Ayres Law Group

June 18, 2012

U.S. Nuclear Regulatory Commission
Office of Secretary of the Commission
Sixteenth Floor
One White Flint North
11555 Rockville Pike
Rockville, MD 20852
Attn: Rulemakings and Adjudications Staff
Washington, DC 20555-0001
hearingdocket@nrc.gov

Re: Request that NRC Open a Docket for the Ongoing Proceeding to Address Major Safety Issues with the Replacement Steam Generators at San Onofre Units 2 and 3

To Commissioners of the Nuclear Regulatory Commission:

Please accept the enclosed Petition to Intervene and Request for a Hearing and Application for Stay in the matter regarding the proceeding to address major safety issues with the replacement steam generators at San Onofre Units 2 and 3. We are filing these documents under docket numbers 50-361 and 50-362.

We requested, but were denied, an approval code to obtain the digital ID certificate necessary to file with the Commission's E-File system.[1] Thus, we are serving the documents via email (and hand delivery to the Office of the Secretary).

We request the Commission create a docket for the proceeding now underway, as described in the enclosed petition.

Regards,

Richard Ayres

Richard E. Ayres
Counsel to Friends of the Earth

Enclosures:
Application for Stay
Petition to Intervene and Request for Hearing

[1] Email from Rebecca Giitter, Office of the Secretary, NRC, to Jessica Olson, Ayres Law Group, *Re: Request for Approval Code-Request for additional information* (June 4, 2012).

Declaration of Arnold Gundersen
Curriculum Vitae of Arnold Gundersen
Declaration of Marcelin E. Keever
Declaration of Lyn Harris Hicks
Notice of Appearance
Certificate of Service

BEFORE THE UNITED STATES
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	Docket Nos. 50-361, 50-362
SOUTHERN CALIFORNIA EDISON COMPANY	)	
(San Onofre Nuclear Generating Station)	)	June 18, 2012

APPLICATION TO STAY ANY DECISION TO RESTART UNITS 2 OR 3 AT THE SAN ONOFRE NUCLEAR GENERATING STATION PENDING CONCLUSION OF THE PROCEEDINGS REGARDING CONSIDERATION OF THE SAFETY OF THE REPLACEMENT STEAM GENERATORS

Petitioner Friends of the Earth (FOE) applies to the Nuclear Regulatory Commission (NRC), pursuant to 10 C.F.R. § 2.342, for a stay of any authorization for restart of Units 2 or 3 at the San Onofre Nuclear Generation Station (San Onofre) pending the conclusion of a license amendment proceeding pursuant to 10 C.F.R. § 2.309 which examines, *inter alia*, the causes and remedies for excessive tube wear and tube rupture in the replacement steam generators at San Onofre.

To prevent any change in the status quo while the Commission considers this stay request, and considering the grave safety concerns surrounding the four replacement steam generators in the two units, FOE also hereby requests a temporary stay pursuant to 10 C.F.R. § 2.342(f) so that San Onofre Units 2 and 3 cannot be restarted until the Commission renders a decision on this Application for Stay. Given the expedited process for Commission decisions on motions for a stay, such a temporary stay should need to be in force for a very limited time.

I. Summary of Action to be Stayed

FOE requests that the NRC issue a stay of any decision authorizing restart of Units 2 or 3 at the San Onofre nuclear power station pending the final outcome of a proceeding, as provided for under 10 C.F.R. § 2.309, for amendment of San Onofre's operating license and including an

adjudicatory hearing to determine the causes of and remedies for the excessive tube wear and tube rupture in the replacement steam generators in Units 2 and 3. Under 10 C.F.R. § 50.59, the licensee, Southern California Edison Company (SCE), is under a continuing obligation to seek amendment of San Onofre's license, to account for replacing the facility's steam generators with significantly redesigned steam generators. The subsequent failure of the replacement steam generators only confirms the point that their design presents new safety risks outside of those taken into account in the Updated Final Safety Analysis Report (UFSAR) for the plant, thereby requiring amendment of the license.

Consequently, as FOE argues in the Petition filed concurrently with this stay request, San Onofre Units 2 and 3 cannot be restarted without an amendment of the license adopted under 10 C.F.R. § 50.90. Petitioner has requested that the Commission convene a public adjudicatory hearing, as provided in 10 C.F.R. §2.309, to which Petitioner requests admission as a party. In addition to the Commission's authority under section 2.309, Petitioner asks that the Commission invoke its inherent supervisory authority over agency proceedings, as it has done in the past, to consider this motion for a stay.[1]

A Confirmatory Action Letter (CAL) from the NRC staff to SCE on March 27, 2012 directed SCE to keep San Onofre Units 2 and 3 shut down until SCE has taken, and the NRC has reviewed, certain actions related to the investigation of the rapid tube degradation that was detected in both units and which caused a radioactive release in Unit 3. The CAL, however, does not require SCE to propose a license amendment, nor does it require a public adjudicatory

[1] *See In the Matters of Union Electric Co.* 2011 WL 4027741 (N.R.C.), 1 (Sept. 9, 2011) (citing *Private Fuel Storage*, CLI-01-26, 54 NRC 376; *Catawba/McGuire*, CLI-01-27, 54 NRC 385; *MOX*, CLI-01-28, 54 NRC 393; *Diablo Canyon*, CLI-02-23, 56 NRC 230. *See also AmerGen Energy Co., LLC* (Oyster Creek Nuclear Generating Station); *Entergy Nuclear Operations, Inc.* (Indian Point, Units 2 and 3); *Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station); *Entergy Nuclear Operations, Inc.* (Vermont Yankee Nuclear Power Station), CLI-08-23, 68 NRC 461, 484-85 (2008) (citing *Private Fuel Storage*, CLI-01-26, 54 NRC 376; *Diablo Canyon*, CLI-02-23, 56 NRC 230; *MOX*, CLI-01-28, 54 NRC 393) (considering petitions to suspend multiple license renewal proceedings in view of an Inspector General's report on the agency's license renewal process).

hearing process as called for by 10 C.F.R. § 2.309. Instead, the CAL merely restates SCE's description of the steam generator problems and the commitments SCE made as of March 23, 2012 to address the issues at Units 2 and 3; it does not show any independent analysis by the NRC, nor require anything of the licensee beyond the actions SCE volunteered.

A stay is necessary because the significant changes made in the replacement steam generators at San Onofre require: (1) a renewed safety analysis based on all relevant information necessary to understand and correct the failures of the replacement steam generators; and (2) an amendment to the license to account for the new safety analysis. A stay is also needed to allow time for a section 2.309 public adjudicatory hearing in which the safety concerns about the San Onofre replacement steam generators can be aired in an open and transparent process. Granting a stay would serve to preserve the current situation until the Commission has had time to consider the evidence adduced through the hearing process.

To maintain the status quo while the Commission considers this stay request, FOE also requests a temporary stay pursuant to 10 C.F.R. § 2.342(f) to prevent restart until the Commission decides this Application for Stay. This case involves extraordinary conditions warranting a temporary stay. NRC's order in the CAL to keep San Onofre Units 2 and 3 shut down until its investigation is completed is evidence of the seriousness of the problems at San Onofre. Given that San Onofre Units 2 and 3 are already shut down indefinitely, a temporary stay only formalizes what the Commission has ordered previously and assures that the Commission will have the time it needs to decide Petitioner's Application for Stay.

II. Grounds for Stay of the Decision Whether to Restart San Onofre Units 2 and 3

According to 10 C.F.R. § 2.342, the Commission will base its decision to grant a stay application on the following four criteria: (1) whether the moving party has made a strong

showing that it is likely to prevail on the merits; (2) whether the party will be irreparably injured unless a stay is granted; (3) whether the granting of a stay would harm other parties; and (4) where the public interest lies. FOE asserts that under these criteria, this application for a stay should be granted pending conclusion of a license amendment proceeding under 10 C.F.R. § 2.309. Each criterion is discussed in turn below.

A. Likelihood of Prevailing on the Merits

Under 10 C.F.R. § 2.342(e)(1), Petitioner is likely to prevail on the merits with respect to the Petition in the ongoing proceeding. Pursuant to 42 U.S.C. § 2239(a)(1)(A) and 10 C.F.R. § 2.309, the Commission is required as part of a license amendment proceeding to provide a public hearing and allow intervention by "any person whose interest may be affected by the proceeding." The Petitioner has demonstrated in its Petition, filed concurrently, that a licensing amendment proceeding is required under 10 C.F.R. § 50.59, and that its interests are sufficient to warrant intervention in such a proceeding, along with an adjudicatory public hearing.

B. The Public, Represented by Petitioner, Will be Irreparably Injured Unless a Stay is Granted

In recent decisions, the Commission has interpreted 10 C.F.R. § 2.342(e)(2) to require applicants to show that they will be irreparably harmed in a way that is "imminent," "certain and great."[2] Petitioner's harm is imminent because without a stay the NRC could approve the restart of San Onofre Units 2 and 3 at any time.

Petitioner will suffer certain and great harm of increased risk of exposure to radioactivity if San Onofre Units 2 and 3 are restarted without a complete understanding of the causes of the tube rupture and tube wear that has been discovered in the units, together with whatever steps are

[2] *In the Matter of Southern Nuclear Operating Co.* 2012 WL 1343183 (N.R.C.) (April 16, 2012) (*citing Entergy Nuclear Vermont Yankee, LLC* (Vermont Yankee Nuclear Power Station), CLI-06-8, 63 NRC 235, 237 (2006).

necessary to eliminate the excessive risk of exposure. Petitioner will also be greatly and certainly harmed if the NRC fails to implement 10 C.F.R. § 50.59, under which a license amendment is clearly required in this case. Petitioner will be deprived of its rights under 42 U.S.C. § 2239(a)(1)(A) and 10 C.F.R. § 2.309 to participate in the process of determining the causes and potential remedies for the failures of the replacement steam generators if the reactors are restarted without the public adjudicatory hearing required by NRC regulations on the major changes SCE made to Units 2 and 3.

Lastly, Petitioner's risk of harm is great. The public must be assured that San Onofre Units 2 and 3 can be operated in a manner that provides for adequate safety. FOE represents a substantial number of people who live within range of any radioactivity released from San Onofre. Whether the licensee is required to fully correct the safety risks created by the replacement steam generators could profoundly affect FOE's members' health, safety, environmental quality, and economic well-being. The damage that could follow from a malfunction resulting from a failure to understand and correct the problems with the San Onofre steam generators could be catastrophic. As the world has seen at the sites of several nuclear plant disasters, even a small risk of such an event amounts to a great harm.

Petitioner's expert Arnold Gundersen, a nuclear engineer with experience as a licensed reactor operator, asserts in three technical reports[3] and his Declaration accompanying the Petition that the defects in the steam generators cannot be cured to ensure operation with an adequate margin of safety without extensive repair or possibly replacement. Declaration of Arnold Gundersen, ¶¶ 42-53, May 31, 2012 (hereinafter "Gundersen Expert Decl."). If the steam generators are not properly repaired prior to restart, the great risk to the public is the release of

[3] Arnie Gunderson, Fairewinds Associates, Inc., STEAM GENERATOR FAILURES AT SAN ONOFRE (Mar. 2012); SAN ONOFRE CASCADING GENERATOR FAILURES CREATED BY EDISON (Apr. 10, 2012); *and* WHY SAN ONOFRE STEAM GENERATORS ARE NOT "LIKE-FOR-LIKE" (May 4, 2012).

substantial radioactivity into the air due to:

- Insufficient tube plugging, caused by misplaced confidence in the Mitsubishi three dimensional steam analysis, which should be applied with a very large margin of error to account for the relative inaccuracy of the analysis. Gundersen Expert Decl. at ¶ 45;

- Already plugged tubes continuing to vibrate and damage adjacent tubes, *id.* at ¶ 43; and

- A potential main steam line break that would cause depressurization of the steam generator, which, when coupled with insufficient water at the top of the generators, would cause cascading tube failures, numbering in the hundreds. *Id.* at ¶ 44.

The Commission should grant this stay application to allow the public an opportunity to raise these concerns in a license amendment proceeding and otherwise meaningfully participate in the process of determining what measures should be taken at San Onofre to ensure that the reactors are operating safely prior to restart.

C. Granting this Stay Application Would Not, on Balance, Harm Other Parties

Any harm to other parties by the granting of a stay pending a public adjudicatory hearing and the Commission's review of SCE's license amendment application must be considered against the potential harm that could occur if the units are prematurely restarted before the safety issues have been adequately addressed. Two other parties would be potentially affected by a stay: 1) SCE; and 2) residential and commercial electricity consumers. Each is discussed below.

SCE: The NRC staff has already indicated that the safety risk to the public is high enough to justify suspending operations at the plant until the technical issues are resolved. The NRC staff's response demonstrates the seriousness of the issue, and Petitioner simply asks that a stay be formalized and continued until the public has been given the opportunity to participate in an adjudicatory hearing and contribute to the Commission's and public's understanding of the causes and possible fixes for the facility's equipment failures, as required

by NRC regulations. Petitioner's request supports the Commission in this action and is aimed at securing the procedures necessary to publicly review the technical issues involved.

It is unlikely that the stay requested will result in any delay in placing San Onofre Units 2 and 3 back into service. Ted Craver, the Chief Executive Officer of Edison International, parent company to Southern California Edison, has stated publicly that he does not expect either unit will be back in service during the summer of 2012, and that the process of assuring the safety of the units could require additional time.[4] Mr. Craver said "I don't see how we could submit [a restart plan] to the NRC before the end of July, and their process is maybe another month, so that's the end of August."[5] Thus, granting this application for a stay would simply formalize existing circumstances and guarantee the time needed for a public adjudicatory hearing.

To the unlikely extent that a hearing were to extend the time period that San Onofre is out of operation, a stay is nevertheless necessary to protect public safety. The risk to SCE of a stay of operation pending a public adjudicatory hearing and review by the Commission is self-imposed. The SCE erred in its assessment of the effect of the design changes on reliability and safety and cannot now be heard to protest the NRC's decision to condition restart on demonstrating that the safety issues have been resolved. When it acted to avoid a license revision proceeding, SCE incurred the risk that the Commission or other decision-making body might stay operation of the reactor pending a full, public review process.

2. Electricity Consumers: Neither the California Independent System Operator (ISO) nor the California Public Utility Commission (PUC) indicate that reliability of the electric system or grid stability will necessarily be adversely affected if San Onofre is kept offline through the peak summer months of 2012. The ISO and PUC are actively working, including in conjunction with

[4] Statement of Ted Craver, Chief Executive Officer, Edison International, quoted in the *Los Angeles Times* (June 7, 2012) *LANow Section*, at p. 32
[5] *Id.*

SCE, to manage any outage risk. The ISO has proposed and begun to implement more than half a dozen actions to mitigate the risk of any power outages, including: returning the Huntington Beach gas plants to service, an action that has already been taken; accelerating other planned upgrades and outage planning; and mobilizing a number of demand-side response programs from various consumer groups.[6] Indeed, the Chairman of the Federal Energy Regulatory Commission, Jon Wellinghoff, is convinced that San Onofre's customers will have adequate power throughout the summer, even if both units remain shut down. Wellinghoff said, "With the reports I've read, I believe there are adequate resources. I think we're going to be in fine shape."[7]

The total cost of the replacement power during the outage and who will bear it has not yet been determined. In light of the fact that some of the electricity load will be addressed by energy efficiency measures that may be less expensive than power generated on the SCE system, the net cost cannot be determined *a priori*. Whether the costs, if any, will be borne by ratepayers, or SCE shareholders, is also not yet determined.

D. The Public Interest Lies in Granting This Stay Application

Lastly, 10 C.F.R. § 2.342(e)(4) calls for the Commission to consider "where the public interest lies" when determining whether to grant an application for a stay. The public interest is in the safe operation of San Onofre Units 2 and 3 and would best be served by delaying a decision on whether to restart the reactors until the public has exercised its right to participate in a hearing on the significant safety issues presented by the many major design changes to the replacement steam generators. Until these proceedings conclude, the public cannot be assured that San Onofre can be operated with an adequate margin of safety.

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[6] Neil Millar, California ISO, *Briefing on Summer 2012 Operations Preparedness*, Board of Governors Meeting (Mar. 22-23, 2012) http://www.caiso.com/Documents/BriefingSummer2012OperationsPreparedness-Presentation-Mar2012.pdf.

[7] *Top grid regulatory: SoCal in 'fine shape' for summer without San Onofre*, U-T San Diego (June 4, 2012) http://www.utsandiego.com/news/2012/jun/04/top-grid-regulator-southern-california-fine-shape-/.

