PRM-50-104
(77FR25375)

Anthony R. Pietrangelo
SENIOR VICE PRESIDENT AND
CHIEF NUCLEAR OFFICER

July 16, 2012

Ms. Annette L. Vietti-Cook
Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

ATTN: Rulemakings and Adjudications Staff

Subject: Industry Comments on the Petition for Rulemaking regarding Emergency Planning Zones (PRM-50-104; 77 Fed. Reg. 25,375 [April 30, 2012]; Docket ID NRC-2012-0046)

Project Number: 689

Dear Ms. Bladey,

The Nuclear Energy Institute (NEI)[1] is pleased to provide the enclosed comments on the Petition for Rulemaking (PRM-50-104 or Petition) noticed in the Federal Register on April 30, 2012.[2] The Petition, submitted by Mr. Michael Mariotte on behalf of the Nuclear Information Resource Service and 37 co-petitioners, requests several modifications to the Commission's requirements governing the Emergency Planning Zones (EPZs) for nuclear power plants.

NEI's detailed comments on PRM-50-104 are included in the attachment to this letter. As explained in the attachment, NEI recommends that the NRC deny the Petition because the Petitioner has not provided an adequate justification for modifying the Commission's regulations. More specifically, the Petition should be denied because: (1) the NRC's existing EPZs are based on a conservative analysis of a wide range of severe accident consequences and continue to provide assurance that adequate protective measures can and will be taken in the event of an emergency; (2) the NRC's existing EPZs are large enough to facilitate protective actions over larger areas, if necessary; and (3) the

[1] NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all utilities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

[2] 77 Fed. Reg. 25,375 (April 30, 2012).

1776 I Street, NW | Suite 400 | Washington, DC | 20006-3708 | P: 202.739.8081 | F: 202.533.0182 | arp@nei.org | www.nei.org

Template = SECY-067

DS10

Petition provides no significant or new information that undermines the current planning basis or warrants a change to the size of the existing EPZs.

If you have any questions concerning these comments please feel free to contact Jerry Bonanno (202-739-8147; jxb@nei.org), Susan Perkins-Grew (202-739-8016; spg@nei.org) or me.

Sincerely,

Anthony R. Pietrangelo

Attachment

Rulemaking Comments

From: PIETRANGELO, Tony [arp@nei.org]
Sent: Monday, July 16, 2012 1:56 PM
Subject: Industry Comments on the Petition for Rulemaking regarding Emergency Planning Zones (PRM-50-104; 77 Fed. Reg. 25,375 [April 30, 2012]; Docket ID NRC-2012-0046)
Attachments: 07-16-12_NRC_Industry Comments on the Petition for Rulemaking regarding Emergency Planning Zones.pdf; 07-16-12_NRC_Industry Comments on the Petition for Rulemaking regarding Emergency Planning Zones_Attachment.pdf

July 16, 2012

Ms. Annette L. Vietti-Cook
Secretary
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

ATTN: Rulemakings and Adjudications Staff

Subject: Industry Comments on the Petition for Rulemaking regarding Emergency Planning Zones (PRM-50-104; 77 *Fed. Reg.* 25,375 [April 30, 2012]; Docket ID NRC-2012-0046)

Project Number: 689

Dear Ms. Bladey,

The Nuclear Energy Institute (NEI) is pleased to provide the enclosed comments on the Petition for Rulemaking (PRM-50-104 or Petition) noticed in the *Federal Register* on April 30, 2012. The Petition, submitted by Mr. Michael Mariotte on behalf of the Nuclear Information Resource Service and 37 co-petitioners, requests several modifications to the Commission's requirements governing the Emergency Planning Zones (EPZs) for nuclear power plants.

NEI's detailed comments on PRM-50-104 are included in the attachment to this letter. As explained in the attachment, NEI recommends that the NRC deny the Petition because the Petitioner has not provided an adequate justification for modifying the Commission's regulations. More specifically, the Petition should be denied because: (1) the NRC's existing EPZs are based on a conservative analysis of a wide range of severe accident consequences and continue to provide assurance that adequate protective measures can and will be taken in the event of an emergency; (2) the NRC's existing EPZs are large enough to facilitate protective actions over larger areas, if necessary; and (3) the Petition provides no significant or new information that undermines the current planning basis or warrants a change to the size of the existing EPZs.

If you have any questions concerning these comments please feel free to contact Jerry Bonanno (202-739-8147; jxb@nei.org), Susan Perkins-Grew (202-739-8016; spg@nei.org) or me.

Sincerely,

Anthony R. Pietrangelo
Senior Vice President and Chief Nuclear Officer

Nuclear Energy Institute
1776 I Street NW, Suite 400
Washington, DC 20006
www.nei.org

P: 202-739-8081
F: 202-533-0182
M: 202-439-2511
E: arp@nei.org

nuclear. clean air energy.

nuclear
Putting Clean Air Energy to Work.

FOLLOW US ON

Attachment

NEI Comments on PRM-50-104

I. Introduction.

On February 17, 2012, the NRC docketed a Petition for Rulemaking filed by Mr. Michael Mariotte on behalf of the Nuclear Information and Resource Service and 37 co-petitioners.[1] The Petition proposes the following changes to the NRC's Emergency Preparedness requirements:

- Expand the radius of the Plume Exposure Pathway Emergency Planning Zone (EPZ) from 10-miles to a 25-mile radius;
- Establish a new 50-mile radius EPZ, with more limited requirements than the 25-mile EPZ;
- Expand the radius of the Ingestion Pathway EPZ from 50-miles to 100-miles;
- Ensure that emergency plans are tested to encompass initiating and/or concurrent natural disasters that may affect both accident progression and evacuation conduct.[2]

The Petition makes multiple assertions to support these changes, however the Petition's primary claim is that these modifications are necessary because experience since the Three Mile Island accident – namely, the accident at Fukushima – shows that the EPZs must be expanded in order to protect public health and safety. NEI's detailed comments are provided below. In sum, NEI recommends that the NRC deny the Petition because:

- The current EPZs remain conservative and protective – even in light of the severe nuclear accident at Fukushima. In fact, the highly conservative nature of the analysis supporting the current EPZs was reconfirmed in a recent report published by an American Society of Mechanical Engineers Presidential Task Force, which was chaired by former NRC Chairman Nils J. Diaz. The ASME Task Force was formed specifically to examine the implications of the nuclear accident at Fukushima.[3]
- The U.S. nuclear power fleet substantially improved its ability to respond to severe accidents after the terrorist attacks on September 11, 2001, and comparable improvements were not adopted in Japan. In this regard, a recent report issued by Japan's Fukushima Nuclear Accident Independent Investigation Commission, states: "If NISA had passed on to TEPCO measures that were included in the B.5.b subsection of the U.S. security order that followed the 9/11 terrorist action, and if TEPCO had put the

[1] 77 Fed. Reg. 25,375 (Apr. 30, 2012).

[2] Petition for Rulemaking to Improve Emergency Planning Regulations, PRM-50-104, at 1 [hereinafter "Petition" or "PRM"].

[3] *See* AMERICAN SOCIETY OF MECHANICAL ENGINEERS, FORGING A NEW NUCLEAR SAFETY CONSTRUCT (2012) *available at* http://files.asme.org/asmeorg/Publications/32419.pdf. [hereinafter "ASME Report"].

measures in place, the [Fukushima] accident may have been preventable."[4] In addition, the U.S. nuclear power fleet is in the process of implementing additional protective measures in response to the accident at Fukushima, which will further enhance our ability to prevent and mitigate the consequences of severe accidents at U.S. nuclear plants.

- In order to support the recommended changes, the Petition mischaracterizes the assumptions relied upon by the NRC in developing its EPZs, the agency's recent State-of-the-Art Reactor Consequence Analyses (SOARCA), and the damage to the spent fuel pools at Fukushima (particularly the Unit 3 spent fuel pool); as well as offering an incomplete description of the performance of U.S. nuclear plants, in light of recent natural events (*i.e.*, earthquakes and severe weather) in this country.

For these reasons, and those discussed below, NEI recommends that the NRC deny the Petition.

II. NRC's Emergency Planning Zones are based upon Conservative Analyses 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.

Before addressing the specific claims and recommendations included in the Petition, it is important to review what EPZs are and how they were developed. First, it is important to understand that EPZs and the associated protective actions (*e.g.*, evacuation and sheltering) are flexible and practical tools designed to reduce harm to the public in the event of serious, but highly unlikely accidents at nuclear power plants. The EPZs were not, however, based upon the presumption that no radioactive material would be deposited outside of the 10 and 50 mile zones in the event of a severe accident. To the contrary, EPZs were determined to be of sufficient size to provide dose savings to the population in areas where the projected dose from design basis accidents *could exceed* Protective Action Guidelines (expressed as radiation dose) under unfavorable atmospheric conditions. Further, the 10 and 50 mile EPZs called into question by the Petition were developed and determined to be effective, even upon consideration of a wide spectrum of reactor accidents and accident consequences – including very severe accidents resulting in core melting and catastrophic containment failure. Finally, the ability to respond to emergencies outside of the defined EPZs has been a consideration since incorporation of the EPZ concept into the NRC's emergency preparedness program. And the NRC has consistently found that – given the large degree of coordination between federal, state, and local emergency response organizations prompted by the 10 and 50 mile EPZs – the current zones are large enough to facilitate wider-reaching protective actions, should the need for such actions arise. Thus, the NRC's EPZs continue to provide assurance that adequate protective measures can and

[4] THE OFFICIAL REPORT OF THE FUKUSHIMA NUCLEAR ACCIDENT INDEPENDENT INVESTIGATION COMMISSION (Executive Summary) (2012), 16, available at http://naiic.go.jp/wp-content/uploads/2012/07/NAIIC_report_lo_res.pdf. [hereinafter "Diet Report"].

will be taken in the event of a serious, but highly unlikely accident at a nuclear power plant in the United States.

