BEFORE THE COMMISSION

In the Matter of	)	
	)	
PACIFIC GAS AND ELECTRIC COMPANY	)	Docket No. 72-26-ISFSI
	)	
(Diablo Canyon Power Plant Independent Spent Fuel Storage Installation)	)	ASLBP No. 08-860-01-ISFSI-BD01
	)	

NRC BRIEF AND SUMMARY OF RELEVANT FACTS, DATA AND ARGUMENTS UPON WHICH THE STAFF PROPOSES TO RELY AT ORAL ARGUMENT ON SAN LUIS OBISPO MOTHERS FOR PEACE'S CONTENTION 2

Lisa B. Clark
Molly L. Barkman
Counsel for the NRC Staff

April 14, 2008

TABLE OF CONTENTS

ATTACHMENTS

TABLE OF AUTHORITIES

PAGE

FEDERAL COURT CASES

STATUTES

REGULATIONS

FEDERAL REGISTER

RULES OF EVIDENCE

April 14, 2008

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of	)	
	)	
PACIFIC GAS AND ELECTRIC COMPANY	)	Docket No. 72-26-ISFSI
	)	
(Diablo Canyon Power Plant Independent Spent Fuel Storage Installation)	)	ASLBP No. 08-860-01-ISFSI-BD01

NRC BRIEF AND SUMMARY OF RELEVANT FACTS, DATA AND ARGUMENTS UPON WHICH THE STAFF PROPOSES TO RELY AT ORAL ARGUMENT ON SAN LUIS OBISPO MOTHERS FOR PEACE'S CONTENTION 2

INTRODUCTION

Pursuant to 10 C.F.R. § 2.1113, the Nuclear Regulatory Commission staff ("Staff") hereby submits its written presentation summarizing all facts, data and arguments on which the Staff intends to rely at oral argument. For the reasons set forth below, the Staff submits that there is no genuine or substantial dispute of fact or law relating to San Luis Obispo Mothers for Peace's ("SLOMFP's") Contention 2 as admitted by the Commission. The written presentation is supported by the affidavits of Elizabeth Thompson (Affidavit 1) and of Paul Kelley, Jr., James Randall Hall, Roberta Warren and Scott Flanders (Affidavit 2).

BACKGROUND

In December 2001, Pacific Gas & Electric Company ("PG&E") filed an application for a materials license authorizing construction and operation of an Independent Spent Fuel Storage Installation ("ISFSI") for dry cask storage of spent nuclear fuel at the Diablo Canyon Nuclear Power Plant site. The Staff conducted an environmental review of the application, issuing an

Environmental Assessment ("EA") in October 2003.[1] In response to a notice of opportunity for hearing, petitions to intervene were received from numerous petitioners, including SLOMFP. The Licensing Board presiding over the application referred to the Commission its decision to deny SLOMFP contentions alleging that the Staff's environmental review was inadequate in that it did not include consideration of the impacts of terrorism. The Commission accepted the referral and affirmed the Board's decision to reject SLOMFP's contentions.[2]

On appeal, the Ninth Circuit Court of Appeals ruled that the NRC's refusal to consider the environmental effects of a terrorist attack was unreasonable under NEPA and remanded this issue to the Commission for further proceedings.[3] Pursuant to the Court's remand, the Commission directed the Staff to prepare a revised environmental assessment addressing the likelihood of a terrorist attack on the Diablo Canyon ISFSI and the potential consequences of such an attack.[4] The Commission expressed the expectation that the Staff would base its analysis on information already available in agency records, including information on the ISFSI design, mitigative, and security arrangements bearing on likely consequences. *Id.* at 150. Pursuant to the Commission's direction, the Staff issued a draft supplement to the EA[5] and

---

[1] "Environmental Assessment Related to the Construction and Operation of the Diablo Canyon Independent Spent Fuel Storage Installation" ("EA").

[2] *In the Matter of Pacific Gas and Electric Co.* Diablo Canyon Power Plant Independent Spent Fuel Storage Installation), CLI-03-1, 57 NRC 1 (2003).

[3] *San Luis Obispo Mothers for Peace v. NRC*, (449 F.3d 1016, 1028, 1035 (9th Cir. 2006) ("*SLOMFP")*.

[4] *Pacific Gas and Electric Co.* (Diablo Canyon Power Plant Independent Spent Fuel Storage Installation), CLI-07-11, 65 NRC 148, 149 (2007).

