resident inspectors at each plant who have unfettered access to the site. The NRC inspectors have direct access to the plant site including the control room and any and all vital plant areas. Inspectors from other sites and regional offices also can be deployed if needed. The NRC requires that direct communication links between the NRC Incident Response Center and each plant be installed, tested, and routinely exercised. These links provide the NRC with up-to-date and reliable information about plant conditions, radioactivity release rates, and meteorological conditions at the plant. The availability of this information, in addition to the information gathered by inspectors, would enable NRC staff to perform an informed, realistic assessment instead of relying on unknowns and worst-case scenarios. In addition, the NRC can order the plant to take actions to mitigate the event if the NRC concludes that the appropriate actions are not being taken by the plant operators.

The NRC concludes that the EPZs surrounding nuclear power plants in the United States should not be expanded based on the travel advisory issued by the U.S. Government. That advisory was based on limited information obtained by the U.S. Government about an event in a foreign nation. As previously explained, the NRC would have access to relevant information during an event at one of its licensees' plants. As a result, the NRC's response to an accident in the United States would not resemble the U.S. Government's response to the

events at Fukushima Dai-ichi, so the fact that the U.S. Government issued a 50-mile travel advisory should not be the basis for expanding the size of EPZs.

Issue 4. There has been little change to emergency planning regulations in 30 years.

The petitioner claimed that the emergency planning regulations established by the NRC in 1980 remain essentially the same today. The petitioner stated that "[w]ith the exception of a 2011 rule requiring licensees to use current U.S. census data to prepare evacuation time estimates (ETEs) and update them every 10 years, the NRC has made few significant improvements to its offsite emergency response regulations since they were promulgated in 1980."

A State emergency management agency and the Nuclear Energy Institute disagreed and stated that there have been several significant changes to emergency planning regulations since 1980 including the consideration of emergency preparedness exercises during the licensing process, the frequency of participation by State and local authorities in emergency preparedness exercises, and other topics. The Nuclear Energy Institute also argued that the 2011 rule was broader than the petitioner implied.

NRC Response to Issue 4

The NRC disagrees with the petitioner's comments. The statement that emergency planning has changed little in the past 30 years conflicts with the fact that the NRC has made numerous revisions to its EP regulatory program over the years; in fact, the NRC's EP regulations have been revised more than 10 times since 1980. The NRC has continually evaluated and revised as necessary the requirements associated with emergency planning such as the following: the consideration of emergency preparedness exercises as part of the licensing process (50 FR 19323; May 8, 1985), the frequency of State and local agency participation in licensee emergency preparedness exercises (49 FR 27733; July 6, 1984), the

criteria for the evaluation of utility-prepared emergency plans in situations in which State or local governments decline to participate further in emergency planning (52 FR 42078; November 3, 1987), the requirements for emergency preparedness training activities between biennial full-participation exercises (61 FR 30129; June 14, 1996), and the requirement to consider including potassium iodide as a protective measure for the general public as a supplement to sheltering and evacuation (66 FR 5427; January 19, 2001).

The most recent change was the revision to the emergency preparedness regulations in a final rule, "Enhancements to Emergency Preparedness Regulations," published in the *Federal Register* on November 23, 2011 (76 FR 72560). The areas that were addressed in this amendment included both security-related and non-security-related emergency preparedness issues. A total of 12 regulatory areas were revised: on-shift staffing; emergency action levels for hostile action; emergency response organization (ERO) augmentation and alternate facilities during hostile action; licensee coordination with offsite response organizations during hostile action; protection for onsite personnel; challenging drills and exercises; backup means for alert and notification systems; emergency declaration timeliness; Emergency Operations Facility-performance based approach; evacuation time estimate updating; amended emergency plan change process; and removal of completed one-time requirements. This process took several years to complete and involved numerous public meetings, workshops, and comment periods that involved external stakeholders throughout the process.

The following are examples of changes to the emergency preparedness regulations that will directly enhance the coordination between onsite and offsite response organizations.

Licensee Coordination with Offsite Response Organizations:

Licensees are required to establish relations with offsite response organizations to coordinate emergency response efforts should they ever be needed. The scope of offsite response organization support includes the implementation of State and local response plans to

protect public health and safety in the event of a severe reactor accident and to provide fire, medical, and Local Law Enforcement Agency (LLEA) support to the nuclear power plant site. All nuclear power plants have established such relations, and their response in integrated exercises is tested biennially. However, demands on offsite response organization resources have changed in the post-September 11, 2001, threat environment. In the unlikely event that a hostile action event takes place at a plant, LLEA resources will have multiple duties in addition to supporting implementation of the emergency plan. For example, police officers designated to staff evacuation traffic control points may instead be responding to hostile actions at the plant, or firefighters designated to perform route alerting may instead be responding to major fires at the plant resulting from hostile actions. This situation could detract from offsite response organization emergency plan implementation if plans have not been revised to address this contingency. For a nuclear power plant to be licensed and maintain its license, existing NRC regulations require the NRC to find that reasonable assurance exists that a plant's emergency plans can and will be implemented to protect public health and safety during a radiological emergency.

The 2011 EP final rule requires licensees to ensure that adequate planning exists for the resources necessary to implement emergency plans during hostile action events. Licensees must verify that offsite response organizations have plan and procedure elements to address the need for emergency plan implementation support during all contingencies, including hostile action events. Routine evaluation of offsite response organization performance during biennial exercises also addresses offsite response organizations' abilities to implement plans during reactor accidents not involving hostile action.

Challenging Drills and Exercises:

A basic principle of emergency preparedness is that licensees conduct drills and exercises to develop and maintain key skills in order to protect public health and safety in the unlikely event of a radiological emergency. Licensees demonstrate their ability to implement emergency plans and critique response actions during evaluated biennial exercises. The NRC inspects licensee response in biennial exercises, and FEMA evaluates offsite response organizations. These programs have been in effect for many years, and the agencies have determined that there is reasonable assurance that protective actions can and will be implemented should they be necessary. The 2011 EP final rule added the requirement to § IV.F.2.i of appendix E to 10 CFR part 50 to require that drill and exercise scenarios encompass a wide spectrum of events and conditions to avoid anticipatory responses from preconditioning of participants. Such scenarios must include a wide spectrum of radiological releases and events, including hostile action. These drills and exercises must emphasize coordination among onsite and offsite response organizations, as appropriate.

Backup Means for Alert and Notification Systems:

An alert and notification system (ANS) provides the capability to promptly alert the populace within the plume exposure pathway EPZ of a nuclear power plant emergency event and to inform the public of protective actions that need to be taken. The predominant method used around U.S. nuclear power plants for alerting the public is an ANS based on sirens to provide an acoustic warning signal. Some sites employ other means, such as tone alert radios and route alerting, as either primary or supplemental alerting methods. The public typically receives information about an event and offsite protective actions via emergency alert system (EAS) broadcasts or other means, such as mobile loudspeakers.

An ANS has two distinct functions. The alert function provides a warning signal to the population indicating the need to seek additional information regarding an event in progress. By

itself, this function provides no information about the type of event or any protective actions that need to be taken. The notification function informs the public about the nature of the event and any protective actions. These functions may be performed by separate means, such as sirens for alerting and EAS broadcasts for notification, or by one method, such as tone alert radios and electronic hailers, that can provide both a warning signal and an instructional message. Although most ANS problems have involved degradation of the alerting capability, both functions are important for protecting public health and safety during an emergency.

Nuclear power plant licensees are required by § IV.D.3 of appendix E to 10 CFR part 50 to demonstrate that the ANS capability exists. Alerting and notifying the public is a function assigned to the State and local governments and evaluated by FEMA. The 2011 EP final rule provides the requirement that the ANS include administrative and physical means for a backup method of public alerting and notification. The methods of alerting the public using either the primary or backup means is a process that involves coordination between the onsite and offsite response organizations, and the responsibility for activation of these systems must remain with the appropriate governmental authorities.

Evacuation Time Estimate Updating:

The implementation of protective actions, including the evacuation of the public from the affected area surrounding a nuclear power plant, can mitigate the consequences of a radiological emergency at the plant. During the licensing process, applicants for a nuclear power reactor operating license under 10 CFR part 50, or for an early site permit (as applicable) or combined license under 10 CFR part 52, are required to provide estimates of the time required to evacuate the public from the various sectors and distances of the plume exposure pathway EPZ. These ETEs are used in the planning process to identify potential challenges to efficient evacuation, such as traffic constraints, and, in the event of an accident, to assist the

onsite and offsite emergency response managers in making appropriate decisions regarding the protection of the public.

The 2011 EP final rule requires that at any time during the decennial period between national censuses, if the EPZ permanent resident population increases such that it causes the longest ETE value for the 2-mile zone or the 5-mile zone, including all affected Emergency Response Planning Areas,[1] or the entire 10-mile EPZ to increase by 25 percent or 30 minutes, whichever is less, from the licensee's currently NRC approved or updated ETE, the licensee shall update the ETE analysis to reflect the impact of the population increases. These ETEs would be used by both the licensee and the State and local governments for development of protective action guidelines in the event of an accident at a nuclear power facility.

In contrast to the statement in the petition that emergency planning regulations have changed little in the last 30 years, the NRC has made numerous revisions to its EP regulatory program during this time period. However, the NRC does not base the need to enhance regulations upon the age of the regulation. The NRC remains open to specific input from stakeholders that identifies inadequate EP regulations. When the NRC staff or stakeholders identify a deficiency in the regulations that could result in a lack of reasonable assurance of adequate protection of public health and safety, the NRC will consider the need to revise the regulations.

[1] An Emergency Response Planning Area is a local area within the EPZ for which emergency response information is provided; the EPZ is typically divided into Emergency Response Planning Areas along geographic or political boundaries.

Issue 5. Expand EPZs because ad hoc expansion beyond 10 miles will not be adequate.

The petitioner argued that ad hoc expansion of an evacuation beyond the 10-mile EPZ will not be adequate. The petitioner stated that "[w]aiting to see how bad an emergency gets before expanding evacuation beyond a planned radius is not a plan of action, it is a recipe for disaster and an abdication of responsibility."

The petitioner stated that there were delays in detecting radioactive contamination after the accidents at Chernobyl and Fukushima Dai-ichi and that this "was a failure of emergency planning and radiation monitoring, not evidence that relocation may be taken at a leisurely pace."

The petitioner stated that natural disasters such as hurricanes, tornadoes, wildfires, and floods may cause or occur concurrently with accidents at nuclear power plants and that "natural disasters can greatly complicate the ability to evacuate a given area…."

The petitioner stated that "the wind blew the vast majority of the radiation released during the first week of the Fukushima Dai-ichi accident over the ocean and away from land." The petitioner stated, "[H]ad the wind been blowing in a different direction, could Japan have evacuated a large enough area fast enough? Would the U.S. be able to do so in a similar scenario? The answer to both questions is almost certainly no. And yet, this is real world data—the NRC cannot rely upon favorable wind patterns as an emergency response measure."

Some commenters agreed that an ad hoc expansion may not be adequate.

Several State agencies and the Nuclear Energy Institute disagreed and stated that EPZs are large enough to facilitate protective actions over larger areas, if necessary. Several State and county emergency management agencies stated that Federal policies after the September 11, 2001, attacks and Hurricane Katrina, such as the National Incident Management System (NIMS) and Incident Command System (ICS) all-hazards approach, have strengthened the ability to expand the response effort beyond the existing EPZs, if necessary.

NRC Response to Issue 5

The NRC disagrees with the petitioner's assertions on this issue. As stated previously, the NRC has studied evacuations within the United States (NUREG/CR-6864) and found that State and local governments are capable of protecting public health and safety through implementation of protective actions up to and including evacuations using both preplanned and ad hoc protective action decisionmaking.

Several large scale evacuations were studied in NUREG/CR-6981, many of which were conducted in an ad hoc manner. All of the approximately 250 evacuations studied were successful without NRC regulatory requirements (the exception of Hurricane Rita was previously noted).

Emergency preparedness within the EPZ is required to provide immediate response capability. This response would address those people most at risk (i.e., those closest to the nuclear power plant). Immediate protection of the EPZ population allows additional time for implementation of ad hoc actions beyond the EPZ. As stated in NUREG-0396:

> [I]t was the consensus of the [NRC-EPA] Task Force that emergency plans could be based upon a generic distance out to which predetermined actions would provide dose savings for any such accidents. Beyond this generic distance it was concluded that actions could be taken on an ad hoc basis using the same considerations that went into the initial action determinations.

Additionally, emergency actions could be successfully carried out beyond the 10-mile EPZ for the following reasons:

- The 10-mile emergency planning basis establishes an infrastructure similar to that used by other offsite response organizations, such as police and fire departments. The infrastructure consists of emergency organizations, communications capabilities, training, and equipment that can be used in the event of an accident at a facility.

- Coordination is enhanced by the practice of having offsite response organizations, which include local, State, and Federal responders, participate in training

exercises with the licensee. The studies cited previously noted a valuable contributor to effective evacuation implementation was participation in training and drills.

- The emergency notification equipment required by the NRC (10 CFR 50.47(b)(5)) for prompt notification of the public within the EPZ reaches beyond the plume exposure EPZ, and current communications technology enhances this process.

In addition, State and local response agencies have improved their incident response plans and guidance following the events of September 11, 2001. The U.S. Department of Homeland Security (DHS) has issued guidance for Federal, State, and local response to emergencies which includes the National Response Framework, NIMS, and ICS. These guidance documents present a framework for use during an emergency that is scalable, is flexible, and allows for an adaptable coordinating structure.

The DHS policy and initiatives have provided another basis for implementing protective actions for nuclear power plant emergencies beyond the EPZ should they ever be necessary. State and local response organizations have recognized the possibility that actions may be warranted beyond the established EPZs and these issues have been included in drills and exercises. The development and implementation of NIMS and ICS under the National Response Framework enhances State and local response capabilities through uniform and logical management of response resources to facilitate prompt and effective protective measures for all populations that may be affected. The NIMS and ICS programs are a comprehensive approach to incident management that provides a common operating picture and interoperability for communications and management of events. These programs are scalable, so the response can be expanded or contracted as dictated by the event, such as an expansion of protective actions beyond the EPZ during an event if warranted. This allows for all levels of government response organizations to work together efficiently for responding to emergencies, including an event involving a nuclear power reactor.

Every nuclear power plant licensee has an approved emergency plan that includes procedures for the necessary interactions with State and local authorities. These emergency plans are drilled and exercised on a regular basis and inspected during a biennial exercise (i.e., every 2 years) and include the integrated response of licensees, State and local responders, and decisionmakers. The licensee is required by 10 CFR 50.47(b)(5) to notify State and local authorities of the emergency status and by 10 CFR 50.47(b)(10) to make protective action recommendations. This requirement includes the need to evacuate areas beyond the EPZ should it be necessary. During biennial exercises, FEMA evaluates the ability of ORO decisionmakers to identify the need for protective actions.

The NRC notes that the requirement for a classification scheme for identification of emergencies in 10 CFR 50.47(b)(4) is anticipatory, which means that emergencies are declared before a radiological release takes place. Licensees must rapidly activate emergency organizations in response to emergency conditions and recommend protective actions in a timely manner. The NRC's regulations at 10 CFR 50.47(b)(9) also require timely assessment of radiological conditions in response to an accident. Additionally, State and local emergency response programs have radiological assessment capabilities independent of licensees' assessment resources. During a nuclear power plant emergency, the NRC expects that radiological assessment information would be obtained by licensees and OROs and made available to the NRC and to State and local response organizations.

The petition did not provide examples of evacuations within the U.S. that were unsuccessful and would cause the NRC to lose confidence in the ability of State and local authorities to implement protective actions for the public when necessary. The NRC studies show that State and local authorities are quite capable of protecting their citizens.

Issue 6. Expand EPZs because current planning is inadequate for increased populations around many U.S. nuclear power plants.

The petition included "significantly larger populations near many existing reactor sites" in a list of several factors that have changed since the existing emergency planning regulations were promulgated.

The petitioner stated, "Imagine the difficulties of using a 10 mile planning zone as the basis for a rapid expansion of the zone to 25 miles or more in a heavily urban area such as near Indian Point in New York, Limerick in Pennsylvania or many other existing reactor sites."

Several commenters stated that populations living near some U.S. nuclear power plants have increased significantly since the plants were originally licensed, and stated that this is one of the reasons why current evacuation plans are insufficient.

NRC Response to Issue 6

The NRC disagrees that current EP planning requirements are inadequate. The petition and commenters did not provide any evidence that an increase in a population is a reason to expand the EPZ. The Commission has previously stated that "[t]hrough its standards and required exercises, the Commission ensures that existing plans are adequate throughout the life of any plant even in the face of changing demographics and other site-related factors" (Denial of Petitions for Rulemaking, PRM-54-02 and PRM-54-03 (71 FR 74852; December 13, 2006)).

In the 2011 EP final rule, the NRC amended 10 CFR 50.47(b)(10) and § IV, "Content of Emergency Plans," of appendix E to 10 CFR part 50 to require the periodic review and updating of ETEs. The NRC also published guidance (NUREG/CR-7002, "Criteria for Development of Evacuation Time Estimate Studies," dated November 2011 (ADAMS Accession No. ML113010515)) to enhance the quality of ETEs. The population within EPZs varies broadly from a few thousand to over 270,000 people. However, even sites with large populations can achieve general public evacuation within about 10 hours. The data available from the ETEs

show that large populations can be effectively evacuated. A review of the evacuations studied in NUREG/CR-6864 shows that effective evacuations of large numbers of people were routinely accomplished, including:

- Hurricane Floyd, 373,000 people (1999)
- Hurricane Andrew, 650,000 people (1992)
- Hurricane Georges, 1,500,000 people (1998)
- Centennial Olympic Park, 60,000 people (1996)
- World Trade Center, 300,000 people (2001)
- World Trade Center, 150,000 people (1993)
- The East Bay Hills Wildfire, 30,000 people (1991)

The NRC is not aware of data that would indicate that evacuation of larger populations cannot be accomplished in an effective manner. The data shows that OROs can accomplish large evacuations and this process is generally viewed as successful.