The public interest also includes adherence to the laws and regulations adopted by the NRC to assure that Americans' health, safety, and environment are protected. Nuclear power has been compared to a "Faustian bargain" because, while it brings great benefits, it also comes with dangers of a scale unknown in any other civilian technology. For this reason, the authors of the Atomic Energy Act were at pains to assure public participation, through a license amendment, when changes were made in systems of nuclear power stations that could affect the safety and health of the populace. By requiring adherence to 10 C.F.R. § 50.59 and § 2.309, the Commission would advance the public interest, as well as increase confidence in the Commission's decision making.

It is in the public interest for the Commission to grant this stay motion until it can hear the testimony of Arnold Gundersen. Mr. Gundersen, a nuclear engineer with experience as a licensed reactor operator, brings a wealth of experience and knowledge that would benefit the Commission and the public interest in assuring that San Onofre is repaired in a way that will protect public safety and health. Mr. Gundersen has formed opinions on the causes of the excessive tube wear and how it might be addressed. In his Declaration accompanying the FOE Petition, Mr. Gunderson concludes that the defects in the steam generators cannot be cured to ensure operation with an adequate margin of safety without extensive repair or replacement. Gundersen Expert Dec at ¶¶ 42-53. Among the design changes that need further analysis in a public adjudicatory hearing are the following:

1. Mitsubishi Heavy Industry's design removed the stay cylinder, most likely to fit an additional 400 tubes into the already tightly packed tube bundle. *Id.* at ¶ 23.

2. In order to compensate structurally for the removal of the stay cylinder, which functioned as a support pillar to the tube sheet into which the U-tubes are inserted, the tube sheet had to be thickened. This change reduced the inspection access area below the tube sheet and altered the structural loads on the tube sheet, a

critical safety consideration as the tube sheet serves as the key barrier to keeping radiation inside the containment. *Id.*

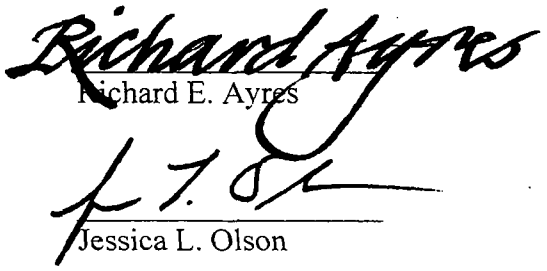
3. Mitsubishi Heavy Industry's computer codes were benchmarked off the Westinghouse steam generator design and thus were insufficient to validate the tube design and vibration pattern of the original San Onofre steam generators, which had a very different Combustion Engineering (CE) steam generator design. *Id.* at ¶ 40.

4. The original steam generators at San Onofre had a triangular tube pitch pattern, very closely packed U-tubes, and unique egg-crate tube supports that kept the tubes from vibrating and colliding. The pitch to diameter ratio of tubes in the original CE generators is dramatically different from any of the Westinghouse generators fabricated by Mitsubishi. Moreover, the egg-crate tube supports in the CE design were replaced with broached (quatrefoil and trefoil) tube support plates, which greatly increased the resistance to water flow towards the top of the steam generator. *Id.* at ¶¶ 33-38.

Mr. Gundersen has concluded that these design changes are causing the unusually high rate of wear in the tubes. For example, as a result of the very tight pitch-to-diameter ratios used in the original CE steam generators. Mitsubishi's broached plate design allows almost no water to reach the top of the steam generator. A water/steam mixture of about fifty percent each is necessary to provide adequate damping against vibration. Mr. Gundersen's assertion is that inadequate water supply at the top of the generator could cause the additional vibration that has resulted in untimely tube wear in the San Onofre replacement steam generators. *Id.* at ¶ 38.

The public interest would be served by the Commission's exploring Mr. Gundersen's analysis as well as those of the licensee and the NRC staff in a public adjudicatory forum. Such an open exchange would foster increased public confidence in whatever result emerges from the analysis of the San Onofre steam generators' tube degradation and leaks.

Respectfully submitted,



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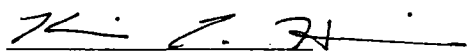

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Date: June 18, 2012

BEFORE THE UNITED STATES
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
SOUTHERN CALIFORNIA EDISON COMPANY	)	Docket Nos. 50-361, 50-362
	)	
(San Onofre Nuclear Generating Station)	)	June 18, 2012

PETITION TO INTERVENE AND REQUEST FOR HEARING BY FRIENDS OF THE EARTH

I. INTRODUCTION

On January 31, 2012, San Onofre Nuclear Generating Station ("San Onofre") in San Clemente, California suffered a steam generator tube rupture in Unit 3 that resulted in the release of radioactive material into the environment. Prior to the leak in Unit 3, SCE discovered excessive wear in Unit 2, which was offline for a refueling outage. Subsequently, advanced deterioration of many tubes was discovered in the replacement steam generators (SG), which had been in operation for eleven months in Unit 3 and less than two years in Unit 2.

As detailed in the attached May 31, 2012 Declaration of Mr. Arnold Gundersen ("Gundersen Expert Decl."), a nuclear engineer and former licensed reactor operator, the failure of tubes in the steam generator has the potential to cause extremely serious releases of radioactivity into the environment, which in turn could cause grave injury to public health and the environment.[1] Significantly, more than 8.3 million people live within 50 miles of the San Onofre Nuclear Power Station. The safety of members of the Petitioner, Friends of the Earth (FOE), and the viability of the environment and economy of Southern California, may depend on

[1] Fairewinds Associates is a nuclear safety firm retained as a consultant to Petitioner. Mr. Gunderson is the Chief Engineer at Fairewinds Associates.

whether the NRC understands and corrects the root causes of the steam generator failures that have happened at San Onofre.

Pursuant to 10 C.F.R. § 2.309, Petitioner hereby petitions to intervene and requests a hearing in the NRC proceeding to amend the operating license for Southern California Edison's (SCE, or Licensee) San Onofre plant. The outcome of the current proceeding could jeopardize the Petitioner's interests, which are detailed below in Section II. Petitioner sets forth its contentions in Section IV.

Petitioner asserts that under 10 C.F.R. § 50.59 the San Onofre replacement steam generators may not be operated without an amendment to the San Onofre operating license.[2] It asks that the Commission either recognize that the current Confirmatory Action Letter (CAL) process is in fact a license amendment proceeding under 10 C.F.R. § 2.309 and 42 U.S.C. § 2239, or convene such a license amendment proceeding under these authorities or under the Commission's inherent supervisory authority over the nuclear industry.[3] Petitioner further requests that it be given status as a party in such proceeding, and that, pursuant to 10 C.F.R. § 2.309, the Commission provide an adjudicatory public hearing with respect to the causes and potential remedies for the failure of the replacement steam generators at San Onofre.

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[2] SCE's amendments to the licenses for Unit 2 and Unit 3, proposed on June 27, 2008 and approved on June 25, 2009, are insufficient to address all of the changes Edison made in the replacement steam generators. The license amendment application clearly states: "The proposed changes reflect revised [steam generator] inspection and repair criteria and revised peak containment post-accident pressure resulting from installation of the replacement [steam generators]." The application does not include any request to amend the licenses with regard to major design changes such as removal of the stay cylinder, replacement of the egg crate tube support with a broached plate tube support, or the thickening of the tube sheet. Thus, the previous license amendment was incomplete and additional amendments are required before the replacement steam generators can be allowed to restart. Letter from Southern California Edison Company to the Nuclear Regulatory Commission re "Amendment Application Numbers 252 and 283," 2 (June 27, 2008); Letter from James Hall, Nuclear Regulatory Commission to Ross T. Ridenoure, Southern California Edison Company re "San Onofre Nuclear Generating Station, Units 2 and 3- Issuance of Amendments Re: Technical Specification Changes in Support of Steam Generator Replacement (TAC Nos. MD9160 and MD9161)" (June 25, 2009).

[3] *See Statement of Policy on Conduct of Adjudicatory Proceedings*, 48 N.R.C. 18, 20, 1998 WL 518232 (N.R.C.); *Public Service Co. of New Hampshire* (Seabrook Station, Units 1 and 2), CLI–90–3, 31 NRC 219, 229 (1990).

As will be shown below, operating San Onofre after SCE replaced the steam generators six years ago without a license amendment and § 2.309 proceeding was improper under NRC regulations. The failure of the replacement steam generators has only made that impropriety more obvious. Though SCE apparently convinced itself that it did not have to seek a license amendment for the replacement steam generators,[4] the major changes in the steam generators proposed by SCE created risks not considered in the Updated Final Safety Analysis Report (UFSAR). Under 10 C.F.R. § 50.59, these changes triggered the Commission's obligation to convene a formal license amendment proceeding.[5]

Only two years after the installation of the replacement steam generators it has become apparent that the changes in the steam generators have resulted in risks not considered in the UFSAR. The excessive degradation of the SG tubes in both units and the tube rupture in Unit 3 demonstrate graphically the new safety issues created, but never analyzed, by the licensee or the NRC. Thus, San Onofre Units 2 and 3 may not properly be restarted until the Commission approves a license amendment under the process provided in 10 C.F.R. § 2.309.

It is immaterial that NRC staff has not called its current action a "license amendment proceeding," since that is the function served by the NRC's current activity and what is required by NRC's own regulations. *See, e.g., Brodsky v. U.S. Nuclear Regulatory Com'n,* 578 F.3d 175 (2009), quoting *Columbia Broad. Sys., Inc. v. United States*, 316 U.S. 407, 416 (1942) ("The particular label placed upon [an order] by [an agency] is not necessarily conclusive, for it is the

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[4] *See* Boguslaw Olek & Tomoyuki Inoue, "Improving Like-for-Like RSGs," *Nuclear Engineering International* 36, 37 (Jan. 2012) ("the major premise of the steam generator replacement project was that it would be implemented under the 10 C.F.R. 50.59 rule, that is, without prior approval"). In the end, SCE sought and received minor licensing amendments that encompass neither the full suite of changes nor the most significant structural alterations made to the design of the replacement steam generators.

[5] To date, the NRC has sought to treat the failure of the steam generators as an enforcement matter, but this approach lacks credibility and legal authority, given that the poorly performing and potentially hazardous steam generator replacements are currently outside the approved licensing basis for the plant.

substance of what the [agency] has purported to do and has done which is decisive"). Where changes of the magnitude of those at San Onofre are made, the NRC's own regulation requires the licensee to apply for a license amendment, which requires the NRC to evaluate its effect on the safety of the plant and hold a public hearing if requested so that the public may evaluate the safety risks associated with the proposed changes. While the federal courts often defer to an agency's procedural determinations, they will not permit an agency to ignore its own regulations. *Auer v. Robbins*, 519 U.S. 452, 461 (1997) (finding that an agency's application of its own regulations is "controlling unless plainly erroneous or inconsistent with the regulation[s]").

To support Petitioner's contention, the Declaration from Mr. Arnold Gundersen, MSNE, a nuclear engineer with Fairewinds Associates, is attached.[6] A former nuclear industry Senior Vice President, Mr. Gundersen earned his Bachelor's and Master's Degrees in nuclear engineering and was a licensed reactor operator during a twenty-year career in the nuclear industry. During his nuclear industry career, Mr. Gundersen reviewed projects at seventy nuclear plants and was frequently called upon to testify to the NRC and Congressional and State officials on nuclear power operations. He was also an expert witness in the cases involving Three Mile Island, Western Atlas, Peach Bottom, and Florida Power and Light.

In addition to the Declaration Mr. Gundersen has provided, he has authored three expert reports providing an analysis of the reasons for the tube degradation and rupture at San Onofre and offering an assessment of possible technical solutions.[7] Mr. Gunderson's third report from May 11th, 2012, entitled "San Onofre's Steam Generator Failures Could Have Been Prevented,"

[6] Fairewinds Associates is a nuclear safety firm retained as a consultant to Petitioner. Mr. Gunderson is the Chief Engineer at Fairewinds Associates.

[7] Arnie Gunderson, Fairewinds Associates, Inc., STEAM GENERATOR FAILURES AT SAN ONOFRE (Mar. 2012); SAN ONOFRE CASCADING GENERATOR FAILURES CREATED BY EDISON (Apr. 10, 2012); *and* WHY SAN ONOFRE STEAM GENERATORS ARE NOT "LIKE-FOR-LIKE" (May 4, 2012).

contains extensive analysis of the steam generator design changes likely responsible for the vibration causing the tube degradation and failures, as well as the options for continued operation of the reactors.

II. STANDING

FOE is a national non-profit environmental organization headquartered and incorporated in the District of Columbia with an office in San Francisco, California. Declaration of Marcelin Keever at ¶ 2, May 30, 2012 ("Keever Decl."). FOE has a nationwide membership of over 9,100 (including 1,900 members in California) and over 140,000 activists. *Id.* at ¶ 4. Among its missions, FOE seeks to ensure the public has an opportunity to influence the outcome of government and corporate decisions that affect the lives of many people. *Id.* at ¶ 7. Since its inception in 1969, FOE has sought to improve the environmental, health, and safety conditions at civil nuclear facilities licensed by the NRC and its predecessor agencies. *Id.* at ¶ 3. To that end, FOE utilizes its institutional resources, including legislative advocacy, litigation, and public outreach and education, to minimize the risks that nuclear facilities pose to its members and to the general public. *Id.*

Under the Atomic Energy Act (AEA), the Commission must grant a hearing on a license amendment application upon "the request of any person whose interest may be affected by the proceeding, and shall admit any such person as a party to such proceeding." 42 U.S.C. § 2239(a)(1)(A). To support the request, a petitioner must provide the Commission with information regarding "(1) the nature of the petitioner's right under the governing statutes to be made a party; (2) the nature of the petitioner's property, financial, or other interest in the proceeding; and (3) the possible effect of any decision or order on the petitioner's interest." *Entergy Nuclear Vermont Yankee, L.L.C., and Entergy Nuclear Operations, Inc. (Vermont*

Yankee Nuclear Power Station), 60 N.R.C. 548, 552 (2004) (citing 10 C.F.R. § 2.309(d)(1)). "The NRC generally uses judicial concepts of standing in interpreting this regulation." *Entergy Nuclear Vermont Yankee,* 60 N.R.C. at 552. Thus, a petitioner may intervene if it can specify facts showing "that (1) it has suffered or will suffer a distinct and palpable harm constituting injury-in-fact within the zone of interests arguably protected by the governing statutes, (2) the injury is fairly traceable to the action being challenged, and (3) the injury will likely be redressed by a favorable determination." *Id.* at 552–53. In determining whether a petitioner has met the requirements for establishing standing, the Commission "construe[s] the petition in favor of the petitioner." *Id.* at 553.

Member organizations such as FOE may intervene on behalf of their members if they can "demonstrate that the licensing action will affect at least one of [their] members, . . . identify that member by name and address, and . . . show that [they are] authorized by that member to request a hearing on his or her behalf." *Id.* Lyn Harris Hicks, a member of FOE, resides at 3908 Calle Ariana, San Clemente, California, 92672. Declaration of Lyn Harris Hicks at ¶ 1, May 29, 2012 ("Hicks Decl."). Ms. Hicks's declaration describes her personal health, safety, economic, aesthetic, and environmental interests in the proper operation of the San Onofre Nuclear Generating Station and the risk of harms that SCE's defective steam generators, without further analysis and repair, poses to those interests. She also describes her interest in open government and corporate decision making, which is also at stake in this proceeding. The Declaration of Mr. Gundersen affirms the engineering basis for Ms. Hicks's concerns. *See* Gundersen Expert Decl. Ms. Hicks supports this Petition, and has authorized FOE to intervene in this proceeding and request a hearing on her behalf. Hicks Decl. at ¶ 11, 12.

For over thirty years, Ms. Hicks has lived within about three miles from the San Onofre Nuclear Generating Station. *Id.* at ¶ 1, 3. Thus, Ms. Hicks and her family are at risk of serious health effects caused by exposure to radioactivity if the defective steam generators are not properly repaired before the Commission allows them to be restarted. *Id.* at ¶ 8.

In addition to risking the health effects of radiation exposure, Ms. Hicks would suffer substantial devaluation of her property and loss of the enjoyment of the beautiful coastal environment, where her family has lived for decades, in the event of an accident caused by restarting the reactors without thorough analysis of the root cause of the existing problems in the steam generators. *Id.* at ¶ 10. She and her family have spent many years enjoying the beautiful beaches of San Clemente. *Id.* at ¶ 5. Both her property value and the aesthetic value of the surrounding area will decline if the steam generators are not operated safely. *Id.* at ¶ 10.

Petitioner's expert, Mr. Gundersen, discusses in his Declaration the scenarios under which Ms. Hicks could suffer the effects of radiation leaks. Mr. Gundersen details the potential for San Onofre to release radioactivity into the atmosphere as a result of the design flaws in the replacement steam generators. Gundersen Expert Decl. at ¶¶ 15-18.