A. Emergency Planning Zones are Flexible and Pragmatic Tools Designed to Reduce Public Harm in the Event of a Serious but Highly Unlikely Accidents at Nuclear Power Plants.

The concept of an EPZ was added to the NRC's regulatory framework in a final rule issued in August of 1980.[5] Provisions defining the EPZ – which is the geographic area within which predetermined protective action planning is required – were added, at least in part, in response to recommendations flowing from the accident at Three Mile Island. In the 1980 rulemaking, which added § 50.47 to Title 10 of the Code of Federal Regulations, the Commission explained that the basis for adopting the EPZ concept was its "decision to have a conservative emergency planning policy in addition to the conservatism inherent in the defense-in-depth philosophy."[6] This conservative emergency planning policy was first articulated by the Commission in a 1979 Policy Statement, "Planning Basis for Emergency Response to Nuclear Power Reactor Accidents" (Policy Statement).[7] In the Policy Statement, the Commission explained that the technical basis for the plume and ingestion pathway EPZs was provided in a joint NRC/EPA report entitled "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants" (NUREG-0396).[8]

In the introduction to NUREG-0396, the NRC/EPA Joint Task Force (Joint Task Force) articulated a fundamental principle that continues to inform emergency preparedness and planning at nuclear facilities:

> The Task Force accepts the principle noted in existing NRC and EPA guidance that acceptable values for emergency doses to the public under actual conditions of a nuclear accident cannot be predetermined. The emergency actions taken in any individual case

[5] Emergency Planning: Final Rule, 45 Fed. Reg. 55,402 (Aug. 19, 1980) (to be codified at 10 C.F.R. § 50.47).

[6] *Id.* at 55,406.

[7] Planning Basis for Emergency Response to Nuclear Power Reactor Accidents, 44 Fed. Reg. 61,123 (Oct. 23, 1979).

[8] NUCLEAR REGULATORY COMMISSION & ENVIRONMENTAL PROTECTION AGENCY, 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 (Dec. 1978) [hereinafter "NUREG-0396"]. In the Policy Statement, the Commission concurred with and endorsed the guidance in NUREG-0396.

> must be based on the actual conditions that exist and are projected at the time of the accident.[9]

This fundamental principle, which is often lost in discussions of emergency preparedness, expresses the idea that while equally important, the NRC's emergency planning requirements:

> [D]iffer in character from most of [the agency's] siting and engineering design requirements which are directed at achieving or maintaining a minimum level of public safety protection. Our emergency planning requirements do not require that an adequate plan achieve a present minimum radiation dose saving or a minimum evacuation time for the plume exposure pathway emergency planning zone in the event of a serious accident.[10]

Thus, in order to be properly understood, emergency preparedness activities at nuclear facilities must be viewed in the context of – rather than in the imaginary absence of – the extensive preventative and mitigative measures that are required of NRC licensees in the siting, design, and operation of nuclear power facilities. Indeed, even when limiting the discussion to emergency preparedness, it is important to view implementation of EPZ protective measures in conjunction with the substantial aspects of emergency preparedness programs that are aimed at preventing initiating events from progressing to the severe accident stage. As the NRC staff has explained:

> An effective emergency preparedness (EP) program decreases the likelihood of an initiating event at a nuclear power reactor proceeding to a severe accident. Emergency preparedness cannot affect the probability of the initiating event, but a high level of EP increases the probability of accident mitigation if the initiating event proceeds beyond the need for initial operator actions. As a defense-in-depth measure, emergency response is not normally quantified in probabilistic risk assessments. However, the level of EP could affect the outcome of an accident in that the accident may be mitigated by the actions of the ERO or, in the worst case, consequences to the public could be reduced through the effective use of protective actions.[11]

As these passages reveal, emergency planning and preparedness activities at nuclear power facilities – particularly the establishment of EPZs – are properly discerned as important, but

---

[9] NUREG-0396, at 2–3 (internal citations omitted).

[10] Long Island Lighting Company (Shoreham Nuclear Power Station, Unit 1), 24 NRC 22, 30 (1986) (citations omitted).

[11] Enhancements to Emergency Preparedness Regulations, 76 Fed. Reg. 72560, 72562 (Nov. 23, 2011) (emphasis added).

necessarily flexible and pragmatic measures designed to "reduce any public harm in the event of a serious but highly unlikely accident."[12]

This pragmatic approach to the establishment of EPZs is evident in NUREG-0396, which states:

> [T]he range of possible selections for a planning basis is very large, starting with a zero point of requiring no planning at all because significant offsite radiological accident consequences are unlikely to occur, to planning for the worst physically possible accident regardless of its extremely low likelihood. As an alternative to attempting to define a specific accident sequence, the Task Force decided to identify the bounds of the parameters for which planning is recommended based upon a knowledge of the potential consequences, timing, and release characteristics of a spectrum of accidents.
>
> . . . . .
>
> 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 [Protective Action Guides (PAG)]. [13]

Protective Action Guides (PAG) were introduced to radiological emergency response planning to assist governmental authorities in deciding what level of radiation hazard constitutes a basis for initiating emergency protective actions. These PAGs, which are expressed in units of radiation dose (rem), act as initial levels that trigger implementation of pre-determined protective actions for the public if the projected (*i.e.*, future) dose received by an individual in absence of the protective action could exceed the PAG.[14] For example, the PAG triggering the protective actions of evacuation or sheltering is a projected whole body dose of 1-5 rem.[15] While PAGs are very useful tools for officials charged with protecting the public in the event of a nuclear emergency, it is important to understand that a PAG is not a dose limit. As the Joint Task Force explained:

> The nature of PAGs is such that they cannot be used to assure that a given level of exposure to individuals in the population is prevented. In any particular response situation, a range of doses may be experienced, principally depending on the distance

---

[12] Citizens Task Force of Chapel Hill, 32 NRC 281, 291 (1990).

[13] NUREG-0396, at 5. NUREG-0396 goes on to state: "Radiological emergency planning is not based upon probabilities, but on public perceptions of the problem and what could be done to protect health and safety. In essence, it is a matter of prudence rather than necessity." NUREG-0396, at I-2.

[14] *See id.* at 3-4.

[15] *See* ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF RADIATION PROGRAMS, MANUAL OF PROTECTIVE ACTION GUIDES AND PROTECTIVE ACTIONS FOR NUCLEAR INCIDENTS 2-6 (1992).

> from the point of release. Some of these doses may be well in excess of the PAG levels and clearly warrant the initiation of any feasible protective actions. 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. Methods for the implementation of Protective Action Guides are an essential element of emergency planning. These include the predetermination of emergency conditions for which planned protective actions such as shelter and/or evacuation would be implemented offsite.[16]

So, while establishment of EPZs and implementation of the associated protective actions are meant to minimize exposure of the public to radiation, they are not "guarantees" that any specific dose savings will be realized. In essence, the PAGs are to be utilized as triggers to prompt implementation of protective actions – but are not, in and of themselves, radiation dose limits.

B. The 10 and 50 Mile Emergency Planning Zones are Based on Consideration of a Full Spectrum of Postulated Accidents and Accident Consequences.

Ultimately, the Joint Task Force recommended that two EPZs be established around light water nuclear power plants: (1) an EPZ for airborne exposure (*i.e.*, plume exposure pathway EPZ) having a radius of about 10 miles, and (2) an EPZ for contaminated food (*i.e.*, ingestion pathway EPZ) having a radius of about 50 miles. In determining how to define the size of the EPZs, the Joint Task Force considered several possible rationales. These rationales included risk, probability, cost effectiveness, and accident consequence spectrum. "After reviewing these alternatives, the Task Force chose to base the rationale on a full spectrum of accidents and corresponding consequences tempered by probability considerations."[17]

More specifically, the Joint Task Force derived the size of the EPZs by considering the consequences of both design basis accidents and a spectrum of severe ("Class 9") accidents. This spectrum of Class 9 accidents included core melt accidents in which containment catastrophically fails, resulting in the release of large quantities of radioactive materials directly to the atmosphere because of over-pressurization or a steam explosion. These types of accidents – which could involve the release of hundreds of millions of curies – have the potential to result in life-threatening doses. [18] To provide a frame of reference, according to the IAEA, the Chernobyl accident resulted in the release of approximately 378,400,000 curies of

---

[16] *See* NUREG-0396, at 4.

[17] *Id.* at 15 (emphasis added).

[18] *See id.* at I-3 – I-6.

radioactivity.[19] And the Nuclear Safety Commission of Japan has estimated that the accident at Fukushima resulted in approximately 17,127,000 curies of iodine-131 equivalent radioactive material being released into the air and sea between March 11 and April 5, 2011.[20] The Joint Task Force included Class 9 accidents in arriving at the planning basis, despite concluding that they "are at least 100 times less likely to occur than . . . other disasters requiring emergency response."[21]

After considering a spectrum of accident consequences, the Joint Task Force concluded:

> The EPZ recommended is of sufficient size to provide dose savings to the population in areas where the projected dose from design basis accidents could be expected to exceed the applicable PAGs under unfavorable atmospheric conditions . . . . [C]onsequences of less severe Class 9 accidents would not exceed the PAG levels outside the recommended EPZ distance. In addition, the EPZ is of sufficient size to provide for substantial reduction in early severe health effects (injuries and deaths) in the event of the more severe Class 9 accidents.[22]

So, the Joint Task Force considered the consequences of a broad spectrum of accidents – including the most severe Class 9 accidents – and concluded that 10 and 50 mile EPZs were appropriate for generic application to nuclear power reactors.