[5] "Supplement to the Environmental Assessment and Draft Finding of No Significant Impact Related to the Construction and Operation of the Diablo Canyon Independent Spent Fuel Storage Installation," May 2007. ADAMS Accession No. ML071500033.

published it for public comment. This was followed by issuance of the final supplement in August 2007, including an appendix addressing public comments.[6] The Staff subsequently published an addendum to the Supplemental EA, augmenting the list of references.[7]

SLOMFP filed five contentions challenging the Staff's Supplemental EA,[8] two of which were admitted by the Commission, in part.[9] Importantly, the Commission defined the scope of NEPA adjudicatory hearings when sensitive security information is involved. Citing the Supreme Court's decision in *Weinberger v. Catholic Action of Hawaii*, 454 U.S. 139, 146-47, the Commission declined to disclose national security information the NRC has a statutory obligation to protect, leaving the matter of threat assessment under NEPA within the purview of the NRC. CLI-08-01, 66 NRC __, slip op. at 24. Pursuant to the Commission's schedule, the Staff hereby submits written summaries of facts, data and arguments in accordance with 10 C.F.R. § 2.1113.

SUBPART K REGULATORY FRAMEWORK AND STANDARDS

Following the Ninth Circuit remand, Commission decided that, in the interest of expeditious resolution, it would determine the admissibility of contentions submitted on the Staff's revised environmental assessment addressing terrorism and whether, in resolving the

---

[6] "Supplement to the Environmental Assessment and Final Finding of No Significant Impact Related to the Construction and Operation of the Diablo Canyon Independent Spent Fuel Storage Installation" ("Supplemental EA"). August 2007. ADAMS Accession No. ML072400511.

[7] "Addendum to Supplement to the Environmental Assessment Related to the Construction and Operation of the Diablo Canyon Independent spent Fuel Storage Installation," November 7, 2007. ADAMS Accession No. ML073040434.

[8] "San Luis Obispo Mothers for Peace's Contentions and Request for a Hearing Regarding Diablo Canyon Environmental Assessment Supplement," ("SLOMFP Hearing Request") June 28, 2007.

[9] *In the Matter of Pacific Gas and Electric Co.* (Diablo Canyon Power Plant Independent Spent Fuel Storage Installation), CLI-08-01, 66 NRC ___, slip op. at 29 (January 15, 2008).

admitted contentions, oral argument or other further action would be required. CLI-07-11, 65 NRC at 150. Thereafter, in its decision to admit SLOMFP contentions, the Commission determined that the proceeding would be held under the special hybrid proceeding in Part 2, Subpart K. CLI-08-01, 66 NRC __, slip op. at 4. The Commission established a tentative schedule for further consideration of each of the two contentions and stated that a Subpart K oral argument would be heard by the Commission on a date to be determined on SLOMFP contention 2. *Id.* at 31.

This procedures of Subpart K, set forth in 10 C.F.R. § 2.1101 *et seq.*, were established in response to a congressional mandate in the Nuclear Waste Policy Act of 1982, 42 U.S.C. § 10101, *et seq.*[10] Subpart K provides that its procedures may be used, at the request of any party, in contested proceedings concerning "an application for a license or license amendment to expand the spent nuclear fuel storage capacity at the site of a civilian nuclear power plant." 10 C.F.R. § 2.1101. The procedures include a discovery period followed by submittal of a detailed written summary of relevant facts, data, and an oral argument. 10 C.F.R. §§ 2.1113(a); CLI-08-01, 66 NRC __, slip op. at 30-31. The detailed written presentation must contain all the facts, data, and arguments known to the party and on which the party intends to rely at oral argument to support or refute the existence of a genuine and substantial dispute of fact. 10 C.F.R. § 2.1113(a). All supporting facts and data must be submitted in the form of sworn written testimony or other sworn written submission. *Id.* The written submissions are to be simultaneously served on all other parties. *Id.*

After considering the submissions and oral arguments, the adjudicatory body, in this

---

[10] *Pacific Gas & Electric Co.* (Diablo Canyon Independent Spent Fuel Storage Installation), LBP-03-11, 58 NRC 47, 56-57 (2003).

