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

In the Matter of	)	
AP1000 Design Certification Amendment	)	NRC-2010-0131
10 CFR Part 52	)	RIN 3150-A18

PETITION TO SUSPEND AP1000 DESIGN CERTIFICATION RULEMAKING PENDING EVALUATION OF FUKUSHIMA ACCIDENT IMPLICATIONS ON DESIGN AND OPERATIONAL PROCEDURES AND REQUEST FOR EXPEDITED CONSIDERATION

I. INTRODUCTION

Petitioners, the AP1000 Oversight Group, Bellefonte Efficiency and Sustainability Team, Blue Ridge Environmental Defense League, Citizens Allied for Safe Energy, Friends of the Earth, Georgia Women's Action for New Directions, Green Party of Florida, Mothers Against Tennessee River Radiation, North Carolina Waste Awareness and Reduction Network, Nuclear Information and Resource Service, Nuclear Watch South, South Carolina Chapter - Sierra Club, and Southern Alliance for Clean Energy, hereby petition the Commissioners of the U.S. Nuclear Regulatory Commission ("NRC" or "Commission") to immediately suspend the AP1000 design certification rulemaking, which was noticed on February 24, 2011, at 76 Fed. Reg. 10,269. Petitioners request expedited consideration because the comment period is due to expire on May 10, 2011, which is just five weeks from today.

The AP1000 design approval process should be suspended while the NRC investigates the implications of the ongoing catastrophic accident in Fukushima, Japan, and decides what "lessons learned" must be incorporated into the AP1000 design and operational procedures to ensure that they do not pose an undue risk to public health and safety or unacceptable

environmental risks. The implications that must be studied cover a wide spectrum of regulatory issues, including, but not limited to, adequacy of backup measures for loss of offsite power, emergency core cooling, spent fuel storage risks, sufficiency of emergency planning and adequacy of containment and shield structures. It is apparent that while little is known definitively about the cause and impacts of what occurred at Fukushima, many aspects of the accident have grave consequences for U.S. nuclear plants, including the AP1000 reactors.

At a minimum, the Commission's study of the lessons learned from the Fukushima accident should contain the elements of the Lessons Learned study conducted by the Commissioners in the aftermath of the 1979 Three Mile Island ("TMI") accident. Setting the precedent for a full review and suspending actions, the Commission in that case, as well as an independent Presidential Commission and several NRC technical panels, spent a year and a half studying the regulatory implications of the accident and included an opportunity for comment on its evaluation and the proposed regulatory reforms that emerged from that evaluation. *See Statement of Policy: Further Guidance for Power Reactor Operating Licenses*, CLI-80-42, 12 NRC 654 (1980), describing the NRC's decision to suspend all licensing activities while the accident was being investigated. ATTACHMENT 1.[1] That decision and the NRC's Backgrounder on the Three Mile Island Accident demonstrates the careful and comprehensive manner by which the Commission investigated the accident and made regulatory changes and recommendations to make existing and proposed reactors safer. ATTACHMENT 2.

Petitioners respectfully submit that the Commission has both the legal authority and the duty to grant the above-requested relief under the Atomic Energy Act ("AEA") and the National Environmental Policy Act ("NEPA"). The Commission may not license any new reactor if it would pose an undue risk to public health and safety or the common defense and security, or if it

[1] A list of attachments and their citations is included at the end of this Petition.

poses significant environmental risks that have not been evaluated in an environmental impact statement ("EIS"). Although the Fukushima accident is not yet well understood, it has already presented the Commission with significant new information demonstrating potentially serious deficiencies in both its regulatory program under the AEA and its assessment of environmental risks under NEPA. Further review will yield further new information.

Therefore, the Commission should exercise its supervisory authority to order the immediate suspension of any AP1000-related rulemaking while it conducts a thorough and open investigation of the implications of the Fukushima accident. That investigation should lead to a safety and environmental evaluation of all aspects of the AP1000 design and operational procedures, with appropriate opportunities for public participation.[2]

II. DESCRIPTION OF PETITIONERS

The Petitioners are primarily organizations that have petitioned to intervene and have standing, because their members live within fifty miles, to bring appeals of combined construction permit and operating license ("COL") hearings for new reactors that use the AP1000 design: Vogtle Units 3 and 4 (Docket Nos. 52-025-COL and 52-026-COL), Bellefonte Units 3 and 4 (Docket Nos. 52-014-COL and 52-015-COL), Levy County Units 1 and 2 (Docket Nos. 52-029-COL and 52-030-COL), Shearon Harris Units 2 and 3 (Docket Nos. 52-022-COL and 52-023-COL), Turkey Point Units 6 and 7 (Docket Nos. 52-040-COL and 52-041-COL) and Virgil C. Summer Units 2 and 3 (Docket Nos. 52-027-COL and 52-028-COL) and William States Lee III Nuclear Station (Docket Nos. 52-018 and 52-019).