Issue 7. Expand EPZs because the U.S. reactor fleet is aging and more vulnerable to the occurrence of accidents.

The petition included "increasing age and vulnerability of operating reactors" in a list of several factors that have changed since the existing emergency planning regulations were promulgated to conclude that aging U.S. reactors have a greater risk of an accident and require an expansion of EPZs.

Commenters claimed that aging reactors are more vulnerable to damage from earthquakes, aging concrete, human error, and Alloy 600 embrittlement.

One commenter specifically identified Indian Point Nuclear Generating, Diablo Canyon Nuclear Power Plant, and Vermont Yankee Nuclear Power Station as reactors that are "more antiquated or dangerously sited."

NRC Response to Issue 7

The NRC disagrees with the petitioner's assertion that aging U.S. reactors have a greater risk of an accident. Neither the petitioner nor the commenters provided support for their conclusions that aging reactors have a greater risk of an accident and are more vulnerable to damage from earthquakes, aging concrete, human error, and Alloy 600 embrittlement. Because the NRC's regulatory framework provides reasonable assurance of adequate protection of public health and safety over the lifetime of the reactors, EPZs do not need to be expanded due to the age of the reactors.

Each operating power reactor licensee is required to maintain its facility to ensure that the safety-related functions of preventing and mitigating accidents are not compromised. The regulatory objective of the Maintenance Rule, found in 10 CFR 50.65, is to require licensee monitoring of the overall continuing effectiveness of its maintenance programs to ensure the following:

- Safety-related structures, systems, and components (SSC) and certain SSCs that are not safety-related are capable of performing their intended functions.
- For equipment that is not safety-related, failures will not occur that prevent the fulfillment of safety-related functions.
- Failures resulting in scrams and unnecessary actuations of safety-related systems are minimized.

The NRC provides reasonable assurance of adequate protection of public health and safety, in part, through the NRC's Reactor Oversight Process (ROP), in which the NRC ensures that an acceptable level of licensee performance is maintained. The ROP involves inspecting licensees, reviewing performance indicators (PI), evaluating PIs, assessing licensee performance, and taking appropriate regulatory actions to ensure compliance with the NRC's regulations. The ROP continuously assesses licensee performance using performance-based

risk-informed baseline inspections and performance indicators reported by licensees. The ROP inspections seek to evaluate licensee performance by identifying degraded conditions and the deficient licensee performance that led to those degraded conditions. When risk-significant aging management performance issues are identified, the NRC will perform additional supplemental inspections to verify that appropriate corrective actions are taken to address recurrence of the issues and restore compliance with aging management programs. Less risk-significant licensee performance issues would typically be entered into the licensee's corrective action program and corrected by the licensee. In addition to inspection under the ROP, the NRC evaluates operating experience and trends those issues important to safety, such as those associated with aging SSCs. Negative trends and significant inspection findings impacting safety would be addressed through enforcement, backfit, or rulemaking as appropriate.

The license renewal regulatory process requires that for SSCs that are safety-related, could affect the performance of a safety-related function, or are necessary to respond to specific events regulated by the NRC, aging management programs must be in place to manage the effects of aging. The implementation of the aging management programs ensures that SSCs retain the ability to perform their intended functions and that the licensee's current licensing basis, which has been shown to provide an acceptable level of safety, will be maintained in the renewal period.

The NRC's regulations in 10 CFR part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," require that each license renewal application contain technical information and evaluations about the different types of plant aging that might be encountered in the plant and how the licensee will manage or mitigate those aging effects. This information must be sufficiently detailed to permit the NRC to determine whether the effects of aging will be managed such that the plant can be operated during the period of extended operation without undue risk to the health and safety of the public. If the NRC can make this

determination, it will renew the licensee's operating license and continue monitoring the licensee's operational performance throughout the renewal period.

Issue 8. Expand EPZs because risk from spent fuel pools is too high.

The petitioner argued that the risk of accidents at spent fuel pools is too high to ignore and, therefore, the plume exposure pathway EPZ must be expanded to adequately protect the public. According to the petitioner, "real-world experience," improved understanding of severe accident risks at nuclear spent fuel pools, and the fact that accidents could cause widespread contamination with highly radioactive materials prove that the 10-mile EPZ is inadequate. The petitioner referred to several papers to raise issues that describe the improved understanding of spent fuel pool severe accidents and their risks, including:

- The NRC has permitted high-density storage in spent fuel pools in the absence of a geologic repository. Under accident conditions including a loss of water in the pool, cooling of the spent fuel could be difficult or ineffective in the densely packed pool, which could result in a zirconium fire in the pool.

- Spent fuel pools contain a large amount of radioactive material with much more long-lived radioisotopes than in a reactor core. Therefore, spent fuel pool accidents could lead to larger releases of radioactive materials than accidents in a reactor core.

- Spent fuel pools are located outside of containment. Therefore, they are more vulnerable than the reactor to natural disasters and terrorist attacks and have little to prevent a release to the environment.

The petitioner further stated that the Commission previously did not consider the effects of spent fuel pool failure as a source of severe accident consequences, but only considered containment and core failure in the previous denial of three similar petitions for rulemaking (*Citizens Task Force of Chapel Hill, et al.*, 32 NRC 281 (1990)). The petitioner stated that given

the information on how serious a threat spent fuel pool accidents are, continued failure to address the risks of spent fuel pool accidents is flawed.

Several commenters agreed with the petitioner and called for spent fuel to be moved as quickly as possible into hardened dry cask storage.

One State agency stated that the petitioner has some valid points regarding spent fuel, but that the utilities were forced into this situation due to inaction by various levels of government. The primary concern is that the health and safety of citizens is protected in the event of a release, regardless of the source.

The Nuclear Energy Institute stated that the petitioner's description of the damage to the Unit 3 spent fuel pool at Fukushima Dai-ichi is inaccurate. The Nuclear Energy Institute disagreed with the petitioner's arguments and stated that spent fuel pools are robust structures designed to withstand severe external events. The zirconium fire scenario has been studied extensively by the NRC for decades, according to the Nuclear Energy Institute, and the NRC has consistently concluded that the risk of such fires is extremely low. The Nuclear Energy Institute pointed out that the NRC issued an Order to further ensure that reliable spent fuel pool water level indications can be identified by trained personnel.

NRC Response to Issue 8

The NRC disagrees with the petitioner's assertions on this issue. The NRC has previously evaluated one of the papers referenced by the petitioner, "Reducing the Hazards from Stored Spent Power-Reactor Fuel in the United States," dated April 21, 2003, Robert Alvarez, et al., (published in the Science and Global Security, Spring 2003) and concluded that it fails to make the case for its central recommendation ("Fact Sheet: NRC Review of Paper on Reducing Hazards from Stored Spent Nuclear Fuel," dated August 20, 2003 (ADAMS Accession No. ML032320620)).

The NRC concludes that both spent fuel pools and dry casks provide adequate protection of public health and safety and the environment. After the September 11, 2001, terrorist attacks, the NRC issued Orders to plant operators requiring several measures aimed at mitigating the effects of a large fire, explosion, or accident that damages a spent fuel pool. These measures were intended to deal with the aftermath of a terrorist attack or plane crash; however, they would also be effective in responding to natural phenomena such as tornadoes, earthquakes, or tsunamis.

These mitigating measures include:

- Controlling the configuration of fuel assemblies in the pool to enhance the ability to keep the fuel cool and recover from damage to the pool.
- Establishing emergency spent fuel cooling capability.
- Staging emergency response equipment nearby so that it can be deployed quickly.

As an example of the "real-world experience" of spent fuel pool accidents, page 28 of the petition refers to a video uploaded to YouTube on October 18, 2011, that shows an underwater camera inspection by the Tokyo Electric Power Company (TEPCO). The petitioner speculated that the spent fuel pool at Fukushima Dai-ichi Unit 3 was essentially destroyed by the explosion of the Unit's reactor building, based on the video not showing intact fuel rods. Since the posting of that video, TEPCO has performed additional investigations and has confirmed that the spent fuel in the Fukushima Dai-ichi Unit 3 spent fuel pool remains intact and within the racks, as far as what could be seen by the underwater camera. See images from an underwater camera taken on October 11 and 12, 2012, as discussed in a TEPCO press conference on October 15, 2012. A handout from the press conference including the images is available at http://www.tepco.co.jp/en/nu/fukushima-np/images/handouts_121015_01-e.pdf.

During the events at Fukushima Dai-ichi, responders did not have reliable instrumentation to determine the water levels in the spent fuel pools. This caused concerns that

the pools may have boiled dry and damaged the fuel. Numerous attempts were made to refill the spent fuel pools, which diverted resources and attention from other efforts to maintain water level above the fuel. The events at Fukushima Dai-ichi demonstrated the confusion and misapplication of resources that can result from beyond-design-basis external events when adequate instrumentation is not available.

In the agency's review of the Fukushima Dai-ichi accident in the NTTF report, the NRC staff noted that the low likelihood of such events and the current mitigation capabilities at U.S. nuclear power plants allow the NRC to conclude that a sequence of events such as the Fukushima Dai-ichi accident is unlikely to occur in the United States. These events have not undermined the emergency preparedness assumptions or the basis for the size of the EPZs. Therefore, continued operation and continued licensing activities do not pose an imminent threat to public health and safety.

Current activities being undertaken by the NRC staff for the NTTF recommendations resulting from the Fukushima Dai-ichi event are addressing the issue of additional requirements, including developing, implementing, and maintaining guidance and strategies to maintain or restore spent fuel pool cooling in the event of a beyond-design-basis external event such as a natural disaster (Order EA-12-049, "Order Modifying Licenses with regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated March 12, 2012 (ADAMS Accession No. ML12054A736)).

The NRC issued Order EA-12-051, "Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation," dated March 12, 2012 (ADAMS Accession No. ML12054A682), which required all power reactor licensees and holders of construction permits, in active or deferred status, to implement measures to ensure that reliable spent fuel pool water level indications can be identified by trained personnel. Specifically, personnel must be capable of identifying: (1) the level that is adequate to support operation of the normal fuel pool cooling system, (2) the level that is adequate to provide substantial radiation shielding for a person

standing on the spent fuel pool operating deck, and (3) the level where fuel remains covered and at which actions to implement make-up water addition should no longer be deferred. As noted in the Order, full implementation must be completed no later than two refueling cycles after the licensee's submittal of an overall integrated plan or December 31, 2016, whichever comes first. Construction permit holders must complete full implementation prior to issuance of an operating license, and combined operating license holders must complete full implementation prior to initial fuel load.

The NRC staff completed a spent fuel pool risk study in 2001 (NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants," dated February 28, 2001 (ADAMS Accession No. ML010430066)) in which the risk of spent fuel severe accidents was evaluated and found to be low and well within the Commission's safety goals outlined in its Policy Statement on Safety Goals for the Operation of Nuclear Power Plants (51 FR 28044; August 4, 1986. Correction published on August 21, 1986 (51 FR 30028)). The NRC staff published a report in October 2013 with a similar conclusion that storage of spent fuel in a high-density configuration in spent fuel pools is safe and that the risk of an accident resulting from the beyond-design-basis seismic event analyzed is low ("Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor," dated October 2013 (ADAMS Accession No. ML13256A342)). In addition, the NRC staff is embarking on a full-scope site Level 3 PRA project, which will evaluate the severe accident risks at a currently operating multi-unit reactor site, including the risk from a spent fuel pool accident. The insights from this study may be a useful input to inform or enhance regulatory decisionmaking, potentially including emergency preparedness requirements, as described in SECY-12-0123, "Update on Staff Plans to Apply the Full-Scope Site Level 3 PRA Project Results to the NRC's Regulatory Framework," dated September 13, 2012 (ADAMS Accession No. ML12202B170).

The NRC has concluded that the risk from spent fuel pools is low and this petition presented no new information related to spent fuel pools for a basis to expand EPZs.

Issue 9. Emergency planning regulations must be strengthened because there are significant concerns related to pressure suppression containments.

The petitioner argued that there are significant concerns related to pressure suppression containments, such as the General Electric (GE) Mark I containment that was used at five of the units at Fukushima Dai-ichi, and, therefore, emergency planning regulations must be strengthened to adequately protect the public. The petitioner cited the accidents at Three Mile Island, Chernobyl, and Fukushima Dai-ichi to show that hydrogen explosions, pressure spikes, and containment failures have occurred, resulting in releases of radioactive materials. The petitioner pointed out that there are 23 operational nuclear power reactors with GE Mark I containments in the United States. The petitioner claimed that they are susceptible to failure in the event of a hydrogen explosion and that there has been much scrutiny and criticism of their design flaws. The petitioner stated that the "NRC can no longer dismiss the reality of devastating nuclear accidents based on supposedly superior U.S. reactor designs." The petitioner stated that, given the history of nuclear power, the NRC must assume, at least for emergency planning purposes, that devastating nuclear accidents will occur in the United States.

One commenter stated that the Mark I containment is a flawed design. Specifically, the commenter stated that the problem of overpressure in the torus must be addressed and that valves to allow manual release of pressure are not sufficient.

NRC Response to Issue 9

The NRC disagrees with the petitioner's assertions on this issue. The petitioner is correct that there were lessons to be learned from the accident at Fukushima Dai-ichi related to

pressure suppression containments. These lessons and NRC follow-up actions are summarized in the following paragraphs. In light of these actions, the NRC disagrees that concerns related to pressure suppression containments support the petitioner's position that the NRC's EP regulations need to be revised or its overall conclusion that EPZs must be expanded. The petitioner asked that the NRC assume that a radiological release from containment will occur. Instead, the NRC has taken steps to enhance the performance of these containments in response to the Fukushima Dai-ichi accident, as noted in the following paragraphs.

The events at Fukushima Dai-ichi highlight the possibility that extreme natural phenomena could challenge the defense-in-depth layers for accident prevention, mitigation, and emergency preparedness. At Fukushima Dai-ichi, a variety of challenges significantly hindered attempts by the responders to preclude core damage and containment failure. The operators were unable to successfully operate the containment venting system early in the event. The inability to reduce containment pressure inhibited efforts to cool the reactor core. If additional backup or alternate sources of power had been available to operate the containment venting system remotely, or if certain valves had been more accessible for manual operation, the operators at Fukushima Dai-ichi may have been able to depressurize the containment earlier. This, in turn, could have allowed operators to implement strategies using low-pressure water sources that may have limited or prevented damage to the reactor core. Thus, the events at Fukushima Dai-ichi demonstrate that reliable hardened vents at BWR facilities with Mark I and Mark II containment designs are important to maintain core and containment cooling.

Based on these lessons learned, the NRC issued Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions," dated June 6, 2013 (ADAMS Accession No. ML13143A334), which required all BWR licensees with Mark I and Mark II containment designs to have a reliable, severe accident capable hardened vent to assist in the removal of decay heat and maintain control of containment pressure within acceptable limits following an event that results

in the loss of active containment heat removal capability such as an extended loss of electrical power. The hardened vent system must be accessible and functional under a range of plant conditions, including severe accident conditions, extended loss of electrical power, and inadequate containment cooling. As noted in the Order, full implementation must be completed no later than startup from the first refueling outage that begins after June 30, 2017, or June 30, 2019, whichever comes first.

The events at Fukushima Dai-ichi have not undermined the emergency preparedness assumptions or the basis for the size of the EPZs. Therefore, continued operation and continued licensing activities do not pose an imminent threat to public health and safety.

Issue 10. Expand EPZs because expansion is supported by the current improved understanding of the health effects of radiation.

The petitioner claimed that improved understanding of the health effects of radiation indicates that greater consideration should be given to the effects of the release of radiation. In particular, the petitioner referred to the National Academies Biological Effects of Ionizing Radiation VII report, "Health Risks from Exposure to Low Levels of Ionizing Radiation" (2006) (BEIR VII report), as "confirming that any exposure to radiation—including background radiation—increases a person's risk of developing cancer." The BEIR VII report is available online from the National Academies Press at http://www.nap.edu.

The petitioner took issue with the emergency response goal of preventing exposure above 5 rem/year as the basis for the EPA Protective Action Guides, as cited in the NRC's denial of a petition for rulemaking for emergency preparedness submitted previously by the Citizens Task Force of Chapel Hill (55 FR 5603; February 16, 1990). The petitioner stated that according to the BEIR VII report, this level of exposure would cause cancer in more than 1 in 50 female children and that this is a hopelessly outdated and politically indefensible policy.

The petitioner stated that the BEIR VII report clarifies that women and children are much more susceptible to radiation exposure than the "average man"[2] and regulations should protect the most vulnerable members of the population.

The petitioner also stated that emergency response programs should be designed such that exposure limits during an emergency should not be higher than the annual exposure limits under non-emergency conditions.

The petitioner's discussion on the improved understanding of the health effects of radiation was provided as support to the proposed upgrades to emergency planning standards, which requested changes to the areas for the plume exposure EPZ and ingestion exposure pathway EPZ and to the emergency exercise requirements. No changes were proposed to the EPA PAGs themselves.

Many commenters agreed with the opinion expressed in the petition that the improved understanding of the health effects of radiation support expanding the EPZs.