case the Commission, will issue an order (1) designating any disputed issues of fact and law for hearing, and (2) disposing of any issues of fact or law not designated for hearing. 10 C.F.R. § 2.1115(a). In designating issues for hearing, the presiding officer "shall identify the specific facts that are in genuine and substantial dispute, the reason why the decision of the Commission is likely to depend on the resolution of that dispute, and the reason why an adjudicatory hearing is likely to resolve the dispute." *Id.* As for the issues not designated for hearing, only a brief statement of the reasons for the disposition is required. *Id.*

These procedures provide a form of summary disposition. 50 Fed. Reg. 41,662, 41,664 (1984). However, there are several differences between the provisions of Subpart K and traditional NRC summary disposition practice, including: simultaneous filing of pleadings, mandatory oral argument, and placing the burden of demonstrating the existence of a genuine and substantial issue of material fact on the party requesting the adjudication.[11]

While the Staff may have the ultimate burden of proving the sufficiency of its EA and FONSI, the burden of moving forward to an evidentiary hearing is on the intervenor.[12] In promulgating Subpart K, the Commission discussed the criteria for designating an issue for hearing, stating that:

> Not only must there be a genuine and substantial dispute of fact, but the dispute must be material: *i.e.*, the decision must be likely to depend on resolution of the dispute. In addition, the dispute must be one that can be resolved with sufficient accuracy only by the introduction of evidence in an adjudicatory proceeding.

50 Fed. Reg. at 41,666-67. The Commission also emphasized that the threshold for an adjudicatory hearing is strict:

---

[11] *Id.* at 41,667. *Compare Georgia Power Co.* (Vogtle Generating Plant, Units 1 & 2), ALAB-872, 26 NRC 127 (1987).

[12] *Carolina Power & Light Co.* (Shearon Harris Nuclear Power Plant), LBP-01-9, 53 NRC 239, 249 (2003).

> As the Commission pointed out in connection with the proposed rules, the statutory criteria are quite strict and are designed to ensure that the hearing is focused exclusively on real issues. They are similar to the standards under the Commission's existing rule for determining whether summary disposition is warranted. They go further, however, in requiring a finding that adjudication is necessary to resolution of the dispute and in placing the burden of demonstrating the existence of a genuine and substantial dispute of material fact on the party requesting adjudication.

Id. at 41,667. Therefore, in Subpart K proceedings such as this one, the burden of going forward and demonstrating the existence of a genuine and substantial issue of material fact that can only be resolved by the introduction of evidence at an adjudicatory hearing is on the intervenors, SLOMFP.[13]

THE ADMITTED CONTENTION BEFORE THE COMMISSION

Of the two admitted contentions, the Commission has referred Contention 1(b), relating to disclosure of information under FOIA, to the Presiding Officer designated to consider certain matters as directed by the Commission.[14] The contention before the Commission, designated Contention 2, is premised on SLOMFP's claim that the EA Supplement relied on improper and hidden assumptions in not considering the non-fatal health effects resulting from a terrorist attack and by ignoring the environmental effects on surrounding land. *Id.*, slip op. at 20.

Specifically, SLOMFP's Contention 2, "Reliance on hidden and unjustified assumptions" claimed:

> The EA Supplement fails to satisfy NEPA because the NRC's decision not to prepare an EIS is based on hidden and unjustified assumptions

SLOMFP Hearing Request at 10. As the basis for this contention, SLOMFP cited case law

---

[13] *See Pacific Gas & Electric Co.,* LBP-03-11, 58 NRC at 57; *Shearon Harris*, LBP-00-12, 53 NRC 239, 249 (2001).

[14] *In the Matter of Pacific Gas and Electric Co.* (Diablo Canyon Power Plant Independent Spent Fuel Storage Installation) CLI-08-05, 66 NRC ___ , slip op. at 4 (March 27, 2008).

which stated that an agency may not rely on misleading assumptions or projections or on misleading or unqualified statements in evaluating environmental consequences under NEPA. *Id.* SLOMFP then claimed that the NRC had relied on unjustified assumptions by (1) only considering early fatalities and (2) excluding the impacts of land contamination. *Id.* While SLOMFP also claimed that the NRC improperly assumed that the environmental impacts would be reduced to insignificance by emergency planning upgrades, the Commission explicitly declined to admit that basis, noting that there was no need to convene a hearing upon the statement in the Supplemental EA that "[i]n some situations, emergency planning and response actions could provide an additional measure of protection." CLI-08-01, 66 NRC __, slip op. at 21, *citing* Supplemental EA at 7.