[2] This petition will also be submitted to the NRC Staff as a rulemaking comment, although the Petitioners reserve the right to file additional comments and legal challenges to the rulemaking.

Petitioners are also members of the AP1000 Oversight Group, a consortium of affected organizations that has previously submitted comments and testimony to the Commission, the Advisory Committee on Reactor Safeguards ("ACRS") and the NRC staff on the AP1000 reactor design and operational procedures.

III. FACTUAL BACKGROUND

A. AP1000 Design Certification Rulemaking

Westinghouse-Toshiba submitted its AP1000 DCD Revision 15 to the NRC in March 2002, and the Commission issued a final rule certifying the AP1000 design in January 2006. 10 C.F.R. Part 52, Appendix D. However, at the time of the rulemaking approval, a significant number of major Tier 1 items had not been completed by Westinghouse or reviewed by the NRC staff. By letter dated May 26, 2007, Westinghouse submitted Revision 16 of the AP1000 DCD. On September 22, 2008, Westinghouse again updated its application to amend the AP1000 DCD. The update, Revision 17, contained changes from those submitted in Revision 16. On December 1, 2010, Westinghouse submitted Revision 18 to the AP1000 DCD. As discussed at page 10,271 of the AP1000 rulemaking notice, the AP1000 DCD has been referenced in COL applications for several proposed reactors, each incorporating various revisions of the AP1000 DCD as reference documents:

Vogtle Units 3 and 4 – Rev. 18

Bellefonte Units 3 and 4 – Rev. 17

Levy County Units 1 and 2 – Rev. 16

Shearon Harris Units 2 and 3 – Rev. 17

Turkey Point Units 6 and 7 – Rev. 17

Virgil C. Summer Units 2 and 3 – Rev. 18

Despite the fact that the AP1000 DCD revisions have been referenced in individual COL applications ("COLAs"), the NRC Staff has repeatedly found serious deficiencies in the design requiring new revisions.

A notable example of a design issue that has not been resolved is the shield building. Several years after the initial AP1000 design was "certified" by the NRC on May 26, 2007, and after several revisions of the DCD, the Commission issued a rule, 10 CFR 50.150, requiring applicants to include an assessment of the reactor design to withstand the impact of a large, commercial aircraft. NRC staff issued a positive Advanced Final Safety Evaluation Report on December 28, 2010 approving the shield building. This was done despite the filing by Dr. John Ma, the NRC's lead structural engineer in charge of evaluating the shield building, of a formal "non-concurrence" of dissent against the Staff's approval of the shield building.[3] Dr. Ma, supported by other experts, expressed concerns about the brittleness of the shield building and concluded that it could fail if struck by a natural or manmade catastrophe. Among Dr. Ma's concerns were:

a. The AP1000 shield building employed a new material never before used at nuclear power plants, comprising 60% of the shield building, failed critical physical tests and demonstrated that it was too brittle to withstand a natural or manmade impacts. In Dr. Ma's words, impacts could cause the building to shatter "like a glass cup."

[3] *Dissenting View on AP1000 Shield Building Safety Evaluation Report With Respect to the Acceptance of Brittle Structural Module to be Used for the Cylindrical Shield Building Wall* (Redacted Version of Dr. John S. Ma's Non-concurrence, November 4, 2010) and responses by other staff was packaged in ADAMS document ML103370648, December 13, 2010. Other concerns may have been raised in the unredacted version.

b. Westinghouse substituted reconstituted computer simulations to demonstrate the building's "robustness" rather than appropriate physical tests. Dr. Ma noted that Westinghouse had failed these physical tests earlier.

c. Westinghouse uses a "mathematical concept" that underestimates the force of earthquakes on the AP1000, according to Dr. Ma. As he wrote, "the design will be grossly inadequate if the 'correct' and actual earthquake analyses were used."

d. The building design fails to meet American Concrete Institute standards that are otherwise endorsed by the NRC.

In its related January 24, 2011 report on safety aspects of the Vogtle COL (which has been designated by the NRC as the "reference" project for the AP1000 design), the ACRS also indicated that the DCD was not ready for review, noting "the staff should review with us the changes in design or commitments that are not yet incorporated in the COLA or referenced in the Design Control Document (DCD), which significantly deviate from those presented during our review." ATTACHMENT 3. The ACRS also stated it expected a new revision to the AP1000 DCD subsequent to or during the rulemaking period.