NRC Response to Issue 10

The NRC disagrees that these studies warrant expansion of the EPZs. The NRC agrees that it is appropriate to continually review these and other studies of radiation effects to ensure continued adequate protection of public health and safety. The NRC staff reviewed the BEIR VII report and provided an information paper, SECY-05-0202, "Staff Review of the National Academies Study of the Health Risks from Exposure to Low Levels of Ionizing Radiation (BEIR VII)," dated October 29, 2005 (ADAMS Accession No. ML052640532), to the Commission regarding the potential implications of the report for NRC regulations. The NRC staff concluded that "none of the findings in the BEIR VII report warrant initiating immediate change to NRC

[2] The petition's use of the term "average man" is interpreted to refer to "reference man," which is defined as a person with the anatomical and physiological characteristics of an average individual that is used in calculations assessing internal dose (also may be called "standard man"). See also the International Commission on Radiological Protection Publication 23 (1975). This publication is available for purchase online through the publisher at http://www.icrp.org/publications.asp.

regulations or Federal Guidance." In the BEIR VII report, the National Academies concluded that current scientific evidence is consistent with the hypothesis that there is a linear, no-threshold dose response relationship between exposure to ionizing radiation and the development of cancer in humans. The Commission's regulations regarding radiation protection are based on this linear, no-threshold assumption. As stated in SECY-12-0064, "Recommendations for Policy and Technical Direction to Revise Radiation Protection Regulations and Guidance," dated April 25, 2012 (ADAMS Accession No. ML121020108), the NRC staff found that the International Commission on Radiological Protection (ICRP) concluded that a linear, no-threshold approach remained a prudent basis for practical purposes of radiation protection. The same conclusion has been drawn by the National Academy of Sciences in the BEIR VII report, the United Nations Scientific Committee on the Effects of Atomic Radiation, and the National Council on Radiation Protection and Measurements report.

The ICRP Publication 103, "The 2007 Recommendations of the International Commission on Radiological Protection" (December 2007), contained the revised recommendations for a system of radiological protection, which reflect an evolution from the previous recommendations contained in ICRP Publication 60 in 1990 and in ICRP Publication 26 in 1977. These publications are available for purchase online through the publisher at http://www.icrp.org/publications.asp. The ICRP makes recommendations on such topics as the quantities used in radiological protection, biological effects of radiation, principles of radiation protection, dose limits, and optimization. The ICRP recommendations are generally used to inform radiation protection policy or regulations by pertinent governmental or international agencies, and their development has been discussed with many international and national organizations with an interest in radiological protection. In SECY-12-0064, the NRC staff provided the Commission with a notation vote paper that discusses the history of radiation protection recommendations and regulations and the ICRP's 2007 recommendations and their impact on evaluating radiation risk. The paper also discusses the NRC staff's evaluation of

information in the BEIR VII report, referenced by the petitioner. SECY-12-0064 provided the Commission with options on whether to revise the dosimetry basis of appendix I to 10 CFR part 50 design objective and guidance and 10 CFR part 20 based on the ICRP 2007 recommendations. The NRC staff recommended the option of developing the regulatory basis for a revision of certain provisions of 10 CFR part 20 occupational dose limits and initiate the parallel development of the regulatory basis for revision of appendix I to 10 CFR part 50 to align with the update of 10 CFR part 20 and to address the unique set of issues that are not directly connected with 10 CFR part 20.

The Commission issued its SRM for SECY-12-0064 on December 17, 2012 (SRM-SECY-12-0064, "Recommendations for Policy and Technical Direction to Revise Radiation Protection Regulations and Guidance" (ADAMS Accession No. ML12352A133)). In the SRM, the Commission approved in part the NRC staff's recommendations for development of the regulatory basis for a revision to 10 CFR part 20 and parallel alignment of appendix I to 10 CFR part 50 with the most recent methodology and terminology for dose assessment. The Commission also directed the NRC staff to continue discussions with stakeholders on alternative approaches to deal with individual protection at or near the current dose limit.

In SECY-05-0202, the NRC staff also discusses the potential influence of gender on radiation sensitivity as an issue that may warrant additional consideration, and stated that the NRC staff will continue to monitor the issue as the ICRP finalizes its new radiation protection recommendations. The 2007 recommendations in ICRP Publication 103 considered gender and age related sensitivity to radiation (e.g., in the development of revised age-averaged and sex-averaged tissue weighting factors) and will be one source of information that the NRC staff considers in development of the regulatory basis for rulemaking, as discussed in SECY-12-0064.

The petitioner stated that the emergency response goal is to prevent exposures to 5 rem/year. This is a misinterpretation of the basis for emergency response planning

requirements, including the PAGs. It states on page III-3 of NUREG-0396 that for a very large release of radioactive material, the principle emergency response planning basis goal is to prevent serious adverse health effects to individuals. To accomplish this goal, the longer term objective of the PAGs, as stated in Section 4.2.1 of the 1992 EPA PAG Manual (EPA-400-R092-001, "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," U.S. Environmental Protection Agency, dated May 1992 (http://www.epa.gov/radiation/docs/er/400-r-92-001.pdf)), is that the cumulative dose to an individual over 50 years will not exceed 5 rem. In March 2013, the EPA published a draft revised PAG Manual for interim use and public comment (http://www.epa.gov/radiation/docs/er/pag-manual-interim-public-comment-4-2-2013.pdf). In the 2013 EPA PAG Manual, the EPA proposes to remove the intermediate phase PAG of 5 rem over 50 years to avoid confusion with long-term cleanup. The longer-term objective of the PAGs to ensure that doses in any single year after the first will not exceed 0.5 rem remains the same as previously in the 1992 EPA PAG Manual.

It should be noted that a PAG is not a regulatory limit or an acceptable dose, but is instead, "the projected dose to reference man, or other defined individual, from an unplanned release of radioactive material at which a specific protective action to reduce or avoid that dose is recommended" (1992 EPA PAG Manual, Section 1.0). The petitioner questioned the Commission's previous denial of petitions for rulemaking, under dockets PRM-50-31, PRM-50-45, and PRM-50-46, to make changes to the emergency preparedness regulations (55 FR 5603; February 16, 1990). As a basis for its denial, the Commission referred to NUREG-0396, which clarifies that PAGs represent trigger or initiation levels proposed as guidance to be used as the basis for taking action to minimize impact on individuals. In other words, a PAG is "the projected dose…from an unplanned release of radioactive material at which a specific protective action to reduce or avoid that dose is recommended" (1992 EPA PAG Manual, Section 1.0). It states on page III-11 of NUREG-0396:

> This does not mean, however, that doses above PAG levels can be prevented or that emergency response plans should have as their objective preventing doses above PAG levels. Furthermore, PAGs represent only trigger levels and are not intended to represent acceptable dose levels. PAGs are tools to be used as a decision aid in the actual response situation.

The currently used PAGs for the early phase of the incident recommend evacuation (or sheltering in certain cases) at a projected dose of 1 rem total effective dose equivalent (TEDE) and administration of stable iodine (e.g., potassium iodide (KI)) at a projected dose of 25 rem committed dose equivalent to the thyroid. The dose is calculated from the estimated atmospheric release. These values are taken from the 1992 EPA PAG Manual. In the 2013 EPA PAG Manual, the EPA proposes to change the early phase PAG for supplementary administration of KI to a projected dose of 5 rem to the child thyroid. In planning, the "early phase" of a nuclear incident is usually assumed to last for four days for dose projection purposes. This definition of the early phase is intended to coincide with the event initiation and primary release when evacuation or KI administration may be warranted. Exposure to deposited materials after four days can be addressed through other protective measures, such as relocation, if warranted.

The "intermediate phase" is defined as the period beginning after the source and releases have been brought under control and environmental measurements are available for use as a basis for protective actions decisions. The intermediate phase ends when the protective actions are terminated. The intermediate phase may overlap both the early and the late (or "recovery") phases. For the intermediate phase, there are EPA PAGs for deposited radioactive materials, where the major relevant protective action is relocation. Dose to persons not relocated and in lesser contaminated areas may be reduced by decontamination and spending more time in low exposure rate areas, such as indoors. There are also PAGs published by the U.S. Food and Drug Administration for food and water. The 1992 EPA PAG Manual states that the intermediate phase PAGs for deposited radioactive materials should be considered mandatory only for use in planning. During an incident, responsible officials will

need to exercise their professional judgment in the implementation of protective actions because of unanticipated local conditions.

As explained in the 1992 EPA PAG Manual, the PAGs for the intermediate phase of the incident recommend relocation of the general population at a projected dose greater than or equal to 2 rem TEDE and application of simple dose reduction techniques at a projected dose less than 2 rem TEDE. The projected dose is due to inhalation of resuspended materials, from exposure or intake during the first year, and is the dose that would be received without shielding from structures or application of dose reduction techniques. The 1992 EPA PAG Manual states that the objective of these PAGs is to assure that doses in any single year after the first year will not exceed 0.5 rem and that the cumulative dose over 50 years (including the first and second years) will not exceed 5 rem. In the 2013 EPA PAG Manual, the EPA proposes to remove the intermediate phase PAG of 5 rem over 50 years to avoid confusion with long-term cleanup. The longer-term objective of the PAGs to ensure that doses in any single year after the first will not exceed 0.5 rem remains.

The petitioner stated that emergency response programs should be designed to protect against radiation levels that would exceed annual exposure limits. The NRC disagrees with the petitioner's assertions on this issue. The PAGs are established for implementing public protective actions to minimize health effects following a low probability severe accident that releases radioactive material to the environment in an uncontrolled, acute manner. The considerations that establish such PAGs differ significantly from the considerations associated with establishing radiation protection standards for routine (i.e., high probability) controlled releases of radioactive material to the environment. In establishing the PAGs for emergency conditions, the EPA followed the principle that the risk to health from a protective action should not itself exceed the risk to health from the dose that would be averted. Using a PAG based on the lower magnitude radiation protection standards could place the public in the situations where the risk of the protective action is greater than the benefit obtained from taking the action.

Appendix B, “Risks to Health from Radiation Doses That May Result from Nuclear Incidents,” and Appendix C, “Protective Action Guides for the Early Phase: Supporting Information,” of the 1992 EPA PAG Manual describe in detail the EPA’s bases and rationale for the PAGs.

The rationale for the 10-mile distance for the plume exposure EPZ and the 50-mile ingestion exposure pathway EPZ is provided in NUREG-0396, which was based on a full spectrum of accident and corresponding consequences, taking probability into consideration. It is stated in NUREG-0396 that emergency response plans should be useful for responding to any accident that would result in offsite doses in excess of the PAGs. The early phase PAG ranges as published at that time were used in the determination of the plume exposure EPZ distance: projected doses per accident of 1 – 5 rem to the whole body and 5 – 25 rem to the thyroid.

The NRC has more recent data on reactor accident consequences and risks in the SOARCA study, is finalizing a spent fuel pool accident scoping study, and has embarked on a full-scope site Level 3 PRA project. In SECY-12-0123, the NRC staff specifically states that insights from the Level 3 PRA project could inform the process for evaluating the potential impact that a multi-unit accident (or an accident involving spent fuel) may have on the efficacy of the EPZ in protecting public health and safety. Insights gained from the Level 3 PRA project are expected to include radiological source term characterization to support determination as to whether the EPZ size and response timing remains protective of public health and safety in response to severe accidents.

Issue 11. Expand EPZs because radiation does not stop at an EPZ boundary.

Several commenters stated that radioactive contamination would not stop at an EPZ boundary. One commenter stated that airborne radiation plumes from past releases including Chelyabinsk, Seversk, Chernobyl, Three Mile Island, and Fukushima Dai-ichi have not stopped

10 miles from the reactor site. Therefore, 10-mile EPZs need to be enlarged to provide adequate protection of the public health and safety beyond 10 miles from the plant.

NRC Response to Issue 11

The NRC agrees that in the event of a radioactive release the plume might not stop at the 10-mile EPZ boundary. However, the NRC disagrees with the commenter that this requires expansion of the EPZ. As stated previously, the basis for the EPZ is that it provides a substantial basis for the expansion of emergency response beyond the EPZ should that prove to be necessary. The competence of State and local authorities to implement protective measures for the public (as described in NUREG/CR-6864 and NUREG/CR-6981) has also been discussed previously in response to Issues 5 and 6. Additionally, the DHS has provided several documents that guide Federal, State, and local response efforts should they be required for an event at a licensee facility. These documents include FEMA's National Response Framework, NIMS, and ICS which were established by Homeland Security Presidential Directive/HSPD-5—Management of Domestic Incidents on February 28, 2003. These programs present a framework for use in an emergency that is scalable, is flexible, and allows for an adaptable coordinating structure. The DHS has achieved near universal acceptance of the National Response Framework at the Federal, State, and local levels in the United States. The supporting systems, NIMS and ICS, are implemented daily in response to routine emergencies nationwide, such as response to hazardous material spills and fires.

In addition to the DHS guidelines that are used by offsite response organizations, the current requirements for the 10-mile planning basis used by licensees establish an infrastructure consisting of emergency organizations, communications capabilities, training, and equipment that are similar to other normal community emergency organizations, such as police and fire departments that can be used in the event of an accident at the facility. The DHS guidance and

the process it outlines would support ORO efforts to implement protective actions beyond the plume exposure pathway EPZ if conditions warranted them.

Issue 12. Expand EPZs because current regulations do not provide adequate protection. Amending the regulations as requested in the petition would more likely provide adequate protection.

Many commenters agreed with the petitioner that the current emergency planning regulations do not provide adequate protection of the public health and safety and are outdated. Several commenters stated that one of the lessons that should be learned from Fukushima Dai-ichi is that the NRC's current emergency planning regulations are inadequate. One commenter stated that while Japan and Germany are closing their nuclear power plants, the United States continues building new ones despite having outdated and inadequate emergency planning regulations. Some comments stated that shadow evacuations occurred after the accidents at Fukushima Dai-ichi and Three Mile Island and would be a problem for any future evacuation. Some commenters stated that geography, roadways, bridges, traffic patterns, and other site-specific features would make evacuation in an emergency difficult or impossible.

The Nuclear Energy Institute disagreed with the petitioner and argued that the September 11, 2001, attacks and the accidents at Chernobyl and Fukushima Dai-ichi do not show that the current 10- and 50-mile EPZs are inadequate. The Nuclear Energy Institute and several emergency management agencies stated that the existing EPZs are based on a conservative analysis of a wide range of accident consequences and continue to provide assurance that adequate protective measures can and will be taken in the event of an emergency.

NRC Response to Issue 12

The NRC disagrees with the comments that current emergency preparedness regulations do not provide adequate protection. On December 13, 1991 (56 FR 64966), the Commission stated that "through its standards and required exercises, the Commission ensures that existing plans are adequate throughout the life of a plant even in the face of changing demographics and other site related factors." The current regulations in 10 CFR 50.47 require that a finding be made by the NRC that there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency before an initial operating license is issued. These measures are required to be outlined in each site's radiological emergency plan. The site-specific emergency plans must meet the 16 planning standards listed in 10 CFR 50.47(b). Additionally, a holder of a nuclear power reactor operating license under 10 CFR 50.54(q) is required to follow and maintain the effectiveness of an emergency plan that meets the standards in 10 CFR 50.47(b) and the requirements in appendix E to 10 CFR part 50. All U.S. nuclear power plants currently have NRC-approved emergency plans that include EPZs in compliance with the regulations in 10 CFR 50.47 and appendix E to 10 CFR part 50.

The FEMA approves offsite emergency response plans and evaluates the capability of State and local agencies to implement their plans in a biennial demonstration exercise. The ORO's evacuation planning and protective action decisionmaking are major components of the FEMA evaluation and are addressed in every biennial exercise. Any finding of deficiency must be addressed by the responsible agency in order to maintain the FEMA finding that there is adequate protection of public health and safety.

The NRC agrees that shadow evacuations may occur and should be appropriately considered. The NRC's guidance document for preparing evacuation time estimate studies establishes the need to include a 20 percent shadow evacuation in the analysis (NUREG/CR-7002). The NRC defines a shadow evacuation as an evacuation of people from areas outside

an officially declared evacuation zone. The shadow population is considered in the analysis to account for the potential for this population group to impede the evacuation of those under evacuation orders. It should be recognized that 20 percent was chosen based on data in NUREG/CR-6864 and is an estimate of the potential for shadow evacuation. The shadow evacuation can be minimized through frequent and effective crisis messaging by OROs. Supplement 3 to NUREG-0654 provides guidance to assist OROs with crisis messaging.

The NRC staff has conducted considerable research into evacuations, including the impact of shadow evacuations on evacuation outcomes. As stated in NUREG/CR-6864:

> Shadow evacuations, defined as evacuations by persons outside of any officially declared evacuation zone(s), occurred in 18 (36%) of the 50[3] case studies examined. Of those 18 cases involving shadow evacuations, traffic movement was impacted in only five of the cases and there was no impact on congregate care center capacity, according to the individuals interviewed. These five cases were all in Florida and included Hurricane Andrew, Hurricane Floyd (3 cases), and the Mims Fire. In the Mims Fire, Interstate 95 was closed due to poor visibility from the smoke and significantly contributed to the traffic congestion. The hurricanes that had traffic movement problems were exceptionally large, with two cases involving over 600,000 evacuees.
>
> The Governor's Hurricane Task Force has since identified improvements in the areas of decision making, traffic management, congregate care center management, and dissemination of emergency public information, that are expected to improve the efficiency and effectiveness of future large hurricane evacuations, and thus, reduce impacts from shadow evacuations.

Based on this research, the NRC has confidence that shadow evacuations generally have little impact on traffic movement, and concludes that the licensees' current emergency planning bases continue to provide reasonable assurance of protection of the public's health and safety.

The NRC agrees that most evacuations would be considered difficult by those experiencing them but disagrees that evacuations would be impossible. All U.S. nuclear power plants have provided updated ETEs to the NRC per 10 CFR 50.47(b)(10). The NRC staff is not

[3] These 50 evacuations were selected because they were of sufficient size and complexity to challenge local and regional emergency response capabilities and to provide sufficient detail to identify the factors contributing to evacuation efficiency.

aware of any evacuations that are impossible. A review of the evacuations studied in NUREG/CR-6864 shows that effective evacuations of large numbers of people were routinely accomplished, including:

- Hurricane Floyd, 373,000 people (1999)
- Hurricane Andrew, 650,000 people (1992)
- Hurricane Georges, 1,500,000 people (1998)
- Centennial Olympic Park, 60,000 people (1996)
- World Trade Center, 300,000 people (2001)
- World Trade Center, 150,000 people (1993)
- The East Bay Hills Wildfire, 30,000 people (1991)

The petition provided no substantial information that would indicate evacuations cannot be accomplished in support of a nuclear power plant accident should it be necessary or that support its claim that the NRC's emergency planning regulations do not provide adequate protection of the public health and safety.