STATEMENT OF FACTS

The facts on which the Staff relies are set forth in the environmental review documents the Staff issued for PG&E's application for the construction and operation of an ISFSI at the Diablo Canyon power reactor site as supplemented by the affidavits from Elizabeth Thompson, James Randall Hall, Scott Flanders, Roberta Warren, and Paul Kelley, Jr. The professional qualifications of the Staff experts are set forth in their resumes attached to their affidavits.

The facts are detailed in those documents and described further in the Staff's argument. In summary, the facts detailed in those filings support the following factual conclusions:

1) Although the probability of a terrorist attack cannot be reliably quantified, the Staff believes that under general credible threat conditions the probability of a terrorist attack is low.

2) The calculated radiological dose to the maximally exposed member of the public offsite, including the contribution to dose from four days of exposure to contaminated land, would result in a very small risk of any discernible health effects.

3) The low probability of a terrorist attack, together with the low dose to the public that would result even if a terrorist attack is successfully completed, support the Staff's finding that there is

a low risk of significant environmental impacts from a terrorist attack at the Diablo Canyon ISFSI.

ARGUMENT

I. The Staff's Reliance on Probability of a Terrorist Attack and Mitigation Afforded by The ISFSI Cask Design and Security Measures in Assessing Environmental Impacts is Proper Under the National Environmental Policy Act.

The National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. § 4321 *et seq.* (2000), prescribes a process for federal government agencies to consider the environmental impacts of major federal actions. The "twin aims" of NEPA are (1) to obligate agencies to consider every significant aspect of the environmental impact of a proposed action, and (2) to ensure that agencies inform the public that they have "considered those environmental concerns in their decisionmaking."[15] "Rather than mandating particular results, NEPA imposes on federal agencies procedural requirements that force consideration of the environmental consequences of agency actions.[16]

NEPA requires the preparation of an Environmental Assessment (EA) to determine whether a major Federal action will significantly affect the quality of the human environment. 42 U.S.C. § 4332(2)(C); 10 C.F.R. 51.21. If the agency determines there is a significant impact to the environment, it must prepare an Environmental Impact Statement. 10 C.F.R. § 51.31. If it concludes that there is no significant impact, the agency will prepare a Finding of No Significant Impact (FONSI). *Id.*[17] In preparing an EA an agency must take a "hard look" at the

---

[15] *SLOMFP*, 449 F.3d at 1020 (quoting *Baltimore Gas & Elec. Co. v. Natural Res. Def. Council, Inc.*, 462 U.S. 87,97 (1983)); *Private Fuel Storage* (Independent Spent Fuel Storage Installation), CLI-02-25, 56 NRC 340, 348 (2002).

[16] *Id.* at 1020 (citing *Dept. of Transp. v. Pub. Citizen*, 541 U.S. 752, 756 (2004)).

[17] *Virginia Electric & Power Co.* (North Anna Power Station, Units 1 and 2), ALAB-790, 20 NRC 1450, 1452 n.5 (1984) (finding that the Staff is not required to prepare a complete environmental impact (continued. . .)

environmental impacts of the proposed action.[18]

In preparing the Supplemental EA addressing terrorism, the Staff considered the potential radiological impacts of a terrorist attack on the Diablo Canyon ISFSI notwithstanding the fact that the Staff considered the probability of a malevolent act against an ISFSI that resulted in a significant radiological release to be very low. EA Supplement at 6. As explained further below, the Staff premised this conclusion on (1) the Staff's belief that, while it cannot be quantified, the probability of a terrorist attack is low and (2) the Staff's finding that the protection and mitigation offered by the cask design and security measures required by the NRC provide high assurance that the radiological consequences to the nearest resident will not result in discernible health effects. The Staff also recognizes that security and mitigation measures required for the Diablo Canyon ISFSI may, under certain circumstances, mitigate the consequences of a terrorist attack. EA Supplement at 8; Aff. 2 at ¶¶ 7-9. Based on the Staff's belief concerning probability and the mitigation of potential consequences, the Staff concluded that a terrorist attack that would result in a significant release of radiation affecting the public is not reasonably expected to occur. EA Supplement at 8; Aff. 2 at ¶¶ 7-9.