Despite Dr. Ma's non-concurrence and the ACRS' reservations, the Staff asked the Commission to approve publication of the rule in the Federal Register. Even at that point, however, Westinghouse-Toshiba was in the process of preparing Revision 19. Aware of the weaknesses and potential revisions to the design, NRC Chairman Jaczko said in his comments on the proposed rule that "it is clear from the staff's safety evaluation that one of the challenges they faced in reviewing the AP1000 shield building was the lack of a directly acceptable design and consensus standard." ATTACHMENT 4. In spite of his concerns, however, the Commission went ahead and published the proposed rule on February 24, 2011.

Despite the large volume of the application and the significant number of revisions it had undergone, the NRC offered an opportunity for public comment that was only 75 days long or until May 10, 2011. The 75-day comment period was reduced from a one-year period that the NRC had promised in its earlier versions of it schedule for new reactor licensing applications. The proposed rule then specifies that NRC Staff will complete its review of public comments within the extraordinarily short period of 30 days.

B. Fukushima Reactor Accident

As a brief summary of news reports, there are six nuclear reactors at the Fukushima Daiichi nuclear power site, located near the town of Okama in the Fukushima Prefecture, with another four reactors at another site nearby, Fukushima Daini. The sites are on the eastern Japanese coast about 170 miles north of Tokyo. All of these GE-Hitachi boiling water reactors ("BWRs") are owned and operated by Tokyo Electric Power Company ("TEPCO"). The earthquake and ensuing tsunami of March 11, 2011 appears to be causing the greatest problems for the Fukushima Daiichi reactors and spent fuel pools.

Specifically, the Daiichi reactors lost backup power and emergency cooling capability; hydrogen explosions caused serious damage to the crippled plants; reactor cores and spent fuel pools overheated; and considerable radiation has been released. The use of plutonium MOX fuel in Fukushima Unit 3 may have contributed to high radiation levels that have hindered adequate control of the reactors and possibly to plutonium release into the environment.

Radiation effects on workers at the plants, emergency workers and the surrounding population remain largely unquantified. Over the days following the accident, evacuation zones were increased in size and it became apparent that devastation of homes and buildings from the

earthquake and tsunami, and the lack of electricity and necessities, have compounded the public health and safety problems of emergency planning efforts.

IV. THE COMMISSION MUST EXERCISE ITS SUPERVISORY JURISDICTION TO ENSURE THAT REACTORS OF THE AP000 DESIGN DO NOT POSE UNACCEPTABLE HEALTH, PUBLIC SAFETY, OR ENVIRONMENAL RISKS.

This petition invokes the Commission's supervisory authority under the AEA to oversee all aspects of the regulatory and licensing process and its overriding responsibility for assuring public health and safety in the operation of nuclear power facilities." *Consolidated Edison Co. of N.Y., Inc.* (Indian Point, Units 1, 2 and 3), CLI-75-8, 2 NRC 173 (1975). *See also* 42 U.S.C. §§ 2233(d), 2236(a), 2237. We also invoke the Commission's responsibility to ensure that no reactor is licensed if it would pose undue risk to public health and safety or the common defense and security.

One of the AEA's primary mandates is to prohibit the Commission from issuing a license to operate a nuclear power plant if it would be "inimical to the common defense and security or to the health and safety of the public." 42 U.S.C. §2133(d). Since the agency's inception, public safety is "the first, last, and a permanent consideration in any decision on the issuance of a construction permit or a license to ope rate a nuclear facility." Petition for Emergency and Remedial Action, CLI-78-6, 7 NRC 400, 404 (1978) (citing *Power Reactor Development Corp. v. International Union of Electrical Radio and Machine Workers*, 367 U.S. 396, 402 (1961)). Therefore, under the AEA, the fundamental goal of the licensing process is to analyze and evaluate the ability of the plant to operate in compliance with safety rules, and protect against "anticipated" accidents and design basis accidents.

Independent of the AEA, NEPA forbids the Commission from issuing a reactor license unless and until you have taken a "hard look" at the environmental impacts of that licensing action. *Baltimore Gas & Electric v. Natural Resources Defense Council,* 462 U.S, 87, 97 (1983). Even where the impacts of a proposed licensing action have been studied and reported in an EIS, NEPA requires you to supplement that EIS by considering the implications of any new information that could significantly affect its outcome. 10 C.F.R. § 51.92. *See also Marsh v. Oregon Natural Resources Council,* 490 U.S. 360 (1989). Under NEPA, the NRC must also evaluate "reasonably foreseeable" impacts which have "catastrophic consequences, even if their probability of occurrence is low." 40 C.F.R. § 1502.22(b)(1). In licensing hearings, the Commission has required that the EIS address the probability of severe accidents and how to prevent them if at all possible, or mitigate them if they cannot be prevented. *See, e.g., Vermont Yankee Nuclear Power Corp.* (Vermont Yankee Nuclear Power Station), CLI-90-4, 31 NRC 333, 334-35 (1990); *Carolina Power & Light Co.* (Shearon Harris Nuclear Power Plant), CLI-01-11, 53 NRC 370, 386-87 (2001).