As Ms. Hicks has explained, she will suffer a concrete and particularized risk of injuries from the operation of San Onofre Units 2 and 3 with defective steam generators.[8] Petitioner's experts confirm the engineering behind Ms. Hicks's assertions as to these risks, which will occur if the reactors are restarted with defective steam generators without sufficient understanding of the cause of the defects and adequate repair. The fact that the NRC staff have ordered the two units shut down during investigation confirms the risks Ms. Hicks is exposed to if the root

[8] So long as a Petitioner falls within the zone of interests protected by the statute, and alleges harm that is "concrete and particularized," rather than "conjectural" or "hypothetical," the "requisite injury may either be actual *or threatened*." *Crow Butte Res., Inc. (License Amendment for the North Trend Expansion)*, 67 N.R.C. 241, 271 (2008) (emphasis added).

cause(s) degrading the steam generator are not fully understood and appropriate action taken.. Ms. Hicks also suffers concrete and particularized injury to her interests in transparent government and corporate decision making when the NRC allows SCE to avoid the license amendment process required in the NRC's own regulations, and, as consequence, neither SCE nor the NRC is required to provide the public with a root cause analysis of what has happened at San Onofre and explain how, and whether, it can be repaired.

The Commission is capable of granting the Petitioner redress by requiring SCE to undergo the license amendment process of 10 C.F.R. § 2.309, including convening a public adjudicatory hearing in which Petitioner has the opportunity to participate as a party. Such a hearing will assure that the Commission obtains the benefit of the testimony of Petitioner's witnesses regarding the root cause of the untimely deterioration of the San Onofre steam generators. It will also assure the public that the San Onofre reactors will not be restarted until the health and safety of the millions of people who live near the San Onofre plant will be protected.

Ms. Hicks's concerns plainly fall within the zone of interests protected by the AEA and its implementing regulations. *Sequoyah Fuels Corp. and General Atomics (Gore, Oklahoma Site)*, 39 N.R.C. 54, 75 (1994) (membership organization granted standing by showing that "the health and safety interests of its members are within the AEA-protected zone of interests"); *Babcock and Wilcox (Apollo, Pennsylvania Fuel Fabrication Facility)*, 37 N.R.C. 72, 80 (1993) (holding that specified "health, safety, and environmental concerns . . . clearly come within the zone of interests safeguarded by the AEA and NEPA").

Ms. Hicks therefore has standing to intervene in her own right: she has met the requirements for injury-in-fact, causation, and redressability, and her concerns fall within the

zone of interests protected by the AEA and implementing regulations. She will be affected by the failure of SCE's replacement steam generators, has provided her name and address, and has authorized FOE, of which she is a member, to intervene in this proceeding on her behalf. Thus, Petitioner FOE has standing to pursue this action. *Entergy Nuclear Vermont Yankee,* 60 N.R.C. at 553.

III. TIMELINESS

The balance of the criteria under 10 C.F.R. § 2.309(c)(1) weigh heavily in favor of considering the petition. Each criterion is examined below.

Good cause. Petitioner has shown good cause to become a party to the current San Onofre license amendment proceeding. Petitioner FOE represents a substantial number of members who live within fifty miles of the San Onofre plant, and who have an interest in the outcome of the proceeding because whether the licensee is required to fully correct the safety risks created by SCE's replacement steam generators could profoundly affect their health, safety, environmental quality, and economic well-being.

As described above, Petitioner FOE has retained the services of consultant Fairewinds Associates with expertise in nuclear engineering and operation of nuclear power plants. Mr. Gunderson can provide important expert assistance to the NRC in understanding and correcting the steam generator problems at San Onofre.

Nature of Petitioner's rights under the Atomic Energy Act to be made a party to the proceeding. Under the Atomic Energy Act (AEA), the Commission must grant a hearing in a proceeding upon "the request of any person whose interest may be affected by the proceeding, and shall admit any such person as a party to such proceeding." 42 U.S.C. § 2239(a)(1)(A). As described in section II, above, and in the attached declaration, Petitioner's members have

economic, aesthetic, health, safety, and environmental interests, and interests in open and transparent government and corporate decision making, that they wish to safeguard. Operation of SCE's defective steam generators, without undergoing the proper license amendment process, poses a grave threat to those interests.

Nature and extent of Petitioner's property, financial or other interest in the proceeding. Petitioner's interests in the proceeding are fully described in the attached declaration and in section II, above.

Possible effect of any order that may be entered in the proceeding on the Petitioner's interests. Any order issued by the NRC in this proceeding will have potentially fundamental effects on the interests of Petitioner and its members, such as Lyn Hicks, living in Southern California. As detailed in Report 3 of Petitioner's expert, Fairewinds Associates, a catastrophic failure of the San Onofre steam generators that resulted in cascading tube failure could cause substantial releases of radioactivity into the air of southern California. Petitioner's interests, described in Section II, in the health and physical safety of its members, such as Ms. Hicks, and the economic well-being, and environmental quality of the area surrounding San Onofre are all potentially threatened by the current situation at the plant, where a radioactive release has already occurred. Whether the order(s) resulting from this proceeding are adequate to assure that the San Onofre reactor is safe to operate thus could directly and profoundly affect the interests of Petitioner and its members.

Likewise, an order requiring that SCE amend its license to account for the potential effects on public health and safety and the environment related to the replacement steam generators, and requiring an adjudicatory hearing on the health, safety and environmental issues

associated with the replacement steam generators, will affect the Petitioner's interests in open and accountable government and corporate decision making.

Availability of other means whereby the Petitioner's interest will be protected. The CAL issued by the NRC is not sufficient to protect Petitioner's interest. Foremost, the CAL merely restates SCE's description of the steam generator problems and the commitments SCE made as of March 23, 2012 to rectify the issues at Units 2 and 3. The CAL, issued only four days later, shows no independent analysis by the NRC, nor does it require anything further than what the licensee had itself volunteered. Thus, the CAL simply reiterates the licensee's plan for managing the technical issues at the reactors and facilitating an expeditious restart; it does not demonstrate that the NRC, as the regulator, has intervened on behalf of the public to require any particular action by the licensee to ensure that both reactor units will operate safely prior to restart.

The current situation at San Onofre may be seen as result of a too close and closed relationship between the NRC staff and the licensee. While the Petitioner does not know the full details of that relationship on the steam generator matter, it is apparent already that the licensee went to considerable trouble in an attempt to avoid any public review of its decision to install significantly different steam generators built by a company that was unfamiliar with the particular needs of a steam generator in the San Onofre type of reactor, and that the NRC staff willingly acceded. As detailed in Mr. Gundersen's Declaration, under NRC regulation 10 C.F.R. § 50.59 it is clear that a formal license amendment was required. Gundersen Expert Decl. at ¶¶ 24-32. Yet the NRC mutely accepted the licensee's incorrect conclusion that no license amendment was called for.

The requirements of the license amendment process recognize that for the NRC to do its job it must keep the public informed. Even the best technical oversight is insufficient if the

public does not have the opportunity to participate to ensure its interests are being protected. While it makes no sense to require a public proceeding on every change a licensee makes to a nuclear power plant, a nearly $671 million entire replacement of one of the major structures that determines whether the public health and safety will be protected is not a minor change. The NRC's CAL fails to provide the public involvement that NRC regulations, *e.g.*, 10 C.F.R. § 2.309, require. By passively accepting the licensee's self-evident misreading of 10 C.F.R. § 50.59 to avoid any public process, the NRC failed to do its job. Now, with the potentially dangerous results of that failure apparent, the Commission needs to reassure the public by providing an adjudicatory public hearing. Speaking for the public, Petitioner's interests are not satisfied by the continuation of the private conversation between the licensee and the Commission that has produced the failure of the San Onofre steam generators; nor are Petitioner's interests satisfied by the promised public meetings, which do not offer the kind of procedure guaranteed by 42 U.S.C. § 2239 and 10 C.F.R. § 2.309.

The CAL, a mere restatement of the licensee's conclusion about what actions are necessary, does not afford meaningful opportunity for independent technical evaluation of the adequacy of the fixes proposed to be adopted and for public participation in the form of an opportunity for an adjudicatory hearing. As one might suppose from a document that is devoid of any directive originated from the expert government agency entrusted with ensuring the safe commercial operation of nuclear power plants, the CAL also does not adequately assure the public of the safety of the replacement steam generators, in particular because it does not require a root cause analysis of the excessive tube vibration and resulting untimely wear.

Lastly, the Augmented Inspection Team (AIT) ordered by the CAL to "assess the circumstances surrounding the tube leak and unexpected wear of tubes in the Unit 3 steam

generators"[9] is insufficient to protect the Petitioner's interests. First, the AIT investigation does not reflect the reality that severe tube wear was discovered in both Unit 2 and Unit 3. Petitioner's interest lies in assuring the adequate safety of *both* units, not just Unit 3. Second, the AIT charter does not include an assessment of whether SCE illegally skirted the license amendment process by incorrectly asserting that no amendment is necessary for the major design changes it made to the replacement steam generators under the criteria of 10 C.F.R. § 50.59.[10]

Third, while the AIT has promised public meetings to review the AIT's report, such meetings are not an adequate substitute for the kind of adjudicatory public hearing available under 10 C.F.R. § 2.309. Petitioner requests a hearing on the root cause of the rapid tube wear in *both* Unit 2 *and* Unit 3, with the ability to participate in review of the safety issues using adjudicatory procedures. The kind of public meetings the Commission promises will not provide Petitioner with the hearing contemplated by 10 C.F.R. § 2.309 (*see, e.g.*, 10 C.F.R. § 2.310 (detailing the required procedures for hearings granted under § 2.309)). For these reasons, there are no other means outside the requested proceeding by which Petitioner's interests can be protected.[11]

Extent to which Petitioner's interests will be represented by existing parties. Petitioner's interests will not be represented by either the licensee or the NRC staff. The continuing failure of both SCE and the NRC staff to recognize the need for a public adjudicatory hearing on a matter of such concern demonstrates that neither can represent the interests of the Petitioner.

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[9] *Memorandum to Gregory Werner, Chief, Plant Support Branch 2, Division of Reactor Safety from Elmo Collins, Regional Administrator, Region IV,* "Augmented Inspection Team Charter to Evaluate the Steam Generator Tube Integrity Issues at San Onofre Nuclear Generating Station Unit 3, Revision 1," at 1 (May 16, 2012).

[10] *Id.*

[11] Petitioner's request is properly before the Commission under 10 C.F.R. §2.309 rather than 10 C.F.R. §2.206 for two reasons. First, Petitioner is requesting the opportunity to participate in a license amendment proceeding. Section 2.206 does not provide for such a request. It instead offers the public a means by which to request enforcement action by NRC. Second, there is no authority under §2.206 for the staff to entertain requests for public participation in a proceeding. Section 2.309, on the other hand specifically provides that authority.

SCE's economic interest lies in restarting San Onofre Units 2 and 3 as soon as possible. For the reasons stated in this petition, specifically in Contention 1, that approach is at odds with Petitioner's interest in adequately addressing safety risks presented by the root cause of the defects in the replacement steam generators. Given the prima facie case that it may have erred both technically and legally in allowing installation of substantially modified steam generator replacements at San Onofre, the NRC staff involved in that decision may have a vested interest in defending the adequacy of its prior review, and this interest would detract from taking a clear-eyed objective view of the implications of this troubled steam generator replacement for public health and safety.

The NRC has given no indication to date that it plans to afford the public this adjudicatory hearing opportunity. Thus, Petitioner's interests are not represented by existing parties to the proceeding.

Extent to which the Petitioner's participation will broaden the issues or delay the proceeding. Of its own accord, the NRC has already ordered Units 2 and 3 to remain shut down until the internal technical evaluations formalized in the CAL are completed. Petitioner simply asks that the NRC follow its established public procedures for considering a license amendment application with respect to the replacement of all four steam generators in San Onofre Units 2 and 3 with ones that contain a significantly different design than the original generators. Although Petitioner brings new information and perspective, it wishes to focus on the safe operation of the replacement steam generators.

Extent to which the Petitioner's participation may reasonably be expected to assist in developing a sound record. If granted, a hearing on Petitioner's contentions would provide an opportunity to assure the public that the NRC has conducted an adequate assessment of the

safety of the replacement steam generators at San Onofre, including input and review by independent experts. FOE has retained Mr. Gundersen to assist in developing the record regarding the problems with the steam generator replacements, and to date Mr. Gundersen has produced three technical reports, referenced above, providing analysis on the causes and potential remedies for the steam generator failures. His wealth of experience in nuclear engineering and the nuclear industry will assist the Commission in deliberating and deciding the correct response to the situation at San Onofre.

IV. ADDITIONAL COMMISSION AUTHORITY

In addition to its authority to convene a license amendment proceeding under 10 C.F.R. § 2.309, the Commission can convene such a proceeding, including an adjudicatory public hearing, under its inherent supervisory authority.[12] In the interest of assuring adequate protection of the health and safety of the public, the Commission must consider what amendment(s) to the license is/are required by the cumulative changes made to the replacement generators, both in their original design and manufacture and in response to the recently revealed tube wall erosion, rupture, and vibration problems.

[12] *See supra*, n. 3.

V. CONTENTION

CONTENTION 1

PETITIONER CONTENDS THAT SAN ONOFRE CANNOT BE ALLOWED TO RESTART WIHOUT A LICENSE AMENDMENT AND ATTENDANT ADJUDICATORY PUBLIC HEARING AS REQUIRED BY 10 C.F.R. § 2.309, IN WHICH PETITIONER AND OTHER MEMBERS OF THE PUBLIC MAY PARTICIPATE

BASES FOR CONTENTION:

1. The San Onofre Nuclear Operating Station consists of two twin units, Unit 2 and Unit 3, each of which originally had two recirculating steam generators fabricated by Combustion Engineering (the "CE generators"), beginning operation in 1983 and 1984, respectively. In 2009, SCE replaced Unit 2's CE generators with new steam generators designed and fabricated by Mitsubishi Heavy Industries (MHI). Unit 3's replacement steam generators were ordered under the same contract and to the same specifications, and were replaced in 2010.

2. SCE extensively modified the original CE generator without seeking a license amendment pursuant to 10 C.F.R. § 50.90 in clear violation of 10 C.F.R. § 50.59.

3. There is evidence that a deliberate design objective shared by SCE and MHI was to avoid NRC review by claiming the new MHI steam generators were replacements that met the section 50.59 safety criteria enabling licensees to make modifications without having to seek a license amendment. According to engineers at SCE and MHI, "the major premise of the steam generator replacement project was that it would be implemented under the 10 C.F.R. § 50.59 rule, that is, without prior approval" by the NRC.[13]

[13] Boguslaw Olek & Tomoyuki Inoue, "Improving Like-for-Like RSGs," *Nuclear Engineering International* 36, 37 (Jan. 2012).

4. To this end, the SCE's Facility Change Report for San Onofre Units 2 and 3 for the period from December 19, 2008 through February 10, 2011 asserts: "Replacement of the steam generators is a replacement in kind in terms of overall fit, form, and function with no, or minimal, permanent modifications to the plant Safety Systems or Components (SSC)." Facility Change Report at 4.

5. The Facility Change Report also asserts: "The results of the RSG [Replacement Steam Generators] tube wall thinning analysis are conservative or essentially the same as results from the USFAR described tube wall thinning analysis for the OSGs [Original Steam Generators]. [...] It was concluded that this change may be made without prior NRC approval." Facility Change Report at 4.

6. Contrary to SCE's claim that the new steam generators were in-kind replacements, the MHI generators differ significantly from the previous CE model. The key fabrication change in the new generators was the decision to add almost 400 tubes to each steam generator, increasing the total number of tubes by more than 4%. This significant increase in the number of tubes resulted in a series of subsequent design changes necessary to physically accommodate the additional tubes, including: removing the stay cylinder, which functioned as a support pillar to the tubesheet into which the U-tubes are inserted; thickening the tubesheet to compensate structurally for the removal of the stay cylinder; reducing the volume of water in the steam generator; changing the flow pattern; and reducing the inspection access area below the tubesheet. Gundersen Expert Decl. at ¶¶ 20, 23.1-23.2.

7. These design modifications altered the structural loads on the tubesheet, a critical safety consideration as the tubesheet serves as the key barrier keeping radiation inside the containment. Adding tubes also required increasing the nuclear reactor core flow, on which the

original design basis safety calculations for cooling the reactor are based. This flow increase necessitated yet more modifications to control the flow distribution to the tubes, including subsequent changes to the tube supports in an attempt to avoid increased vibration in the tubes. Gundersen Expert Decl. at ¶¶ 23.3-23.5. Notably, increased vibration resulting from the cascading design changes is now hypothesized to be the cause of the rapid tube degradation.

8. Replacement of the original steam generators with a substantially modified steam generator design created risks not considered in the safety analysis that require public review.