C. The 10 and 50 Mile Emergency Planning Zones are Large Enough to Facilitate Protective Actions Over Larger Areas if Necessary.

Although the 10 and 50 mile EPZs were thought to be appropriate in most cases, the Commission acknowledged that the exact size and shape of each EPZ will be decided by emergency planning officials after they consider the specific conditions at each site. Further, the Commission considered the 10 and 50 mile radii large enough to provide a response base, which would support activity outside the planning zone should the need ever arise.[23] In 1990, the Commission reaffirmed and expanded upon the idea that the EPZs are large enough to facilitate

---

[19] *See* INSTITUTE OF NUCLEAR POWER OPERATIONS, SPECIAL REPORT ON THE NUCLEAR ACCIDENT AT THE FUKUSHIMA DAIICHI NUCLEAR POWER STATION, at 4 (Nov. 2011) [hereinafter "INPO Special Report"] (citing THE CHERNOBYL FORUM: 2003–2005, INT'L ATOMIC ENERGY AGENCY, CHERNOBYL'S LEGACY: HEALTH, ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS 22 (2d Rev 2006)).

[20] *See* INPO Special Report, at 4.

[21] NUREG-0396.. at I-11.

[22] *Id.* at 16–17.

[23] *See* 44 Fed. Reg. 61,123, 61,123; *See also*, 45 Fed. Reg. 55402, 55406.

response activity outside of the planning zones. Specifically, in denying a petition for rulemaking requesting expansion of the EPZs, the Commission stated:

> Additionally, the Commission firmly believes that emergency actions could be successfully carried out beyond the 10–mile EPZ for the following reasons: First, the 10–mile planning basis established an infrastructure consisting of emergency organizations, communication 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. Second, the radio and TV emergency broadcasting systems that NRC requires for prompt notification of the public within the 10–mile EPZ does reach beyond 10 miles. Third, if emergency actions were necessary beyond 10 miles, the time available to take those actions would be significantly greater than the time available for the taking of protective actions for persons close to the reactor (within 2 miles). This significant additional time (many hours to days) would permit the use of resources from other states, other utilities, the federal government, and even the international community.[24]

The Commission's reasons for concluding that the 10 and 50 mile EPZs are adequate to facilitate wider-ranging response activities in the event of a severe accident are no less relevant or applicable today than they were in 1990. Indeed, the idea that the 10 and 50 mile radii are large enough to adequately support activity outside the EPZs was recently acknowledged and reaffirmed by the NRC's Near-Term Task Force (NTTF) charged with reviewing the Fukushima nuclear accident:

> During the emergency at Fukushima, conditions deteriorated such that Japanese officials required additional protective actions up to and beyond the 20-kilometer (16-mile) area around Fukushima (*i.e.*, beyond the equivalent of the U.S. plume exposure pathway EPZ). The possibility of making protective action recommendations for areas beyond the plume exposures pathway EPZ has been a program consideration since the inception of the EPZ concept in the United States. The emergency planning basis for U.S. plants, as discussed in NUREG-0654, states, ". . . detailed planning within 10 miles would provide a substantial base for expansion of response efforts in the event that this proved necessary."[25]

While recognizing that any relevant insights from the implementation of emergency planning measures at Fukushima should inform improvements to the decisionmaking framework in the

---

[24] Citizens Task Force of Chapel Hill, 32 NRC 281, 294 (1990) (emphasis added).

[25] NUCLEAR REGULATORY COMMISSION, NEAR TERM TASK FORCE, RECOMMENDATIONS FOR ENHANCING REACTOR SAFETY IN THE 21ST CENTURY: THE NEAR-TERM TASK FORCE REVIEW OF INSIGHTS FROM THE FUKUSHIMA DAI-ICHI ACCIDENT, July 12, 2011, at pg. 60 (emphasis added) [hereinafter "NTTF Report"].

United States, the NTTF "acknowledg[ed] that every situation will differ, so detailed planning in this area is not plausible."[26]

When discussing the need for protective action over larger areas, it is also useful to consider that offsite emergency response activities for nuclear power plants in the United States involve a high degree of coordination between nuclear power plant operators, the NRC, the Federal Emergency Management Agency (FEMA), other federal agencies, and state and local emergency response organizations. Although there is little question regarding NRC's statutory authority to regulate offsite preparedness measures required of its commercial nuclear power licensees, this statutory authority should not be misread to imply that the NRC acts unilaterally in this area. To the contrary, the NRC's decisions on the adequacy of offsite plans are based on the review and findings of the Federal Emergency Management Administration (FEMA).[27] This collaboration between the NRC and FEMA has its genesis in a 1979 Executive Order (E.O. 12148) that established FEMA's general mandate "to coordinate the emergency planning functions of executive agencies,"[28] and a Presidential directive issued later that same year that assigned FEMA lead responsibility for off-site emergency preparedness with respect to each nuclear power facility located in the United States.

FEMA, in turn, established the Radiological Emergency Preparedness (REP) Program to (1) ensure the health and safety of citizens living around commercial nuclear power plants would be adequately protected in the event of a nuclear power plant accident; and (2) inform and educate the public about radiological emergency preparedness.[29] Under the auspices of the REP Program, FEMA has the lead in providing guidance to other federal agencies, as well as state and local response organizations. The current 10 and 50 mile EPZs are sufficiently large so that planning for implementation of protective actions involves coordination between the federal, state, and local organizations (*e.g.,* police, fire, and other emergency responders; school officials; hospitals) that would be involved in responding to an actual emergency at the plant in question. Thus, the current EPZs are large enough to facilitate development of the relationships, lines of communication, and procedures necessary to implement protective actions over larger areas, if necessary. At the same time, the current EPZs are sized so that protective actions – which are

---

[26] *Id.* at 61.

[27] *See* 10 C.F.R. §50.47(b)(2).

[28] Executive Order No. 12148 (July 15, 1979).

[29] *See* http://www.fema.gov/about/divisions/thd_repp.shtm.

not, themselves, without consequences[30] – are primarily focused on populations most likely to be affected in the event of a severe accident.

III. The Proposed Amendments to the Commission's Emergency Preparedness Regulations are not Warranted.

The Petition proposes the following changes to the NRC's EPZs:

- Expand the radius of the Plume Exposure Pathway EPZ from 10-miles to a 25-mile radius;
- Establish a new 50-mile radius EPZ, with more limited requirements than the 25-mile EPZ;
- Expand the radius of the Ingestion Pathway EPZ from 50-miles to 100-miles;
- Ensure that emergency plans are tested to encompass initiating and/or concurrent natural disasters that may affect both accident progression and evacuation conduct.[31]

The Petition makes multiple assertions to support these changes, however, in essence, the Petition claims that these modifications are necessary because: (1) the NRC's emergency preparedness requirements have remained largely unchanged for the past 30 years; and (2) experience since the Three Mile Island accident – namely, Chernobyl, September 11, and Fukushima – show that the NRC's emergency preparedness requirements must be strengthened to protect public health and safety. In light of the information presented in Section I above, and as explained more fully below, the Petition presents no new information that warrants a modification to the effective and well-understood 10 and 50 mile EPZs. In addition, we describe several inaccuracies and mischaracterizations that further undermine the merit of the Petition.

A. The NRC's Emergency Planning Regulations have been Re-Examined and Modified Multiple Times Since 1980.

Contrary to the Petition,[32] the NRC's emergency planning regulations – including requirements relevant to offsite planning – have undergone multiple, substantive revisions since 1980. Even before its 2011 emergency preparedness rulemaking, the NRC had examined and re-examined substantial emergency preparedness issues, such as: the consideration of emergency planning exercises during the licensing process,[33] the frequency of participation by State and local

---

[30] Japan's Fukushima Nuclear Accident Independent Investigation Commission reported that 60 patients died in March 2011, due to complications related to evacuations. Diet Report at 38.

[31] PRM, at 1.

[32] *See* PRM, at 12 ("Little Change to Emergency Planning Regulations in 30 Years").

[33] *See* Emergency Planning and Preparedness, 47 Fed. Reg. 30,232 (July 13, 1982); 50 Fed. Reg. 19,323 (May 8, 1985).

authorities in emergency preparedness exercises,[34] criteria for the evaluation of utility-prepared emergency plans in situations in which state and/or local governments decline to participate further in emergency planning,[35] emergency preparedness activities required to be undertaken during the 2-year intervals between biennial full-participation exercises,[36] and the prophylactic use of potassium iodide as a protective measure in the plume exposure pathway EPZ.[37]

Further, the agency promulgated a substantial revision to its emergency preparedness regulations in a final rule published on November 23, 2011.[38] Although the Petition implies that this rulemaking was limited to "requiring licensees to use current U.S. census data to prepare evacuation time estimates . . . and update them every 10 years,"[39] the rulemaking actually addressed both security-related and non-security-related changes in no less than twelve areas. These areas included: (1) on-shift staffing analysis, (2) emergency action levels for hostile action, (3) emergency response organization augmentation and alternative facilities, (4) licensee coordination with offsite response organizations during hostile action, (5) protection for onsite personnel, (6) challenging drills and exercises, (7) backup means for alert and notification systems, (8) emergency declaration timeliness, (9) performance-based approach to emergency operations facilities, (10) evacuation time estimate updating, (11) amended emergency plan change process, and (12) removal of completed one-time requirements.[40]

Thus, in contrast to the jaundiced viewpoint put forth in the Petition, an objective review of the rulemaking record reveals that the agency has been very actively engaged in the area of emergency preparedness over the past 30 years.