In numerous aspects related to the safety and environmental risks posed by the AP1000 design and reactors using that design, the Fukushima accident is now providing new information that must be considered by the NRC before reactors of that design may be certified. Accidents with catastrophic consequences that were once considered to be of extremely low probability have occurred; now the ramifications of those accidents must be dealt with and resolved safely before new designs are reviewed and certified, and new reactors are licensed.

This petition is properly brought before the Commission rather than the NRC Staff, because only the Commission has the authority to order the kind of comprehensive study and suspension of rulemaking activity sought by Petitioners herein. The Energy Reorganization Act

of 1974, 42 U.S.C. 2011 and elsewhere, broadly provides the Commission with responsibility for the licensing and regulation of the construction and operation of nuclear reactors including the review of safety and safeguards at those facilities. As evident in the process to develop the TMI lessons learned, only the Commission has the authority to order the investigations and regulatory actions necessary to review and respond appropriately to all of the ramifications of the Fukushima accident.

V. SIGNIFICANT IMPLICATIONS OF THE FUKUSHIMA ACCIDENT ON THE AP1000 DESIGN PROVIDE GROUNDS FOR SUSPENSION OF PROCEEDINGS AND COMMENCEMENT OF AN INVESTIGATION.

Petitioners understand the fundamental differences between AP1000 reactors and the GE-Hitachi BWRs used at Fukushima and many locations in the U.S. However, the Fukushima accident has several direct implications with respect to the AP1000 design and operational procedures and the proposed reactors that use the AP1000 design. Some of the issues may be design-based and others may be individual plant-based, but given the current flaws in the certification process, those issues are intertwined. And given the Commission's overarching goal of standardizing new reactors, it is appropriate to begin the inquiry by determining what issues may be addressed generically. Only the Commission can postpone both the certification process and the licensing process until the Fukushima lessons learned are investigated and resolved.

While the debate over lessons to be learned from Japan will surely extend for months, if not years, factors that will have great bearing on the proposed AP1000 reactors include the availability of off-site power, the development and implementation of emergency plans, emergency cooling of the reactor core and spent fuel pools, the integrity of the reactor

containment, the need for a far more robust structure around the spent fuel pools, the ability of workers to function in a radioactive environment and the need for rapid operator response. Each of those factors are compounded by the design challenges already identified with the AP1000 reactors.

During the past year Westinghouse-Toshiba and others within the nuclear industry have made clear their wish that the DCD process be moved to completion. Based on recent events, it seems that the only reason not to carefully reassess the AP1000 design, and in particular after the Fukushima accident, would be due to the industry's hope to obtain financing for current projects. With so many U.S. nuclear projects being sidelined over the past two years, the industry is eager to convey to decision makers that U.S. nuclear power can be safely constructed and safely operated.

While Petitioners do not have access to the Japanese plants to investigate causes or effects, nor do they have access to evaluations carried out by TEPCO and others, news reports about the Fukushima accident have already pointed to several real-world issues with the AP1000 design, and other issues certainly may arise upon further investigation. Three of the more important center on the loss of on-site and off-site power, the need to review all seismic and natural disaster standards, and the need to plan for and implement emergency evacuations out to a minimum of fifty miles.[4] The lessons learned from Fukushima on these will need to be incorporated in design and operational procedures, as well as accident risk assessment and environmental impacts. Regardless of whether the accident is considered a design-basis threat or beyond a design-basis threat, public health and safety simply need to be protected. The Commission cannot resolve this matter until it has a better understanding of the precise problems

[4] The Commission announced a full review of earthquake impacts on plant performance on March 19, 2011. www.nrc.gov/reading-rm/doc-collections/news/2011/11-053.pdf

and conditions that faced the operators at the Fukushima reactors, and what that means for U.S. reactors.

The following additional issues are just some of the major concerns with the AP1000 design and operational procedures, showing how they may interact with preliminary Fukushima lessons learned. In addition, it seems likely that as yet unidentified, or previously approved, AP1000 design considerations now require additional scrutiny based on the lessons of the past few weeks.

1. SHIELD BUILDING

Incorporating lessons learned from the Fukushima accident will require a new assessment of the integrity of the shield building and in all likelihood necessitate a significant revision of the AP1000 DCD. The shield building is among the many significant component and system changes that occurred during the Rev. 18 review period, and yet significant questions remain about the ability of the revised shield building to withstand similar pressures and stresses placed on the Fukushima reactors. Although the Fukushima reactor buildings are of a different design, reports suggest that internal pressures resulted in collapse of several reactor buildings, forces that could be exceeded by external impacts caused by deliberate acts of malice.