9. In SCE's Safety Evaluation assessing whether the proposed changes in the replacement steam generator's design would affect the safety analysis on which San Onofre's license is based, SCE took the position that the design changes would not affect the reactors' reliability or safety. This evaluation was wrong at the time of the generators' replacement because the new design repeatedly triggered the requirement for a license amendment under 10 C.F.R. § 50.59, as Mr. Gundersen's Declaration demonstrates. Gundersen Expert Decl. at ¶¶ 24-32. The failures of the steam generators at the reactors in 2012 showed why review of the design and amendment of the license is necessary.

10. The NRC failed to follow its own regulations, in particular 10 C.F.R. § 50.59, which require a formal licensing proceeding be convened and a license amendment granted before changes can be made to the facility that affect the final safety analysis. The NRC failed to follow its own regulations by allowing SCE to replace the steam generators without the requisite proceeding to amend the license. Accordingly, before San Onofre may be cleared to restart, the NRC must undertake a license amendment proceeding, including the adjudicatory public hearing required under 10 C.F.R. § 2.309.

SUPPORTING EVIDENCE

A. UNDER NRC REGULATION 10 C.F.R. § 50.59, THE NRC CONTINUES TO BE OBLIGED TO REQUIRE A LICENSE AMENDMENT BEFORE SAN ONOFRE UNITS 2 AND 3 MAY BE RESTARTED

11. Under 10 C.F.R. § 50.59, a licensee is required to obtain a license amendment if the proposed modification meets any one of eight criteria affecting the existing safety analysis as enumerated in subpart (c)(2) of section 50.59. The criteria, in part, require an amendment when the proposed changes would:

> a. Create a possibility for an accident of a different type than any previously evaluated in the final safety analysis report [(FSAR)] (as updated);
>
> b. Create a possibility for a malfunction of an SSC [system, structure, or component] important to safety with a different result than any previously evaluated in the final safety analysis report (as updated);
>
> c. Result in a departure from a method of evaluation described in the FSAR (as updated) used in establishing the design bases or in the safety analyses.

12. The design of the replacement steam generators at San Onofre met the criteria that trigger a license amendment thirty-nine separate times. Gundersen Expert Decl. at ¶ 32. Thus, the replacement of the steam generators at San Onofre triggered an obligation that the NRC determine, through a license amendment proceeding, whether the new design was safe.

13. As an example, SCE's removal of the stay cylinder alone meets at least three of the criteria in section 50.59. Each criterion independently triggers the requirement to seek a license amendment. As has now become apparent, the removal of the stay cylinder alone

increased the possibility of a structural malfunction or a different type of accident than previously analyzed as a result of the changes in structural loading. While every one of the regulation's eight triggering criteria has since been subsequently manifested through the failures at San Onofre in 2012, even at the time of replacement the changes SCE proposed required it to seek a license amendment under section 50.59. Gundersen Expert Decl. at ¶ 32.

14. Despite their own regulations, the NRC staff failed to require SCE to propose a formal license amendment. Had a license amendment proceeding been convened, it is likely that the NRC staff would have understood the important safety-related changes SCE planned, and the untimely tube degradation and radioactivity leak might have been avoided.

B. FAILURES IN TUBE INTEGRITY AND REACTOR PERFORMANCE AT SAN ONOFRE IN 2012 DEMONSTRATE THE NEED FOR A PUBLIC REVIEW OF THE SAFETY OF SAN ONOFRE, INCLUDING A ROOT CAUSE ANALYSIS OF THE TUBE FAILURES AND REVIEW OF NECESSARY DESIGN CHANGES IN THE SAN ONOFRE STEAM GENERATORS

15. SCE's assertion that the design modifications would have no impact on safety and reliability have also proven to be wrong in practice, as evidenced by the current inoperability of both reactors and the uncontrolled radioactive leak from Unit 3 into the environment. SCE's claim that the new MHI steam generators are replacements "in-kind" has thus been demonstrated empirically to be incorrect. Gundersen Expert Decl. at ¶ 32.

16. As explained further in Mr. Gundersen's Declaration, had the NRC conducted a review of the SG replacement design, it would have identified inadequacies in MHI's and SCE's analysis and design that could have prevented the present situation. Specifically, the NRC would have identified the inadequacy of the MHI computer codes applied to validate the tube design and vibration pattern prior to fabrication. MHI has had very little experience with the type of CE

reactor design at San Onofre, in particular the tight tube pitch and unique egg crate tube supports in the original SGs that kept the tubes from vibrating and colliding, and which MHI changed to broached plate tube supports in the replacement steam generator design. The computer code MHI used for design validation simply was not capable of analyzing the reactor design at San Onofre; rather, the code was qualified only for Westinghouse generators, which are not similar to CE generators. Review by the NRC would have identified this and other deficiencies, and is now necessary to rectify the public safety problem the generators present in their current state. *Id.* at ¶ 39-41.

17. A root cause analysis is necessary to determine the cause of the tubal degradation and failure, and to identify what design changes are needed to assure safe operation of the replacement steam generators. To this end, a public hearing process would enable experts such as Mr. Gundersen to contribute their knowledge of the current steam generator problem to the NRC's diagnostic work. Mr. Gundersen explains in his Declaration how the flow resistance of the broached plate designed by MHI is much higher than the original CE egg crate design because of the reduced spacing of the tubes in the broached plate. *Id.* at ¶ 33, 34. This key design difference between the old and new steam generators that both MHI and SCE missed has resulted in almost no water reaching the top of the steam generator, creating regions where the U-tubes are almost dry. Without liquid in the mixture, there is no damping against vibration, resulting in a severe fluid-elastic instability. A fundamental problem in the steam generator causing the vibration and, consequently, the tube wear is that there is too much steam and too little water at the top of the steam generators in the U-bend region. *Id.* at ¶ 35-38.

18. SCE has begun plugging damaged tubes in an attempt to return the reactor units to service quickly. This solution is inadequate, as Mr. Gundersen's analysis of the problem

demonstrates: plugging tubes will not address the root cause of the vibration and therefore additional large numbers of tubes will continue to degrade rapidly or rupture, leaving the public perpetually at risk. *Id.* at ¶ 43. Further, even if the tubes are not leaking or have not ruptured, they are at risk of bursting in a main steam line accident scenario. If a steam line break accident were to occur, the depressurization of the steam generator caused by the steam line break, coupled with the lack of water at the top of the steam generators, would cause cascading tube failures resulting in a massive radiation leak. *Id.* at ¶ 44. Plugging tubes as a solution fails to address the design deficiency causing the vibration and thus will never be sufficient to ensure the safety of the reactors. Input from experts like Mr. Gundersen will assist the Commission in determining an appropriate solution to the tube wear following a root cause analysis.

19. The magnitude of the risks to public health and safety from the excessive and rapid tube degradation at San Onofre is too great for too many people to be dealt with without public participation. The current shutdown and potentially very large financial penalty for replacing or repairing the steam generators is the result of a closed process including only the licensee and the NRC staff. An open hearing will allow the Commission to obtain the valuable insights of experts outside SCE and NRC staff. It will also help to assure the public that their health and safety are not being compromised behind closed doors.

20. The real-world evidence now available proving that the replacement steam generators meet the section 50.59 criteria triggering the licensing amendment process provides further reason for the Commission to require a formal adjudicative hearing at this time and allow parties such as Petitioner full rights of participation as contemplated in 10 C.F.R. § 2.309.

21. This Contention is supported by the Expert Declaration attached hereto. Specific paragraphs of the Declaration that support each basis are identified following each basis, and the Declaration as a whole is also generally supportive of the Contention.

VI. CONCLUSION

For the foregoing reasons, Petitioner has demonstrated that it has standing and that its contention should be admitted. Under 10 C.F.R. § 50.59, the cumulative changes in the licensing basis of San Onofre, carried out to accommodate substantially modified steam generators, necessitate a formal license amendment proceeding. The Commission should either clarify that the CAL process is a license amendment proceeding convened under 10 C.F.R. § 2.309 requiring an adjudicatory hearing, or in the alternative, pursuant to § 50.59 and its inherent supervisory authority[14] find that such a proceeding is in the public interest to fulfill the NRC's mandate to ensure adequate protection of the public health and safety. The Petitioner should be permitted to intervene in this proceeding and is entitled under 10 C.F.R. §2.309 to a hearing on its contention.

Respectfully submitted,

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Richard E. Ayres

Jessica L. Olson

Kristin L. Hines

[14] *See supra* note 3.

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Date: June 18, 2012

Docket No. 50-361 and 50-362
FRIENDS OF THE EARTH
EXHIBIT ONE

UNITED STATES OF AMERICA BEFORE THE NUCLEAR REGULATORY COMMISSION

In the matter of

	)	May 31, 2012
Southern California Edison Company	)	Docket No. 50-361 and 50-362
	)	
San Onofre Nuclear Generating Station	)	

DECLARATION OF ARNOLD GUNDERSEN SUPPORTING THE PETITION TO INTERVENE BY FRIENDS OF THE EARTH REGARDING THE ONGOING FAILURE OF THE STEAM GENERATORS AT THE SAN ONOFRE NUCLEAR GENERATING STATION

I, Arnold Gundersen, declare under penalty of perjury under the laws of the United States of America that the following is true and correct, and executed this 31st day of May 2012:

1. My name is Arnold Gundersen. I am sui juris. I am over the age of 18-years-old.

2. As Chief Engineer for Fairewinds Associates, I have been retained by Friends of the Earth to provide expert services in connection with the above captioned matter regarding the ongoing failure and deterioration of the steam generators at San Onofre Nuclear Generating Station.

3. I earned my Bachelor Degree in Nuclear Engineering from Rensselaer Polytechnic Institute (RPI) cum laude. I earned my Master Degree in Nuclear Engineering from RPI via an Atomic Energy Commission Fellowship. Cooling tower operation and cooling tower plume theory were my area of study for my Master Degree in Nuclear Engineering.

4. I began my career as a reactor operator and instructor in 1971 and progressed to the position of Senior Vice President for a nuclear licensee prior to becoming a nuclear engineering consultant and expert witness. My Curriculum Vitae is attached as Exhibit 2.

5. I have testified before the Nuclear Regulatory Commission (NRC) Atomic Safety and Licensing Board (ASLB) and Advisory Committee on Reactor Safeguards (ACRS), the State of Vermont Public Service Board, the State of Vermont Environmental Court, the Florida Public Service Commission, the State of New York Department of Environmental Conservation, and in Federal Court.

6. I am an author of the first edition of the Department of Energy (DOE) Decommissioning Handbook, and the book entitled *Fukushima Daiichi: The Truth And The Way Forward*, Shueisha Publishing, 2012-2-17, Japan.

7. I have more than 40-years of professional nuclear experience *including and not limited to*: Cooling Tower Operation, Cooling Tower Plumes, Consumptive Water Loss, Nuclear Plant Operation, Nuclear Management, Nuclear Safety Assessments, Reliability Engineering, In-service Inspection, Criticality Analysis, Licensing, Engineering Management, Thermohydraulics, Radioactive Waste Processes, Decommissioning, Waste Disposal, Structural Engineering Assessments, Nuclear Fuel Rack Design and Manufacturing, Nuclear Equipment Design and Manufacturing, Prudency Defense, Employee Awareness Programs, Public Relations, Contract Administration, Technical Patents, Archival Storage and Document Control, Source Term Reconstruction, Dose Assessment, Whistleblower Protection, and NRC Regulations and Enforcement.

8. I have personal knowledge of the facts contained in this Declaration; and I am qualified to testify in support of this Petition. I have previously testified to the Advisory Committee on Reactor Safeguards and the NRC's 2.206 Petition Review Board.

OVERVIEW AND SCOPE OF THE PROCEEDING

9. My declaration is intended to support Friends of the Earth's Petition Concerning the Steam Generators at San Onofre Nuclear Generating Station.

SAN ONOFRE NUCLEAR REACTOR BACKGROUND

10. Originally designed and built by Combustion Engineering (CE), San Onofre's nuclear steam generators are a very unique design that is radically different from all other Pressurized Water Reactor (PWR) designs. Southern California Edison (Edison) decided to replace each San Onofre steam generator due to tube deterioration and degradation that slowly evolved during each Unit's 25-years of operation.

11. Documents reviewed show that the four replacement steam generator specifications are identical to each other and they were purchased together under a single contract with Mitsubishi Heavy Industries (MHI). However, rather than simply rebuild the steam generators to their original design specifications, Edison decided to extensively modify the original San Onofre steam generator design. Furthermore, none of the design modifications were necessary for operation of either San Onofre Unit 2 or 3.

ISSUES OF REACTORS

12. It now appears that after new Steam Generators were installed at San Onofre Unit 2 and Unit 3, the new tubes began to seriously degrade very quickly. Technicians first detected the unanticipated problems of significant wear in the tubes during the Unit 2 refueling outage in January 2012.

13. The wear-rate for these steam generator tubes is extraordinary because tube thickness has been reduced by as much as 30 percent in less than two years. While Unit 2 was shutdown for refueling, San Onofre Unit 3 was operating at full power when it experienced a complete perforation of one steam generator tube that allowed highly radioactive water from inside the reactor to mix with the non-radioactive water that turns the turbine.

14. As a consequence, an uncontrolled release of radiation into the environment ensued, and San Onofre Unit 3 was also forced to shut down due to steam generator failure.

RISKS POSED

15. The San Onofre reactors have significant problems because their newly installed steam generators have extensive degradation and are unable to perform their design function of containing the radioactive water in the facility. Steam generator tube degradation, like that which San Onofre is experiencing, causes a significant nuclear safety risk by substantially increasing the likelihood of an accident that releases radioactivity into the environment.

16. Unfortunately, a leak or disintegration of one or more tubes would cause the radioactive water to escape the containment. Because there is a 1,000-pound-per-square-inch (psi) pressure difference between the high-pressure radioactive side of the tubes and the lower pressure steam that then leaves the containment, a leak will inevitably release radioactivity to the environment.

17. Gross failure of one or more of the steam generator tubes could create a nuclear design basis accident and cause the nuclear reactor core to lose a portion of its cooling water. However, the unique concern of degraded steam generator tubes is that uncontrolled radiation releases from a tube break do not remain inside the containment building and instead leak out of the facility and into public areas via atmospheric dump valves and steam generator blowdown.

18. If a steam line break accident were to occur, the depressurization of the steam generator caused by the steam line break coupled with the lack of water at the top of the steam generators would cause cascading tube failures, involving hundreds of tubes. The cascading tube failures would pop like popcorn and cause excessive offsite radiation exposures.

CASCADING DESIGN CHANGES AS BASIC CAUSE

19. A cascading series of deliberate design changes likely caused the tube failures and tube degradation.

20. The key fabrication change supplanted to the San Onofre steam generators by the Edison/MHI team increased the total number of tubes in each steam generator by almost 400

tubes to more than 104 percent of each generator's original design. Each Original Steam Generator contained 9350 tubes while the Replacement Steam Generators each contain 9727 tubes.

21. Fairewinds believes it was this management decision to increase the number of tubes that lead in turn to a series of cascading design changes that created the serious problems San Onofre is experiencing in 2012.

22. The original San Onofre steam generator contained a tubesheet, which is a metal disc approximately 13-feet in diameter and slightly less than two feet thick, located near the bottom of the steam generator. Due to the already extremely large size of the CE steam generators, this tubesheet is one of the largest tubesheets ever fabricated after which 18,700 holes (9,350 in-hot/9,350 out-cold) were then drilled. This metallic disk serves as an anchor into which both sides of the U-tubes are inserted. Not only is the tubesheet extraordinarily heavy, but also there can be a pressure difference of approximately 2,000 pounds per square inch (psi) between the radioactive water on one side and non-radioactive water on the other.

23. In order to support the enormous tubesheet metallic disk, the original steam generator design at San Onofre contained a 'stay cylinder' in the center of the tubesheet that is a support pillar designed to relieve the weight in the middle of the tubesheet.

    23.1. When Edison decided to cram in additional steam generator tubes, the fabrication technique created by Edison/MHI for the San Onofre steam generators necessitated the removal of the 'stay cylinder' so that more tube holes could be drilled through the tubesheet. The Edison/MHI decision to add additional tubes and replace this key support pillar was part of the cascading fabrication changes that caused additional stresses and steam generator failure.

    23.2. Removing the stay cylinder required additional cascading fabrication changes. Because the tubesheet was no longer supported in the center by the stay cylinder, Edison/MHI required the fabrication of a thicker tubesheet so that it could bear the additional stress without a stay cylinder. This change in the tubesheet thickness meant

yet another design change by reducing the volume of water in the steam generator and changing the flow pattern and also reducing the inspection access area beneath the tubesheet that is required to fit personnel and equipment for tube inspection.