In SECY-12-0095, the NRC staff stated that the existing EP framework of regulations and guidance to provide reasonable assurance of adequate protection of public health and safety in a radiological emergency. The NRC staff referred to several studies that have informed the NRC evaluation of the adequacy of this approach. These studies, which are discussed in more detail in the response to Issue 2, included NUREG/CR-6864 and NUREG-1935. These studies have informed the NRC's conclusion that the NRC's existing EP framework provides reasonable assurance of adequate protection of public health and safety in the event of a radiological emergency at an existing U.S. power reactor facility.

The Commission concludes that the current size of EPZs helps to provide reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency at an existing nuclear power plant. In addition, as part of previously-approved research efforts associated with Tier 3 program plans, the NRC plans a long-term

action involving EPZs. The NRC will use insights from the current full-scope site Level 3 PRA project as well as information obtained from the UNSCEAR assessment to inform the evaluation of the potential impacts that a multi-unit event may have on an EPZ. If these research activities indicate that changes need to be made to the existing EP regulations, the NRC will commence a rulemaking effort to make those changes.

Issue 13. Require EP exercises to include a regionally-relevant initiating or concurrent natural disaster because natural disasters can challenge nuclear safety systems.

The petitioner argued that the NRC should amend its regulations to require that licensees include a regionally-appropriate natural disaster in every other exercise because a natural disaster may trigger a nuclear accident or complicate the emergency response to an accident.

The petitioner listed several recent natural disasters including Hurricane Katrina and Hurricane Irene and expressed the opinion that there is a trend due in large part to climate change. "If this is correct," the petitioner stated, "'unprecedented' natural disasters will not only continue to occur, they will accelerate."

The petitioner stated that natural disasters can greatly complicate the ability to evacuate a given area.

Many commenters agreed that exercises should include a regionally-relevant initiating or concurrent natural disaster for the reasons provided in the petition.

Several State and county emergency management agencies stated that many nuclear power plant licensees already incorporate natural disasters into their drills.

NRC Response to Issue 13

The NRC agrees that natural disasters may challenge nuclear safety systems; however, the NRC disagrees that it is necessary to modify the regulations as proposed by the petitioner

because the existing requirements and emergency planning framework are sufficient. The majority of nuclear power plant licensees currently incorporate natural or destructive phenomena into their drill and exercise scenarios. This planning helps licensees prepare for natural disasters that could coincide with a reactor emergency. All NRC-licensed sites in the United States have emergency action levels (EAL) in their radiological emergency plans that include protective actions related to aspects of natural disasters. Moreover, current activities being undertaken by the NRC staff for the NTTF recommendations resulting from the Fukushima Dai-ichi event are addressing the issue of additional requirements, including training and drills, for a beyond-design-basis event such as a natural disaster (Order EA-12-049). The proposed requirements to perform a drill for an event that originates from a beyond-design-basis external event and leads to a multi-unit prolonged station blackout would involve licensees planning, preparing, and practicing for these unlikely natural events.

The NRC notes that each U.S. nuclear power plant has an emergency plan as a defense-in-depth measure. Emergency plans contain contingencies for alternate evacuation routes, alternate means of notification, and other backup plans in the event of a natural disaster that damages the infrastructure surrounding a nuclear power plant. Licensees exercise these plans on a regular basis. The NRC performs oversight to verify the acceptable performance of the licensee's response during exercises, drills, and actual incidents and events. The FEMA provides oversight for offsite response. For Incidents of National Significance where the critical infrastructure is severely damaged, the DHS has a lead role as a coordinating agency to orchestrate Federal, State, and local assets. The Nuclear/Radiological Incident Annex to the National Response Framework provides for the NRC to be a coordinating agency for incidents involving NRC-licensed materials.

As noted in the response to Issue 1, the NTTF conducted a systematic and methodical review of the NRC's regulations and processes to determine if the agency should make safety improvements in light of the events in Japan. As a result of this review, the NTTF issued SECY-

11-0093, “Near-Term Report and Recommendations for Agency Actions Following the Events in Japan,” dated July 12, 2011 (ADAMS Accession No. ML11186A950). SECY-11-0124, “Recommended Actions to be Taken Without Delay from the Near-Term Task Force Report,” dated September 9, 2011 (ADAMS Accession No. ML11245A158), and SECY-11-0137, “Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned,” were issued to establish the NRC staff's prioritization of the recommendations. The NRC staff determined that Recommendation 4.2, concerning strategies to mitigate the consequences of accidents similar to those that occurred at Fukushima Dai-ichi, was a high-priority action. Order EA-12-049, “Order Modifying Licenses with regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,” was issued to each power reactor licensee and each holder of a construction permit on March 12, 2012. The Order requires a three-phase approach for mitigating beyond-design-basis external events. The initial phase requires the use of installed equipment and resources to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities. The transition phase requires providing sufficient, portable, onsite equipment and consumables to maintain or restore these functions until they can be accomplished with resources brought from offsite. The final phase requires obtaining sufficient offsite resources to sustain those functions indefinitely. Specifically, the Order requires the following:

(1) Licensees or construction permit holders shall develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment and spent fuel pool cooling capabilities following a beyond-design-basis external event.

(2) These strategies must be capable of mitigating a simultaneous loss of all alternating current (ac) power and loss of normal access to the ultimate heat sink and have adequate capacity to address challenges to core cooling, containment, and spent fuel pool cooling capabilities at all units on a site subject to this Order.

(3) Licensees or construction permit holders must provide reasonable protection for the associated equipment from external events. Such protection must demonstrate that there is adequate capacity to address challenges to core cooling, containment, and spent fuel pool cooling capabilities at all units on a site subject to this Order.

(4) Licensees or construction permit holders must be capable of implementing the strategies in all modes.

(5) Full compliance shall include procedures, guidance, training, and acquisition, staging, or installing of equipment needed for the strategies.

These new requirements provide a greater mitigation capability consistent with the overall defense-in-depth philosophy, and, therefore, greater assurance that the challenges posed by beyond-design-basis external events, such as natural disasters, to power reactors do not pose an undue risk to public health and safety.

Issue 14. Require EP exercises to include a regionally-relevant initiating or concurrent natural disaster because natural disasters may affect communications during emergency response.

The petitioner stated that natural disasters can greatly complicate the ability to provide sufficient communication to assure that sheltering or other protective actions are taken within a given area.

NRC Response to Issue 14

The NRC agrees that natural disasters may affect communications during emergency response; however, the NRC disagrees that it is necessary to modify the regulations as proposed by the petitioner because of the existing requirements and emergency planning framework. The majority of nuclear power plant licensees currently incorporate natural or destructive phenomena into their drill and exercise scenarios. This planning helps licensees

prepare for natural disasters that could coincide with a reactor emergency. All NRC-licensed sites in the United States have EALs in their radiological emergency plans that include protective actions related to aspects of these natural events. However, current activities being undertaken by the NRC for the NTTF recommendations resulting from the Fukushima Dai-ichi event associated with emergency preparedness communications are addressing the issue of reliable communications following a natural disaster. The proposed requirements to perform a drill for an event that originates from a beyond-design-basis external event and leads to a multi-unit prolonged station blackout would involve licensees planning, preparing, and practicing for these unlikely natural events.

Emergency plan communications requirements and detailed guidance on how to meet those requirements are contained in the following:

- 10 CFR 50.47(b)(6) states that provisions should be made for prompt communications among principal response organizations to emergency personnel and to the public.

- Section IV.E.9 of appendix E to 10 CFR part 50 states that adequate provisions shall be made and described for emergency facilities and equipment, including "at least one onsite and one offsite communications system; each system shall have a backup power source."

- NUREG-0696, "Functional Criteria for Emergency Response Facilities," dated February 1981 (ADAMS Accession No. ML051390358), offers guidance on how to meet the requirements of appendix E to 10 CFR part 50 and discusses the onsite and offsite communications requirements for the licensee's emergency operating facilities.

As a result of the Tier 1 recommendations in the NTTF report, the NRC issued to each power reactor licensee and each holder of a construction permit on March 12, 2012, a "Request for Information Pursuant to Title 10 of the *Code of Federal Regulations* 50.54(f) regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the

Fukushima Dai-ichi Accident" (ADAMS Accession No. ML12056A046). The NRC issued this information request regarding the power supplies for communications systems to determine if additional regulatory action is warranted. This request is based upon NTTF Recommendation 9.3, which proposed that facility emergency plans provide for a means to power communications equipment needed to communicate onsite (e.g., radios for response teams and between facilities) and offsite (e.g., cellular telephones and satellite telephones) during a prolonged station blackout. The NRC requested that the following assumptions be made in preparing responses to this request for information: assume that the potential onsite and offsite damage is a result of a large-scale natural event resulting in a loss of all alternating current (ac) power, and assume that the large-scale natural event causes extensive damage to normal and emergency communications systems both onsite and in the area surrounding the site. The NRC recognizes that following a large-scale natural event, ac power may not be available to cell and other communications infrastructures.

The NRC requested that addressees assess their current communications systems and equipment used during an emergency event given the aforementioned assumptions. The NRC also requested that consideration be given to any enhancements that may be appropriate for the emergency plan with respect to the communications requirements of 10 CFR 50.47 and appendix E to 10 CFR part 50, and the guidance in NUREG-0696 in light of the assumptions previously stated. Also, addressees were requested to consider the means necessary to power the new and existing communications equipment during a prolonged station blackout.

Addressees were requested to provide an assessment of the current communications systems and equipment used during an emergency event to identify any enhancements that may be needed to ensure communications are maintained during a large-scale natural event meeting the conditions previously described. The assessment should:

- Identify any planned or potential improvements to existing onsite communications systems and their required normal and/or backup power supplies,

- Identify any planned or potential improvements to existing offsite communications systems and their required normal and/or backup power supplies,
- Provide a description of any new communications system(s) or technologies that will be deployed based upon the assumed conditions previously described, and
- Provide a description of how the new and/or improved systems and power supplies will be able to provide for communications during a loss of all ac power.

Nuclear power plant licensees were also requested to describe any interim actions that have been taken or are planned to be taken to enhance existing communications systems power supplies until the communications assessment and the resulting actions are complete, and to provide an implementation schedule of the time needed to conduct and implement the results of the communications assessment.

The NRC staff is evaluating the responses received from this information request to determine their acceptability as part of the agency's lessons learned from the events at Fukushima Dai-ichi.

III. Determination of the Petition

The Commission has reviewed the petition and the public comments. For the reasons described in Section II, Public Comments on the Petition, of this document, the Commission does not find that the arguments raised by the petitioner warrant changing the current regulations. The Commission reiterates that the basis for the current size of EPZs is valid for existing reactors and proposed new reactors. Furthermore, the Commission has reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency at an existing nuclear power plant. For new reactors under construction and licensed to operate, the Commission has determined that subject to the required conditions and limitations of the full-power license, adequate protective measures can and will be taken in the event of a radiological emergency. Separate from this petition, as part of previously-

approved research efforts associated with Tier 3 program plans, the NRC plans a long-term action involving EPZs. If, as a result of those research activities, the NRC determines that a rulemaking action is necessary, it can begin the rulemaking process without a petition for rulemaking.

Because the Commission has decided that the petition does not present sufficient information to warrant changing the size of EPZs or requiring licensees to include natural disasters in their EP exercises at this time, the NRC cannot consider this PRM in the rulemaking process. Therefore, the NRC is denying the petition under 10 CFR 2.803, "Determination of petition."

IV. Availability of Documents

The following table provides information on how to access the documents referenced in this document. For more information on accessing ADAMS, see the ADDRESSES section of this document.

Date	Document	ADAMS Accession Number/*Federal Register* Citation
October 1975	Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants (WASH-1400 (NUREG-75/014))	ML072350618
December 1978	Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants (NUREG-0396)	ML051390356
October 23, 1979	Planning Basis for Emergency Responses to Nuclear Power Reactor Accidents	44 FR 61123

Date	Document	ADAMS Accession Number/*Federal Register* Citation
February 28, 1981	Functional Criteria for Emergency Response Facilities (NUREG-0696)	ML051390358
July 6, 1984	Emergency Planning and Preparedness	49 FR 27733
May 8, 1985	Emergency Planning and Preparedness	50 FR 19323
August 4, 1986	Safety Goals for the Operations of Nuclear Power Plants; Policy Statement	51 FR 28044
August 21, 1986	Safety Goals for the Operation of Nuclear Power Plants; Policy Statement; Correction and Republication	51 FR 30028
November 3, 1987	Evaluation of the Adequacy of Off-Site Emergency Planning for Nuclear Power Plants at the Operating License Review Stage Where State and/or Local Governments Decline to Participate in Off-Site Emergency Planning	52 FR 42078

Date	Document	ADAMS Accession Number/*Federal Register* Citation
April 30, 1989	Implications of the Accident at Chernobyl for Safety Regulation of Commercial Nuclear Power Plants in the United States (NUREG-1251)	ML082030501, ML082030502
June 14, 1996	Production and Utilization Facilities; Emergency Planning and Preparedness Exercise Requirements	61 FR 30129
January 19, 2001	Consideration of Potassium Iodide in Emergency Plans	66 FR 5427
February 28, 2001	Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants (NUREG-1738)	ML010430066
August 20, 2003	Fact Sheet: NRC Review of Paper on Reducing Hazards from Stored Spent Nuclear Fuel	ML032320620
January 31, 2005	Identification and Analysis of Factors Affecting Emergency Evacuations (NUREG/CR-6864)	ML050250245, ML050250219
July 18, 2005	NRC Bulletin 2005-002: Emergency Preparedness and Response Actions for Security-Based Events	ML051740058

Date	Document	ADAMS Accession Number/*Federal Register* Citation
October 29, 2005	SECY-05-0202, Staff Review of the National Academies Study of the Health Risks from Exposure to Low Levels of Ionizing Radiation (BEIR VII)	ML052640532
October 31, 2008	Assessment of Emergency Response Planning and Implementation for Large Scale Evacuations (NUREG/CR-6981)	ML082960499
June 17, 2011	Response Letter to Senator James Webb from Chairman Jaczko regarding NRC Evacuation Recommendations for the U.S. Residents within 50 Miles of Fukushima Reactors	ML11143A033
July 12, 2011	SECY-11-0093, Near-Term Report and Recommendations for Agency Actions Following the Events in Japan	ML11186A959
July 12, 2011	Recommendations for Enhancing Reactor Safety in the 21st Century, The Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident	ML111861807
September 9, 2011	SECY-11-0124, Recommended Actions to be Taken Without Delay from the Near-Term Task Force Report	ML11245A158
October 3, 2011	SECY-11-0137, Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned	ML11272A111

Date	Document	ADAMS Accession Number/*Federal Register* Citation
October 18, 2011	Staff Requirements Memorandum – SECY-11-0124 – Recommended Actions to be Taken Without Delay from the Near-Term Task Force Report	ML112911571
November 20, 2011	Guidance for Protective Action Strategies (Supplement 3 to NUREG-0654/FEMA-REP-1, Rev. 1)	ML113010596
November 28, 2011	Criteria for Development of Evacuation Time Estimate Studies (NUREG/CR-7002)	ML113010515
January 31, 2012	State-of-the-Art Reactor Consequence Analyses (SOARCA) Report, Draft Report for Comment (NUREG-1935)	ML120250406
February 15, 2012	Incoming Petition (PRM-50-104) from Mr. Michael Mariotte	ML12048B004
March 12, 2012	Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, NRC Order EA-12-049	ML12054A736
March 12, 2012	Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation, NRC Order EA-12-051	ML12054A682

Date	Document	ADAMS Accession Number/*Federal Register* Citation
March 12, 2012	Request for Information Pursuant to Title 10 of the *Code of Federal Regulations* 50.54(f) regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident	ML12056A046
April 25, 2012	SECY-12-0064, Recommendations for Policy and Technical Direction to Revise Radiation Protection Regulations and Guidance	ML121020108
April 30, 2012	Notice of Receipt of Petition for Rulemaking and Request for Comment (77 FR 25375)	ML120820212
July 13, 2012	SECY-12-0095, Tier 3 Program Plans and 6-Month Status Update in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Subsequent Tsunami	ML12208A208, ML12165A092, ML12165A093, ML12208A210
September 13, 2012	SECY-12-0123, Update on Staff Plans to Apply the Full-Scope Site Level 3 PRA Project Results to the NRC's Regulatory Framework	ML12202B170
November 30, 2012	State-of-the-Art Reactor Consequence Analyses (SOARCA) Report, Final Report (NUREG-1935)	ML12332A057, ML12332A058
December 17, 2012	SRM-SECY-12-0064, Recommendations for Policy and Technical Direction to Revise Radiation Protection Regulations and Guidance	ML12352A133

Date	Document	ADAMS Accession Number/*Federal Register* Citation
March 19, 2013	SRM-SECY-12-0157, Consideration of Additional Requirements for Containment Venting Systems for Boiling Water Reactors with Mark I and Mark II Containments	ML13078A017
June 6, 2013	Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions, NRC Order EA-13-109	ML13143A321
October 9, 2013	Consequence Study of a Beyond-Design-Basis Earthquake Affecting the Spent Fuel Pool for a U.S. Mark I Boiling Water Reactor	ML13256A342
Month Date, 2013	Comment Response Document, Petition for Rulemaking to Expand Emergency Planning Zones, PRM-50-104	ML13109A523

Dated at Rockville, Maryland, this ___day of ___, 2013.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission.