B. Chernobyl and the 9-11 Terrorist Attacks do not Show that the Current 10 and 50 Mile EPZs are Inadequate.

---

[34] *See* Emergency Planning and Preparedness, 49 Fed. Reg. 27,733 (July 6, 1984).

[35] *See* 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 Fed. Reg. 42,078 (Nov. 3, 1987).

[36] *See* Production and Utilization Facilities; Emergency Planning and Preparedness Exercise Requirements, 61 Fed. Reg. 30,129 (June 14, 1996).

[37] *See* Consideration of Potassium Iodide in Emergency Plans, 66 Fed. Reg. 5,427 (Jan. 19, 2001).

[38] *See* Enhancements to Emergency Preparedness Regulations, 76 Fed. Reg. 72,560 (Nov. 23, 2011).

[39] PRM, at 12.

[40] *See* 76 Fed. Reg. 72,560, 72,563–72,573 (Nov. 23, 2011).

The Petition claims that experience since the Three Mile Island accident shows that the current NRC emergency planning regulations must be modified. Specifically, the Petition argues that the nuclear accident at Chernobyl and the 9-11 terrorist attacks require modification of the 10 and 50 mile EPZs. But these incidents have already been considered extensively by the NRC, and the Petition presents no new information that requires a change to the size of the EPZs.

i. Chernobyl.

As acknowledged in the Petition, the Commission previously considered and rejected a request to change the size of the 10 and 50 mile EPZs based on the events at Chernobyl.[41] The Petitioners argue, however, 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."[42] While the effects of significant radiological releases can undoubtedly be "severe, long lasting, and widespread," the Commission obviously understood the dramatic nature of the Chernobyl accident when it denied the petition for rulemaking at issue in *Citizens Task Force of Chapel Hill.*

Citizens Task Force of Chapel Hill, involved the denial of three petitions for rulemaking – all requesting (among other things) changes to the Commission's generic plume exposure pathway EPZ. The *Citizens Task Force* decision addresses sixteen different issues, twelve of which are relevant to expansion of the 10 mile EPZ. Among these twelve issues was: "Issue 7. Extend EPZ from 10 Miles to 20 Miles Because of the Lessons Learned from the Chernobyl Accident."[43] The Commission described this issue, stating "A few commenters suggested that the NRC should modify its regulations because of the evacuation that took place as a result of the Chernobyl accident."[44] The Commission responded to these comments, first point pointing to the significant differences between emergency planning practices in the United States and the former Soviet Union:

> In drawing a nexus between the Soviet response to the Chernobyl accident and emergency planning implications for U.S. plants, contrasts and differences should be noted. First, there is a substantial difference in the emergency planning base. After the accident at Three Mile Island, large resources were expended to improve emergency planning and response capabilities around U.S. plants. In contrast, although some prior planning appears to have existed in the Soviet Union, perhaps for civil defense, there is

[41] *See* Citizens Task Force of Chapel Hill, 32 NRC 281, 298–301 (1990).

[42] PRM, at 13.

[43] Citizens Task Force of Chapel Hill, 32 NRC 281, 298 (1990).

[44] *Id.*

> little indication that the Soviets have comparable site-specific emergency plans for the general public around their nuclear power plants. Despite this, the Soviets mounted a large and generally effective ad hoc response.
>
> Second, the specifics of the Chernobyl release are unique to the RBMK design. The amounts of radioactive material released from U.S. plants could be as severe but for many accident sequences would be considerably less because, among other things, U.S. plants have substantial containments. In addition, although low-probability, fast-moving accident sequences may be possible, severe accidents at U.S. plants would, in general, progress more slowly resulting in longer warning times before release.
>
> Third, some aspects of the Chernobyl evacuation defy comparison with similar aspects at U.S. plants because of economic and societal differences. For example, the Soviets had to assemble 4000 buses and trucks for the Chernobyl evacuation, whereas, in the United States most people have access to private transportation, and necessary alternative transportation is preplanned around U.S. nuclear power plants.[45]

With regard to the issue of EPZ size, the Commission reasoned:

> [T]he Soviets evacuated the population out to 18 miles, or roughly twice the distance for which an evacuation capability is required to be demonstrated in the United States. Similarly, measures were taken to prevent ingestion of foodstuffs, milk, and water at distances considerably greater than the 50–mile ingestion exposure pathway in the United States. This might imply that the U.S. EPZs are too small. However, examination of the background leading to the U.S. requirements leads to a different conclusion.
>
> The sizes of the EPZs were derived from accident considerations, including the severe accidents studied in the Reactor Safety Study (WASH–1400). The more severe and most unlikely accidents studied in WASH–1400 involve releases of radioactivity that are comparable to or in some instances larger in magnitude than that which was actually released at Chernobyl. The 10–mile and 50–mile EPZs were chosen as a planning basis to demonstrate a capability and to provide emergency plans with the flexibility of dealing with a broad range of accident releases, rather than being based solely on a single highly unlikely event, such as the worst case. It was recognized that protective actions might need to be taken beyond these planning zone distances for the most severe releases.
>
> . . . . .

[45] *Id.* at 298–299 (emphasis added).

> Consequently, a release magnitude similar to the one associated with Chernobyl and the possibility that ad hoc actions beyond the planning zone boundaries might be needed for very unlikely events were considered and have been factored into the development of U.S. requirements, including the sizes of the EPZs.
>
> In conclusion, the Chernobyl accident and the Soviet response do not reveal any apparent deficiency in U.S. plans and preparedness, including the 10–mile plume exposure pathway EPZ size and the 50–mile ingestion exposure pathway EPZ size. These zones provide an adequate basis to plan and carry out the full range of protective actions for the populations within these zones, as well as beyond them, if the highly improbable need should arise. [46]

In addition to the *Citizens Task Force* decision, the NRC undertook a comprehensive review of the implications of the Chernobyl accident in NUREG-1251, "Implications of the Accident at Chernobyl for Safety Regulation of Commercial Nuclear Power Plants in the United States," issued in April 1989. The report concluded that no immediate changes to the NRC's regulations regarding the design or operation of U.S. commercial nuclear reactors were warranted as a result of lessons learned from Chernobyl.[47] The Petition presents no new insights into the Chernobyl accident that should cause the Commission to modify the conclusions reached in the *Citizens Task Force* decision or NUREG-1251.

ii. September 11 Terrorist Attacks.

Although conceding that the NRC undertook a "top to bottom" review of nuclear power plant security after 9-11, the Petition asserts that this review did not include a re-examination of the Commission's offsite emergency planning requirements. This assertion is inaccurate.

Although the size of the emergency planning zones were not revised as a result of the September 11 terrorist attacks, the NRC's initial 9-11 response (in the form of Order EA-02-026), included provisions requiring that licensees enhance their ability to coordinate with offsite response organizations during hostile actions (*i.e.*, attacks on the plant). More specifically, EA-02-026 required licensees to develop plans, procedures and training to ensure coordination between the nuclear power plant site and offsite response organizations, and directed licensees to review their emergency plans to ensure that sufficient personnel would be able to respond during a hostile action.[48] Indeed, as the Commission has stated, "Licensees are required to identify [Offsite

---

[46] *Id.* at 301–302 (emphasis added).

[47] *See* NUREG-1251, at 2.

[48] *See* 76 Fed. Reg. 72,560, 72,565–67 (Nov. 23, 2011).

Response Organization (ORO)] support for emergency response as well as demonstrate that various ORO capabilities exist through biennial evaluated exercises. Licensees and OROs have successfully demonstrated these capabilities for many years."[49] So, while EPZ size was not modified as a result of 9-11, the NRC's post-9-11 actions did include provisions to increase the already high level of coordination between licensees and OROs.

The Petition points to no new information suggesting that the Commission's response to the September 11 terrorist attacks should have included an expansion of the EPZs. Further, the Petition does not mention, much less address, requirements flowing from the NRC's post-9-11 regulatory activities – such as the aircraft impact rule and the adoption of § 50.54(hh) – which substantially improved the ability of nuclear power plant operators to mitigate the effects of large fires and explosions. These measures further reduced the likelihood that offsite protective actions would be required as a result of initiating events that could otherwise result in a severe accident.

C. Events at Fukushima do not Show that Current 10 and 50 Mile EPZs are Inadequate.

With respect to the accident at Fukushima, the Petition states:

> The accident at Fukushima, added to the experience of the Chernobyl disaster, demonstrates that the 10 mile plume exposure pathway EPZ and 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.[50]

The Petition, however, offers no significant new information that calls the NRC's understanding of either the likelihood or severity of severe accidents into question.

i. Petitioners Arguments are Based on the False Premise that the Fukushima Accident Demonstrates that Severe Accidents are More Likely than any Government Previously Estimated.

The Petition offers no support for its assertion that the Fukushima accident reveals deficiencies in the either the NRC's or the industry's understanding of the likelihood of severe accidents in the United States.[51] Several specific inaccuracies and mischaracterizations contained in the

---

[49] *Id.* at 72,565.

[50] PRM, at 13 (emphasis added).

[51] Indeed, in contrast to the Petitioners' assertion that the accident at Fukushima revealed a misunderstanding of the likelihood of severe accidents, the recent report of the National Diet of Japan indicates that it was not a lack of

Petition are discussed below. Inaccuracies and mischaracterizations aside, the Petition's primary focus with respect to Fukushima seems to be that the accident resulted in contamination outside of the NRC's 10 and 50 mile EPZs. This point, which we address below, is most germane to our understanding of accident severity, rather than likelihood or probability that severe accidents will occur in the first instance.