23.3. Changing the structural loads on the tubesheet have not only affected the reliability of the steam generators but also should have raised a serious safety concern because the tubesheet is the key barrier keeping radiation inside the containment. Should the tubesheet fail, radiation within the reactor would bypass the containment and pass directly into the environment. Due to the installation of the 'stay cylinder' in the original San Onofre steam generator configuration, a tubesheet failure and subsequent radiation release is considered to be beyond the calculations for a design basis accident at San Onofre. Yet Edison chose to challenge this critical safety barrier and licensing parameter by removing the "stay cylinder" in order to install more, unnecessary tubes.

23.4. Fabricating more tubes increased nuclear reactor core flow, which was unacceptable because it changed the original design basis safety calculations for cooling the reactor. For that reason Edison welded a flow-restricting ring into the steam generator nozzle in order to reduce the flow of cooling water back into the reactor to the original design parameters, which also changes the flow distribution to the tubes. Thus significant operational changes were also made to the radioactive side of the steam generator as a result of Edison's addition of more steam generator tubes.

23.5. All of these changes necessitated even more fabrication changes within the steam generator. For example, more tubes meant that the tube supports had to be modified in an attempt to avoid the increased vibration caused by the flow changes induced by the Edison/MHI fabrication changes. The feedwater distribution ring inside the steam generator was also dramatically modified in order to avoid a serious flow induced water hammer.

SIGNIFICANCE OF DESIGN MODIFICATIONS ON SAFETY

24. The requirements for the process by which nuclear power plant operators and licensees may make changes to their facilities and procedures as delineated in the safety analysis report and without prior NRC approval are limited by specific regulations detailed in The Nuclear Regulatory Commission's *10 CFR Part 50, Domestic Licensing of Production and Utilization Facilities, Section 50.59, Changes, Tests and Experiments.*

25. The implementing procedures for the 10 CFR 50.59 regulations have eight criteria that are important for nuclear power plant safety. (These eight criteria are provided in Table 1, footnote A below.)

26. These implementing procedures created for 10 CFR. 50.59 require that the license be amended unless none of these eight criteria are triggered by any change made by Edison at San Onofre. If a single criterion is met, then the regulation requires that the licensee pursue a license amendment process.

27. By claiming that the steam generator replacements were a *like-for-like* design and fabrication, Edison avoided the more rigorous license amendment process. From the evidence reviewed, it appears that the NRC accepted Edison's statement and documents without further independent analysis. In the analysis detailed below, Fairewinds identified 39 separate safety issues that failed to meet the NRC 50.59 criteria. Any one of these 39 separate safety issues should have triggered the license amendment review process by which the NRC would have been notified of the proposed significant design and fabrication changes.

28. As the NRC guidelines state:

> "(c)(1) A licensee may make changes in the facility as described in the final safety analysis report (as updated), make changes in the procedures as described in the final safety analysis report (as 1.187-A-1updated), and conduct tests or experiments not described in the final safety analysis report (as updated) without obtaining a license amendment pursuant to § 50.90 only if: (i)A change to the technical specifications

incorporated in the license is not required, and **(ii) The change, test, or experiment does not meet any of the criteria in paragraph (c)(2) of this section."**[1] [Emphasis Added]

29. In its previous reports, Fairewinds identified at least eight modifications to the original steam generators at San Onofre.

30. Table 1 below was designed to compare the eight major design modifications that Fairewinds identified in its analysis with the eight criteria the NRC applies to the license review process in order to determine whether or not a new license amendment process is required.

31. The major design changes are located at the top of the table, and the NRC Criteria are listed in the left hand column of table. The term SSC stands for Systems, Structures and Components. A green *No* means that the *like-for-like* criteria were indeed met and that no license amendment was required. A red *Yes* means that Edison should have applied for a license amendment.

32. Table 1 shows that 7 out of 8 of the major design changes to the original steam generators meet a total of 39 of the NRC's 50.59 criteria requiring amendment to the license.

[1] See, 1.187-A-1, ttp://pbadupws.nrc.gov/docs/ML0037/ML003759710.pdf

Table 1
Steam Generator Design Changes Identified By Fairewinds Compared With The NRC's Like-For-Like Criteria

50:59 Criteria (A)	(B) Remove stay cylinder	Change tube sheet	Tube alloy change	Add tubes	Change tube support	Add flow restrictor	Additional water volume	Feed water distribution ring
i – Accident Frequency Increase	Yes (1)	Yes (1)	No	Yes (3,4)	Yes (3,4,8)	No	No	No
ii – Increase in SSC Malfunction occurrence	Yes (1)	Yes (1)	No	Yes (3,4)	Yes (3,4,8)	No	No	No
iii - Accident consequent increase	Yes (1)	Yes (1)	No	Yes (3,4)	Yes (3,4,8)	Yes (2)	Yes (2,5,6)	No
iv - Increase in SSC consequence of malfunction	Yes (1)	Yes (1)	No	Yes (3,4)	Yes (3,4,8)	Yes (2)	Yes (2,5,6)	No
v - Create unanalysed accident	Yes (1)	Yes (1)	No	No	No	Yes (2)	Yes (2,5,6)	Yes (3,7,8)
vi – Create new malfunction	Yes (1)	Yes (1)	No	No	Yes (3,8)	Yes (2)	No	Yes (3,7,8)
vii – Alter fission product barrier	Yes (1)	Yes (1)	No	Yes (3)	No	No	No	No
viii – Change design basis evaluation method	Yes (2)	Yes (2)	No	Yes (2)	Yes (2,8)	Yes (2)	Yes (2,5,6)	No

Table Footnotes

A - The criteria listed in the left column in the table above refers to the criteria as laid out in the NRC Guidelines[2] which states as follows:

"(2) A licensee shall obtain a license amendment pursuant to § 50.90 prior to implementing a proposed change, test, or experiment if the change, test, or experiment would:

(i) Result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the final safety analysis report (as updated);

(ii) Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system, or component (SSC) important to safety previously evaluated in the final safety analysis report (as updated);

(iii) Result in more than a minimal increase in the consequences of an accident previously evaluated in the final safety analysis report (as updated);

(iv) Result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the final safety analysis report (as updated);

[2] See, 1.187-A-1, ibid, ttp://pbadupws.nrc.gov/docs/ML0037/ML003759710.pdf

(v) Create a possibility for an accident of a different type than any previously evaluated in the final safety analysis report (as updated);

(vi) Create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in the final safety analysis report (as updated);

(vii) Result in a design basis limit for a fission product barrier as described in the FSAR (as updated) being exceeded or altered; or

(viii) Result in a departure from a method of evaluation described in the FSAR (as updated) used in establishing the design bases or in the safety analyses."

B – The horizontal axis contains a list of design changes made by Edison and whether they meet or have not met the criteria as set out in 10 CFR 50.59.

1 – The Steam Generator Replacement Project modified the tube sheets and stay cylinder that are a containment barrier – The NRC was not informed nor did it specifically approve these changes to the containment barrier as they were apparently not addressed under Edison's analysis for the 10 CFR 50.59 process;

2 – The Mitsubishi thermo hydraulic code is inadequate to assess flow inside the Steam Generators that dramatically affect the ability to cool the nuclear reactor core in the event of an accident;

3 – The Steam Generator Replacement Project increases the consequences of a steam line break accident;

4 – The Steam Generator Replacement Project has already proven to increase the frequency of tube failure;

5 – The Steam Generator Replacement Project changed the volume of primary coolant because more tubes were added, which changes the Final Safety Analysis Report;

6 – The Steam Generator Replacement Project changed the flow rate of primary coolant, which changes the Final Safety Analysis Report;

7 – The Steam Generator Replacement Project changed the potential for water hammer. Given that the Mitsubishi thermo hydraulic code is inadequate, the potential for water hammer is increased;

8 – The Steam Generator Replacement Project created steam binding at top of steam generator. The steam generator is designed to remove heat in the event of an accident and its role has been compromised.

The Actual Steam Generator Problem Causing Vibration

33. As water moves vertically up in a steam generator, the water content reduces as more steam is created. When the volume of steam is much greater than water then the flow resistance of the water/steam mixture passing through the tube supports accounts for one third of the total resistance at the top of the steam generator. Therefore to avoid vibration at the top of the tubes, Mitsubishi needed to specifically analyze the type of tube support to use in this unique application.

34. The flow resistance of the Mitsubishi broached plate is *much higher* than that of the original Combustion Engineering egg crate design because the tubes are so tightly packed in the original CE San Onofre steam generators. By reviewing the documents thus far produced, it appears that due to Mitsubishi's fabrication experience with broached plates, both Edison and Mitsubishi missed this key difference in the design and fabrication of the new San Onofre steam generators.

35. Not only is Mitsubishi unfamiliar with the tightly packed CE design, but also Edison's engineers created so many untested variables to the new fabrication that this new design had a significantly increased risk of failure. As a result of the very tight pitch to diameter ratios used in the original CE steam generators, Mitsubishi fabricated a broached plate design that allows almost no water to reach the top of the steam generator.

36. The maximum quality of the water/steam mixture at the top of the steam generator in the U-Bend region should be approximately 40 to 50 percent, i.e. half water and half steam. With the Mitsubishi design the top of the U-tubes are almost dry in some regions.[3] Without liquid in the mixture, there is no damping against vibration, and therefore a severe fluid-elastic instability developed.

37. In response to the Edison/Mitsubishi steam generator changes, the top of the new steam generator is starved for water therefore making tube vibration inevitable. Furthermore, the problem appears to be exacerbated by Mitsubishi's three-dimensional thermal-hydraulic analysis determining how the steam and water mix at the top of the tubes that has been benchmarked against the Westinghouse but not the Combustion Engineering design.

38. The real problem in the replacement steam generators at San Onofre is that too much steam and too little water is causing the tubes to vibrate violently in the U-bend region. The tubes are quickly wearing themselves thin enough to completely fail pressure tests. Even if the new tubes are actively not leaking or have not ruptured, the tubes in the Mitsubishi fabrication are at risk of bursting in a main steam line accident scenario and spewing radiation into the air.

RAMIFICATIONS OF AN INADEQUATE NRC REVIEW

39. Edison's strategic goal was to avoid the process of license amendment according to the January 2012 article in *Nuclear Engineering International NEI Magazine.*[4] Had Edison

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[3] With the Mitsubishi design the top of the U-tubes are almost dry in some regions. Fairewinds research and four independent industry experts, who wish to remain anonymous, substantiate this statement.

[4] Improving Like-For-Like Replacement Steam Generators by Boguslaw Olech of Southern California Edison and

notified the NRC that the new steam generators at San Onofre were not a *like-for-like* replacement, a more thorough review through the license amendment process would have been required. Given that scenario, it is likely that the requisite and thorough NRC review would have identified the design and fabrication inadequacies that appear to have caused the San Onofre steam generator tube failures.

40. More specifically, Fairewinds believes that the NRC would have identified the inadequacy of the Mitsubishi Heavy Industry computer code applied to validate the tube design and vibration pattern prior to fabrication. Mitsubishi's computer code was simply not capable of analyzing Combustion Engineering (CE) designs like San Onofre and was only qualified for Westinghouse designs that are not similar to the original CE steam generator design. In NRC licensing jargon, the Mitsubishi design codes were not benchmarked for the CE Design.

41. While Mitsubishi Heavy Industry has been supplying steam generators for many years in Japan, it did so under a specific license from Westinghouse for Westinghouse nuclear reactors. Although Mitsubishi made several incremental changes to the Westinghouse design, such as switching to alloy 690 tubing and the use of stainless steel broached plate tube supports. Mitsubishi has had very little experience with the tight tube pitch and the egg crate design used in the original CE design for San Onofre.

REPAIR

42. San Onofre engineers should have precise maps detailing the degraded and leaking tubes as well as the exact location of the leak(s) on each tube. Such data is just one piece of critical information required in conducting a thorough root cause analysis of the problem and determining an accurate solution. Edison claims that the proximate cause of these U-tube failures at San Onofre is high vibration, and it has embarked upon a process of plugging some of these damaged tubes in hopes of quickly restarting one or both units. Fairewinds

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Tomouki Inoue of Mitsubishi Heavy Industries, Nuclear Engineering International, January 2012, page 39. This article was based on a paper published at ICAPP 2011, 2-5 May 2011, Nice, France, paper 11330. Boguslaw Olech, P.E., Southern California Edison Company, 14300 Mesa Rd., San Clemente, CA 92674, USA, Email: bob.olech@sce.com. Tomoyuki Inoue, Mitsubishi Heavy Industries Ltd. (MHt), 1-1 Wadasaki-cho 1-Chome, HyogoKu, Kobe, Japan 652 8585, Email: tomoyukiJnoue@mhi.co.jp.

believes that this damage is occurring on the outside of the tubes where they collide with each other, while access to the tubes for repair and/or plugging can only be conducted from inside the tubes. Space limitations due to the tight fit of the 9,700 tubes (19,400 holes in the tube sheet) in each steam generator have made it impossible to access the outside of the U-tubes for inspection where the wear is actually occurring.

43. Presently, the Edison approach is to plug tubes in the most heavily damaged zone of each steam generator. Plugging the tubes only eliminates the radioactive water inside the tubes, but it does not eliminate the vibration, so the plugged tubes will continue to vibrate and damage adjacent tubes.

44. If a steam line break accident were to occur, the depressurization of the steam generator caused by the steam line break coupled with the lack of water at the top of the steam generators would cause cascading tube failures, involving hundreds of tubes. The cascading tube failures would pop like popcorn and the cascading failures would cause excessive offsite radiation exposures.

45. Fairewinds investigation has found that plugging the tubes is not a sure solution, because it fails to deal with the root causes of a failed design and it relies upon the incorrectly applied Mitsubishi 3-Dimensional steam analysis to determine which tubes should be plugged. Realistically, the 3-D steam analysis is not accurate enough to apply to such important safety-related determinations. To make such mathematical risk 3-D analysis, a very large margin of error must be applied, and that has not been done. For example, if the 3-D steam analysis determines that plugging 100 tubes is a solution, then plugging ten times that number might be the appropriate solution due to the mathematical errors in the 3-D analysis being applied by Edison and Mitsubishi.

46. Fairewinds concludes that plugging the tubes will never solve the underlying problem because vibration is the result not the root cause of the steam generator problems at San Onofre. The actual problem is a variety of design changes that have caused too much steam and too little water at the top of the steam generators. Plugging tubes cannot repair these design changes that are causing the tubes to collide with each other.

OPTIONS FOR CONTINUED OPERATION

47. Complete Replacement - The ongoing plugging of the tubes will not eliminate the vibrational failure mechanism causing tube failures. Over time, the damaged tubes that are plugged will in turn damage more tubes. Therefore, Fairewinds believes that the only sure solution to this significant safety issue is to once again cut open the reactor containment and install new steam generators that replicate the original CE design.

48. Repair In Place - While technically this would be an extremely challenging repair process, it may be possible to cut the steam generators apart while still inside the containment. Such a process would take approximately 18 months to make repairs and then weld the steam generators back together again without cutting the containment open. Cutting the top off the steam generators would allow construction personnel access so that additional supports could be inserted into the U-tube region. Smaller replacement packages would fit through the existing equipment hatch and the containment would not be compromised another time. The cost for these repairs would be less than completely redesigning and manufacturing new steam generators and replacement power costs would be less.

49. Power Reduction - Reducing power does not provide a remedy for the underlying structural problems that are creating the vibration that has damaged and will continue to damage tubes deep inside the San Onofre steam generator. Edison has suggested that plugging tubes and operating at indeterminate reduced power levels for the remainder of the life of the plant may be a solution to the San Onofre tube vibration problem.

50. Unfortunately this course of action would leave San Onofre operating with a significant safety risk if the NRC were to allow the reactors to restart.

51. Operating at reduced power will not prevent previously damaged tube supports and plugged tubes from vibrating and damaging surrounding tubes and tube supports, and it will worsen the existing damage.

52. More importantly, Fairewinds concern is that operating the San Onofre reactors at a lower power and flow rate might actually create a resonant frequency within the steam generators at

which some of the tubes will vibrate as bad or worse than they did originally. Because the plugged tubes are now filled with air their weight has changed, and therefore the plugged tubes will vibrate with a different amplitude and frequency. The inaccuracies in the Edison and Mitsubishi computer code do not allow Edison and Mitsubishi to conduct a resonant frequency analysis proving that such a problem will not occur.

53. Historical evidence from other operating nuclear reactors that have attempted to mitigate vibrational damage by using power reductions rather than solving the resonant frequency issues have in fact compromised other nuclear safety related components by operating at reduced power.