PRM-50-104

NUCLEAR INFORMATION AND RESOURCE SERVICE

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February 15, 2012

Attn: Annette L. Vetti-Cook

Secretary

Rulemakings and Adjudications Staff

U.S. Nuclear Regulatory Commission

Washington, DC, 20555

Pursuant to 10 C.F.R. 2.802, Nuclear Information and Resource Service along with thirty seven co-petitioners files this Petition for Rulemaking to expand the Emergency Planning Zone regulations promulgated by 10 C.F.R. 50.47.

The Petitioners statement of interest and grounds for the Petition for Rulemaking are set forth below.

Should there be any questions regarding the Petition for Rulemaking please call Dominique French at 301-270-6477.

Sincerely,

Michael Mariotte
Executive Director
NIRS

Template = SECY-051

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UNITED STATES OF AMERICA
U.S. NUCLEAR REGULATORY COMMISSION
BEFORE THE NRC STAFF

PETITION FOR RULEMAKING TO IMPROVE EMERGENCY PLANNING REGULATIONS (10 C.F.R. 50.47)

I. INTRODUCTION

As provided by 10 CFR § 2.802, the undersigned Petitioners[1] request the U.S. Nuclear Regulatory Commission (NRC) to amend the NRC's offsite emergency planning regulations in 10 CFR § 50.47 and Appendix E to Part 50, as well as including these modifications within 10 C.F.R.§52 Licenses, Certification and Approvals for Nuclear Power Plants for new reactors. These amendments include, among other provisions:

- Expand the radius of the Plume Exposure Pathway Emergency Planning Zone (EPZ) from a 10-mile radius to a 25-mile radius;
- Establish a new 50-mile radius Emergency Response Zone, with more limited requirements than the EPZ;
- Expand the radius of the Ingestion Pathway EPZ from the current 50 mile radius to a 100-mile radius;
- Ensure that emergency plans are tested to encompass initiating and/or concurrent natural disasters that may affect both accident progression and evacuation conduct.

As demonstrated below, the requested amendments are essential for the protection of public health and safety in light of the real-world experience of the Chernobyl and Fukushima disasters, which were more severe and affected a much larger geographical area than provided

[1] Petitioners are the following organizations: Nuclear Information and Resource Service, XXX, YYY, ZZZ.

for in NRC regulations. Other factors that have changed since the existing emergency planning regulations were promulgated over thirty years ago include the increasing age and vulnerability of operating reactors, changing weather patterns and increased incidents of natural disasters, and significantly larger populations near many existing reactor sites. Studies currently and previously relied upon to justify the existing 10-mile Emergency Planning Zone, including the State-of-the-Art Reactor Consequence Analyses (SOARCA) report and studies of irradiated (or "spent") fuel pool accident risks, are based on assumptions of reactor and fuel pool accident risk and accident progression and consequences that are significantly underestimated based on real-world experience and more recent understanding of the risks of radiation as documented in the National Academy of Sciences Biological Effects of Ionizing Radiation-VII report.

II. STATEMENT OF PETITIONERS' INTEREST IN THE RULEMAKING

Petitioners are environmental and civic organizations with members who live within 100 miles of U.S. nuclear power plants and who are concerned that current NRC emergency planning requirements are not adequate to protect their health and safety in the event of an accident at the plant.

NIRS:

Nuclear Information and Resource Service (NIRS) is a non-profit organization based in Takoma Park, Maryland. NIRS is a national information and networking center for people concerned about nuclear power, radioactive waste, radiation and sustainable energy issues. Since its founding in 1978, NIRS has sought to educate and coordinate the public on specific issues, such as licensing of new reactors, radioactive waste transportation, deregulation of radioactive materials, and nuclear reactor safety.

Other Petitioners:

1. **Bellefonte Efficiency and Sustainability Team**
   Bellefonte Efficiency and Sustainability Team was founded in February 2008 by residents of Alabama and Tennessee to urge the Tennessee Valley Authority to adopt efficient, sustainable energy options.

2. **Beyond Nuclear**
   Beyond Nuclear is a non-profit organization based in Takoma Park, Maryland. Beyond Nuclear aims to educate and activate the public about the connections between nuclear power and nuclear weapons and the need to abandon both to safeguard our future. Beyond Nuclear advocates for an energy future that is sustainable, benign and democratic. The Beyond Nuclear team works with diverse partners and allies to provide the public, government officials, and the media with the critical information necessary to move humanity toward a world beyond nuclear.

3. **Blue Ridge Environmental Defense League**
   Founded in 1984, Blue Ridge Environmental Defense League is a regional, community-based non-profit environmental organization active in Virginia, North Carolina, South Carolina, Tennessee, Alabama and Georgia. BREDL's founding principles are earth stewardship, environmental democracy, social justice, and community empowerment. BREDL is a league of community groups which is unitary, with a common incorporation, financial structure and governing board.

4. **Citizen Action Coalition**
   Citizen Action Coalition's mission is to initiate, facilitate and coordinate citizen action directed to improving the quality of life of all inhabitants of the State of Indiana through principled advocacy of public policies to preserve democracy, conserve natural resources, protect the environment, and provide affordable access to essential human services. CAC has been a stalwart opponent of nuclear and coal generation technologies for more than three decades. Having played a key role in the demise of the problem-plagued Marble Hill nuclear power plant, CAC is no stranger to the devastating environmental and financial risks associated with nuclear technology. With a continued emphasis on truly clean renewables, distributed resources, and energy efficiency, CAC is a firm believer that clean, safe, and affordable energy is not only attainable, but it is our right as an essential human service.

5. **Citizens Awareness Network**
   CAN is a volunteer, grassroots organization, committed to the creation of vibrant communities through the replacement of nuclear reactors in the Northeast with sustainable solutions. In a fight to shut a local nuke, frightened, aroused citizens formed CAN. With over 4,000 members, CAN grew from a local to a regional group, with 4 Northeast chapters. Instrumental in closing 3 reactors in New England, CAN won lawsuits against NRC and nuclear corporations, organized tours to radioactive waste communities, national high level waste tours opposing Yucca Mountain as well as 3 Action camps in southern Vermont. CAN organized a high level waste summit, bringing

together reactor and waste communities to create a waste policy that supports the needs of both communities CAN with other groups, ensured through our community organizing work, as well as lobbying efforts, the Vermont Senate vote to close Vermont Yankee in 2010 and stopped a re-vote in 2011.

6. **Citizen Power**
   Citizen Power is the outgrowth of 20 years of work for safe, clean and affordable energy. We work to protect the consumer and the environment by influencing public policy through research, education and advocacy. As educators, we disseminate information, in an understandable format, through the media, and by providing direct educational services to requesting organizations. As advocates, we participate in regulatory and legal proceedings at the state, regional and national level that can impact the environment and the regional economy. For more information, see citizenpower.com.

7. **C-10 Research & Education Foundation**
   C-10's prime mission for 20 years, C-10 Foundation has been operating a radiological airborne monitoring system in the Massachusetts Emergency Planning Zone (EPZ) communities near the Seabrook, NH nuclear power plant. This system operates continuously to act as an early warning in the event of any unusual release from the Seabrook plant. C-10 Foundation is pleased to be under contract with the Massachusetts Department of Public Health, Bureau of Environmental Health.

8. **Citizens' Environmental Coalition**
   Citizens' Environmental Coalition is a statewide coalition of individuals and groups working to protect New York's environment and the public's health from harm. Following the Fukushima disaster in 2011, we determined that to fulfill our mission it would be essential to close all the nuclear reactors in NY, all six of them. We are currently pursuing this agenda through many avenues. New York is home to 6 aged and problem-ridden nuclear reactors. Indian Point, the most publicized, has 2 plants at the juncture of two earthquake faults and could harm 20 million people in the event of a meltdown. Serious events at any of the other NY reactors could harm over 1 million people. Two of our reactors are Mark 1 designs like those at Fukushima with inadequate containment. In the event of a meltdown-- venting radioactive emissions to the public would be necessary. Since the Fukushima disaster the NRC has not adequately addressed three of the most serious problems that are relevant to the disaster-- earthquake potential, Mark 1 nuclear designs, and the dangers of overcrowded spent fuel pools.

9. **Coalition for a Nuclear Free Great Lakes**
   Coalition for a Nuclear Free Great Lakes (CNFGL - 1986) - Is comprised of safe energy and environmental groups throughout the basin (8 states, 2 provinces) who exchange expertise and documentation on all things nuclear, and then formulate campaigns to address these specific threats. The Great Lakes basin constitutes 20% of Earth's surface fresh water, and is among the most precious resources on our planet. There are some 60 nuclear power plants that could directly impact the basin air-shed and watershed. The Great Lakes are ringed by nuclear reactors and other nuclear installations that represent an acute radiological risk to the region. Chernobyl, and now Fukushima Daiichi, are clear

and unmistakable warnings. Eight of ten of the oldest U.S. nuclear reactors are located within the Great Lakes air-shed and watershed.

10. Concerned Citizens of Shell Bluff

Concerned Citizens of Shell Bluff was founded in March 2010 to protect local residents living near Georgia Power's Plant Vogtle from the negative health and economic impacts of nuclear power.

11. Connecticut Coalition Against Millstone

12. Don't Waste Arizona

Don't Waste Arizona, Inc. (DWAZ) is a non-profit environmental organization based in Arizona. DWAZ is especially concerned about emergency planning, emergency response issues, and nuclear reactor and waste issues, has served as a member of the Maricopa County Local Emergency Planning Committee for over ten years, and operates a website dedicated to emergency planning issues. (Maricopa County is the home of the Palo Verde Nuclear Generating Station.) DWAZ has been a significant enforcer of the Emergency Planning and Community Right to Know Act.

13. Don't Waste Michigan

Don't Waste Michigan (DWM - 1987) first comprised of citizens throughout the state organized to stop the nuclear power industry from targeting Michigan to become a nuclear waste dump, the campaign was successful. DWM continues to be active and to educate the public about nuclear waste, and where it comes from. DWM is a frequent intervenor of record in Federal Court on nuclear matters in Michigan. Currently DWM is intervenor of record to stop the proposed Fermi 3 nuclear plant, and to stop Davis-Besse re-licensing. Recently DWM became intervenor on the Fermi 2 located on Lake Erie south of Detroit calling for shut-down. The Fermi 2 has been identified as the largest Fukushima design (Mark I) reactor in the world. DWM frequently joins in coalition with environmental groups and conducts a series of conference under the banner Nuclear Free Great Lakes Action Camps.

14. The Ecology Part of Florida

The Ecology Party of Florida is a Florida political party that believes environmental destruction is the most important issue facing America today. The goals of the party are: to have elected officials who place environmental issues at the top of their agendas, to inform voters on issues related to the environment, and to use legal means to protect the ecosystem. The Ecology Party was founded in 2007, and is headquartered at 641 SW 6th Ave, Ft Lauderdale, FL.

15. Empire State Consumer Project, Inc.

The purpose of Empire State Consumer Project is to reduce the use of pesticides and other chemicals toxic too human and environmental health and well-being to benefit the health and well-being of all consumers especially children. We have tested products such as imported jewelry for heavy metals. We are now in the process of working to set standards for the amount of cadmium that can leach from children's jewelry: we are

working with Food and Water Watch on setting standards for the amount of arsenic allowed in food; helping consumer deal with contamination of their towns (Le Roy, New York)

16. GRAMMES (Grandmothers, Mothers, and More for Energy Safety)

GRAMMES is a grassroots networking organization working for safe, renewable energy choices. We are part of a coalition that fought the relicensing of Oyster Creek Nuclear Generating Station in New Jersey, and continue efforts to improve safety conditions while lobbying for a closure of the plant.

17. Greenpeace

Greenpeace is one of 40 national Greenpeace organizations worldwide, Greenpeace, Inc. (hereafter "Greenpeace") is a non-profit membership organization registered with the Internal Revenue Service as a 501(c)(4) non-profit entity. Our national headquarters are located in Washington DC, with other offices located across the United States. Greenpeace members rely on Greenpeace to represent their interests in the protection of the environment. We reach out to our members through a quarterly newsletter and occasional e-mail messages, and to the public as well as our members through our website and pursuit of media coverage of our campaigning efforts. Greenpeace uses peaceful protest and creative communication to expose global environmental problems and to promote solutions that are essential to a green and peaceful future. Since 1971, Greenpeace has been a leading voice of the environmental movement in taking a stand against powerful political and corporate interests whose policies put the planet at risk. Greenpeace furthers its mission through research, advocacy, public education, lobbying, and litigation with a staff that includes scientists, lawyers, campaigners, policy experts, and communications specialists.

18. Indian Point Safe Energy Coalition (IPSEC)

The Indian Point Safe Energy Coalition (IPSEC) is a nonprofit, non-partisan coalition of citizen, civic, environmental, health and public policy organizations that formed in the aftermath of the Sept. 11 attack in response to a flood of citizen concerns about the security and safety of the Indian Point nuclear power plants located approximately 24 miles from New York City.

19. Jersey Shore Nuclear Watch

Jersey Shore Nuclear Watch was formed 11 years ago with the mission of shutting down Oyster Creek Nuclear Power Plant as soon as possible. In 2002, we filed a petition with the NRC challenging on site dry cask storage casks and called for a public hearing. Twenty eight out of 33 municipalities supported the JSNW petition. In 2005, JSNW was part of a coalition opposing the relicensing of Oyster Creek. More than 20 municipalities adopted resolutions opposed to relicensing.

20. Missourians for Safe Energy

Missourians for Safe Energy is a grassroots, non-profit group engaged in public education and advocacy to promote a sustainable, clean energy future. MSE is the energy

policy arm of Mid-Missouri Peaceworks, a multi-issue, membership-based organization with approximately 500 member households. MSE and MMPW operate under the incorporation of the Missouri Nuclear Weapons Education Fund, a 501.c.3 non-profit corporation. MSE today carries on the legacy of the original Missourians for Safe Energy, founded in 1976. In its current incarnation, MSE has been active since March of 2006.

21. New England Coalition

22. Nuclear Energy Information Service

NEIS provides information about the hazards, safety problems, environmental effects and economic costs of nuclear power, radioactive waste, and radiation exposure; and about viable energy alternatives to nuclear. We are Illinois' nuclear watchdog organization.

23. Not On Our Fault Line

Not on Our Fault Line (NOOFL) is a local citizens group in the Louisa County area which is working to insure that the North Anna reactors are not operating if they are unable to withstand earthquakes in the region. NOOFL is also working to get potassium iodine distributed to local residents and on public education about the reactors.

24. NC WARN

NC WARN is a member-based nonprofit tackling the accelerating crisis posed by climate change – along with the various risks of nuclear power – by watch-dogging utility practices and working for a swift North Carolina transition to energy efficiency and clean power generation. In partnership with other citizen groups, NC WARN uses sound scientific research to inform and involve the public in key decisions regarding their wellbeing.

25. Northwest Environmental Advocates

Northwest Environmental Advocates (NWEA), formerly the Coalition for Safe Power, was founded in 1969 by citizens concerned about the imminent operation of the now-closed Trojan Nuclear Power Plant, in Oregon. NWEA was also involved in the closure of the dual-purpose N reactor at Hanford, Washington. In addition to intervention in the Trojan spent fuel pool expansion hearings, NWEA intervened in the Trojan license amendment proceedings to address control room earthquake safety and the operating license proceedings for the WPPSS and Skagit/Hanford reactors in Washington. NWEA has filed numerous petitions concerning safety matters to the Commission pursuant to 10 C.F.R. § 2.206, including a petition addressing the impacts of the eruption of the Mt. Helens volcano on the ability to carry out Trojan's emergency evacuation plans and one concerning the unsafe construction of the Washington Public Power Supply System ("WPPSS") No. 2 reactor, now renamed the Columbia Generating Station (CGS). NWEA recently petitioned to intervene in the operating license extension proceedings for the CGS and was a party to a petition to the Commission regarding the implications of the Fukushima accident to nuclear reactor safety in the United States

26. People's Alliance for Clean Energy

Peoples Alliance for Clean Energy (PACE) is a Charlottesville VA based group which works on promoting alternatives to nuclear power, rapid phase out of the existing plants and stopping the construction of additional reactors at the North Anna site. PACE organizes protests, public hearings, clean energy symposiums and other public education and political pressure events designed to help move the region away from nuclear solutions.

27. Promoting Health and Sustainable Energy (PHASE) and Council on Intelligent Energy & Conservation Policy (CIECP)

PHASE and CIECP are sister nonprofit, non-partisan, energy public policy groups that advocate for policies that promote clean safe energy.

28. Public Citizen

Public Citizen is a nonprofit organization that does not participate in partisan political activities. We accept no government or corporate money – we rely solely on foundation grants, publication sales and support from our 80,000 members. Since our founding in 1971, we have delved into an array of areas, but our work on each issue shares an overarching goal: To ensure that all citizens are represented in the halls of power. We have five policy groups: our Congress Watch division, the Energy Program, Global Trade Watch, the Health Research Group and our Litigation Group

29. San Luis Obispo Mothers for Peace

San Luis Obispo Mothers for Peace (SLOMFP) is a non-profit organization concerned with the local dangers involving the Diablo Canyon Nuclear Power Plant, and with the dangers of nuclear power, weapons and waste on national and global levels. Since 1973 SLOMFP has been an active legal intervenor challenging the licensing of the Diablo Canyon Nuclear Power Plant (DCNPP) owned and operated by Pacific Gas and Electric Company. In order to qualify for intervenor status, SLOMFP had to demonstrate that its members live within a 50 mile radius of the DCNPP. In 2012 a majority of the members of SLOMFP live within 25 miles of DCNPP. In addition to its intervention in opposition to DCNPP licenses, SLOMFP has also taken an active role in the effort to improve the safety of nuclear power plants nation-wide. Documentation of the past four decades of SLOMFP actions can be found at the organization's website at mothersforpeace.org

30. SEED Coalition:

The Sustainable Energy and Economic Development (SEED) Coalition educates and organizes citizens throughout Texas, leads legal opposition to the proposed South Texas Project and Comanche Peak reactors, and works to limit the radioactive waste being sent to West Texas for disposal. We support energy efficiency and renewable solar, wind and geothermal power, while actively opposing nuclear and coal burning power plants. We raise awareness of the health and safety risks of potential nuclear accidents, including widespread exposure to radioactivity and environmental contamination. We also oppose nuclear power due to its vast water consumption and production of radioactive waste, and because it is unreliable and extremely expensive.