The integrity of the AP1000 shield building remains unresolved long after the NRC staff signed off on Westinghouse-Toshiba's report that the AP1000 design complied with the aircraft impact rule, 10 CFR 50.150, and its structural requirements for protecting the reactor and critical safety equipment against aircraft impact, as well as stress from earthquakes, winds and the weight of the emergency cooling water tank located on top of the building. Instead of requiring Westinghouse-Toshiba to correct the deficiencies in the design, the NRC has apparently allowed

industry's increasing pressure for DCD approval to cause it to bypass safety-based regulations and ignore the grave concerns of one of the agency's longest serving technical experts.

As discussed above, Dr. John Ma, the NRC's lead structural engineer in charge of evaluating the shield building, has voiced very serious criticisms of the shield building, including the concern that impacts could cause the building to shatter "like a glass cup." He also said Westinghouse-Toshiba underestimates the force of earthquakes. As he wrote, "the design will be grossly inadequate if the 'correct' and actual earthquake analyses were used." He also concluded that the AP1000 building design fails to meet American Concrete Institute standards that are otherwise endorsed by the NRC. In light of the Fukushima accident, these concerns are very serious indeed and must be investigated before the AP1000 rulemaking can proceed.

On March 7, 2011 Rep. Edward J. Markey wrote to Chairman Jaczko regarding Dr. Ma's concerns and raised questions about why the NRC approved the AP1000 design without having resolved several fundamental contradictions between the NRC's position and safety standards. ATTACHMENT 5.[5] Rep. Markey's letter lays out the procedures leading up to the Ma Non-concurrence and the subsequent Staff response, and concludes that the NRC Staff appears to have acknowledged that addressing Dr. Ma's concerns would improve the shield building design, but then "chose to abdicate responsibility."

As Chairman Jaczko noted in his comments on the DCD rulemaking regarding the concrete standard, "If this type of construction is to be continued in the United States for facilities regulated by the NRC, it would be advantageous to have such a detailed standard

[5] The Petitioners join Rep. Markey in calling on the NRC to immediately publish an unredacted version of the Non-concurrence Statement and related documents.

developed independent of any specific design approval."[6] ATTACHMENT 4. The Chairman also indicated the Staff believes the module "is strong enough" to be used in certain regions of the U.S. where "forces ... would be much lower than the loads that would lead to failure of the module." That not only seems to represent a narrow sliver of regulatory assurance, it also indicates that the AP1000 could not be licensed in parts of the U.S. with seismic histories of some undefined magnitude and longevity.

Chairman Jaczko's assessment of the Staff findings refers only to earthquake forces, ignoring hurricanes and manmade forces the shield building is also required to protect against. That apparent exclusion, along with Dr. Ma's overall concerns, are of particular importance given that the NRC's aircraft impact rule in essence exempts the AP1000 from of the risk of an airliner crash into the shield building. The rule simply requires Westinghouse to conduct an in-house assessment but does not require that it be submitted for NRC or public scrutiny.

2. EMERGENCY COOLING

The power failure caused by the earthquake and resulting tsunami resulted in one of the most serious conditions that can affect a nuclear plant—a "station blackout"—during which off-site power and on-site emergency alternating current (AC) power is lost. Nuclear plants generally need AC power to operate the motors, valves and instruments that control the systems that provide cooling water to the radioactive core. If all AC power is lost, the options to cool the core are limited. Under the present DCD rulemaking plan, with the intention to issue a COL at Vogtle immediately upon the promulgation of the rule, the result would be to begin construction without resolving fundamental issues with the AP1000 design or the results of lessons learned

[6] Chairman Jaczko's Comments on SECY-11-0002 "Proposed Rule: AP1000 Design Certification Amendment," January 31, 2010. ML110400453 (February 9, 2011)

from Fukushima regarding the ability to provide adequate water or other options to cool the reactor cores.

Of direct concern is that water tanks on the top of the proposed AP1000 reactors could be lost or water recirculation pumps hindered by severe earthquakes, tornadoes, plane crashes or terrorist attacks. Recent communications between Westinghouse-Toshiba and the ACRS regarding emergency cooling indicate a continuing dispute over the purported benefits of the AP1000's "passive cooling" compared to active, safety-grade high injection pumps used in nuclear power plants in the U.S. Those communications are replete with clear indications of future design changes and years of bickering over compliance and marginalizing safety. The importance of this problem is clear, as noted in the above-mentioned ACRS report on the proposed Vogtle reactor, January 24, 2011, at page 6:

> The DCD PRA [Probabilistic Risk Assessment] acknowledges that core damage frequency would increase by a factor of 6,000 if failures of containment recirculation and in-containment refueling water storage tank screens occur, but uses only a "conservative screen failure rate, rather than a model that would account for debris."