53.1. In 2002 the Exelon Quad Cities Nuclear Power Plant in Illinois operated its Unit 2 reactor at reduced power in order to eliminate vibrationally induced damage causing high moisture carryover in its steam dryer. While the power reduction temporarily reduced moisture carryover, the problem reoccurred and a shutdown was ordered causing an extended unplanned outage. Vibrationally induced severe cracking was discovered in the steam dryer and repaired. Following an analysis and subsequent repairs, Exelon claimed to have rectified the Quad Cities Unit 2 problems only to be forced in 2003 to once again attempt operation at a reduced power level when vibrationally induced steam dryer moisture carryover became excessive. Following this second attempt to operate the reactor at a reduced power level, pieces of the dryer as large as a man broke off and damaged nuclear power safety related components, and a second unplanned extended outage ensued. Once again, vibration was determined to be the cause of the gross failure and another unplanned and forced outage. Finally, following years of analysis and two damaged steam dryers, Quad Cities made major piping modifications that are alleged to have eliminated harmonic frequencies, prevented further component damage, and allowed Unit 2 to eventually return to full power production.[5]

53.2. A second example of a failed attempt to reduce power to solve vibrationally induced resonance frequency problems occurred at the Susquehanna nuclear plant in

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[5] http://pbadupws.nrc.gov/docs/ML0609/ML060960338.pdf

Pennsylvania. During the mid 1990s, a vibrationally induced failure in the jet pump sensing lines occurred at Susquehanna. This failure was attributed to the vane passing frequency from the recirculation pumps causing harmonic vibration of the lines. Like Quad Cities, Susquehanna attempted to implement a power reduction in order to minimize the harmonic vibrations. Unfortunately, the resonant vibration issues continued to damage systems after the power was reduced thereby forcing an unplanned outage and extensive modifications and repairs.

CONCLUSION

54. In conclusion, the NRC has stated that nuclear power plants like San Onofre cannot risk compromising critical safety systems and possible radiological contamination in an effort to return to operation before a thorough root cause analysis, modifications, and subsequent repairs are adequately reviewed by the NRC and implemented. Historical evidence has proven that power reductions do not solve underlying and serious degradation problems, resonance frequency issues. Rather, power reductions can significantly increase the risk of unplanned, forced outages during times of peak demand and can cause significant risk to public health in the event of a single tube rupture or a series of ruptures if the main steam line were to break.

55. Finally, if a steam-line accident were to occur, vibrationally induced tube damage at San Onofre could cause an inordinate amount of radioactivity to be released outside of the containment system compromising public health and safety in one of the most heavily populated areas in the entire United States.

-End-

I declare that under penalty of perjury that the foregoing is true and correct to the best of my knowledge. The facts presented in this declaration are true and correct to the best of my knowledge, and the opinions expressed are based on my best professional judgment. Executed in Accord with 10 CFR 2.304 (d) and 2.326 (b),

(Electronically signed)

Arnold Gundersen, MENE, RO
Fairewinds Associates, Inc
Burlington, Vermont 05408
Tel: (802) 865 9955
Email: arnie@sailchamplain.net
Date: May 31, 2012

I declare under penalty of perjury that the foregoing is true and correct.

Executed this day, May 31, 2012 at Palermo, Italy.

Arnold Gundersen, MNE
Chief Engineer, Fairewinds Associates, Inc

Docket No. 50-361 and 50-362
FRIENDS OF THE EARTH
EXHIBIT TWO

CURRICULUM VITAE

Arnold Gundersen
Chief Engineer, Fairewinds Associates, Inc
May 2012

Education and Training

ME NE	Master of Engineering Nuclear Engineering Rensselaer Polytechnic Institute, 1972 U.S. Atomic Energy Commission Fellowship Thesis: Cooling Tower Plume Rise
BS NE	Bachelor of Science Nuclear Engineering Rensselaer Polytechnic Institute, Cum Laude, 1971 James J. Kerrigan Scholar
RO	Licensed Reactor Operator, U.S. Atomic Energy Commission License # OP-3014

Qualifications – including and not limited to:

- Chief Engineer, Fairewinds Associates, Inc
- Nuclear Engineering, Safety, and Reliability Expert
- Federal and Congressional hearing testimony and Expert Witness testimony
- Former Senior Vice President Nuclear Licensee
- Former Licensed Reactor Operator
- 40-years of nuclear industry experience and oversight
    - Nuclear engineering management assessment and prudency assessment
    - Nuclear power plant licensing and permitting – assessment and review
    - Nuclear safety assessments, source term reconstructions, dose assessments, criticality analysis, and thermohydraulics
    - Contract administration, assessment and review
    - Systems engineering and structural engineering assessments
    - Cooling tower operation, cooling tower plumes, thermal discharge assessment, and consumptive water use
    - Nuclear fuel rack design and manufacturing, nuclear equipment design and manufacturing, and technical patents
    - Radioactive waste processes, storage issue assessment, waste disposal and decommissioning experience
    - Reliability engineering and aging plant management assessments, in-service inspection
    - Employee awareness programs, whistleblower protection, and public communications
    - Quality Assurance (QA) & records

Publications

Co-author — *Fukushima Daiichi: Truth And The Way Forward,* Shueisha Publishing, February 17, 2012, Tokyo, Japan.

Co-author — *Fairewinds Associates 2009-2010 Summary to JFC, July 26, 2010* State of Vermont, Joint Fiscal Office, (http://www.leg.state.vt.us/jfo/envy.aspx).

Co-author — *Supplemental Report of the Public Oversight Panel Regarding the Comprehensive Reliability Assessment of the Vermont Yankee Nuclear Power Plant July 20, 2010,* to the Vermont State Legislature by the Vermont Yankee Public Oversight Panel.

Co-author — The Second Quarterly Report by Fairewinds Associates, Inc to the Joint Legislative Committee regarding buried pipe and tank issues at Entergy Nuclear Vermont Yankee and Entergy proposed Enexus spinoff. See two reports: *Fairewinds Associates 2nd Quarterly Report to JFC* and *Enexus Review by Fairewinds Associates.*

Author — Fairewinds Associates, Inc *First Quarterly Report to the Joint Legislative Committee*, October 19, 2009.

Co-author — *Report of the Public Oversight Panel Regarding the Comprehensive Reliability Assessment of the Vermont Yankee Nuclear Power Plant*, March 17, 2009, to the Vermont State Legislature by the Vermont Yankee Public Oversight Panel.

Co-author — *Vermont Yankee Comprehensive Vertical Audit – VYCVA – Recommended Methodology to Thoroughly Assess Reliability and Safety Issues at Entergy Nuclear Vermont Yankee, January 30, 2008 Testimony to Finance Committee Vermont Senate.*

Co-author — *Decommissioning Vermont Yankee – Stage 2 Analysis of the Vermont Yankee Decommissioning Fund – The Decommissioning Fund Gap*, December 2007, Fairewinds Associates, Inc. Presented to Vermont State Senators and Legislators.

Co-author — *Decommissioning the Vermont Yankee Nuclear Power Plant: An Analysis of Vermont Yankee's Decommissioning Fund and Its Projected Decommissioning Costs*, November 2007, Fairewinds Associates, Inc.

Co-author — *DOE Decommissioning Handbook, First Edition*, 1981-1982, invited author.

Presentations & Media

Fairewinds Energy Education Corp 501c3 presentations at the University of Vermont (2), Boston Library (6/16/11), Duxbury Emergency Management (6/15/11), Vermont State Nuclear Advisory Panel (VSNAP), Elder Education Enrichment, New Jersey Environmental Federation (5/14/11), Quaker Meeting House, Press Conference for Physicians for Social Responsibility (5/19/11), St. Johnsbury Academy – Nuclear Power 101.

Educational videos on nuclear safety, reliability and engineering particularly Fukushima issues. Videos may be viewed @ fairewinds.com 24 videos (July 21, 2011).

Expert commentary: CNN (6), The John King Show (14), BBC, CBC, Russia Today, VPR, WPTZ, WCAX, WBAI, NECN, Pacifica, Democracy Now, *Washington Post*, *New York Times*, *The Guardian*, *Bloomberg* (print & TV), *Reuters*, *Associated Press*, *The Global Post*, *Miami Herald*, *Al Jazeera*, *The Tennessean*, The Chris Martinson Show, *Mainichi News*, *Gendai Magazine*, NHK television, *Scientific American*. *Huffington Post* (Paris) named Fairewinds.com the best go to site for Fukushima information (5/9/11).

Patents

Energy Absorbing Turbine Missile Shield – U.S. Patent # 4,397,608 – 8/9/1983

Committee Memberships

Vermont Yankee Public Oversight Panel, appointed 2008 by President Pro-Tem Vermont Senate

National Nuclear Safety Network – Founding Board Member

Three Rivers Community College – Nuclear Academic Advisory Board
Connecticut Low Level Radioactive Waste Advisory Committee – 10 years, founding member
Radiation Safety Committee, NRC Licensee – founding member
ANSI N-198, Solid Radioactive Waste Processing Systems

Honors

U.S. Atomic Energy Commission Fellowship, 1972
B.S. Degree, Cum Laude, RPI, 1971, 1st in nuclear engineering class
Tau Beta Pi (Engineering Honor Society), RPI, 1969 – 1 of 5 in sophomore class of 700
James J. Kerrigan Scholar 1967–1971
Teacher of the Year – 2000, Marvelwood School
Publicly commended to U.S. Senate by NRC Chairman, Ivan Selin, in May 1993 – "It is true...everything Mr. Gundersen said was absolutely right; he performed quite a service."

Expert Witness Testimony and Nuclear Engineering Analysis and Consulting

Expert Witness Report For Friends Of The Earth – May 15, 2012
San Onofre's Steam Generator Failures Could Have Been Prevented, Fairewinds Associates

Expert Witness Report For Friends Of The Earth – April 10, 2012
San Onofre Cascading Steam Generator Failures Created By Edison: Imprudent Design And Fabrication Decisions Caused Leaks, Fairewinds Associates

Expert Witness Report For Friends Of The Earth – March 27, 2012
Steam Generator Failures At San Onofre: The Need For A Thorough Root Cause Analysis Requires No Early Restart

Expert Witness Report For Greenpeace – February 27, 2012
Lessons From Fukushima: The Echo Chamber Effect, Fairewinds Associates

Nuclear Regulatory Commission – December 21, 2011
Expert witness report to Atomic Safety and Licensing Board: *Prefiled Direct Testimony of Arnold Gundersen Regarding Consolidated Contention RK-EC-3/CW-EC-1 (Spent Fuel Pool Leaks)*

New York State Department Of Environmental Conservation – November 15-16, 2011
Expert witness for Riverkeeper: hearing testimony regarding license extension application for Indian Point Units 2 and 3 – contention: tritium in the groundwater.

Nuclear Regulatory Commission – November 10, 2011
Expert witness report entitled: *Fukushima and the Westinghouse-Toshiba AP1000, A Report for the AP1000 Oversight Group by Fairewinds Associates, Inc,* and Video. Submitted to NRC by the AP1000 Oversight Group.

Nuclear Regulatory Commission – October 7, 2011

Testimony to the NRC Petition Review Board Re: Mark 1 Boiling Water Reactors, Petition for NRC to shut down all BWR Mark 1 nuclear power plants due to problems in containment integrity in the Mark 1 design.

New York State Department Of Environmental Conservation, October 4, 2011
Prefiled Rebuttal Testimony Of Arnold Gundersen On Behalf Of Petitioners Riverkeeper, Inc., Scenic Hudson, Inc., And Natural Resources Defense Council, Inc. To The Direct Testimony Of Matthew J. Barvenik (Senior Principal GZA Geoenvironmental, Inc.) Regarding Radiological Materials

Southern Alliance for Clean Energy (SACE) submission to TVA Board of Directors – August 3, 2011– Expert witness report entitled: *The Risks of Reviving TVA's Bellefonte Project,* and Video prepared for the Southern Alliance for Clean Energy (SACE).

New York State Department Of Environmental Conservation, July 22, 2011
Prefiled Direct Testimony Of Arnold Gundersen On Behalf Of Petitioners Riverkeeper, Inc., Scenic Hudson, Inc., And Natural Resources Defense Council, Inc. Regarding Radiological Materials

Nuclear Regulatory Commission – May 10, 2011
Comment to the proposed rule on the AP1000 Design Certification Amendment Docket ID NRC-2010-0131 As noticed in the Federal Register on February 24, 2011 Retained by Friends of the Earth as Expert Witness.

Nuclear Regulatory Commission – May 10, 2011
Comment to the proposed rule on the AP1000 Design Certification Amendment Docket ID NRC-2010-0131 As noticed in the Federal Register on February 24, 2011 Retained by Friends of the Earth as Expert Witness.

NRC Advisory Committee on Reactor Safeguards (ACRS) – May 26, 2011
Lessons learned from Fukushima and Containment Integrity on the AP1000.

Vermont Energy Cooperative (VEC) – April 26, 2011
Vermont Yankee – Is It Reliable for 20 more years?

Vermont State Nuclear Advisory Panel (VSNAP) – February 22, 2011
Testimony and presentation entitled the *Vermont Yankee Public Oversight Panel Supplemental Report* regarding management issues at the Vermont Yankee Nuclear Power Plant to the reconvened Vermont State Nuclear Advisory Panel.

Vermont State Legislature Senate Committee On Natural Resources And Energy
February 8, 2011. Testimony: *Vermont Yankee Leaks and Implications.*
(http://www.leg.state.vt.us/jfo/envy.aspx)

Vermont State Legislature – January 26, 2011
House Committee On Natural Resources And Energy, and
Senate Committee On Natural Resources And Energy

Testimony regarding Fairewinds Associates, Inc's report: *Decommissioning the Vermont Yankee Nuclear Power Plant and Storing Its Radioactive Waste* (http://www.leg.state.vt.us/jfo/envy.aspx). Additional testimony was also given regarding the newest radioactive isotopic leak at the Vermont Yankee nuclear power plant.

Vermont State Legislature Joint Fiscal Committee Legislative Consultant Regarding Entergy Nuclear Vermont Yankee *Decommissioning the Vermont Yankee Nuclear Power Plant and Storing Its Radioactive Waste* January 2011. (http://www.leg.state.vt.us/jfo/envy.aspx).

U.S. Nuclear Regulatory Commission Advisory Committee on Reactor Safeguards (NRC-ACRS) AP1000 Sub-Committee
Nuclear Containment Failures: Ramifications for the AP1000 Containment Design, Supplemental Report submitted December 21, 2010. (http://fairewinds.com/reports)
Vermont State Legislature Joint Fiscal Committee Legislative Consultant Regarding Entergy Nuclear Vermont Yankee *Reliability Oversight Entergy Nuclear Vermont Yankee, December 6, 2010.* Discussion regarding the leaks at Vermont Yankee and the ongoing monitoring of those leaks and ENVY's progress addressing the 90-items identified in Act 189 that require remediation. (http://www.leg.state.vt.us/jfo/envy.aspx).

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB)
Declaration Of Arnold Gundersen Supporting Blue Ridge Environmental Defense League's Contention Regarding Consumptive Water Use At Dominion Power's Newly Proposed North Anna Unit 3 Pressurized Water Reactor in the matter of Dominion Virginia Power North Anna Power Station Unit 3 Docket No. 52-017 Combined License Application ASLBP#08-863-01-COL, October 2, 2010.

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB)
Declaration Of Arnold Gundersen Supporting Blue Ridge Environmental Defense League's New Contention Regarding AP1000 Containment Integrity On The Vogtle Nuclear Power Plant Units 3 And 4 in the matter of the Southern Nuclear Operating Company Vogtle Electric Generating Plant, Units 3&4 Combined License Application, Docket Nos. 52-025-COL and 52-026-COL and ASLB No. 09-873-01-COL-BD01, August 13, 2010.

Vermont State Legislature Joint Fiscal Committee Legislative Consultant Regarding Entergy Nuclear Vermont Yankee – July 26, 2010
Summation for 2009 to 2010 Legislative Year For the Joint Fiscal Committee Reliability Oversight Entergy Nuclear Vermont Yankee (ENVY) Fairewinds Associates 2009-2010. This summary includes an assessment of ENVY's progress (as of July 1, 2010) toward meeting the milestones outlined by the Act 189 Vermont Yankee Public Oversight Panel in its March 2009 report to the Legislature, the new milestones that have been added since the incident with the tritium leak and buried underground pipes, and the new reliability challenges facing ENVY, Entergy, and the State of Vermont. (http://www.leg.state.vt.us/jfo/envy.aspx)

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB)

Declaration Of Arnold Gundersen Supporting Blue Ridge Environmental Defense League's Contentions in the matter of Dominion Virginia Power North Anna Station Unit 3 Combined License Application, Docket No. 52-017, ASLBP#08-863-01-COL, July 23, 2010.

Florida Public Service Commission (FPSC)
Licensing and construction delays due to problems with the newly designed Westinghouse AP1000 reactors in *Direct Testimony In Re: Nuclear Plant Cost Recovery Clause By The Southern Alliance For Clean Energy (SACE)*, FPSC Docket No. 100009-EI, July 8, 2010.