31. Sierra Club of South Carolina

The Sierra Club chapter in South Carolina routinely makes comments and appearances at nuclear regulatory hearings and procedures urging the utilities and the industry to heighten awareness and plan for the inevitable. South Carolina has several reactors that could in accident scenario potentially affect hundreds of thousands of people including the Myrtle Beach area. As far as we can tell there are little if any plans on this scale or scope. As populations grow it is imperative that emergency plans grow as well. The lessons at Fukushima should teach us that we must do more to prepare emergency personnel and citizens for likelihood of event around accident. New information is showing that even low levels of radiation causes serious health problems and this is why we believe that evacuation zones should be greater.

32. Southern Alliance for Clean Energy

SACE is a non-profit, non-partisan, membership organization that promotes responsible energy choices that solve global warming problems and ensure clean, safe, and healthy communities throughout the Southeast. SACE has staff and members throughout the Southeast, including offices in Tennessee, Georgia, Florida and the Carolinas.

33. Three Mile Island Alert

Three Mile Island Alert, Inc. is a non-profit citizens' organization based in Harrisburg, Pennsylvania and founded in 1977. TMI-Alert monitors nuclear power plants located on the Susquehanna River including: the Peach Bottom Atomic Power Station, the Susquehanna Steam Electric Station Unit, Three Mile Island Nuclear Generating Station and the proposed Bell Bend Nuclear Power Plant.

34. Tri-Valley CARE

35. HEAL Utah

HEAL Utah (Healthy Environment Alliance of Utah) is a non-profit grassroots advocacy organization that works to protect Utah's environment and health from nuclear threats. We enjoy the support of thousands of supporters state-wide and use the tools of civic engagement--lobbying, public comment, and speaking out in the media--to ensure that it is the public, and not polluters, who determine our nuclear waste and energy policies.

36. Vermont Public Interest Research Group

Vermont Public Interest Research Group ("VPIRG") is a nonprofit organization based in Montpelier, Vermont. Founded in 1972, VPIRG's mission is to promote and protect the health of Vermont's environment, people, and locally-based economy, and bring the voice of citizens to public policy debates that shape the future of Vermont. VPIRG currently has over 14,000 active supporters. The organization's top priority campaign over the past five years has been to promote an energy future based on local renewable energy resources. VPIRG has been involved in the legislative and regulatory processes regarding the Vermont Yankee nuclear plant for decades. Over the past five years more than 3,500 Vermont households have played an active role with VPIRG to ensure that the Vermont Yankee reactor is retired on schedule.

37. We The People, Inc.

III. DESCRIPTION OF CURRENT EMERGENCY PLANNING REGULATIONS

A. Emergency Planning Rules Were Developed to Provide Essential Protection of Public Health and Safety in the Event of Reactor Accidents Causing Offsite Radiological Releases.

The history of the NRC's emergency planning regulations demonstrates that they are a fundamentally important part of the NRC's mandatory safety requirements for protection of public health and safety under the Atomic Energy Act. Before 1980, the NRC did not require offsite emergency plans as a condition for reactor operating licenses. State and local governments prepared emergency plans on a voluntary basis, if at all. The Commission was jolted into a reappraisal of the importance of emergency planning by the 1979 accident at Three Mile Island, when the emergency response "was dominated by an atmosphere of almost total confusion."[2]

Not only did the NRC establish mandatory emergency planning requirements in response to the TMI accident, but it made clear that henceforth those requirements would be a "primary" and essential part of the NRC's regulatory scheme for protecting public health and safety from the dangers of nuclear reactor operation. As the NRC explained, the regulations were:

> "[p]redicated on the Commission's considered judgment in the aftermath of the accident at Three Mile Island that safe siting and design-engineered features alone do not optimize protection of the public health and safety. Before the accident it was thought that adequate siting in accordance with existing staff guidance coupled with the defense-in-depth approach to design would be primary public protection. Emergency planning was conceived as a secondary but additional measure to be exercised in the unlikely event that an accident would happen. The Commission's perspective was severely altered by the unexpected sequence of events that occurred at Three Mile Island. The accident showed

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[2] *Report of the President's Commission on the Accident at Three Mile Island – The Need for Change: The Legacy of TMI* at 17 (1979).

clearly that the protection provided by siting and engineered safety features must be bolstered by the ability to take protective measures during the course of an accident."[3]

B. Requirements of 1980 Regulations

The emergency planning regulations established by the NRC in 1980 remain essentially the same today. The regulations require the establishment of two emergency planning zones ("EPZs") around each nuclear power plant: a 10 mile radius plume exposure pathway EPZ and a 50 mile radius ingestion exposure pathway EPZ:

> Generally, the plume exposure pathway EPZ for nuclear power plants shall consist of an area about 10 miles in radius and the ingestion pathway EPZ shall consist of an area about 50 miles in radius. The exact size and configuration of the EPZs surrounding a particular nuclear power reactor shall be determined in relation to the local emergency response needs and capabilities as they are affected by such conditions as demography, topography, land characteristics, access routes, and jurisdictional boundaries. The size of the EPZs also may be determined on a case by- case basis for gas-cooled reactors and for reactors with an authorized power level less than 250 MW thermal. The plans for the ingestion pathway shall focus on such actions as are appropriate to protect the food ingestion pathway. [4]

In determining the size of the plume exposure pathway EPZ and the ingestion pathway EPZ, a task force composed of NRC and U.S. Environmental Protection Agency (EPA) officials looked at factors like risk, probability, cost effectiveness and accident consequence spectrum.[5] In examining the probability of needing to evacuate populations beyond the EPZ, the task force examined the probability of design-basis/loss-of-coolant accidents (DBA/LOCA), and concluded, among other things, that for most plants the 25-rem (thyroid) and 5-rem (whole-body) EPA protective action guides would not be exceeded beyond 10 miles from the plant, even using conservative assumptions and analyses.[6] As for serious Class 9 accidents involving core

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[3] Proposed Rule, 44 Fed. Reg. 75,167, 75,169 (Dec. 19, 1979).
[4] 10 C.F.R. § 50.47(c)(2).
[5] NUREG-0396 Appendix I- Rationale for the Planning Basis.
[6] Report, Appendix I at 4–6

melt and containment failure, the Report concluded that these protective action guides generally would not be exceeded beyond 10 miles *unless the containment failed catastrophically and there was a very large release of radioactive material.* (emphasis supplied). The Report further concluded that even for very large releases, emergency actions such as sheltering or evacuation within 10 miles would result in significant reductions in deaths and early injuries.[7] From a probability standpoint, the Report concluded that the probability of large doses from core-melt accidents drops off substantially at about 10 miles from the reactor.

C. Little Change to Emergency Planning Regulations in 30 Years

With the exception of a 2011 rule requiring licensees to use current U.S. census data to prepare evacuation time estimates (ETEs) and update them every 10 years,[8] the NRC has made few significant improvements to its offsite emergency response regulations since they were promulgated in 1980. The NRC rebuffed requests to upgrade offsite emergency preparedness and expand the Emergency Planning Zone in the aftermath of the Chernobyl accident. In *Citizens Task Force of Chapel Hill, et al.* 32 N.R.C. 281 (1990), the NRC denied a set of petitions to increase the size of the plume exposure pathway EPZ and the ingestion pathway EPZ. The Commission declined to revisit the assumptions about severe reactor accident risks that underlie its emergency planning regulations, concluding that the existing size of the EPZs was adequate to achieve "reasonable and feasible dose reduction" under the circumstances of each individual reactor site. The NRC also concluded that both the Chernobyl RBMK reactor

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[7] Report at 6-7.

[8] 10 C.F.R. Part 50, Appendix E, § IV, in *Enhancements to Emergency Planning Regulations,* 76 Fed. Reg. 72,560 (Nov. 23, 2011). The NRC also modified its regulatory guidance to account for this change. *Emergency Planning Guidance for Nuclear Power Plants,* 76 Fed. Reg. 75,771 (Dec. 5, 2011).

and the Soviet regulatory scheme were so different from the U.S. reactors that they did not provide a sufficient basis for amending the U.S. emergency planning regulations.[9]

IV. Experience since the Three Mile Island Accident Shows that Current NRC Emergency Planning Regulations Must be Strengthened to Protect Public Health and Safety Adequately.

1. Chernobyl, September 11, and Fukushima experiences

The accident at Fukushima, added to the experience of the Chernobyl disaster, demonstrates that the 10 mile plume exposure pathway EPZ and the 50 mile ingestion pathway EPZ are inadequate to protect the public health and safety, both because severe accidents are clearly more likely than any government previously has estimated and because their effects are far more widespread. In both instances, containments failed catastrophically and very large releases of radiation resulted. And in both instances—although the accident causes and progressions were considerably different—these very large radiation releases occurred on a sustained basis and affected very large geographical areas.

The terrorist attacks of September 11, 2001 indicate a new and previously inconceivable ability and willingness by terrorist groups to target large civilian populations. Notwithstanding enhanced security measures at nuclear facilities since that date, nuclear reactors remain attractive targets for attack, thus increasing the need for offsite preparedness.

a. Chernobyl

As discussed above, in 1990 the NRC rejected petitions to strengthen its offsite emergency planning regulations based on the experience of the Chernobyl accident. Petitioners respectfully submit that the effects of the accident should be re-examined, because they show that the effects of a significant radiological release are severe, long lasting, and widespread. With

[9] 32 N.R.C. at 299-300, 316.

respect to the severity and duration of effects, the 18-mile radius surrounding the reactor has been labeled a "dead zone," and is expected to remain uninhabitable for several hundred years. The explosion has caused increased incidents of cancer in residents of Ukraine, Belarus and Russia.[10]

The Chernobyl accident also demonstrates that a very large area may be affected significantly by a radiological release from a reactor. While evacuations initially were limited to several zones within an 18-mile radius of the reactor, in fact, the 30 kilometer exclusion zone was amended and expanded to cover 4300 square kilometers, stretching as far as 300 miles north.[11] Between the years 1986 and 2000 approximately 350,400 people were evacuated from severely contaminated areas of Belarus, Russia and Ukraine.[12] Additionally, areas up to 500 kilometers away in neighboring Belarus remain uninhabitable.

Petitioners recognize that evacuation to protect against the most severe consequences of a nuclear disaster is the not the same as re-location to avoid long-term contamination and resultant illness. In retrospect, however, it is clear that had adequate emergency plans and radiation monitoring been in place in the Soviet Union during 1986, many—probably most—of the towns and areas would have been evacuated to protect against exposure from the radioactive "hotspots" that plagued enormous geographical areas rather than relocating people when these "hotspots" were actually identified—well after they were created. "Hotspots" obviously were created immediately after the accident, as radiation deposited on the ground. That they were not

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[10] "Health Effects of the Chernobyl Accident Overview," April 2006. http://www.who.int/mediacentre/factsheets/fs303/en/index.html

[11] "Chernobyl Accident 1986," updated Sep. 2011, http://www.world-nuclear.org/info/chernobyl/inf07.html

[12] UNDP and UNICEF. 2002. The Human Consequences of the Chernobyl Nuclear Accident.. 22 Jan. 2002. p. 32 (Table 2.2 Number of people affected by the Chernobyl accident (to December 2000)). Retrieved 17 September 2010.

identified until sometimes months or even years later was a failure of emergency planning and radiation monitoring, not evidence that relocation may be taken at a leisurely pace.

Finally, food contamination continues to plague the Chernobyl region. Radionuclides including iodine 131, cesium 134 and cesium 137 tainted crops and animal products in Belarus, which is some 70 miles from Chernobyl.[13] Belarus was once known as the "bread basket" of the Soviet Union. After the Fukushima disaster, samples of milk, berries, and potatoes in areas grown outside the Chernobyl exclusion zone were taken.[14] Those samples continued to exhibit contamination. Meanwhile, thousands of miles away, sheep in Wales continue to be prohibited from public consumption because of contamination from Chernobyl, indicating that food interdiction from a nuclear accident knows nearly no boundaries—but also indicating that the current 50 mile ingestion pathway zone is woefully inadequate for real-world nuclear accidents.[15]

b. September 11, 2001 attacks

On September 11, 2001, successful attacks were made by the subnational group Al Qaeda on the World Trade Center and the Pentagon, causing catastrophic damage and resulting in the evacuation of the immediate areas. Recognizing that nuclear facilities are attractive targets for attacks by subnational groups, the NRC undertook a "top-to-bottom" review

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[13] WIT's World Ecology Report, Vol. 8, No. 1 (1996) http://collections.infocollections.org/ukedu/ru/d/Jwit17e/4.html

[14] Greenpeace: Food in Ukraine Still Contaminated from Chernobyl, http://www.voanews.com/english/news/europe/Greenpeace-Food-in-Ukraine-Still-Contaminated-From-Chernobyl-119265069.html

[15] *Farms still suffering Chernobyl restrictions,* http://www.walesonline.co.uk/news/wales-news/2010/05/10/farms-still-suffering-chernobyl-restrictions-91466-26411200/, Wales Online, May 10, 2010

of security at nuclear power plants.[16] Although a September 11-style attack on a nuclear power plant or irradiated fuel pool could result in a catastrophic accident with significant offsite radiation releases, the NRC did not re-examine its offsite emergency planning regulations as part of this "top-to-bottom" review.

c. Fukushima accident and emergency response

On March 11, 2011 the Great East Japan Earthquake, a 9.0 magnitude rated earthquake, occurred 130 kilometers off the coast of Japan. Approximately 40 minutes later, an earthquake-triggered tsunami reached Japan that was about 15 meters high (a little more than 49 feet) when it struck the Fukushima Daiichi Nuclear Power Plant.[17] The tsunami inundated and flooded the site causing extensive damage and complete loss of ac electrical power at 5 out of the 6 reactor units, although there are some indications that the earthquake itself caused significant damage to Unit 1 of Fukushima Daiichi.[18]

Evacuation efforts began first in a three-kilometer zone on March 11, 2001, which was quickly expanded to a 10 kilometer radius around Fukushima Daiichi and then to 20 kilometers (12 miles). By March 12, 2011, 140,000 people had been evacuated from the area.[19] On March 15, 2011 U.S. NRC Chairman Greg Jazcko urged Americans within 50 miles of the Fukushima

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[16] Holt, Mark and Anthony Andrews, "Nuclear Power Plants: Vulnerability to Terrorist Attack" CRS Report for Congress, Resources, Science and Industry Division. Available at http://www.fas.org/sgp/crs/terror/RS21131.pdf

[17] Okada, Yuji and Aaron Sheldrick, "Tsunami that Struck Fukushima was 15 Meters High," Apr. 10, 2011. http://www.bloomberg.com/news/2011-04-10/tepco-says-damaged-fukushima-nuclear-plant-was-hit-by-a-15-meter-tsunami.html

[18] See for example, "Real Cause of Nuclear Crisis," Dec. 13, 2011, http://www.japantimes.co.jp/text/eo20111213a1.html,

[19] Meyers, Chris and Kim Kyung-Hoon, "Quake-hit Japan Nuclear Plant Faces Fresh Threat," Mar. 12, 2011, http://www.reuters.com/article/2011/03/12/us-japan-quake-idUSTRE72A0SS20110312

Daiichi plant to evacuate.[20] This recommendation was followed by a similar statement from the U.S. State Department.[21] Around March 25, 2011, the Japanese government established a new zone, covering the area 20 to 30 kilometers from the Daiichi site and encouraged (but did not require) evacuation from that zone.[22] About three weeks later, the government issued mandatory evacuation orders for some communities about 25 miles (40 km) northwest of the Fukushima Daiichi site, where heavy radiation levels were measured that exceeded evacuation criteria.[23] Japan's government was strongly criticized, both in Japan itself and internationally, for delaying the evacuation of these communities. These people should have been evacuated much earlier—a tested evacuation plan and appropriate radiation monitoring likely would have substantially reduced this population's exposure to radiation. For these kinds of reasons, in October 2011, Japan announced plans to expand its own emergency planning zones to include a 30 kilometer (18-mile) evacuation zone and a 50 kilometer (30-mile) Plume Protection Planning Zone.[24]

During the months following commencement of the Fukushima accident, numerous hotspots have been found throughout north-central Japan, 100 miles and more from the Fukushima Daiichi site.[25] The National Academy of Sciences published detailed maps in mid-

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[20] Vastag, Brian et, al, "U.S. urges Americans within 50 Miles of Japanese Nuclear Plant to Evacuate; NRC Chief Outlines Dangerous Situation, Mar. 16, 2011. http://www.washingtonpost.com/national/us-urges-americans-within-50-miles-of-japanese-nuclear-plant-to-evacuate/2011/03/16/ABwTmha_story.html

[21] Travel Warning, Embassy of the United States Tokyo, Japan. http://japan.usembassy.gov/e/acs/tacs-travel20110317.html

[22] Biddle, Sam. "Japan Widens Evacuation Zone Around Crippled Nuke Plant," Mar. 25, 2011. http://gizmodo.com/5785675/japan-widens-evacuation-zone-around-crippled-nuke-plant

[23] Westall, Sylvia. "High Radiation Outside Japanese Exclusion Zone: IAEA," Mar. 30, 2011. http://www.reuters.com/article/2011/03/30/us-japan-radiation-idUSTRE72T78120110330

[24] "30-km Anti-Disaster Zone Proposed for Nuclear Accidents," Oct. 21, 2011. http://ajw.asahi.com/article/0311disaster/fukushima/AJ2011102115389,

[25] Sanchanta, Mariko, "The Geiger Club: Mothers Bust Silent Radiation Consensus," Jun. 17, 2011. http://blogs.wsj.com/japanrealtime/2011/06/17/the-geiger-club-mothers-bust-silent-radiation-consensus/

November 2011 identifying hot spots where radioactivity levels were highest.[26] According to an article published by the Los Angeles Times, the eastern part of Fukushima near the epicenter of the earthquake had levels of Cesium-137 that leave food production in that area "severely impaired."[27] There have been widespread reports of discoveries and interdiction of tainted food, crops, livestock and soil. A major area of concern is rice contamination. Shortly after the disaster, Iodine-131 was found in milk and spinach in towns within Fukushima Prefecture some 18 kilometers away from Fukushima Daiichi.[28] Some farms 100 kilometers and further away have been contaminated by radiation from Fukushima.[29] Radioactive beef from outside the exclusion zone was found to have been sold in Japanese markets and possibly even sold abroad.[30] Japanese authorities stopped shipments of rice from farms some 60 kilometers north of Fukushima in November 2011 due to high levels of radioactive Cesium.[31] In December 2011, radioactive particles were found in infant formula produced in a plant north of Tokyo.[32]

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[26] Yasnuri, Teppei, et. al., "Cesium-137 desposition and contamination of Japanese Soils due to the Fukushima Nuclear Accident," available at http://www.pnas.org/content/early/2011/11/11/1112058108.