ATTACHMENT 3. In short, Westinghouse-Toshiba sought more relaxed standards at the expense of safety.

The NRC addressed the some of the problems with the water recirculation cooling system on December 20, 2011. The ACRS noted in a December 20, 2011, report on containment cleanliness that

> the gravity head available in the AP1000 for driving flow through a core in which debris has accumulated is limited. Both of these factors add to the difficulties in determining the adequacy of AP1000 LTC [long term cooling].

ATTACHMENT 6. Then in its February 23, 2011 letter, Westinghouse-Toshiba argued that it is not legally required to comply with the ACRS recommendation of December 20, 2010, that

standards for management of debris within containment would be included in the Technical Specifications for the DCD Revision 19. ATTACHMENT 7. The dispute is in part over when and whether additional testing would occur involving the potential clogging of two sets of filters crucial to maintaining emergency cooling, and the prospect of reliance on a later and speculative regulatory compliance strategy based on an inspection program. If approved by the NRC, this approach would leave compliance in the "generic issue" regulatory morass that has confounded compliance at scores of operating nuclear power plants since the 1990s regarding that same critical issue of recirculating cooling water during a Loss of Coolant Accident.[7]

Concerns about systems vital to long term core cooling go well beyond the dispute over debris limits and technical specifications, and the Fukushima accident raises further questions about recirculation failures. The AP1000 design basis accident is predicated on preparations for control of filter-blocking debris originating below the containment flood line, while early images from Fukushima make clear that large amounts of structural debris from high in the building can fall toward the floor, thus potentially clogging recirculation filters. Much of this risk is common among various plant designs, but is even more problematic with passive, rather than safety grade high injection recirculation systems. It should be noted that the ACRS concerns reflect primarily the routine cleanliness of the containment region, not the collapse of the reactor buildings such as those at Fukushima, which for the AP1000 could cause massive amounts of debris to impede emergency water recirculation, thus the cooling of heated core and fuel assemblies.

[7] Union of Concerned Scientists, *Regulatory Malpractice: NRC's Handling of the PWR Containment Sump Problem,* 2003. www.ucsusa.org/nuclear_power/nuclear_power_risk/safety/regulatory-malpractice-nrcs.html

3. SPENT FUEL STORAGE

Much of the attention at the Fukushima accident relates to the apparent release of radiation due to loss of cooling water in the spent fuel pools resulting in excess heat and fires. Upcoming lessons from Fukushima regarding spent fuel cooling will, with all certainty, call for significant changes to AP1000 DCD, such as a robust containment structure for spent fuel storage, far lower storage density, adequate water supplies for cooling, and back-up power to maintain pumps needed for maintaining the flow of cooling water.

All operating nuclear power plants originally used low density spent fuel storage, but the lack of a national solution for long-term storage of spent fuel caused plants owners over the years to reconfigure cooling pools to allow more spent fuel assemblies into those pools. Among the many areas where licensee-requested revisions to the AP1000 design have been made by Westinghouse-Toshiba as a means to lower overall cost estimates, one of the most inconceivable was increasing the proposed storage density in the spent fuel pools. In Revision 15 of the DCD, Section 9.1.2.1, the spent fuel racks allowed for 619 fuel assemblies, while Revision 18 has increased the density of the racks to 884 assemblies, an increase of 42.8%. The higher density fuel pools require boron shields between stored assemblies to reduce the risks of criticality. Those shields, however, also exacerbate the build-up of heat if cooling flow is lost.

Increasing the density of fuel storage certainly cut many millions of dollars in cost, but reverting to higher density racking of assemblies completed defies the National Academy of Sciences ("NAS") warning in 2005, that such re-racking introduced the likelihood that even partial loss of cooling water could cause an exothermic reaction resulting in degradation and possible fire of spent fuel assemblies and leading to release of potentially large inventories of

cesium-137 and other radionuclides.[8] The NAS committee found that an attack or accident which partially or completely drains a plant's spent fuel pool could cause a high-temperature fire and release of large quantities of radioactive material into the environment. This is apparently exactly what is occurring at the Fukushima reactors.

4. CONTAINMENT OF REACTOR UNITS.

The Fukushima accident demonstrates that the integrity of the containment structures is of fundamental importance. The Fukushima lessons learned will show that rather than backsliding because of cost considerations, a robust containment is necessary. Even after the roofs of the secondary containment buildings were blown off by hydrogen explosions, the primary containment structure at each reactor was intended as the last defense against major radiation releases. A review of the effectiveness of the reactor containments, especially if radiation was released through cracks in the containment structure, could have direct implications for containment thickness and material, as well as coating and inspection protocols. The high temperatures already documented at the Fukushima reactors may further impact the effectiveness of the AP1000 design, causing containment degradation, widespread cracks or even major breaches of the containment.