Although the Petition offers no new information on the likelihood of severe accidents in light of Fukushima, we note that the Commission and NRC staff have considered this issue and reach a different conclusion than the Petitioners. Specifically, the NRC's NTTF concluded:

> The current regulatory approach, and more importantly, the resultant plant capabilities allow the Task Force to conclude that a sequence of events like the Fukushima accident is unlikely to occur in the United States and some appropriate mitigation measures have been implemented, reducing the likelihood of core damage and radiological releases. Therefore, continued operation and continued licensing activities do not pose an imminent risk to public health and safety.[52]

The NTTF surely had access to most (if not all) of the information presented in the Petition in reaching this conclusion. Further, in his vote on the NTTF Report, Commissioner Apostolakis – an expert in the area of probabilistic risk assessment and risk management – discussed the effect of the Fukushima accident on our understanding of accident risk, stating:

> The Task Force found that the current regulatory system has served the Commission and the public well and it concluded that a sequence of events like that which occurred at Fukushima is unlikely to occur in the United States. As I discussed at the Task Force briefing to the Commission on July 19, 2011, many people have referred to the events at Fukushima as "unthinkable" and imply that we should strive to protect U.S. plants from events that are of extremely low probability. However, there is growing evidence that the historical record of tsunamis had not been used properly to determine the design basis at

---

understanding, but a lack of action in response to existing knowledge that contributed to the severity of the accident at Fukushima. Specifically, the Diet Report states:

> The Commission has verified that on March 11, 2011, the structure of the Fukushima Daiichi Nuclear Plant was not capable of withstanding the effects of the earthquake and the tsunami. Nor was the Fukushima Daiichi Nuclear Plan prepared to respond to a severe accident. In spite of the fact that TEPCO and the regulators were aware of the risk from such natural disasters, neither had taken steps to put preventive measures in place. It was this lack of preparation that led to the severity of this accident.

Diet Report, at 26. While this conclusion is certainly disquieting and should serve to reinforce the vigilance of both the U.S. nuclear power industry and the NRC in addressing the risks posed by natural phenomena, it reveals a lack of action rather than a lack of knowledge or understanding of severe accident risk.

[52] NTTF Report, at vii (emphasis added).

> Fukushima Daiichi and, consequently, the protection of the plants was not sufficient. The accident was not of extremely low probability, *i.e.*, it was not "unthinkable". This observation suggests that we should be mindful of striking a proper balance between confirming the correctness of the design basis and expanding the design basis of U.S. plants.[53]

As Commissioner Apostolakis points out, the historical record of tsunamis relevant to the Fukushima Daiichi site may not have been adequately considered to properly evaluate flooding risk and derive the design basis of the plant. But that fact should not be misconstrued to conclude, *de facto*, that the NRC and nuclear power industry do not adequately understand the likelihood of severe accidents in the United States. Indeed, in his vote on a subsequent staff paper, Commissioner Magwood cautioned against overly-broad comparisons between the events at Fukushima and the current state of nuclear safety in the United States:

> Since the events at Japan's Fukushima Daiichi site occurred in March 2011, the NRC was faced with the need to quickly and effectively understand the implications events on the other side of the globe might have for current and future nuclear power plants in the United States. This challenge is magnified by the reality that plant operation, government regulation, and industry practices associated with the Japanese nuclear power program are different from that of the United States. It would be unwise and incorrect to assume that every change made in response to Fukushima that might need to occur in Japan—or other countries, for that matter—should be applied in this country.
>
> U.S. plants, regulations, and practices have been demonstratively strengthened by past adversity. The U.S. approach to emergency preparedness, formulated in the aftermath of Three Mile Island, is second to none in the world. The defense-in-depth of U.S. plants was enhanced after the September 11, 2001 terrorist attacks and, as the Near Term Task Force (NTTF) report noted, nuclear plants in the U.S. have greater capability to withstand natural disasters of the magnitude faced by the four reactors most damaged by the tsunami that struck the Fukushima Daiichi site.[54]

Commissioner Magwood's sentiments are supported by the findings of Japan's Fukushima Nuclear Accident Independent Investigation Commission, which included the following:

> The [Japanese] regulators had a negative attitude toward the importation of new advances in knowledge and technology from overseas. If NISA had passed on to TEPCO measures that were included in the B.5.b subsection of the U.S. security order that followed the

---

[53] Hon. George Apostolakis, Commission Voting Record,-SECY-11-0093 (Aug. 19, 2011).

[54] Hon. William D. Magwood, IV, Commission Voting Record, SECY-11-0137 (Dec. 15, 2011) (emphasis added).

> 9/11 terrorist action, and if TEPCO had put the measures in place, the [Fukushima] accident may have been preventable.[55]

Indeed, the already robust protection provided through section B.5.b of the post-9/11 security orders is being further strengthened through the requirements of post-Fukushima Order EA-12-049, which is described below.

In its subsequent papers responding to the NTTF report, the NRC staff agreed with the NTTF conclusion that continued operation and licensing activities in the United States do not pose an imminent risk to public health and safety.[56] Further, in a decision denying a series of petitions to suspend adjudicatory, licensing, and rulemaking activities the Commission agreed with the staff and NTTF conclusions, finding that continued licensing activities and operation do not pose imminent risks to the public.[57]

The NRC is by no means, however, resting on its laurels. The Commission has taken meaningful and well-supported action in response to Fukushima. Thus far, the Commission's regulatory response has been appropriately focused on further reducing the likelihood that initiating events—such as earthquakes, flooding, and loss of power—will result in severe accidents and radiological releases. These actions have included:

- Issuance of Order EA-12-050 requiring that all Boiling Water Reactor licensees with Mark I and Mark II containment designs (similar to those at Fukushima) have a reliable hardened vent to remove decay heat and maintain control of containment pressure within acceptable limits following an event that results in loss of active containment heat removal capability or prolonged Station Blackout. The hardened vent system must be accessible and operable under a range of plant conditions, including prolonged Station Blackout and inadequate containment cooling.[58]

- Issuance of Order EA-12-049 requiring all power reactor licensees and holders of construction permits, in active or deferred status, to implement a three-phased approach for mitigating beyond-design-basis external events. The initial phase requires use of

---

[55] Diet Report, at 16.

[56] *See* Prioritization of Recommended Actions to be Taken in Response to Fukushima Lessons Learned, SECY-2011-0137 (Dec. 15, 2011); Recommended Actions to be Taken Without Delay from the Near-Term Task Force Report, SECY-2011-0124 (Sept. 9, 2011).

[57] *See* Union Electric Co., et al, CLI-11-05, at 27 (Sept. 9, 2011) ("Further, we do not believe that an imminent risk will exist during the time needed to apply any necessary changes to operating plants, whether a license renewal application is pending or not.")

[58] *See* Order to Modify Licenses with Regard to Reliable Hardened Containment Vents, NRC Order EA-12-050 (Mar. 12, 2012).

installed equipment and resources to maintain or restore core cooling, containment, and spent fuel pool (SFP) 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 off site. The final phase requires obtaining sufficient offsite resources to sustain those functions indefinitely.[59]

- Issuance of Order EA-12-051 requiring 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 actions to implement make-up water addition should no longer be deferred.[60]

- Issuance of an extensive information request to all power reactor licensees and holders of construction permits, in active or deferred status, requiring the provision of information and conduct of analyses regarding protection against natural phenomena (*i.e.*, earthquakes, flooding) and emergency planning. This information will be used by the NRC to determine whether licenses should be modified, suspended or revoked. More specifically, the information and analyses requested include:

    - Seismic and flooding hazard walk-downs, the purpose of which is to identify degraded, nonconforming, or unanalyzed conditions and verify the adequacy of licensee monitoring and maintenance procedures.

    - Seismic and flooding hazard re-evaluations, the purpose of which is to determine whether there is a need to update the design basis and systems, structures, and components important to safety.

    - An assessment of the licensee's current communications systems and equipment to be used in the event of an emergency involving a large-scale natural event resulting in loss of all alternating current power and extensive damage to normal

[59] *See* Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, NRC Order EA-12-049 (Mar. 12, 2012).

[60] *See* Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation, NRC Order EA-12-051 (Mar. 12, 2012).

emergency communications systems both onsite and in the area surrounding the site.

- An assessment of the licensee's ability to staff emergency preparedness functions during a large-scale natural event that affects all units at the site, and results in extended loss of all alternating current power and impeded site access.

In addition, the NRC has issued Advanced Notices of Proposed Rulemaking in the areas of Station Blackout and integration of severe accident management procedures.[61] Thus, while the NRC has taken the position that an accident like the one that occurred at Fukushima is unlikely to unfold in the United States, the agency continues to take appropriate, precautionary steps to further reduce the likelihood that a severe accident requiring implementation of protective measures in the 10 and 50 mile EPZs will occur.

ii. Petitioners Arguments are Based on the False Premise that the Fukushima Accident Demonstrates that the Effects of Severe Accidents are More Widespread than Previously Understood.

The Petition also contends that the accident at Fukushima demonstrates that the effects of severe accidents are far more widespread than previously predicted. To make this point, the Petition primarily relies upon the fact that the accident resulted in contamination and protective actions well outside of the NRC's current 10 and 50 mile EPZs. But, as explained in detail above (see Section II), such accidents have "been a program consideration since the inception of the EPZ concept in the United States."[62] Further, as described above in Section III.B.i, the Commission extensively evaluated the accident at Chernobyl, which also resulted in wide-spread contamination. Certainly the Commission understood the extent of the contamination resulting from that accident, but appropriately determined that the 10 and 50 mile EPZs did not require expansion.[63] The Petition presents no information that has not already been carefully considered by the NRC.