This consideration of overall risk as a function of probability and potential consequences, as well as the consideration of mitigation measures which reduce potential consequences, has been determined by the courts to be appropriate under NEPA. Specifically, the use of an approach in which an agency assessed the significance of potential - but not certain -

---

(. . .continued)

statement if, after performing an EA, it determines that the proposed action will have no significant impact).

[18] *Baltimore Gas & Elec.*, 462 U.S. at 97 (citing *Kleppe v. Sierra Club*, 427 U.S. 390, 410 n.21 (1976).

environmental consequences in terms of overall risk was approved by the Second Circuit Court of Appeals in *City of New York v. Department of Transportation,* 715 F.2d 732, 752 (2nd Cir. 1983) *cert. denied* 465 U.S. 1055 (1984). In that case, the Department of Transportation ("DOT") was considering the impacts of potentially high consequences from a low probability incident; a serious accident during transportation of radioactive waste through New York City. The court upheld DOT's calculation of risk achieved "by estimating possible consequences and then discounting them by the improbability of their occurring," finding that it was properly within DOT's discretion to conclude that "such a remote possibility, even of a serious consequence, did not create a 'significant' risk for the human environment." *Id.* at 752. Therefore, the Court found that the EA constituted the "hard look" required by NEPA, and DOT did not have to prepare an EIS." *Id.*

Agencies, including the NRC, have determined that acts of sabotage are so remote and speculative that it is proper to omit them from NEPA analysis.[19] The Second and Third Circuits have held that "agencies have the discretion to exclude such high-consequence, low-probability events," as sabotage, from their NEPA analyses.[20] This approach has been cited with approval by the Commission.[21]

Agencies may also take into account project-related mitigation measures in determining whether an action will have a significant impact.[22] "If significant measures are taken to 'mitigate'

---

[19] See e.g., *Limerick Ecology Action v. NRC*, 869 F2d 719, 739 (3d Cir. 1989); *New York City*, 715 F.2d at 750.

[20] *Id.*

[21] *Private Fuel Storage*, *L.L.C.* (Independent Spent Fuel Storage Installation) CLI-02-25, 56 NRC 340, 349 (2002).

[22] *Env. Protection Info. Ctr. v. U.S. Forest Serv.*, 451 F.3d 1005, 1015 (9th Cir. 2006); see also *Wetlands Action Network v. U.S. Army Corps of Eng'rs*, 222 F.3d 1105, 1121 (9th Cir. 2000) *cert. denied* (continued. . .)

the project's effects, they need not completely compensate for adverse environmental impacts."[23] The sufficiency of mitigation measures is based on "whether the mitigation measures constitute an adequate buffer against the negative impacts that result from the authorized activity to render such impacts so minor as to not warrant an EIS. *Id.*

Indeed, "[w]here the proposal itself so integrates mitigation from the beginning that it is impossible to define the proposal without including the mitigation, the agency may then rely on the mitigation measures in determining that the overall effects would not be significant."[24] At issue in *Environmental Protection Information Center*, was the Forest Service's EA regarding a timber harvest. *Id.* The EA incorporated very specific and detailed information regarding the means by which the timber harvest would be conducted in order to minimize impacts on wildlife and the watershed. *Id.* In addition, the EA explained that there would be concurrent monitoring in place to ensure that those means were implemented effectively and in such a way as to timely identify "threats and the need for preventative measures or project modifications."[25] Based on "the specificity of the protection measures, the analysis of the environmental impacts with those measures in place, and the provision for ongoing monitoring," the court found that the Forest Service had taken the requisite "hard look" at the environmental impacts of the timber harvest. *Id*. at 1015-1016.

(. . .continued)

by 534 U.S. 815 (2001).

[23] *Wetlands Action Network,* 222 F.3d at 1121 (quoting *Friends of Payette v. Horseshoe Bend Hydroelectric Co.,* 988 F.2d 989, 993 (9th Cir. 1993).

[24] *Env. Protection Info. Ctr.,* 451 F.3d at 1015 n.6 (citing CEQ's "Forty Questions" memorandum, 46 Fed. Reg. 18026, 18037 (1981), which the court notes lacks the force of regulation, but recognizes as guidance).

[25] *Id.* (citing *Okanogan Highlands Alliance v. Williams,* 236 F.3d 468, 476 (9th Cir. 2000)).

II. SLOMFP has not Raised a Material or Substantial Dispute Concerning the Staff's Assessment of Probability, Potential Radiological Consequences or Risk of Significant Environmental Consequences.