[27] Kahn, Amina, "Studies Detail post-Fukushima Radioactivity Levels," Nov. 19, 2011. http://articles.latimes.com/2011/nov/19/world/la-fg-fukushima-radiation-20111120

[28] Marder, Jenny. "Radiation in Japan's Food Supply: Dangerous or Benign?" PBS News, Mar. 22, 2011. http://www.pbs.org/newshour/rundown/2011/03/radiation-in-japans-food-supply-dangerous-or-benign.html

[29] "Japan plans to ban Fukushima beef," BBC News, Jul. 18, 2011. http://www.bbc.co.uk/news/business-14181046

[30] *Japan Won't Rule Out Possibility Radioactive Fukushima Beef Was Exported,* http://www.bloomberg.com/news/2011-07-20/japan-won-t-rule-out-possibility-radioactive-fukushima-beef-was-exported.html, July 20, 2011

[31] New Radiation Scare for Rice in Japan, http://articles.cnn.com/2011-11-17/asia/world_asia_japan-fukushima-rice_1_fukushima-daiichi-fukushima-prefecture-cesium?_s=PM:ASIA

[32] Tabuchi, Hiroko. Japanese Tests Find Radiation in Infant Food, Dec. 6, 2011. http://www.nytimes.com/2011/12/07/world/asia/cesium-found-in-japanese-baby-formula.html

On August 21, 2011, the *New York Times* published an article stating that a large zone immediately surrounding the plant will be labeled a dead zone and will be uninhabitable for decades.[33] On August 31, 2011 the Japanese government revealed that 34 locations in a 100-kilometer area surrounding Fukushima have higher levels of radiation than the threshold used for Chernobyl evacuations. The evacuation threshold for radioactive contamination of Cesium-137 from Chernobyl was 1.48 million becquerels per square meter.[34]

Significantly, an estimated 80% of the radioactive Cesium released by the Fukushima Daiichi disaster did not deposit over land, but rather was blown by prevailing easterly winds directly over the Pacific Ocean, according to a study by the Norwegian Institute for Air Research.[35] Had the wind been blowing in any different direction during the period of the greatest radiation releases, the consequences of the Fukushima Daiichi accident would have been much more dire—possibly including exposures causing acute effects—and likely would have affected even larger geographical areas prompting larger evacuations. Not all nuclear accidents will have the benefit of such favorable wind patterns.

During March 2011, the Japanese government actually drew up plans for a mandatory 170 kilometer (about 100 miles) evacuation zone around Fukushima Daiichi, and a voluntary 250 kilometer (150 miles) zone, in the event the accident worsened.[36]

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[33] Fackler, Martin. "Large Zone Near Japanese Reactors to be Off Limits," http://www.nytimes.com/2011/08/22/world/asia/22japan.html?_r=2, Aug. 21, 2011.

[34] "Japanese Government Finds Areas Around Fukushima More Dangerous than Chernobyl Standards," http://gizmodo.com/5835742/japanese-government-finds-34-spots-around-fukushima-more-uninhabitable-than-chernobyl?popular=true

[35] Paddock, Catherine,"Fukushima Radiation Fallout Bigger Than Officially Reported," Oct. 31, 2011. http://www.medicalnewstoday.com/articles/236811.php

[36] *Government envisioned Tokyo evacuation in worst-case scenario,* http://ajw.asahi.com/article/0311disaster/fukushima/AJ201201070039, The Asahi Shimbum, January 7, 2012

All of the above indicates that Japan was presented with a real-world nuclear accident that extended far beyond its own previous six-mile Emergency Planning Zone as well as the existing U.S. 10-mile Emergency Planning Zone, as well as an accident that held food, milk and water ramifications far beyond the existing U.S. 50-mile Ingestion Pathway Zone. Had a larger Emergency Planning Zone been in place and plans regularly exercised, it seems likely that some of the more serious consequences of the Fukushima accident might have been amelioriated. These consequences include the high likelihood of unnecessary cancers and latent fatalities caused both by avoidable radiation exposure and consumption of contaminated food products.

Estimates of these consequences vary widely and wildly—from zero to tens of thousands of people—and petitioners do not attempt to quantify them or endorse any particular study or projection. But petitioners do assert that many, perhaps most, of whatever consequences do occur would have been avoidable with adequate emergency planning and response.

Shortly after the Fukushima accident commenced, the NRC Commissioners appointed a high-level task force to study the regulatory implications of the accident. The Task Force examined the disaster at Fukushima and published a report in July 2011 which addressed the issues of protecting against accidents resulting from natural phenomena, mitigating the consequences of such accidents, and ensuring emergency preparedness.[37] In the area of emergency preparedness, the Task Force made several recommendations, including strengthening and integrating onsite emergency response capabilities such as emergency operating procedures, severe accident management guidelines, and extensive damage mitigation

[37] Recommendations for Enhancing Reactor Safety in the 21st Century, The Near Term Task Force Review of Insights From the Fukushima Daiichi Accident, pg. viii, available at http://pbadupws.nrc.gov/docs/ML1118/ML111861807.pdf

guidelines.[38] There was discussion of several recommendations that would strengthen on-site preparedness for emergencies involving a station blackout and/or multiple reactors.[39] However, the task force failed to make any recommendations on improving emergency response capabilities or expanding EPZ size, despite the Task Force's acknowledgement that it was necessary to evacuate Japanese residents up to and beyond a 20-kilometer (12-mile) area around Fukushima.[40]

2. Real-World experience and improved understanding of severe accident risks at nuclear reactors

The NRC's existing emergency planning regulations (and the NRC's decision in *Citizens Task Force of Chapel Hill)* are based primarily on experience gained by the Three Mile Island accident and on NRC reactor safety studies conducted from the 1950s through the 1970s (for example, WASH-1400 and NUREG-1150) and are encapsulated in NUREG-0396. More recently, in 2006, the NRC began the State-of-the-Art Reactor Consequence Analyses (SOARCA) project to re-evaluate the "realistic consequences of a severe reactor accident."[41] An October 2010 draft of SOARCA indicates that 1,000 cancer fatalities could be expected within a 50-mile radius under certain conditions from an accident at Peach Bottom. This study, however, is essentially a "best case" scenario of a nuclear power plant accident and failed to take into consideration differing weather patterns and worst case scenario situations. Additionally, the figures on cancer deaths were largely based on the assumption that everyone would evacuate within 20 miles of a nuclear reactor—an unsupportable assumption given the current 10 mile

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[38] Id. at 53
[39] Id. at 54
[40] Id. at 60
[41] The SOARCA Process, updated Mar. 31, 2011, http://www.nrc.gov/about-nrc/regulatory/research/soar/soarca-process.html.

Emergency Planning Zone. If not everyone could evacuate from the region in time, then cancer figures certainly would be increased. This indicates that the improved computer modeling and more sophisticated understanding of the progression of reactor accidents incorporated in SOARCA have not substantially changed outcomes—indeed, they may be more severe than previously believed depending on the scenario chosen. But real-world experience at Fukushima trumps the computer modeling of SOARCA in any case and has presented the world—and the NRC—with an actual accident that exceeds postulated scenarios.

In denying emergency planning petitions in *Citizens Task Force of Chapel Hill,* the NRC Commissioners relied on the studies that pre-date Fukushima and Chernobyl and also on an assertion that an accident scenario that could cause the most severe consequences would involve a fast-moving "small highly concentrated puff" of radiation. In the scenario described by the Commissioners (and in NUREG-0396) there would be no evacuation for 24 hours and people would shelter instead. The Commissioners stated this scenario brought about the largest number of casualties postulated under NUREG-0396, but that its probability was "near zero" and "the calculated consequences are greatly overestimated."

This position stated by the Commissioners is fundamentally flawed, as evidenced by the real-life accident at Fukushima. In fact, at Fukushima, the probability that most people within10 miles would not be evacuated within 24 hours turned out to be 100%, not "near zero." The probability that affected people outside 10 miles would not be evacuated was exactly 100%. And, at Fukushima, the "near-zero" probability of a "small highly concentrated puff" of radiation turned out to be days and weeks of massive sustained radiation releases.

Computer models, simulations, evaluations of projected scenarios—all can be useful tools in evaluating the relative risks of complex systems like nuclear reactors. They can even be useful—in the absence of real-world information—in establishing regulations. But they exist

primarily to generate postulated data in the absence of actual data—they are not a substitute for actual, real-world experience.[42]

In the case of Fukushima, Tokyo Electric Power has acknowledged that fuel melted at three reactors and that molten fuel ruptured the reactor pressure vessel and penetrated the concrete basemat at Unit 1 at least.[43] And the accident at Fukushima resulted in sustained very large radiation releases over a period of weeks, and continuing releases—which on their own would spark public demands for evacuation in the U.S.--over many months. Most of the damage to populated areas was caused by two relatively short-lasting wind shifts that occurred during the several-week period of the highest releases. The heavily-contaminated area to the northwest of the Fukushima Daiichi site, for example, such as the town of Iitate about 40 kilometers (25 miles) from the plant, was caused by a wind shift on the day of March 15, four days after the

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[42] Simulation results can vary widely. For example, three simulations conducted by non-governmental organizations came to conclusions that differ significantly from those that underpin NRC safety studies relied on for emergency planning purposes. A Physicians for Social Responsibility simulation at Braidwood predicted that 20,000 people could receive lethal doses of radiation and 200,000 people could suffer from radiation sickness. A Union of Concerned Scientists simulation at Indian Point concluded that 44,000 people could die as the result of a nuclear accident within a year, and 518,000 people could contract and die from cancer over time. After Fukushima, the Natural Resources Defense Council, in conjunction with Riverkeeper, took another look at the implications of a major accident at Indian Point. In addition to looking at the UCS figures, the NRDC used the U.S. Department of Defense computer model HPAC (Hazard Predication and Assessment Capability) to calculate resulting fallout from plumes. The study determined that releases from Indian Point would be similar to those at Fukushima, resulting in roughly a release of 8 percent of the core inventory. Three Indian Point source terms were calculated and it was determined that a gap release would be roughly 2/3 of Fukushima Daiichi, in-vessel severe core damage would be four to five times higher than Fukushima Daiichi, and vessel melt through would be nine times higher than Fukushima. The large disparity between these simulations and those conducted for NRC safety studies is a further indication that real-world experience, such as the Fukushima Daiichi accident, is more relevant and reliable for planning purposes than any simulations.

[43] "The Evaluation Status of Reactor Core Damage at Fukushima Daiichi Nuclear Power Plant Units 1 to 3," Nov. 30, 2011. http://www.tepco.co.jp/en/nu/fukushima-np/images/handouts_111130_04-e.pdf

onset of the accident, accompanied by rain and snow that forced the radiation to the ground.[44] Similarly, radioactive hotspots found well to the south of the Fukushima Daiichi site, 100 miles and more, were caused by a similar shift in the wind to the south from March 21-23.[45]

The Commissioners, in deciding *Citizens Task Force of Chapel Hill,* clearly did not contemplate a nuclear accident affecting multiple reactors and irradiated fuel pools at a single site. Nor did the Commissioners anticipate a nuclear disaster that resulted in extremely large sustained radioactive emissions over a period of several days, even weeks. In fairness, before March 2011, current petitioners did not anticipate such a scenario either. Yet that is exactly the reality that was presented by the Fukushima Daiichi accident in March 2011. These are facts, not hypothesis, not simulation. No reactor safety study, to the best of our knowledge, that ever has been published has attempted to analyze such a scenario. And it is clearly insufficient to rely upon computer models and simulations and safety studies when we have been presented with the actual fact of multiple meltdowns, fuel pool failures and sustained large radiation releases over long periods of time. NRC regulations must be grounded in reality, and certainly cannot ignore reality.

The Commissioners decision in *Citizens Task Force of Chapel Hill* may have been defensible at the time, but it is not defensible now. Nor is simple reliance on hypothetical reactor safety studies when real world disaster has exploded across the world's television screens.

The reality is that Japan evacuated an area already far larger than the NRC's 10 mile zone, and was forced belatedly, by extremely high radiation levels —and to its citizens' detriment—to expand that evacuation area more than twice as far as current NRC regulations

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[44] *The Radioactive Rains of March*, http://blogs.wsj.com/japanrealtime/2011/11/15/the-radioactive-rains-of-march/?mod=WSJBlog&utm_source=twitterfeed&utm_medium=twitter, Wall Street Journal, November 15, 2011

[45] Ibid.

require. Yet the area around Fukushima Daiichi, especially to the hard-hit area northwest of the site, is not heavily populated. Imagine the difficulties of using a 10 mile planning zone as the basis for a rapid expansion of the zone to 25 miles or more in a heavily urban area such as near Indian Point in New York, Limerick in Pennsylvania or many other existing reactor sites. Clearly, the NRC has not adequately imagined those difficulties to date. And, perhaps the NRC can imagine the public outcry in the United States if it evacuated those further away areas—especially in highly-populated areas—as slowly as did Japan (or earlier, Ukraine, Belarus and Russia).

Add to all that the fact that the wind blew the vast majority of the radiation released during the first week of the Fukushima Daiichi accident over the ocean and away from land—had the wind been blowing in a different direction, could Japan have evacuated a large enough area fast enough? Would the U.S. be able to do so in a similar scenario? The answer to both questions is almost certainly no. And yet, this is real world data—the NRC cannot rely upon favorable wind patterns as an emergency response measure.

3. Real-World experience and improved understanding of severe accident risks at nuclear fuel pools

Nuclear fuel pools pose a serious and dangerous threat to the populations surrounding nuclear plants. Accidents could cause widespread contamination of highly radioactive materials. When fuel rods in a nuclear reactor are "irradiated" or no longer usable, they are removed from the reactor core and replaced with new fuel rods.[46] However, these rods continue to generate heat for many years and are placed in pools of water to cool. In theory, this form of storage is

[46] "Safer Storage of Spent Nuclear Fuel, The Problems with Spent Fuel Pools," last revised Mar. 24, 2011. http://www.ucsusa.org/nuclear_power/nuclear_power_risk/safety/safer-storage-of-spent-fuel.html

meant to be temporary.[47] But, because offsite storage of irradiated fuel is currently unavailable, high density storage of this material has been permitted to occur. [48] These densely packed pools create a situation where cooling them could be incredibly difficult under accident conditions, as was the case at Fukushima Daiichi (where the pools were not as densely packed as is typically the case in the U.S.). In the case of a loss of water in the pool, convective air cooling would be relatively ineffective in such a "dense-packed" pool.[49] Irradiated fuel recently discharged from a reactor could heat up relatively rapidly to temperatures at which the zircaloy fuel cladding could catch fire and the fuel's volatile fission products, including 30-year half-life Cesium-137, would be released.[50] The fire could well spread to older irradiated fuel.[51] Radiation exposure would be significantly worse if there were to be an irradiated fuel pool accident in addition to a reactor accident. The irradiated fuel pools can hold 5 to 10 times more long lasting radioactive material than the reactor core.[52] The NRC has already stated that the effects of radiation could be felt as far away as 500 miles.[53] According to former Department of Energy official Robert Alvarez, nearly 40 percent of the radioactivity in U.S. irradiated fuel is cesium-137 (4.5 billion curies) —

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[47] Id.

[48] Alvarez, Robert. "Reducing the Hazards from Stored Spent Power Reactor Fuel in the United States," http://www.ips-dc.org/reports/reducing_the_hazards_from_stored_spent_power-reactor_fuel_in_the_united_states at pg. 2

[49] Id.

[50] Id.

[51] Id.

[52] Alvarez, Robert. "What about the Spent Fuel Pool," Bulletin of the Atomic Scientists, pg. 1, available at http://www.nirs.org/radwaste/atreactorstorage/alvarezarticle2002.pdf

[53] Mason, Margie and Joe McDonald, "Risks from Radiation Low in Japan but Panic High," Mar. 17, 2011, http://www.washingtonpost.com/wp-dyn/content/article/2011/03/17/AR2011031701214.html (The figure is derived from a study issued in 2000 by the NRC regarding a hypothetical event).

roughly 20 times more than released from all atmospheric nuclear weapons tests. U.S. irradiated pools hold about 15-30 times more cesium-137 than the Chernobyl accident released.[54]

The long-term land-contamination consequences of such an event could be significantly worse than those from Chernobyl. Aside from concerns associated with the dense packing of a pool, the pools themselves are located outside of the primary containment which is designed to keep radiation which is released during an emergency event from escaping in to the environment.[55] Because they are outside of the primary containment structure, they are more vulnerable than the core to natural disasters and terrorist attacks.