Nonetheless, the Petition asserts that the "real-world experience at Fukushima trumps" analytical modeling and demonstrates that the Commission's previous conclusions regarding EPZ size are "fundamentally flawed."[64] Specifically, the Petition states:

---

[61] *See* Station Blackout Advanced Notice of Proposed Rulemaking, 77 Fed. Reg. 16,175 (Mar. 20, 2012); Onsite Emergency Response Capabilities Advanced Notice of Proposed Rulemaking, 77 Fed. Reg. 23,161 (Apr. 18, 2012).

[62] NTTF Report at 60–61 (emphasis added).

[63] *See* Citizens Task Force.

[64] PRM at 22.

> 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 and highly concentrated puff" of radiation. In the scenario described by the Commissioners . . . 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 within 10 miles would not be evacuated within 24 hours turned out to be 100%, not "near zero." The probability that affected people outside of 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.[65]

The strong rhetoric contained in this passage (and much of the Petition) falls apart upon closer examination. First, the Petitioners seem to argue that the Commission's assumptions regarding the size and concentration of the plume discussed in NUREG-0396 were somehow made non-conservative by the events at Fukushima. Although no citations are provided to support this argument, the Petition seems to be referring to the following discussion of "rainout" provided in the *Citizens Task Force* decision:

> The statement that the dosage estimates in NUREG–0396 assume a uniform rate of deposition of radioactive material is in error. A full page (p. I–25) of NUREG–0396 is devoted to a discussion of rainout effects. While NUREG–0396 does not explicitly say so, the calculated doses presented in Figures I–10 through I–15 do, in fact, include the effects of rainout.
>
> Rainout is included in the following manner. The entire release of radioactivity is assumed to be contained in a small highly concentrated puff. The probability of such a puff occurring is approximately 1 time in 100,000 years. Wind is assumed to blow the puff directly over a large population center during a period of extreme atmospheric stability with minimal dilution of the puff so it never becomes much more than a mile in

---

[65] *Id.*

> diameter. When the puff is directly over the population center, an extremely heavy rainfall scours most of the non-gaseous radioactive material from the cloud and deposits it on the ground. If such a puff is released, the probability of the puff encountering these weather conditions is approximately 1 in 10,000. The radioactivity is assumed to remain on the surface of the ground with no entrance into sewers, no runoff, and no sinking into the ground to remove or shield the radioactivity. The calculations assume that 100 percent of the radioactivity will remain on the surface without any runoff, but in reality the probability of this is near zero. The people are assumed to be exposed with minimal shielding to the radiation from the deposited material; in other words, that no one is in an apartment building, no one is in an office building, no one is in a basement, and no one is in any other type of building that provides more shielding than a small one-story frame house. The assumed probability of this is one, whereas it is in reality near zero. The people remain where they are with no evacuation or other protective action for 24 hours. The probability of no emergency response for 24 hours is assumed in the calculations of consequences to be one, but in reality the probability is near zero. It is this specific series of events that gives rise to the largest casualty figures that have been calculated for severe nuclear accidents and which are presented in NUREG–0396. Because of these assumptions, the calculated consequences are greatly overestimated.[66]

Based on this discussion, it is clear that the assumptions regarding rainout were not "realistic" – they were very conservative. That is, the agency assumed release characteristics (*i.e.*, a small highly concentrated puff or plume); meteorology (*i.e.*, wind that delivers the highly concentrated puff to a population center with minimum dilution and subsequent heavy rain); environmental transport (*i.e.*, all non-gaseous radioactive materials remain on the surface of the ground with no runoff or sinking); receptor behavior (*i.e.*, the entire exposed population has the benefit of minimal shielding during the exposure duration); and a lack of protective action (*i.e.*, no emergency response for 24 hours) that would result in the maximum possible exposures to the population at issue. As the NRC stated, this extremely unlikely scenario – which was considered in developing the 10 and 50 mile EPZs – would result in the largest casualty figures for severe nuclear accidents.

The Petition is correct to assert that the "rainout" scenario described above did not unfold at Fukushima. In fact, the releases at Fukushima resulted in a much less dire exposure scenario than that assumed in NUREG-0396 – *i.e.*, the releases at Fukushima did not yield any casualties, let alone the largest possible casualty figures. The fact that the accident at Fukushima resulted in a much less dire exposure scenario than the rainout scenario discussed above does not, somehow,

[66] Citizens Task Force, at 292-293.

make NUREG-0396 non-conservative.[67] Also, as the above-quoted discussion makes clear, for the purposes of establishing the 10 and 50 mile EPZs the NRC assumed that the unlikely confluence of circumstances described in the rainout scenario would occur. NRC's statements that this dire scenario is, in fact, very unlikely, did not influence the decision to establish the size of the EPZs. Thus, the Petitioner's argument that the Commission's position on rainout is "fundamentally flawed" appears to be based on standing up a straw man in order to knock it down.

The highly conservative nature of the evaluation provided in NUREG-0396 was confirmed in a recent report published by an American Society of Mechanical Engineers Presidential Task Force, which was chaired by former NRC Chairman Nils J. Diaz. The ASME Task Force was formed to examine the implications of the nuclear accident at Fukushima.[68] With respect to the conservatism used to develop the current EPZ sizes, the ASME Report states:

> A reassessment of EPZ size, using more recent and realistic severe accident source-term information, indicates there is significant margin and conservatism in the 10-mile plume-exposure-pathway EPZ for typical U.S. operating plants. . . . [This reassessment] clearly shows the margin and conservatism that exist in the 10-mile plume-exposure pathway EPZ. Margin is also expected for the 50-mile ingestion-exposure-pathway EPZ. Based on this information, for typical U.S. operating plants, existing EPZ size is expected to fully

---

[67] In its report "Preliminary Dose Estimation from the Nuclear Accident After the 2011 Great East Japan Earthquake and Tsunami," the World Health Organization stated:

> In this context, using conservative assumptions, the assessment shows that the total effective dose received by characteristic individuals in two locations of relatively high exposure in Fukushima prefecture as a result of their exposure during the first year after the accident is within a dose band of 10 to 50 mSv [1 to 5 rem]. In these most affected locations, external exposure is the major contributor to the effective dose. In the rest of Fukushima prefecture the effective dose was estimated to be within a dose band of 1 to 10 mSv [100 millirem to 1 rem]. Effective doses in most of Japan were estimated to be within a dose band of 0.1 to 1 mSv [10 to 100 millrem] and in the rest of the world all the doses are below 0.01 mSv and usually far below this level.
>
> The characteristic thyroid doses in the most exposed locations of Fukushima prefecture were estimated to be within a dose band of 10 to 100 mSv [1 to 10 rem]. In one particular location the assessment indicated that the characteristic thyroid dose to one-year-old infants would be within a dose band between 100 and 200 mSv [10 to 20 rem], with the inhalation pathway being the main contributor to the dose. Thyroid doses in the rest of Japan were within a dose band of 1 to 10 mSv [100 millirem to 1 rem] and in the rest of the world doses are estimated to be below 0.01 mSv [1 millirem] and usually far below this level.

WORLD HEALTH ORGANIZATION, PRELIMINARY DOSE ESTIMATION FROM THE NUCLEAR ACCIDENT AFTER THE 2011 GREAT EAST JAPAN EARTHQUAKE AND TSUNAMI. 8 (2012) *available at* http://whqlibdoc.who.int/publications/2012/9789241503662_eng.pdf.

[68] *See* AMERICAN SOCIETY OF MECHANICAL ENGINEERS, FORGING A NEW NUCLEAR SAFETY CONSTRUCT (2012) *available at* http://files.asme.org/asmeorg/Publications/32419.pdf. [hereinafter "ASME Report"].

> satisfy public-health-and-safety-protection guidelines. There would be even more conservatism for Generation III+ plants now starting construction in the U.S. and around the globe.[69]

The ASME Report goes on to recommend an update to the technical basis for (as opposed to the size of) the current EPZs. The Report offers three reasons supporting such an update. First, contrary to the claims in the Petition, the ASME Report highlights the fact that since NUREG-0396 was developed "the global nuclear power community has acquired a greatly-expanded operational experience base and a significant experimental and analytical knowledge base on severe accidents. It is now recognized that the relatively-rapid, massive, fission-product releases and severe-accident risks estimated in earlier studies . . . are unduly pessimistic."[70] Second, the Report points to the "much-improved" capability to manage a range of accident scenarios that "substantially decreases the risks of core damage and radioactivity release in a severe accident."[71] Lastly, the ASME Report states that an update to the technical basis for the current EPZs would increase public confidence because:

> The existing basis for EPZ size . . . overstates the risk from nuclear plant accidents and could result in unwarranted actions that poorly serve radiological protection of people . . . . Calculation or promulgation of disastrous public health effects or massive releases for highly improbable or unrealistic events helps no one, wastes resources, and frequently results in unfounded fear.
>
> . . . .
>
> While the Fukushima Dai-ichi accident resulted in significant damage to the plant and significant offsite economic effects . . . the effect on public health and safety from radiation was minimal, and the fission product releases were relatively slow and amenable to protective measures.[72]

As illustrative above, the events at Fukushima simply have not called the conservative nature of the NRC's technical basis for the existing 10 and 50 mile EPZs into question.