U.S. Nuclear Regulatory Commission Advisory Committee on Reactor Safeguards (NRC-ACRS) AP1000 Sub-Committee
Presentation to ACRS regarding design flaw in AP1000 Containment – June 25, 2010
Power Point Presentation: http://fairewinds.com/content/ap1000-nuclear-design-flaw-addressed-to-nrc-acrs.

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB)
Second Declaration Of Arnold Gundersen Supporting Supplemental Petition Of Intervenors Contention 15: DTE COLA Lacks Statutorily Required Cohesive QA Program – June 8, 2010.

NRC Chairman Gregory Jaczko, ACRS, Secretary of Energy Chu, and the White House Office of Management and Budget
AP1000 Containment Leakage Report Fairewinds Associates - Gundersen, Hausler, 4-21-2010.
This report, commissioned by the AP1000 Oversight Group, analyzes a potential flaw in the containment of the AP1000 reactor design.

Vermont State Legislature House Committee On Natural Resources And Energy – April 5, 2010
Testified to the House Committee On Natural Resources And Energy regarding discrepancies in Entergy's TLG Services decommissioning analysis. See *Fairewinds Cost Comparison TLG Decommissioning* (http://www.leg.state.vt.us/jfo/envy.aspx).

Vermont State Legislature Joint Fiscal Committee Legislative Consultant Regarding Entergy Nuclear Vermont Yankee – February 22, 2010
The Second Quarterly Report by Fairewinds Associates, Inc to the Joint Legislative Committee regarding buried pipe and tank issues at Entergy Nuclear Vermont Yankee and Entergy proposed Enexus spinoff. See two reports: *Fairewinds Associates 2nd Quarterly Report to JFC* and *Enexus Review by Fairewinds Associates*. (http://www.leg.state.vt.us/jfo/envy.aspx).

Vermont State Legislature Senate Natural Resources – February 16, 2010
Testified to Senate Natural Resources Committee regarding causes and severity of tritium leak in unreported buried underground pipes, status of Enexus spinoff proposal, and health effects of tritium.

Vermont State Legislature Senate Natural Resources – February 10, 2010
Testified to Senate Natural Resources Committee regarding causes and severity of tritium leak in unreported buried underground pipes. http://www.youtube.com/watch?v=36HJiBrJSxE

Vermont State Legislature Senate Finance – February 10, 2010
Testified to Senate Finance Committee regarding *A Chronicle of Issues Regarding Buried Tanks and Underground Piping at VT Yankee.* (http://www.leg.state.vt.us/jfo/envy.aspx).

Vermont State Legislature House Committee On Natural Resources And Energy – January 27, 2010 *A Chronicle of Issues Regarding Buried Tanks and Underground Piping at VT Yankee.* (http://www.leg.state.vt.us/jfo/envy.aspx).

Submittal to Susquehanna River Basin Commission, by Eric Epstein – January 5, 2010
Expert Witness Report Of Arnold Gundersen Regarding Consumptive Water Use Of The Susquehanna River By The Proposed PPL Bell Bend Nuclear Power Plant In the Matter of RE: Bell Bend Nuclear Power Plant Application for Groundwater Withdrawal Application for Consumptive Use BNP-2009-073.

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB)
Declaration of Arnold Gundersen Supporting Supplemental Petition of Intervenors Contention 15: Detroit Edison COLA Lacks Statutorily Required Cohesive QA Program, December 8, 2009.

U.S. NRC Region III Allegation Filed by Missouri Coalition for the Environment
Expert Witness Report entitled: *Comments on the Callaway Special Inspection by NRC Regarding the May 25, 2009 Failure of its Auxiliary Feedwater System,* November 9, 2009.

Vermont State Legislature Joint Fiscal Committee Legislative Consultant Regarding Entergy Nuclear Vermont Yankee
Oral testimony given to the Vermont State Legislature Joint Fiscal Committee October 28, 2009.
See report: *Quarterly Status Report - ENVY Reliability Oversight for JFO*
(http://www.leg.state.vt.us/jfo/envy.aspx).

Vermont State Legislature Joint Fiscal Committee Legislative Consultant Regarding Entergy Nuclear Vermont Yankee
The First Quarterly Report by Fairewinds Associates, Inc to the Joint Legislative Committee regarding reliability issues at Entergy Nuclear Vermont Yankee, issued October 19, 2009.
See report: *Quarterly Status Report - ENVY Reliability Oversight for JFO*
(http://www.leg.state.vt.us/jfo/envy.aspx).

Florida Public Service Commission (FPSC)
Gave direct oral testimony to the FPSC in hearings in Tallahassee, FL, September 8 and 10, 2009 in support of Southern Alliance for Clean Energy (SACE) contention of anticipated licensing and construction delays in newly designed Westinghouse AP 1000 reactors proposed by Progress Energy Florida and Florida Power and Light (FPL).

Florida Public Service Commission (FPSC)
NRC announced delays confirming my original testimony to FPSC detailed below. My supplemental testimony alerted FPSC to NRC confirmation of my original testimony regarding licensing and construction delays due to problems with the newly designed Westinghouse AP 1000 reactors in *Supplemental Testimony In Re: Nuclear Plant Cost Recovery Clause By The*

Southern Alliance For Clean Energy, FPSC Docket No. 090009-EI, August 12, 2009.

Florida Public Service Commission (FPSC)
Licensing and construction delays due to problems with the newly designed Westinghouse AP 1000 reactors in *Direct Testimony In Re: Nuclear Plant Cost Recovery Clause By The Southern Alliance For Clean Energy (SACE)*, FPSC Docket No. 090009-EI, July 15, 2009.

Vermont State Legislature Joint Fiscal Committee Expert Witness Oversight Role for Entergy Nuclear Vermont Yankee (ENVY)
Contracted by the Joint Fiscal Committee of the Vermont State Legislature as an expert witness to oversee the compliance of ENVY to reliability issues uncovered during the 2009 legislative session by the Vermont Yankee Public Oversight Panel of which I was appointed a member along with former NRC Commissioner Peter Bradford for one year from July 2008 to 2009. Entergy Nuclear Vermont Yankee (ENVY) is currently under review by Vermont State Legislature to determine if it should receive a Certificate for Public Good (CPG) to extend its operational license for another 20-years. Vermont is the only state in the country that has legislatively created the CPG authorization for a nuclear power plant. Act 160 was passed to ascertain ENVY's ability to run reliably for an additional 20 years. Appointment from July 2009 to May 2010.

U.S. Nuclear Regulatory Commission
Expert Witness Declaration regarding Combined Operating License Application (COLA) at North Anna Unit 3 *Declaration of Arnold Gundersen Supporting Blue Ridge Environmental Defense League's Contentions* (June 26, 2009).

U.S. Nuclear Regulatory Commission
Expert Witness Declaration regarding Through-wall Penetration of Containment Liner and Inspection Techniques of the Containment Liner at Beaver Valley Unit 1 Nuclear Power Plant *Declaration of Arnold Gundersen Supporting Citizen Power's Petition* (May 25, 2009).

U.S. Nuclear Regulatory Commission
Expert Witness Declaration regarding Quality Assurance and Configuration Management at Bellefonte Nuclear Plant *Declaration of Arnold Gundersen Supporting Blue Ridge Environmental Defense League's Contentions in their Petition for Intervention and Request for Hearing*, May 6, 2009.

Pennsylvania Statehouse
Expert Witness Analysis presented in formal presentation at the Pennsylvania Statehouse, March 26, 2009 regarding actual releases from Three Mile Island Nuclear Accident. Presentation may be found at: http://www.tmia.com/march26

Vermont Legislative Testimony and Formal Report for 2009 Legislative Session
As a member of the Vermont Yankee Public Oversight Panel, I spent almost eight months examining the Vermont Yankee Nuclear Power Plant and the legislatively ordered Comprehensive Vertical Audit. Panel submitted Act 189 Public Oversight Panel Report March 17, 2009 and oral testimony to a joint hearing of the Senate Finance and House Committee On

Natural Resources And Energy March 19, 2009. (See: http://www.leg.state.vt.us/JFO/Vermont%20Yankee.htm)

Finestone v FPL (11/2003 to 12/2008) Federal Court
Plaintiffs' Expert Witness for Federal Court Case with Attorney Nancy LaVista, from the firm Lytal, Reiter, Fountain, Clark, Williams, West Palm Beach, FL. This case involved two plaintiffs in cancer cluster of 40 families alleging that illegal radiation releases from nearby nuclear power plant caused children's cancers. Production request, discovery review, preparation of deposition questions and attendance at Defendant's experts for deposition, preparation of expert witness testimony, preparation for Daubert Hearings, ongoing technical oversight, source term reconstruction and appeal to Circuit Court.

U.S. Nuclear Regulatory Commission Advisory Committee Reactor Safeguards (NRC-ACRS)
Expert Witness providing oral testimony regarding Millstone Point Unit 3 (MP3) Containment issues in hearings regarding the Application to Uprate Power at MP3 by Dominion Nuclear, Washington, and DC. (July 8-9, 2008).

Appointed by President Pro-Tem of Vermont Senate to Legislatively Authorized Nuclear Reliability Public Oversight Panel
To oversee Comprehensive Vertical Audit of Entergy Nuclear Vermont Yankee (Act 189) and testify to State Legislature during 2009 session regarding operational reliability of ENVY in relation to its 20-year license extension application. (July 2, 2008 to present).

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB)
Expert Witness providing testimony regarding *Pilgrim Watch's Petition for Contention 1 Underground Pipes* (April 10, 2008).

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB)
Expert Witness supporting *Connecticut Coalition Against Millstone In Its Petition For Leave To Intervene, Request For Hearing, And Contentions Against Dominion Nuclear Connecticut Inc.'s Millstone Power Station Unit 3 License Amendment Request For Stretch Power Uprate* (March 15, 2008).

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB)
Expert Witness supporting *Pilgrim Watch's Petition For Contention 1: specific to issues regarding the integrity of Pilgrim Nuclear Power Station's underground pipes and the ability of Pilgrim's Aging Management Program to determine their integrity.* (January 26, 2008).

Vermont State House – 2008 Legislative Session
- House Committee on Natural Resources and Energy – Comprehensive Vertical Audit: *Why NRC Recommends a Vertical Audit for Aging Plants Like Entergy Nuclear Vermont Yankee (ENVY)*
- House Committee on Commerce – Decommissioning Testimony

Vermont State Senate – 2008 Legislative Session

- Senate Finance – testimony regarding Entergy Nuclear Vermont Yankee Decommissioning Fund
- Senate Finance – testimony on the necessity for a Comprehensive Vertical Audit (CVA) of Entergy Nuclear Vermont Yankee
- House Committee on Natural Resources and Energy – testimony regarding the placement of high-level nuclear fuel on the banks of the Connecticut River in Vernon, VT

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB)
MOX Limited Appearance Statement to Judges Michael C. Farrar (Chairman), Lawrence G. McDade, and Nicholas G. Trikouros for the "Petitioners": Nuclear Watch South, the Blue Ridge Environmental Defense League, and Nuclear Information & Resource Service in support of *Contention 2: Accidental Release of Radionuclides, requesting a hearing concerning faulty accident consequence assessments made for the MOX plutonium fuel factory proposed for the Savannah River Site*. (September 14, 2007).

Appeal to the Vermont Supreme Court (March 2006 to 2007)
Expert Witness Testimony in support of *New England Coalition's Appeal to the Vermont Supreme Court Concerning: Degraded Reliability at Entergy Nuclear Vermont Yankee as a Result of the Power Uprate*. New England Coalition represented by Attorney Ron Shems of Burlington, VT.

State of Vermont Environmental Court (Docket 89-4-06-vtec 2007)
Expert witness retained by New England Coalition to review Entergy and Vermont Yankee's analysis of alternative methods to reduce the heat discharged by Vermont Yankee into the Connecticut River. Provided Vermont's Environmental Court with analysis of alternative methods systematically applied throughout the nuclear industry to reduce the heat discharged by nuclear power plants into nearby bodies of water and avoid consumptive water use. This report included a review of the condenser and cooling tower modifications.

U.S. Senator Bernie Sanders and Congressman Peter Welch (2007)
Briefed Senator Sanders, Congressman Welch and their staff members regarding technical and engineering issues, reliability and aging management concerns, regulatory compliance, waste storage, and nuclear power reactor safety issues confronting the U.S. nuclear energy industry.

State of Vermont Legislative Testimony to Senate Finance Committee (2006)
Testimony to the Senate Finance Committee regarding Vermont Yankee decommissioning costs, reliability issues, design life of the plant, and emergency planning issues.

U.S. Nuclear Regulatory Commission Atomic Safety and Licensing Board (NRC-ASLB)
Expert witness retained by New England Coalition to provide Atomic Safety and Licensing Board with an independent analysis of the integrity of the Vermont Yankee Nuclear Power Plant condenser (2006).

U.S. Senators Jeffords and Leahy (2003 to 2005)
Provided the Senators and their staffs with periodic overview regarding technical, reliability, compliance, and safety issues at Entergy Nuclear Vermont Yankee (ENVY).

10CFR 2.206 filed with the Nuclear Regulatory Commission (July 2004)
Filed 10CFR 2.206 petition with NRC requesting confirmation of Vermont Yankee's compliance with General Design Criteria.

State of Vermont Public Service Board (April 2003 to May 2004)
Expert witness retained by New England Coalition to testify to the Public Service Board on the reliability, safety, technical, and financial ramifications of a proposed increase in power (called an uprate) to 120% at Entergy's 31-year-old Vermont Yankee Nuclear Power Plant.

International Nuclear Safety Testimony
Worked for ten days with the President of the Czech Republic (Vaclav Havel) and the Czech Parliament on their energy policy for the 21st century.

Nuclear Regulatory Commission (NRC) Inspector General (IG)
Assisted the NRC Inspector General in investigating illegal gratuities paid to NRC Officials by Nuclear Energy Services (NES) Corporate Officers. In a second investigation, assisted the Inspector General in showing that material false statements (lies) by NES corporate president caused the NRC to overlook important violations by this licensee.

State of Connecticut Legislature
Assisted in the creation of State of Connecticut Whistleblower Protection legal statutes.

Federal Congressional Testimony
Publicly recognized by NRC Chairman, Ivan Selin, in May 1993 in his comments to U.S. Senate, "It is true...everything Mr. Gundersen said was absolutely right; he performed quite a service." Commended by U.S. Senator John Glenn for public testimony to Senator Glenn's NRC Oversight Committee.

PennCentral Litigation
Evaluated NRC license violations and material false statements made by management of this nuclear engineering and materials licensee.

Three Mile Island Litigation
Evaluated unmonitored releases to the environment after accident, including containment breach, letdown system and blowout. Proved releases were 15 times higher than government estimate and subsequent government report.

Western Atlas Litigation
Evaluated neutron exposure to employees and license violations at this nuclear materials licensee.

Commonwealth Edison
In depth review and analysis for Commonwealth Edison to analyze the efficiency and effectiveness of all Commonwealth Edison engineering organizations, which support the operation of all of its nuclear power plants.

Peach Bottom Reactor Litigation
Evaluated extended 28-month outage caused by management breakdown and deteriorating condition of plant.

***Special Remediation Expertise*:**

Director of Engineering, Vice President of Site Engineering, and the Senior Vice President of Engineering at Nuclear Energy Services (NES) Division of Penn Central Corporation (PCC)

- NES was a nuclear licensee that specialized in dismantlement and remediation of nuclear facilities and nuclear sites. Member of the radiation safety committee for this licensee.
- Department of Energy chose NES to write *DOE Decommissioning Handbook* because NES had a unique breadth and depth of nuclear engineers and nuclear physicists on staff.
- Personally wrote the "Small Bore Piping" chapter of the DOE's first edition Decommissioning Handbook, personnel on my staff authored other sections, and I reviewed the entire Decommissioning Handbook.
- Served on the Connecticut Low Level Radioactive Waste Advisory Committee for 10 years from its inception.
- Managed groups performing analyses on dozens of dismantlement sites to thoroughly remove radioactive material from nuclear plants and their surrounding environment.
- Managed groups assisting in decommissioning the Shippingport nuclear power reactor. Shippingport was the first large nuclear power plant ever decommissioned. The decommissioning of Shippingport included remediation of the site after decommissioning.
- Managed groups conducting site characterizations (preliminary radiation surveys prior to commencement of removal of radiation) at the radioactively contaminated West Valley site in upstate New York.
- Personnel reporting to me assessed dismantlement of the Princeton Avenue Plutonium Lab in New Brunswick, NJ. The lab's dismantlement assessment was stopped when we uncovered extremely toxic and carcinogenic underground radioactive contamination.
- Personnel reporting to me worked on decontaminating radioactive thorium at the Cleveland Avenue nuclear licensee in Ohio. The thorium had been used as an alloy in turbine blades. During that project, previously undetected extremely toxic and carcinogenic radioactive contamination was discovered below ground after an aboveground gamma survey had purported that no residual radiation remained on site.