1. There is No Material or Substantial Dispute Concerning the Probability of a Terrorist Attack

The Staff believes that, though not quantifiable, the risk of a terrorist attack on an ISFSI is low under general credible threat conditions. Aff. 2 at ¶ 7. That belief is attested to by a Staff expert in counterterrorism analysis with over 30 years experience with the NRC and the Secret Service. Aff. 2, Att. 3. As described in her resume, she is internationally known as an expert in design basis threat development ("DBT"), having served as a consultant to the International Atomic Energy Agency on DBT and providing training to the international nuclear community. *Id.* She has contributed to numerous national-level intelligence products and participated in Federal task forces related to counterterrorism policy. *Id.*

The information which underlies the qualitative assessment of probability of a terrorist attack cannot be disclosed publicly. CLI-08-01, 66 NRC __, slip op. at 18. The sensitive nature of the information is such that it must be protected from public disclosure and therefore will not be disclosed in this adjudication according to the Commission's direction. *Id.* Further, this information is not available to the expert designated by SLOMFP, Gordon Thompson. Thus, the sensitive nature of this information means that the factual information necessary to make an informed conclusion as to the probability of terrorist attack is only within the knowledge of the NRC Staff. Under these circumstances, the Commission should consider any opinion offered by Dr. Thompson to be uninformed by intelligence information and the ongoing communications and intelligence analyses shared between federal, state and local governments. For this reason alone, the Commission should defer to the Staff's expert conclusion without further consideration of Dr. Thompson's testimony.

In addition, Dr. Thompson suffers from a lack of expertise in the area of terrorism

analysis. Therefore, his testimony should be discounted for the additional reason that he is not qualified to assess the probability of a terrorist attack. It is well established a party seeking to offer a witness as an expert must show that he or she has the necessary qualifications to offer an expert opinion.[26] This standard is at the heart of the Commission's requirement of reliability.

While the Federal Rules of Evidence are not directly applicable to Commission proceedings, NRC adjudicatory boards often look to those rules for guidance, and have adopted the standard for expert witnesses enunciated in Rule 702 requiring a witness to be qualified as an expert by "knowledge, skill, experience, training or education" to testify "[i]f scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue."[27]

SLOMFP has failed to establish that Dr. Thompson has any knowledge, skill, or education which would equip him to provide an expert opinion on the probability of a terrorist attack on the Diablo Canyon ISFSI. Indeed, the only reference to this subject in his statement of qualifications is a generic report he prepared on war and terrorism as risk factors for nuclear power plants in 1996, in which he concluded that public debate about future operation and construction should be broadened to encompass possible involvement of nuclear plants in war or terrorism.[28] This representation is nowhere near the showing necessary to establish him as an expert in assessing the probability of a terrorist attack.

---

[26] *See, Duke Power Co* (William B. McGuire Nuclear Station, Unites 1&2), ALAB-669, 15 NRC 453, 475 (1972).

[27] *McGuire*, ALAB-669, 15 NRC at 475; *Southern California Edison Co.* (San Onofre Nuclear Generating Station, Units 2 & 3), ALAB-717, 17 NRC 346, 365 n.32 (1983).

[28] "Declaration of Dr. Gordon R. Thompson in Support of San Luis Obispo Mothers for Peace's (SLOMFP's) Contentions Regarding the Diablo Canyon Environmental Assessment Supplement," ("G. Thompson Report") submitted with "San Luis Obispo Mothers for Peace's Contentions and Request for a Hearing Regarding Diablo Canyon Environmental Assessment Supplement," June 28, 2007.

Dr. Thompson's lack of knowledge or expertise in assessing the probability of a terrorist attack is evidenced by the absence of any opinion rendered by him on this subject. Rather than provide a reasoned view of his own, he merely recites items that he believes should be discussed or explained in more detail, and argues that the Staff used inconsistent language in discussing this subject in the Supplemental EA. G. Thompson Report at 31. These complaints are not sufficient to raise a genuine material dispute concerning the Staff's view that the probability of a terrorist attack on the Diablo Canyon ISFSI is low.

2. There is No Material or Substantial Dispute That The Public Radiation Dose From a Terrorist Attack Would Not Result in Significant Health Effects

The Staff has high assurance that even if a terrorist attack is assumed to occur, there will not be significant health effects to the public.[29] Aff. 1 at ¶ 51; Aff. 2 at ¶ 8. The Staff's finding of high assurance is premised upon the protection offered by the cask design which will be used at the site as well as the security and mitigation measures which will be in place under the NRC's security regulations and orders. Aff. 2 at ¶¶ 13-14.