Further, the Petition's unsupported assertions regarding the protective actions taken in response to the accident at Fukushima are wrong. The Institute for Nuclear Power Operations' (INPO) "Special Report on the Nuclear Accident at the Fukushima Daiichi Nuclear Power Station"

---

[69] ASME Report. at 60 (emphasis added) (citations omitted).

[70] *Id.* at 61.

[71] *Id.*

[72] *Id*

(INPO Report) provides a detailed timeline of the accident progression at Fukushima. The INPO Report states that Units 1, 2, and 3 lost all alternating current power as a result of flooding on March 11, 2011, at 15:37, 15:41, and 15:38 (JST), respectively.[73] With respect to evacuation of the surrounding area, the INPO Report states:

- March 11 at 20:50: Evacuation of population within 1.2 mile radius ordered.
- March 11 at 21:23: Evacuation of population within 1.9 mile radius ordered, sheltering of population between 1.9 and 6.2 mile radius ordered.
- March 12 at 00:30: Government confirms evacuation of population within 1.9 miles completed.
- March 12 at 01:45: Government reconfirms evacuation of population within 1.9 miles completed.
- March 12 at 05:44: Evacuation of population out to 6.2 miles ordered.
- March 12 at 09:03: Evacuations south of the plant (Ookuma-machii) confirmed complete.
- March 12 at 18:25: Evacuation of population out to 12.4 miles ordered. [74]

Thus, contrary to the Petition, emergency response activity and protective actions were undertaken on March 11 and 12, following the loss of alternating current power. These actions included evacuation and sheltering. The point here is not that the protective actions undertaken in response to the accident at Fukushima were optimal, but simply that the assertions regarding protective actions contained in the Petition are unsupported and inaccurate.

As revealed in the Diet Report, a confused chain of command and a lack of communication complicated implementation of Japan's crisis management system and hampered implementation of evacuation and sheltering measures. And, as described above, the NRC has issued an information request requiring licensees to assess the current communications systems and equipment to be used in the event of an emergency involving a large-scale natural event resulting in loss of all alternating current power and extensive damage to normal emergency communications systems, both onsite and in the area surrounding the site. The results of these assessments will be used by the NRC to determine whether licenses should be modified, suspended or revoked. The problems associated with implementing Japan's crisis management plant in response to the accident at Fukushima do not, however, imply that the size of the EPZs in the United States should be expanded.

D. The Petition's Discussion of Natural Disasters and Emergency Response Planning in the United States is Incomplete.

[73] *See* INPO Special Report, at Section 8.0.

[74] *Id.*

Attachment

NEI Comments on PRM-50-104

The Petition asserts that severe weather and natural disasters are becoming increasingly prevalent in the United States and that nuclear reactors are susceptible "to various weather phenomena and disasters."[75] More specifically, the Petition points out that during 2011, severe weather impacted several U.S. nuclear power reactors, including the Browns Ferry, Surry, Fort Calhoun, and Cooper stations.[76] The Petition also mentions the earthquake that impacted the nuclear station at North Anna. [77] Although the Petition is correct to point out that severe weather can impact the operation of nuclear power reactors in the United States, conspicuously absent from the discussion is any description of how these nuclear facilities performed in the face of these severe conditions. Such a description is provided briefly below.

- **Virginia Earthquake – North Anna:** On August 23, 2011, a magnitude 5.8 earthquake occurred in the United States, with its epicenter located at Mineral, VA, approximately 11 miles from the North Anna Power Station. The earthquake resulted in ground motion exceeding the plant's Operating Basis Earthquake and Safe Shutdown/Design Basis Earthquake. As a result of the earthquake, the station experienced a loss of offsite power and automatic reactor trips from 100% power. Despite the loss of offsite power, the Emergency Diesel Generators started and provided power to the emergency systems until offsite power was restored 3 hours later. Subsequently, the licensee completed walkdowns and plant inspections—accompanied by NRC's resident inspectors—and exited the declared "Notice of Unusual Event" (NOUE).[78] In the following months, over 100,000 hours were devoted to inspecting the plant and $21,000,000 was spent to inspect, test, and evaluate the plant. The results of those inspections revealed that, despite exceeding the design basis for the plant, the earthquake resulted in no functional damage to safety systems.[79] The NRC concluded that the licensee responded to the seismic event in a manner that protected public health and safety, that there was no damage to the safety related systems of the plant, safety system functions were maintained, and that the

[75] PRM, at 31.

[76] PRM at 32.

[77] PRM at 31.

[78] NUCLEAR REGULATORY COMMISSION, FISCAL YEAR 2011 ABNORMAL OCCURRENCE REPORT TO CONGRESS, NUREG-0090, VOL. 34 at C-6 (2012) [hereinafter "Abnormal Occurrence Report"].

[79] *See* Dominion Power Co., Overview of 08/03/2011 Earthquake Response and Restart Readiness Demonstration Plan, ADAMS Accession No. ML11252A006 (Sept. 8, 2011).

licensee responded to the event in accordance with established procedures.[80] In November 2011, the NRC approved restart of the North Anna nuclear power reactors.[81]

- **Missouri River Flooding – Fort Calhoun:** Fort Calhoun station is located approximately 19 miles north of Omaha, NE on the Missouri River. Record snowfall total during the winter months and significant rainfall during the spring caused a rise in the Missouri River system. Due to flooding, Fort Calhoun station declared a "Notification of Unusual Event" (NOUE) in anticipation that the Missouri River level at the plant would reach 1,004 feet mean sea level. The plant's design protects it from a river level elevation of 1,014 feet mean sea level. The station had been shut down since April 9, 2011 for a planned refueling outage and remained shut down during the period of flooding. Although other plant performance issues have been identified and are currently being addressed by the licensee and NRC staff, "[r]eactor shutdown cooling, spent fuel pool cooling, and other plant safety systems were unaffected during" the transfer to onsite Emergency Diesel Generators prompted by the flooding.[82] Further, "[t]he NRC entered the Monitoring Mode of agency response for four days with the Region IV Incident Response Center having the response lead. On August 29, 2011, the licensee terminated the NOUE for flooding when the Missouri River level receded to less than 1,004 feet MSL. The highest river level reported at FCS was 1,006 feet, 10 inches MSL on June 25, 2011."[83]

- **Severe Storms/Tornado Activity – Browns Ferry:** The Browns Ferry site lost offsite power early on the evening of April 25, 2011, due to severe storms that damaged power lines in the area surrounding the plant. Despite the loss of offsite power, the Emergency Diesel Generators started and powered emergency systems, allowing all three units at the site automatically and safely shut down. NRC's Senior Resident Inspector was present in one of the plant's control rooms when power was lost and was able to observe licensee

[80] *See* NRC North Anna Augmented Inspection Team Report, ADAMS Accession No. ML11276A024 (Oct. 3, 2011).

[81] *See* Press Release No. 11-212, Nuclear Regulatory Commission, NRC Approves Restart of North Anna Reactors, Will Ensure Dominion Meets Commitments (Nov. 11, 2011) *available at* http://pbadupws.nrc.gov/docs/ML1131/ML11318A064.pdf.

[82] Abnormal Occurrence Report, at C-4.

[83] *Id.*

activities and provide status updates to other NRC staff manning the agency's incident response center in Atlanta.[84]

- **Severe Storms/Tornado Activity – Surry:** The Surry nuclear power plant lost offsite power early on the evening of April 14, 2011, due to a tornado affecting the electrical switchyard next to the plant. Despite the loss of offsite power, the Emergency Diesel Generators started and powered emergency systems, allowing both affected units to automatically and safely shut down. NRC dispatched resident inspectors to the plant and staffed its incident response center in Atlanta, after being notified by the licensee soon after power was lost.[85]

The nuclear power industry, as well as the NRC, continues to be committed to identifying and incorporating lessons learned from these events. Incorporation of such lessons allows industry to continue to drive the possibility of severe accidents and large releases of radioactive material even lower. As highlighted above, however, and despite the challenges presented by severe natural events during 2011 – including loss of offsite power at several plants – all of the affected units were able to power emergency systems and shut down safely. Any objective discussion of the industry's response to extreme weather and other natural phenomena in the United States should, at the very least, acknowledge that fact.

E. The Petition's Description of the Damage to the Unit 3 Spent Fuel Pool at the Fukushima Daiichi Site is Inaccurate.

The Petition provides the following description of the damage sustained by the Unit 3 Spent Fuel Pool to support its recommended rule changes:

> At Fukushima, the fuel pool at Unit 3 was essentially destroyed by the explosion that also devastated the 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. 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.[86]

---

[84] Press Release No. II-11-030, Nuclear Regulatory Commission, NRC Monitors Events at Browns Ferry Nuclear Power Plant after Loss of Offsite Power and Unusual Event Declaration (Apr, 27, 2011) *available at* http://pbadupws.nrc.gov/docs/ML1111/ML111180062.pdf.

[85] *See* Press Release No. II-11-021, Nuclear Regulatory Commission, NRC Monitors Events at Surry Nuclear Power Plant after Loss of Offsite Power and Unusual Event Declaration (Apr. 17, 2011) *available at* http://www.nrc.gov/reading-rm/doc-collections/news/2011/11-021.ii.pdf.

[86] PRM, at 27 (citing Status of the Spent Fuel Pool of Unit 3 at FukushimaDaiichi Nuclear Power Station, NEI Magazine Youtube Channel, *available at* http://www.youtube.com/watch?v=7qMi6azQCaE).