The AP1000 containment is structurally weaker than those at most currently operating nuclear power plants, in large part because of its alleged "passive design." The Staff's acceptance of the AP1000 containment, lack of hydrogen igniters, and lack of safety grade equipment throughout the reactor reverses decades of NRC and industry advocacy for "defense in depth" and requirements for robust containment. Unlike the containments at Pressurized

[8] National Academy of Sciences, *Spent Fuel Stored in Pools at Some U.S. Nuclear Power Plants Potentially at Risk From Terrorist Attacks; Prompt Measures Needed to Reduce Vulnerabilities*, April 6, 2005. www.nap.edu/catalog.php?record_id=11263

Water Reactors ("PWRs"), the AP1000 design does not have a robust drywell containment. It is evident that instead of having a design that is optimized to provide protection to public health and safety, the AP1000 design has multiple problems that have eluded Westinghouse-Toshiba and Staff resolution.

Last year, the AP1000 Oversight Group submitted two reports by Fairewinds Associates and provided testimony to the ACRS on design flaws with the containment systems in the proposed AP1000 reactors.[9] The fundamental concern expressed in the reports and presentation to the ACRS is that in instances where there were cracks or through holes in the containment structure, excessive amounts of radiation would be released during loss of cooling accidents, as pressurized steam would be forced through the hole and then vented directly into the atmosphere, without any filtering.[10]

In its review of containment liner corrosion, NRC staff conducted a preliminary investigation of containment cracks in several U.S. reactors and found the currently followed coating and inspection regimens may not be sufficient.[11] The information notice reviewed containment flaws at the Beaver Valley, Brunswick and Salem reactors, noting corrosion and through holes undetected by routine inspection. However, a complete investigation of the related containment problems at U.S. reactors has not been conducted although it should be apparent that containment integrity will be shown to be of paramount importance in the Fukushima lessons learned.

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[9] Fairewinds Associates, *Post Accident AP1000 Containment Leakage: An Unreviewed Safety Issue*, April 7, 2010, attached to Petition to Initiate Special Investigation on Significant AP1000 Design Defect by the AP1000 Oversight Groups, April 21, 2010; and Fairewinds Associates, *Nuclear Containment Failures: Ramifications for the AP1000 Containment Design*, December 21, 2010, submitted to ACRS on December 21, 2010. Both reports are available at www.fairewinds.com/reports and will be submitted into the rulemaking record separately.

[10] A related contention regarding the adequacy of the coating and inspection protocols at the Vogtle reactor was raised as a contention in the review of its COLA. Docket Nos. 52-025 COL and 52-026 COL.

[11] Containment Liner Corrosion, NRC Information Notice 2010-12, June 18, 2010. ML100640449.

VI. EVEN IF THE COMMISSION DOES NOT SUSPEND THE RULEMAKING PROCEEDING AND COMMENCE AN INVESTIGATION, 75 DAYS IS NOT A SUFFICIENT AMOUNT OF TIME TO COMMENT ON THE AP1000 DCD.

As discussed above in Section III.A, the time frame provided for comments on the complex and continuing revisions of the AP1000 design is extraordinarily brief under any circumstances. The Petitioners believe the rulemaking period was reduced from its originally planned one year because of pressure on the Commission to license reactors, even though delays from Westinghouse-Toshiba in providing information for the NRC staff review have contributed to the design certification amendment being extended by several years. In our opinion, several unresolved design and operational issues have not been given adequate review, and certainly have not been resolved safely. As shown by the ACRS correspondence cited above and the opinion of Dr. Ma, even prior to the need to fully investigate the ramifications of the Fukushima accident on the AP1000 reactors, their design and operational procedures was so deficient that it should have been sent back for further review.

The Fukushima accident complicates the AP1000 review for all parties, not least because technical experts across the nation and world are devoting countless hours toward minimizing damage and analyzing the unprecedented combination of failures involving various configurations of reactors and spent fuel storage pools. Governments around the world and organizations, such as the World Association of Nuclear Operators, have begun investigating the impacts of the Fukushima accident.

In addition, it is widely reported that Japan's manufacturing infrastructure has been seriously disrupted by the earthquake, tsunami and the evacuation from the region surrounding Fukushima. At this time it is not clear the extent to which Westinghouse-Toshiba's facilities

have been disrupted, but it seems likely there could be production train uncertainties for the multiple components and technical expertise involved in nuclear design and construction in several countries. Since China leads in construction of the AP1000, U.S. orders for those services and equipment may not be prioritized as Toshiba resumes ordinary operations at some point in the future.