The Diablo Canyon ISFSI will use a modified version of the HI-STORM 100 dry cask storage system manufactured by Holtec International which has been certified for general use by the NRC. [30] The Holtec storage system uses vertical, ventilated cylindrical overpacks which

---

[29] In assessing the consequences to members of the public, the Staff considered the effects to individuals who would be outside of the owner controlled area; specifically, at the location of the nearest resident who is assumed to be the maximally exposed member of the public. This assessment did not include the radiological impacts to transient members of the public or workers who may be present within the owner controlled area.

[30] "List of Approved Spent Fuel Storage Casks: Holtec HI-STORM 100 Addition," 64 FR 51271 (September 22, 1999). The addition was based on an NRC Staff Safety Evaluation which determined, among other things, that the structures, systems and components were adequate to prevent accidents and to mitigate the consequences of accidents and natural phenomena. Holtec International HI-STORM 100 Cask System Safety Evaluation Report," September 10, 1999 at 11-10. (ADAMS Accession No. ML003711779).

provide a robust structure enclosing multi-purpose canisters ("MPCs") that contain the spent fuel. Aff. 2 at ¶ 13. The MPCs are cylindrical stainless steel structures. *Id.* Once loaded with fuel, these canisters are placed within cylindrical overpacks which consist of inner and outer steel shells enclosing a 30-inch thick wall of concrete. Aff. 2 at ¶ 14. These overpacks are designed and evaluated to withstand natural phenomena such as tornado wind loading and wind-driven missiles and high-energy lightning. *Id.* The certified HI-STORM system includes a version specifically designed for use in high seismic areas, in which the overpacks are anchored to the storage pad. *Id.* In issuing a site-specific license for the Diablo Canyon ISFSI, the Staff approved a similar, but more extensive anchoring design. *Id.*

These features, designed to protect the spent fuel against natural phenomena and human induced events, will also offer protection against terrorist attacks. The extent of this protection was demonstrated in the analysis conducted by Staff expert Elizabeth Thompson. As explained in her affidavit, she estimated the amount of radioactive material that would be released into the environment from the Diablo Canyon casks, called "source term," for a postulated terrorist attack. Aff. 1 at ¶¶ 14-19. In order to ensure that her dose calculation would be conservative, she considered all of the terrorist threats considered to be plausible and chose the terrorist scenario with the greatest potential release. Aff. 1 at ¶ 14.

Her calculation shows that even for the terrorist attack with the most serious potential consequences, the 50-year total effective dose equivalent to the closest resident to the site would be less than 5 rem. Aff. 1 at ¶ 49. The nearest resident was assumed to be expected to be the maximally exposed individual because the radiological release, which would be airborne, would disperse and settle as it continued downwind. Aff. 2 at ¶ 10. Radiological doses of less than 5 rem are not associated with any discernible health effects and therefore would not be expected to cause any significant health effects to the public. Aff. 1 at ¶ 51.

The Staff's finding of high assurance that an attack on the Diablo Canyon ISFSI will not

result in significant offsite consequences is also informed by security measures and mitigation measures that are required by regulations and NRC security orders. While the Staff cannot disclose the specific measures that are required under the regulations in Part 73, "Physical Protection of Plants and Materials," key features of the requirements for ISFSIs include (1) physical barriers, (2) surveillance, (3) intrusion detection, (4) response to detection and (5) offsite assistance from law enforcement agencies. Aff. 2 at ¶ 11.

These measures are augmented by the additional security measures required by the 2005 security orders issued to ISFSI licensees. These enhanced security requirements include (1) increased security patrols, (2) augmented security forces and weapons, (3) additional security posts, (4) heightened coordination with local law enforcement, state and federal authorities, (5) enhanced screening of personnel, and (6) additional limitations on vehicular access. Aff. 2 at ¶ 12. In addition to these security measures, the NRC requires safeguards and emergency plan strategies which will serve to mitigate radiological consequences should a terrorist attack occur. Aff. 2 at ¶ 13. While these factors were not relied on in determining the public dose that would result from a terrorist attack, they could, in some circumstances, reduce offsite consequences. These measures, along with the storage cask design, are so integrated into the licensing of the ISFSI, that PG&E could not be licensed or load fuel without them. Aff. 2 at ¶ 12-14. Therefore, it was proper for the Staff to account for them in reaching its FONSI.[31]