In stark contrast, the INPO Special Report describes the condition of the spent fuel pools at Fukushima as follows:

> [A]nalysis and inspections performed by TEPCO personnel determined that the spent fuel pool water levels did not drop below the top of fuel in any spent fuel pool and that no significant fuel damage had occurred. Current investigation results indicate that any potential fuel damage was likely caused by debris from reactor building explosions.[87]

Although spent fuel in the Unit 3 pool may have sustained some damage, the Petition's claims that the Unit 3 spent fuel pool was "essentially destroyed" and that the fuel rods in the pool were "thrown out and perhaps vaporized" are unsubstantiated[88] and inconsistent with the information contained in the INPO Special Report.

More generally, the Petition states that "[n]uclear fuel pools pose a serious and dangerous threat to the populations surrounding nuclear plants."[89] To the contrary, spent fuel pools are robust structures designed to withstand severe external events, such as earthquakes and wind-driven missiles. Further, used nuclear fuel has been safely stored in light water reactor fuel pools and dry Independent Spent Fuel Storage Installations for many years. More specifically, the zirconium fire scenario described in the Petition[90] has been studied extensively by the NRC. For decades, the agency has examined and re-examined the issue of spent fuel pool fired due to massive pool-water loss and has consistently concluded that the risk of such fires is extremely low.[91]

As explained above, TEPCO has determined that spent fuel pool water levels at Fukushima did not drop below the top of fuel in any spent fuel pool and that no significant used fuel damage occurred as a result of the accident. Even so, the NRC has ordered U.S. reactor licensees to implement measures to further ensure that reliable spent fuel pool water level indications can be

---

[87] INPO Special Report, at 12, 37.

[88] The video referenced in the PRM on NEI's YouTube Channel depicts a substantial amount of water in the Unit 3 spent fuel pool. While debris from the hydrogen explosions appear to be present in the video, given the water level, it is difficult to see how a viewer could conclude that the pool was "essentially destroyed."

[89] PRM, at 26.

[90] PRM at 25-27.

[91] *See, e.g.*, WASH-1400, NUREG-75/014, REACTOR SAFETY STUDY: AN ASSESSMENT OF ACCIDENT RISK IN U.S. COMMERCIAL NUCLEAR POWER PLANTS (1975); NUREG-1353, REGULATORY ANALYSIS FOR THE RESOLUTION OF GENERIC ISSUE 82, BEYOND DESIGN BASIS ACCIDENTS IN SPENT FUEL POOLS (1989); NUREG-1738, TECHNICAL STUDY OF SPENT FUEL ACCIDENT RISK AT DECOMMISSIONING NUCLEAR POWER PLANTS (2001). *See also, New York v. NRC*, 589 F.3d 551 (2d Cir. 2009)(upholding NRC's denial of two petitions for rulemaking challenging NRC's conclusions regarding the risks associated with spent fuel pool storage).

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 actions to implement make-up water addition should no longer be deferred. Thus, the Petitioners' concerns regarding zirconium fires and, more generally, spent fuel pool storage do not warrant expansion of the current EPZs.

F. The Petition Mischaracterizes the NRC's SOARCA Report

The Petition states:

> More recently, in 2006, the NRC began the State-of-the-Art Ractor Consequence Analyses (SOARCA) project to re-evaluate the "realistic consequences of a severe reactor accident." 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 the "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 Emergency Planning Zone.[92]

i. 1,000 Cancer Fatalities Within a 50-mile Radius

The Petition does not offer a citation to support its claim regarding cancer fatalities, however it appears that the 1000 cancer deaths estimate was derived from the conditional, mean, latent-cancer-fatality risks to residents presented in Table 7-6 of NUREG/CR-7110, Vol. 1 (January 2012).[93] Table 7-6 describes the mean, latent-cancer-fatality risk associated with an unmitigated, short-term station blackout scenario (STSBO) where efforts to operate the turbine driven reactor core isolation cooling (RCIC) system without DC power (*i.e.*, RCIC blackstart) fail.[94] The risk reported in Table 7-6 for individuals within a 50 mile radius, assuming that such an accident sequence occurs, is reported as 1.9×10^{-4} per event, which roughly converts to 1 death per 5,000 individuals. Assuming a population of 5 million individuals within the 50 mile radius, 1,000 deaths can be projected. But, the Petition fails to acknowledge a key piece of information – the

[92] PRM at 21–22.

[93] *See* NUCLEAR REGULATORY COMMISSION, STATE-OF-THE-ART REACTOR CONSEQUENCE ANALYSES PROJECT VOLUME 1: PEACH BOTTOM INTEGRATED ANALYSIS, NUREG/CR-7110 at 213 (Jan. 2012) [hereinafter "SOARCA Peach Bottom"].

[94] *See id.*

$1.9x10^{-4}$ estimate is conditional on the event in question actually occurring. This event – an unmitigated, short term station blackout without RCIC blackstart – has an estimated frequency of $3x10^{-7}$ per reactor year.[95] Consideration of this important piece of information yields a latent cancer fatality risk per reactor year of $5.6x10^{-11}$. This information is included on the very same page of NUREG/CR-7110 Vol. 1 (January 2012) as the conditional risk figures that were apparently the basis for the 1,000 cancer death statement included in the Petition.[96] Discussions of "risk" that do not include consideration of the probability or likelihood of the event in question are incomplete and potentially misleading.

ii. SOARCA Represents a "Best Case Scenario"

The Petition seems to assert that the STSBO scenario described above represents "essentially the best case scenario." This assertion is misguided. Although the SOARCA study does represent a best estimate methodology, the unmitigated, STSBO without RCIC blackstart is by no stretch of the imagination a "best case scenario." Rather, the "best case" for the accident sequences examined in SOARCA would be successful mitigation of the station blackout, resulting in no core damage.

iii. Latent Cancer Death Estimates Based on Evacuation Radius of 20 Miles

The Petition asserts that the estimates of latent cancer deaths were "largely" based on an assumed 20 mile evacuation radius. To the contrary, the base case for the unmitigated, STSBO without RCIC blackstart – which yielded the $5.6x10^{-11}$ risk number cited above – assumed a 10-mile evacuation.[97] Further, the SOARCA included a sensitivity analysis examining the effect of expanded evacuations out to 16 and 20 mile distances, as well as delayed evacuation for the 10 mile plume exposure EPZ. Those analyses did not reveal significant changes in the risk of latent cancer deaths for the populations in question.[98]

iv. Experience at Fukushima Trumps SOARCA

The Petition also attempts to discredit the SOARCA analysis, stating: "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

---

[95] *See id.*

[96] *See id.* Table 7.7.

[97] *See* SOARCA Peach Bottom, at 216 Table 7-8.

[98] *Id.* Risk of latent cancer fatalities per reactor year remained on the order of $1x10^{-11}$ to $1x10^{-10}$, for all sensitivity cases.

scenarios."[99] The comparison of the Fukushima Accident to the SOARCA analysis included in the NRC's brochure summarizing the results of the SOARCA study reaches a different conclusion. Though obviously limited by the information available at the time the Brochure was issued, the NRC staff was able draw the following conclusions regarding the continued validity of the SOARCA analysis in light of Fukushima:

> As the NRC learned more about the damage to plant safety functions was [sic] gathered over the weeks and months following these events [at Fukushima], many similarities became apparent between SOARCA's calculated damage progression in the Peach Bottom SBO accident scenarios and the progression of events at Fukushima. These similarities include the following:
>
> - The sequence and timing of events that followed the loss of core cooling, including the start of core damage and radioactive material release from the fuel,
> - Challenges to containment integrity from the loss of fuel heat removal and the accumulation of hydrogen generated during fuel damage within the reactor vessel, and
> - The destructive effects of hydrogen combustion in the reactor building.
>
> Some notable differences were also obvious between the events that unfolded at Fukushima and the Peach Bottom LTSBO scenario studied in the SOARCA project. These differences, for example the use and timing of certain safety systems, led the NRC staff to take a closer look at the models used and assumptions made in the LTSBO analyses. SOARCA analysis results were qualitatively compared to the preliminary events and information available in the evaluation of the Fukushima Dai-ichi accident. SOARCA's conclusions remain valid in light of information currently available from the events that unfolded at Fukushima.[100]

Thus, contrary to the Petition's claim, the events at Fukushima do not "trump" the NRC's SOARCA analysis. Rather, Fukushima provides operating experience, against which analytical examination of severe accidents can be compared. Such comparisons must, however, carefully examine the relevance of international operating experience given the important differences in areas like plant operation, government regulation, and industry practices. The Petition asks the

[99] PRM, at 22.

[100] NUCLEAR REGULATORY COMMISSION, MODELING POTENTIAL REACTOR ACCIDENT CONSEQUENCES, STATE OF THE ART REACTOR CONSEQUENCES ANALYSES: USING DECADES OF RESEARCH AND EXPERIENCE TO MODEL ACCIDENT PROGRESSION, MITIGATION, EMERGENCY RESPONSE, AND HEALTH EFFECTS, at 14 (Jan. 2012) (emphasis added).

NRC to abandon such careful consideration and simply assume that the accident progression that occurred at Fukushima will occur at nuclear power plants located across the United States. Instead, the NRC must continue to carefully examine the operating experience provided by the accident at Fukushima, both to gauge the adequacy of its analytical work in this area and, where justified, to modify the regulatory framework to provide additional protection of public health and safety.

IV. Conclusion.

As discussed in detail above, the petition for rulemaking should be denied because: (1) the NRC's existing Emergency Planning Zones are based on conservative analysis of a wide range of severe accident consequences and continue to provide assurance that adequate protective measures can and will be taken in the event of an emergency; (2) the NRC's existing Emergency Planning Zones are large enough to facilitate protective actions over larger areas, if necessary; and (3) the Petition provides no new information that undermines the current planning basis or warrants a change to the size of the existing Emergency Planning Zones.