Because of the accident, most of the experts on nuclear power plants have been deluged with news reports and request for information on what that accident means, and have had little opportunity to review the 173 documents, comprising thousands of pages, in the DCD Revision 18 and to compare them to earlier versions of the AP1000 design. And, as the NRC itself has directed significant resources to the Fukushima situation and has placed a renewed focused on safety issues at operating US plants, it is unclear how this redirection of Commission resources and attention will impact the AP1000 rulemaking and 30-day review of public comments.[12]

VII. DELAY OF THE AP1000 RULEMAKING IS NOT ONLY NECESSARY FOR COMPLIANCE WITH FEDERAL LAW BUT WILL CONTRIBUTE TO THE STABILITY OF THE LICENSING PROCESS ON THE FEDERAL AND STATE LEVELS.

In addition to the argument above that the Commission has a legal obligation to address new information before proceeding with a rulemaking that will establish a significant part of the basis for licensing new reactors with the AP1000 design, the precedent set by the thorough review of the TMI accident should be followed. After that accident, the lessons learned showed a number of essential changes to reactor design and operational procedures. Similarly, Petitioners believe that a "hard look" at the Fukushima accident will in all likelihood lead to

[12] See for example the NRC's announced review of the Fukushima accident , March 23, 2011, adjusting the NRC's schedule on a variety of matters. www.nrc.gov/reading-rm/doc-collections/news/2011/11-055.pdf

changes in the design and operation of the AP1000 reactors. The AP1000 reactor design and operational procedures have been through many reiterations over the past decade, and some of the revisions have been significant. But if a change in design or procedures s warranted to protect public health and safety, the Commission is required to make the change.

Unlike the early 1980's during the review of TMI accident, currently no COLs have been issued and no reactors have begun construction. As a result, suspending the rulemaking on the AP1000 design certification will be beneficial for the stability of the regulatory process. Allowing the rulemaking to proceed, and then issuing COLs prior to knowing what the final design will be, is clearly against the long-standing NRC policy to "design once, build many times." Petitioners acknowledge major changes may make the reactors more costly but it makes sense from a policy perspective to find out first what changes are needed, and then implement the changes at the design stage rather than begin construction and make even more costly changes during construction. Its better for all decision makers, agencies, customers, utilities and financial institutions to know what will be expected before construction rather than to face what could be significant cost overruns in the middle of a project.

The Commission's suspension or postponement of a project is not without precedent; the NRC's review of the Bellefonte reactors was suspended on September 29, 2010. The reviews of the Shearon Harris and Levy County reactors have been postponed as the proposed operating dates have been delayed. Many of the reactors on the schedule for new reactor licensing have been constantly delayed as has the overall schedule for the certification process. ATTACHMENT 8. Petitioners find it troublesome for the NRC to issue COLs for these plants on incomplete designs and operating procedures, especially since it appears likely that the design will have to be modified after assessment of the Fukushima accident.

VIII. CONCLUSION AND REQUEST FOR RELIEF

Given that the unresolved design problems with the AP1000 design and operational procedures, some of which are referenced above, and the unknown, but likely, lessons learned from the Fukushima reactors, will in all certainty require changes to the AP1000 design, the Petitioners pray they be given the following relief:

1. The Commission should immediately postpone the ongoing rulemaking on the AP1000 certification; and
2. The Commission should initiate a comprehensive review of the Fukushima accident to develop lessons learned for new reactor designs and the subsequent development and implementation of new regulatory safeguards to protect public health and safety.

Respectfully submitted, this the 6th day of April, 2011.

FOR THE PETITIONERS:

_____/s/jdr_____

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ATTACHMENTS

1. *Statement of Policy: Further Guidance for Power Reactor Operating Licenses*, CLI-80-42, 12 NRC 654 (1980)

2. NRC, Backgrounder on the Three Mile Island Accident, www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.html

3. ACRS, *Report on the safety aspects of the Southern Nuclear Operating Company combined license application for Vogtle Electric Generating Plant*, Units 3 and 4, January 24, 2011.

4. Letter to Chairman Jaczko from Rep. Markey, March 7, 2011

5. Letter from Westinghouse to NRC, "AP1000 Containment Cleanliness - DCD Markup for Rev. 19," February 23, 2011.

6. Commission Voting Record, SECY-11-0002, February 9, 2011

7. ACRS, Long-term core cooling for the Westinghouse AP1000 pressurized water reactor, December 20, 2011

8. NRC's schedule for review of new reactor licensing applications. Available at www.nrc.gov/reactors/new-reactors/new-licensing-files/new-rx-licensing-app-legend.pdf