Additional Education

Basic Mediation Certificate	Champlain College, Woodbury Institute 28-hour Basic Mediation Training September 2010

Teaching and Academic Administration Experience

Rensselaer Polytechnic Institute (RPI) – Advanced Nuclear Reactor Physics Lab
Community College of Vermont – Mathematics Professor – 2007 to present

Burlington High School
Mathematics Teacher – 2001 to June 2008
Physics Teacher – 2004 to 2006
The Marvelwood School – 1996 to 2000
Awarded Teacher of the Year – June 2000
Chairperson: Physics and Math Department
Mathematics and Physics Teacher, Faculty Council Member
Director of Marvelwood Residential Summer School
Director of Residential Life
The Forman School & St. Margaret's School – 1993 to 1995
Physics and Mathematics Teacher, Tennis Coach, Residential Living Faculty Member

Nuclear Engineering Work Experience 1970 to Present

Expert witness testimony in nuclear litigation and administrative hearings in federal, international, and state court and to Nuclear Regulatory Commission, including but not limited to: Three Mile Island, US Federal Court, US NRC, NRC ASLB & ACRS, Vermont State Legislature, Vermont State Public Service Board, Florida Public Service Board, Czech Senate, Connecticut State Legislature, Western Atlas Nuclear Litigation, U.S. Senate Nuclear Safety Hearings, Peach Bottom Nuclear Power Plant Litigation, and Office of the Inspector General NRC.

Nuclear Engineering, Safety, and Reliability Expert Witness 1990 to Present
- Fairewinds Associates, Inc – Chief Engineer, 2005 to Present
- Arnold Gundersen, Nuclear Safety Consultant and Energy Advisor, 1995 to 2005
- GMA – 1990 to 1995, including expert witness testimony regarding the accident at Three Mile Island.

Nuclear Energy Services, Division of PCC (Fortune 500 company) 1979 to 1990
Corporate Officer and Senior Vice President - Technical Services
Responsible for overall performance of the company's Inservice Inspection (ASME XI), Quality Assurance (SNTC 1A), and Staff Augmentation Business Units – up to 300 employees at various nuclear sites.

Senior Vice President of Engineering
Responsible for the overall performance of the company's Site Engineering, Boston Design Engineering and Engineered Products Business Units. Integrated the Danbury based, Boston based and site engineering functions to provide products such as fuel racks, nozzle dams, and transfer mechanisms and services such as materials management and procedure development.

Vice President of Engineering Services
Responsible for the overall performance of the company's field engineering, operations engineering, and engineered products services. Integrated the Danbury-based and field-based engineering functions to provide numerous products and services required by nuclear utilities, including patents for engineered products.

General Manager of Field Engineering
Managed and directed NES' multi-disciplined field engineering staff on location at various nuclear plant sites. Site activities included structural analysis, procedure development, technical specifications and training. Have personally applied for and received one patent.

Director of General Engineering
Managed and directed the Danbury based engineering staff. Staff disciplines included structural, nuclear, mechanical and systems engineering. Responsible for assignment of personnel as well as scheduling, cost performance, and technical assessment by staff on assigned projects. This staff provided major engineering support to the company's nuclear waste management, spent fuel storage racks, and engineering consulting programs.

New York State Electric and Gas Corporation (NYSE&G) — 1976 to 1979
Reliability Engineering Supervisor
Organized and supervised reliability engineers to upgrade performance levels on seven operating coal units and one that was under construction. Applied analytical techniques and good engineering judgments to improve capacity factors by reducing mean time to repair and by increasing mean time between failures.

Lead Power Systems Engineer
Supervised the preparation of proposals, bid evaluation, negotiation and administration of contracts for two 1300 MW NSSS Units including nuclear fuel, and solid-state control rooms. Represented corporation at numerous public forums including TV and radio on sensitive utility issues. Responsible for all nuclear and BOP portions of a PSAR, Environmental Report, and Early Site Review.

Northeast Utilities Service Corporation (NU) — 1972 to 1976
Engineer
Nuclear Engineer assigned to Millstone Unit 2 during start-up phase. Lead the high velocity flush and chemical cleaning of condensate and feedwater systems and obtained discharge permit for chemicals. Developed Quality Assurance Category 1 Material, Equipment and Parts List. Modified fuel pool cooling system at Connecticut Yankee, steam generator blowdown system and diesel generator lube oil system for Millstone. Evaluated Technical Specification Change Requests.

Associate Engineer
Nuclear Engineer assigned to Montague Units 1 & 2. Interface Engineer with NSSS vendor, performed containment leak rate analysis, assisted in preparation of PSAR and performed radiological health analysis of plant. Performed environmental radiation survey of Connecticut Yankee. Performed chloride intrusion transient analysis for Millstone Unit 1 feedwater system. Prepared Millstone Unit 1 off-gas modification licensing document and Environmental Report Amendments 1 & 2.

Rensselaer Polytechnic Institute (RPI) — 1971 to 1972
Critical Facility Reactor Operator, Instructor

Licensed AEC Reactor Operator instructing students and utility reactor operator trainees in start-up through full power operation of a reactor.

Public Service Electric and Gas (PSE&G) — 1970

Assistant Engineer

Performed shielding design of radwaste and auxiliary buildings for Newbold Island Units 1 & 2, including development of computer codes.

Media

Featured Nuclear Safety and Reliability Expert (1990 to present) for Television, Newspaper, Radio, & Internet – Including, and not limited to:

CNN: JohnKingUSA, CNN News, Earth Matters; DemocracyNow, NECN, WPTZ VT, WTNH, VPTV, WCAX, RT, CTV (Canada), CCTV Burlington, VT, ABC, TBS/Japan, Bloomberg: EnergyNow, KPBS, Japan National Press Club (Tokyo), Italy National Press Club (Rome), The Crusaders, Front Page, Five O'Clock Shadow: Robert Knight, Mark Johnson Show, Steve West Show, Anthony Polina Show, WKVT, WDEV, WVPR, WZBG CT, Seven Days, AP News Service, Houston Chronicle, Christian Science Monitor, Reuters, The Global Post, International Herald, The Guardian, New York Times, Washington Post, LA Times, Miami Herald, St. Petersburg Times, Brattleboro Reformer, Rutland Herald, Times-Argus, Burlington Free Press, Litchfield County Times, The News Times, The New Milford Times, Hartford Current, New London Day, Vermont Daily Briefing, Green Mountain Daily, EcoReview, Huffington Post, DailyKos, Voice of Orange County, AlterNet, Common Dreams, and numerous other national and international blogs

Public Service, Cultural, and Community Activities

2009 to Present –Fairewinds Energy Education Corp 501(C)3 non-profit board member

2005 to Present – Public presentations and panel discussions on nuclear safety and reliability at University of Vermont, Vermont Law School, NRC hearings, Town and City Select Boards, Legal Panels, Local Schools, Television, and Radio.

2007-2008 – Created Concept of Solar Panels on Burlington High School; worked with Burlington Electric Department and Burlington Board of Education Technology Committee on Grant for installation of solar collectors for Burlington Electric peak summer use

Vermont State Legislature – Public Testimony to Legislative Committees

Certified Foster Parent State of Vermont – 2004 to 2007

Mentoring former students – 2000 to present – college application and employment application questions and encouragement

Tutoring Refugee Students – 2002 to 2006 – Lost Boys of the Sudan and others from educationally disadvantaged immigrant groups

Designed and Taught Special High School Math Course for ESOL Students – 2007 to 2008

NNSN – National Nuclear Safety Network, Founding Advisory Board Member, meetings with and testimony to the Nuclear Regulatory Commission Inspector General (NRC IG)

Berkshire School Parents Association, Co-Founder

Berkshire School Annual Appeal, Co-Chair

Sunday School Teacher, Christ Church, Roxbury, CT

Washington Montessori School Parents Association Member
Marriage Encounter National Presenting Team with wife Margaret
Provided weekend communication and dialogue workshops weekend retreats/seminars
Connecticut Marriage Encounter Administrative Team – 5 years
Northeast Utilities Representative Conducting Public Lectures on Nuclear Safety Issues

End

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	Docket No. 50-361
	)	50-362
SOUTHERN CALIFORNIA	)	
EDISON COMPANY	)	May 30, 2012
	)	
(San Onofre Nuclear Generating Station)	)	

DECLARATION OF MARCELIN E. KEEVER

I, Marcelin E. Keever, hereby declare as follows:

1. The facts set forth in this declaration are based on my personal knowledge.

2. I am the Oceans and Vessels Project Director and Legal Director for Friends of the Earth, Inc. I have served as the Oceans and Vessels Project Director since being hired at Friends of the Earth in June 2008 and as the Legal Director since September 2010. Friends of the Earth is a tax exempt, nonprofit environmental advocacy organization founded in 1969. Friends of the Earth is headquartered and incorporated in the District of Columbia and has an office in San Francisco, California. I am also a member of Friends of the Earth.

3. I am familiar with the organization's mission, which is to defend the environment and create a more healthy and just world, in particular by engaging in efforts to improve the environmental, health, and safety conditions at civil nuclear facilities licensed by the Nuclear Regulatory Commission and its predecessor agencies and fighting proposals to design and build new reactors that use federal funds to underwrite such initiatives. To that end, Friends of the Earth utilizes its institutional resources, including legislative advocacy, litigation, and public outreach and education, to minimize the risks that nuclear facilities pose to its members and to the general public.

4. Friends of the Earth is a part of Friends of the Earth International, a federation of grassroots groups working in 76 countries on today's most urgent environmental and social issues. Friends of the Earth International is the world's largest grassroots environmental federation. In the United States, Friends of the Earth has more than 9,100 members in all 50 states (including 1,900 members in California), and over 140,000 activists.

5. Friends of the Earth relies on science and uses the law to create and advocate for innovative strategies to conserve natural resources and protect public health and the environment. Friends of the Earth actively engages in a number of efforts before the Nuclear Regulatory Commission (NRC) to improve operating nuclear facilities and in litigation to support these efforts. The instant petition, request for a hearing and request for a stay in the NRC proceeding regarding Southern California Edison's (SCE) San Onofre Nuclear Generating Station (San Onofre) in San Clemente, California, is a central and integral part of our advocacy to address the environmental, health and safety impacts from the San Onofre nuclear facility.

6. Friends of the Earth's work on nuclear facilities and issues frequently appears in its publications, in its quarterly newsmagazine, and on the internet at its website at www.foe.org, its Facebook page and its Twitter feed. As Legal Director, I am familiar with Friends of the Earth's efforts to educate and inform our members and activists, including outreach to members on nuclear issues. Friends of the Earth's members rely on the organization to advocate before the NRC regarding nuclear facilities. They also rely on the organization to represent their interests by participating in rulemaking and other regulatory processes.

7. A major objective for Friends of the Earth is that the public have an opportunity to influence the outcome of government and corporate decisions that affect the lives of many people. Thus the organization regularly advocates for transparency and openness in government and corporate decision making. In particular, Friends of the Earth has sought for many years to

increase public involvement in the decisions of the Nuclear Regulatory Commission and the nuclear industry.

8. Friends of the Earth members include persons owning property and recreating in the area surrounding San Onofre Nuclear Generating Station who risk exposure to radiation from those facilities affecting their health and safety, adverse impacts to the ecosystem of Southern California, and diminished property values, from possible radiation leaks.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge, information, and belief.

Executed at San Francisco, on May 30, 2012.

Marcelin E. Keever

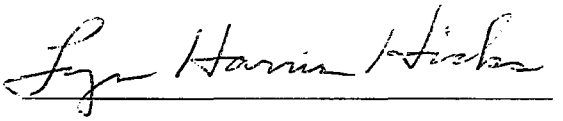
DECLARATION OF LYN HARRIS HICKS

I, LYN HARRIS HICKS, declare as follows:

1. I am a resident of San Clemente, California. I own a house at 3908 Calle Ariana, San Clemente, California, 92672 and I have lived here since 1969 with my husband KC Hicks, and our two daughters Meri Berniece and Lyn Ellen. Prior to living on Ariana at this address, we lived there for eleven years at 253 Avenida Montalvo, San Clemente about 3.5 miles from the San Onofre nuclear plant. I am now a widow of one year.
2. I have been a member of Friends of the Earth intermittently for approximately 40 years and I am currently a member of Friends of the Earth. I became a member of Friends of the Earth due to my appreciation for their work, including their campaign focused on the San Onofre nuclear plant in San Clemente, California.
3. My home is about 2.5 miles from San Onofre nuclear power plant. I am a retired teacher and was a journalist and was the editor of the Daily Sun Post, San Clemente.
4. My two daughters attended school at Concordia Elementary approximately three miles from the San Onofre nuclear plant.
5. One of my grandchildren, fifteen year old Kellen, son of our daughter Ellen and her husband Ken Rhoda, was born and raised within two to three miles of San Onofre nuclear plant. We have spent many decades on our beautiful beaches throughout the summer plus many weekends throughout the years in our bit of heaven.
6. I have been concerned about the environmental and potential impacts from nuclear generated electricity for half a century.
7. After the nuclear accident at Fukushima, Japan in March 2011, I became even more troubled about the impacts from nuclear power. My interest in the issue is heightened due the proximity of my home to San Onofre nuclear power plant which lies 2.5 miles to the south.
8. Given how close I live to San Onofre one of my main concerns is that my health and welfare is at risk from the operation of this plant. I am also worried for the health and safety of my children and grandchild since they live within a few miles of the nuclear plant at San Onofre.

9. My concerns about nuclear power increased further after San Onofre's January 31, 2012, steam generator tube rupture in Unit 3 that released radioactive material into the environment. My interests will be harmed if San Onofre is allowed to restart without the problems at the plant being resolved.
10. The quality of my life in San Clemente and my peace of mind have increased dramatically since the shut down of the nuclear reactors at San Onofre in January 2012. The lack of reliability at San Onofre impacts me and my community in Southern California. An accident at San Onofre as a result of restarting the plant would negatively affect my property value and the property values in my community. An accident at San Onofre would also negatively affect the environment of the community in which I live and enjoy.
11. I request that the Nuclear Regulatory Commission hold a public hearing regarding the safety of the steam generators at San Onofre.
12. I strongly support the petition to intervene, request for a hearing and request for a stay filed by Friends of the Earth with the Nuclear Regulatory Commission regarding San Onofre and I believe that San Onofre should not be restarted until it can be guaranteed that there will be no repeat of the severe damage to the San Onofre steam generators.

I declare, under penalty of perjury, that the foregoing information is true, accurate, and correct. Executed on May 29th, 2012, in San Clemente, California.



Lyn Harris Hicks

BEFORE THE UNITED STATES
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
SOUTHERN CALIFORNIA EDISON COMPANY	)	Docket Nos. 50-361, 50-362
	)	
(San Onofre Nuclear Generating Station)	)	June 18, 2012

NOTICE OF APPEARANCE

Pursuant to 10 C.F.R. § 2.314(b), Richard E. Ayres, Jessica L. Olson, and Kristin L. Hines, of 1707 L St., NW, Suite 850, Washington, D.C. 20036, telephone number 202-452-9200, submit this notice of appearance in a representative capacity in this proceeding. The basis of our eligibility is admission to the Bar of the District of Columbia. We will appear on behalf of Friends of the Earth, of 1100 15th St., NW, Washington, D.C. 20005, Petitioner in the above-titled proceedings.

Dated: June 18, 2012

Richard Ayres

Richard E. Ayres

Richard E. Ayres (D.C. Bar No. 212621)
Jessica L. Olson (D.C. Bar No. 497560)
Kristin L. Hines (D.C. Bar No. 1001208)
Counsel to Friends of the Earth

CERTIFICATE OF SERVICE

I, Richard Ayres, certify that a copy of the enclosed Petition to Intervene and Request for a Hearing, Application for Stay, and Notice of Appearance were served on each of the following by hand delivery or electronic mail on June 18, 2012:

U.S. Nuclear Regulatory Commission
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Mail Stop O-16G4
Washington, DC 20555-0001
CHAIRMAN@nrc.gov

U.S. Nuclear Regulatory Commission
Commissioner Kristine Svinicki
Mail Stop O-16G4
Washington, DC 20555-0001
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U.S. Nuclear Regulatory Commission
Commissioner George Apostolakis
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Office of Secretary of the Commission
Sixteenth Floor
One White Flint North

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Attn: Rulemakings and Adjudications Staff
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hearingdocket@nrc.gov

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Russell.swartz@sce.com

Richard Ayres

Richard E. Ayres

Date: June 18, 2012