At Fukushima, the fuel pool at Unit 3 was essentially destroyed by the explosion that also devastated that unit's reactor building. Video of the fuel pool shows no evidence of intact fuel rods—the presumption is that these rods were thrown out and perhaps vaporized in the explosion.[56] It is likely that small pieces of the fuel rods that once were in this pool have contributed to the creation of intensely-radioactive hotspots onsite as well as across north-central Japan.

The NRC Commissioners in deciding *Citizens Task Force of Chapel Hill* did not consider the effects of irradiated pool failure. Rather, the Commissioners examined containment and core failure as the main sources of severe accident consequences. Failing to address this serious and growing issue may not have been as flawed in the early 1990's, but given what is known about

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[54] Alverez, Robert. "Spent Nuclear Fuel Pools in the U.S.: Reducing the Deadly Risks of Storage." http://www.ips-dc.org/reports/spent_nuclear_fuel_pools_in_the_us_reducing_the_deadly_risks_of_storage

[55] "Safer Storage," http://www.ucsusa.org/nuclear_power/nuclear_power_risk/safety/safer-storage-of-spent-fuel.html

[56] See, for example, this video uploaded to YouTube by NEI Magazine October 18, 2011, which appears to show few, if any, intact fuel rods in the Unit 3 fuel pool: http://www.youtube.com/watch?v=7qMi6azQCaE

the long term effects of irradiated fuel pools and how serious of a threat they are, continued failure to address these risks is now flawed.

4. Particular problems associated with pressure suppression containments

The failure of a pressure suppression containment can result in widespread radioactive contamination of areas surrounding nuclear plants. With the Three Mile Island accident, a hydrogen explosion caused sudden pressure to spike. While containment did not fail, if TMI had had a pressure suppression containment system, designed only to withstand overpressures of less than one atmosphere, then containment failure and large release of radioactive material would have been extremely likely.[57] With Chernobyl, which employed a weak containment using the pressure suppression concept, the containment did fail and the reactor's protective barriers were breached to such a degree that a significant part of the radioactive core was blown to the atmosphere. In Japan, hydrogen explosions occurred at (at least) three GE Mark I reactors using a pressure suppression system. NRC, and earlier, AEC safety officials have warned about the dangers of this containment concept for more than 40 years.

The argument that an accident on a scale of Chernobyl cannot happen here was flawed, and after Fukushima, is even more flawed. There are 23 GE Mark I nuclear reactors—about one-quarter of the nation's reactors--essentially identical to the reactors that were destroyed at Fukushima, that are operational in the United States.[58] This design has been subject to much scrutiny and criticism for its design flaws, specifically the fact that it is susceptible to explosion

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[57] Lyman, Edwin. "Thirty Years After TMI: Five Continuing Vulnerabilities." Mar. 23, 2009, http://www.thebulletin.org/web-edition/features/thirty-years-after-tmi-five-continuing-vulnerabilities

[58] Zeller, Tom. "Experts Had Long Criticized Potential Weakness in Design of Stricken Reactor," Mar. 15, 2011, http://www.nytimes.com/2011/03/16/world/asia/16contain.html

and containment failure.[59] The NRC can no longer dismiss the reality of devastating nuclear accidents based on supposedly superior U.S. reactor designs.

Not only can the NRC no longer dismiss such accidents in the U.S., the NRC must instead assume that such accidents can occur in the U.S. and even, given the history of the nuclear age that large nuclear accidents are occurring at a much greater frequency than previously postulated, the NRC—at least for emergency planning purposes if nothing else—must assume that such accidents will occur in the U.S.

5. Improved understanding of the health effects of radiation

There is no "safe" dose of radiation, and as such the consideration of the effects of release of radiation should be given greater consideration. The National Research Council of the National Academy of Sciences BIER VII Report in 2006 confirmed that any exposure to radiation – including background radiation – increases a person's risk of developing cancer.[60] This report obviously was published well after promulgation of the NRC's existing emergency planning regulations and its decision in *Citizens Task Force of Chapel Hill.* The greater understanding of the risks of radiation exposure revealed by BEIR VII must inform NRC regulations.

For example, Japan has been criticized internationally for increasing its allowable radiation exposure levels for the general public twenty-fold from pre-Fukushima standards to 20 MilliSieverts/year (2 rems/year), apparently to avoid much larger evacuations/relocations than already undertaken.

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[59] Atomic Energy Commission, Hanauer Report, available at: http://graphics8.nytimes.com/images/blogs/greeninc/hanauer.pdf

[60] Lessons From Fukushima and Chernobyl for U.S. Public Health, Physicians for Social Responsibility, Spring 2011. http://www.psr.org/assets/pdfs/fukushima-and-chernobyl.pdf

Even so, this 2 rems/year level is considerably lower than the Protective Action Guide (PAG) referred to by the NRC Commissioners in *Citizens Task Force of Chapel Hill* of an emergency response goal of preventing exposure to 5 rems/year. Given BEIR VII, this exposure level is hopelessly outdated and indefensible.

For example, BEIR VII clarifies that women and children are much more susceptible to radiation exposure than the "average man."[61] Indeed, according to BEIR VII, exposure to 2 rads in a single year (roughly equivalent to the new Japanese standard of 20 MilliSieverts or 2 rems in one year) will cause cancer in about 1 in 200 juvenile males, and the same exposure will cause 1 cancer in about 100 juvenile females.[62] Given the Linear No-Threshold model adopted by BEIR VII, the guideline of 5 rems would cause cancers at more than double those rates for children.[63]

It is difficult to imagine any NRC appointee or employee successfully defending a policy in the aftermath of a nuclear accident in the U.S. that would allow a cancer rate among schoolchildren in the neighborhood of 1 in 50 to 1 in 100.[64] And, indeed, that must not be the NRC's policy. Emergency response planning must, of course, first be oriented toward preventing

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[61] Biological Effects of Ionizing Radiation (BEIR) VII, Phase 2 report, "Health Risks from Exposure to Low Levels of Ionizing Radiation" Table 12D-3 on pg. 312, Published by the National Academy Press in 2006, Washington D.C.

[62] BEIR VII, Phase 2 Report, Table 12D1-12D2, pg. 311. BEIR VII, page 311, Tables 12D-1 (incidence) and 12D-2 provides conclusions on the exposure of various age groups to .1Gy of radiation, reported per 100,000 exposed. Because of the clear difference in gender response to radiation, NIRS finds it important to report the findings for both males and females. The most vulnerable require the greatest protection, so we report the numbers for the youngest, most vulnerable age group, adjusted for the 20 mSv comparison.

[63] Id. Note that subsequently issued PAGs have not offered any increased public protection.

[64] Of course, if people did not evacuate and remained in such a contaminated zone, they would be at proportionately higher risk. At 5 rads/year over a five year period, the risk would be on the order of an unimaginable 1 cancer in 20 young girls.

Rather than allowing unacceptably high radiation exposures, the NRC and licensees must recognize that their emergency response programs must be designed to protect not only against radiation levels that would cause acute effects, but also radiation levels that would exceed annual exposure limits—in real-life, the American public simply will not allow otherwise. Petitioners believe allowable annual exposures under NRC and EPA regulations already are too high, although we are not challenging those with this petition. But a government policy that implicitly states, as do NRC's existing emergency planning regulations, that radiation exposure levels higher than normally allowable—by orders of magnitude—are acceptable under emergency conditions, is a government policy that is unsupportable and without basis in reality.

6. Natural Disasters and Emergency Response Planning

Natural disasters have become increasingly prevalent in recent years causing concerns for nuclear reactors that are susceptible to various weather phenomena and disasters. Before March 2011, few would have believed that a 9.0 earthquake and 40+ foot tsunami would strike the coast of Japan. And before August 2011, few would have believed that an earthquake would strike central Virginia resulting in ground motion acceleration about twice the design basis of a U.S. nuclear power plant. Yet both of these happened within six months of each other.

From the horror of Hurricane Katrina in 2005 and the resultant devastation of a major American city (not to mention a complete failure of emergency evacuation and response plans) to Hurricane Irene in 2011 and the accompanying unprecedented flooding in the northern state of Vermont, natural phenomena are playing a much greater role in our lives than ever before. . Indeed, many have termed 2011 as the most damaging weather year ever for the United States.[65]

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[65] *Billion dollar Weather Disasters of 2011 Break Record*, http://www.accuweather.com/en/weather-news/billion-dollar-weather-diaster-1/58914, December 13, 2011, accuweather.com

Many, including petitioners, believe much—perhaps most—of this is due to the reality of climate change. If this is correct, "unprecedented" natural disasters will not only continue to occur, they will accelerate.

At Fukushima, the earthquake and tsunami initiated a nuclear accident. Hurricanes Katrina or Irene (or many others) would have greatly compromised evacuation had a nuclear emergency occurred concurrently. So could a tornado (during 2011, tornados caused loss of offsite power—the root cause of the Fukushima accident-- at the Browns Ferry and Surry nuclear reactors sites), wildfire (for example, a major wildfire threatened nuclear storage sites at Los Alamos National Laboratories during 2011), floods (a major flood on the Missouri River during 2011 threatened the Fort Calhoun and Cooper reactors in Nebraska and put evacuation routes under water) and other natural disasters.

Current NRC emergency planning regulations do not reflect that natural disasters can both cause nuclear accidents and/or may occur concurrently with nuclear accidents. In either event, natural disasters can greatly complicate the ability to evacuate a given area, or even to provide sufficient communication to assure sheltering or other protective actions within a given area.

Emergency response planning for nuclear facilities must incorporate regionally-relevant initiating and concurrent natural disasters as a regular part of emergency exercises, to assure the most effective possible emergency response in the event of a nuclear accident triggered by or complicated by a natural disaster. For this reason, we propose that every other emergency exercise include a scenario that includes a regionally-relevant initiating or concurrent natural disaster. By "regionally relevant" we mean that plans should be made and exercises undertaken for the type of natural disaster most likely to affect a given licensee site (for example,

earthquakes on the west coast, hurricanes in the southeast, etc.). However, for areas that may be affected by more than one type of natural disaster—for example, Midwest reactors could be affected by tornadoes and earthquakes along the New Madrid Fault; reactors over much of the country could be affected by hurricanes, tornadoes, ice storms, floods and earthquakes, all of which could cause extended loss of offsite power and meltdown—each exercise should include a different regionally relevant scenario.

V. PROPOSED UPGRADES TO EMERGENCY PLANNING STANDARDS.

A. Creation of a three-tiered Emergency Planning Zone.

The NRC should amend 10 C.F.R. 50.47(c)(2) to create a three-tiered emergency planning zone, including an expansion of the current 10 mile EPZ to include area within a 25 mile radius of a reactor site, establishing an emergency evacuation zone of a 50 mile radius within a reactor site, and expand the radius of the ingestion pathway to a 100 mile radius within a reactor site.

1. 25 Mile Plume Exposure Pathway EPZ

> A Plume Exposure Pathway zone shall consist of an area about 25 miles (40 km) in radius. Within this zone, detailed plans must be developed to provide prompt and effective evacuation and other appropriate protective measures, including conducting of biannual full-scale emergency evacuation drills. Sirens will be installed within this zone to alert the population of the need for evacuation. Transportation for elderly, prison and school populations shall be provided within this zone. Emergency shelters shall be located outside of the 25-mile zone.

This zone would be an expansion of the Plume Exposure Pathway EPZ which currently has a 10 mile radius limitation. It would provide no new requirements other than expansion of

the EPZ. The real-world accidents at Chernobyl and Fukushima demonstrate that the radiological effects from nuclear power plant disasters have far reaching effects—well beyond ten miles. The NRC's establishment of the 10 mile EPZ in 1980 may have been seen as appropriate and protective at the time; actual events have now supplanted it—it is manifestly inadequate to address the consequences of accidents that have, in fact, occurred.

Nor does a 10 mile EPZ, and the accompanying required emergency exercises within this zone, any longer provide a sufficient basis for an ad hoc evacuation beyond the zone. Delays in evacuation that occurred because of a lack of preparation in Ukraine and Belarus and Japan have had life-threatening consequences.

2. 50 Mile Emergency Response Zone

> The plume exposure pathway EPZ shall be about 50 miles in radius. Within this 50 mile zone, the licensee must identify evacuation routes for all residents within this zone and annually provide information to all residents within this zone about these routes and which they are supposed to take in the event of an emergency. The licensee must make basic pre-arrangements for potential transport of disabled/hospital/prison populations. Emergency centers for the public currently located less than 25 miles out shall be relocated to 25 miles or further out. Information shall be made available to the public within this zone through television, internet and radio alerts, text message notices, and other appropriate means of public communication.

This would require measures be carried out between the new 25 mile Plume Exposure Pathway EPZ and a new Emergency Response Zone of about a 50 mile radius. Within this zone, the emergency evacuation requirements and biannual exercises of the Plume Exposure Pathway EPZ are not required. Rather, this new zone would provide a modest level of pre-planning that would enable rapid expansion of the 25 mile zone when necessary. Information regarding evacuation such as identification of evacuation routes and locations of emergency shelters in the

event of a large scale disaster would be identified and would be provided to members of the public annually, and a limited number of other pre-arrangements would be made. Given the large scale of the evacuations at both Chernobyl and Fukushima, evacuation and/or other protective actions for populations beyond 25 miles of a nuclear accident site would be highly likely in the event of a serious nuclear accident.

3. 100 mile Ingestion Exposure Pathway Zone:

> The ingestion pathway EPZ shall be about 100 miles in radius. In the event of a radioactive release, the deposition of radionuclides on crops, other vegetation, bodies of surface water and ground surfaces can occur. Measures will be implemented to protect the public from eating and drinking food and water that may be contaminated. Information shall be made available to the public within this zone through television and radio alerts, text message notices, and other appropriate means of public communication.

The current Ingestion Exposure Pathway Zone exists to protect food, water and anything intended for human consumption within 50 miles of a nuclear power plant. However, the effects of radiation at Fukushima and Chernobyl have extended far beyond that 50 mile radius, as stated above. Given that radiation can, and does, have far-reaching effects on food on a large radius, the Ingestion Pathway EPZ should be expanded.

Other Related Amendments to Enhance Emergency Planning:

> Amend 10 C.F.R. 50.47(b)(14) by adding: Within the emergency evacuation zone full scale drills and exercises will be conducted on a biannual basis. Every other exercise

and drill shall include a scenario involving an initiating or concurrent regionally-appropriate natural disaster.

VI. CONCLUSION:

The Petitioners believe that amending 10 C.F.R. 50.47 to expand the Plume Exposure Pathway to about a 25 mile radius of a reactor site, create a new Emergency Response Zone of about 50 miles, and expanding the ingestion pathway zone to about 100 miles would more likely provide adequate protection to the public than current regulations, which do not provide adequate protection. Events that the NRC believed 30 years ago were nearly impossible to occur have in fact occurred and, in the case of Fukushima, continue to occur. Waiting to see how bad an emergency gets before expanding evacuation beyond a planned radius is not a plan of action, it is a recipe for disaster and an abdication of responsibility. Action to expand Emergency Planning Zones and improve emergency response capability must be taken now in light of real-world evidence and the demonstrated history of the widespread damage nuclear accidents cause.

Respectfully submitted
This 15th day of February 2012,

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Rulemaking Comments

From: Dominique French [dominiquef@nirs.org]
Sent: Wednesday, February 15, 2012 1:01 PM
To: Rulemaking Comments
Cc: NIRS
Subject: Petition for Rulemaking by NIRS to Expand Emergency Planning Zones
Attachments: petition for rulemaking NIRS 2-15-2012.pdf

February 15, 2012

Attn: Annette L. Vetti-Cook

Secretary

Dear Ms. Cook,

Attached please find a Petition for Rulemaking to the NRC filed by Nuclear Information and Resource Service as well as 37 Co-Petitioners, pursuant to 10 CFR 2.802. A hard copy of the petition is also being mailed to the NRC.

Thank you,

Dominique French

Michael Mariotte
6930 Carroll Avenue
Suite 340
Takoma Park, MD 20912

Dear Mr. Mariotte:

I am responding to your letter to me dated February 15, 2012, by which you submitted to the Commission a petition for rulemaking (PRM). Specifically, you requested that the Commission amend its regulations in Part 50 of Title 10 of the *Code of Federal Regulations* to expand existing emergency planning zones, create a new emergency planning zone, and require the incorporation of concurrent natural disasters in the required periodic emergency plan drills. The petition was docketed as PRM-50-104, and the Commission published a notice of receipt and request for public comments in the *Federal Register* on April 30, 2012 (77 FR 25375), and on www.regulations.gov under Docket ID NRC-2012-0046. The comment period closed on July 16, 2012. The Commission received 5,993 comment submissions in response to the request for comments. The NRC has prepared a comment response document to demonstrate how all comments were considered and to respond to the issues identified in the comments. The NRC's comment response document is available in the U.S. Nuclear Regulatory Commission's Agencywide Documents Access and Management System under Accession No. ML13109A523.

The Commission has considered the petition, and the arguments raised therein, as well as the comments received in response to the petition. For the reasons stated in the enclosed *Federal Register* notice, your petition for rulemaking is denied.

In summary, the Commission has concluded that the current size of the emergency planning zones is appropriate for existing reactors and that emergency plans will provide an adequate level of protection of the public health and safety in the event of an accident at a nuclear power plant. The current emergency planning zones provide for a comprehensive emergency planning framework that would allow expansion of the response efforts beyond the designated distances should events warrant such an expansion.

This petition is considered closed.

Any questions you may have regarding this matter should be directed to Daniel Doyle by calling 301-415-3748 or by e-mail to Daniel.Doyle@nrc.gov.

Sincerely,

Annette L. Vietti-Cook
Secretary of the Commission

Enclosure:
Federal Register Notice