SLOMFP has not raised a genuine issue of material fact regarding the Staff's finding of high assurance that, even in the unlikely event that a terrorist attack occurs, there will not be significant offsite health consequences. As explained in the Staff's affidavits, this assessment was based on a determination that the resulting estimated dose to the nearest resident,

---

[31] *See Env. Protection Info. Ctr*., 451 F.3d at 1015 n.6.

including the contribution from land contamination, would be so low (below 5 rem), that there is very little risk of discernible health effects. Aff. 1 at ¶¶ 49, 51. This information establishes that the grounds for SLOMFP's admitted contention are factually incorrect. Specifically, there is no factual support for SLOMFP's claim that (1) the Staff only considered early fatalities in assessing health effects or that (2) the Staff entirely ignored the impacts of land contamination.

Further, SLOMFP has not raised a genuine or material dispute concerning the Staff's projected dose through the testimony offered by Dr. Thompson. Beginning with the premise that a dose of 5 rem would require only a small release of radioactive material from a storage module and a comparatively small amount of damage to the MPC and the spent fuel within it, he argues that the Staff improperly failed to consider a threat scenario that would cause more substantial damage and, therefore, a more significant release. G. Thompson Report at 33. Dr. Thompson then postulates such a scenario and projects a release which he claims would result in cancers and other adverse health effects, relocation of populations, abandonment of real estate and economic and social impacts. *Id.* at 33 – 37.

Because of the sensitive nature of information regarding the terrorist scenarios which the Commission considers plausible and the source term which the Staff projects for these scenarios, the Staff is unable to publicly refute Dr. Thompson's postulated scenario. However, as he recognized, he has made conclusions about the magnitude of the potential impacts which are not consistent with the low dose projected by the Staff. *Id.* at 33.

Thus, it may be presumed that the Staff and Dr. Thompson are not in agreement concerning the amount of damage to the ISFSI, and the resulting release of radiological material, that could result from a terrorist attack. However, the only way to resolve this dispute would be to disclose the information which supported the Staff's analysis. This information, relating to threat scenarios and their outcomes, constitutes national security information that the NRC is required to protect. The Commission has declined to allow this information to be

disclosed in this adjudicatory proceeding. CLI-08-01, 66 NRC __, slip op. at 24. While this leaves the determination of what terrorist threat scenarios are plausible, and the extent and nature of the resulting release, in the hands of the Staff without judicial oversight or agency hearings this was deemed necessary by the Commission. *Id.* at 24 – 25.

The Commission went on to note that this decision did not mean that SLOMFP's claims regarding hypothetical terrorist scenarios would be ignored, as both the Staff and the Commission would be mindful of Dr. Thompson's views when considering the range of terrorist attacks considered to be plausible. *Id.* at 25. n.98. In this regard, the Staff notes that Dr. Thompson is not privy to national intelligence information which informs the Staff's determinations as to plausibility of terrorist scenarios, does not have any training or education which would establish him as an expert in assessing adversary characteristics, and does not have any significant training, experience or education in health physics that would equip him to evaluate dose consequences of a radioactive release.[32] Therefore, Dr. Thompson does not possess the qualifications to provide expert opinion on this subject and his views on these subjects would be afforded little weight in an adjudicatory context. Indeed, SLOMFP has acknowledged that Dr. Thompson's discussion of the radiological consequences of a hypothetical attack is meant to be illustrative only and does not purport to be a comprehensive analysis of the source term from an attack or the resulting radiological consequences. *Id.* at 5.

3. There is No Material or Significant Dispute That The Staff's Analysis Supports a Finding of Low Risk of Significant Environmental Impacts From a Terrorist Attack on the Diablo Canyon ISFSI.

[32] Dr Thompson has no specific education, training or certification in health physics, and his only first-hand experience with modeling of atmospheric releases was his use of a straight line Gaussian model in 1977 – 1978. "San Luis Obispo Mothers for Peace's Response to NRC Staff's Interrogatories directed to San Luis Obispo Mothers for Peace," February 22, 2008, at 2 – 3.

As discussed above, when considering the consequences of an event like a terrorist attack in a NEPA review, it is appropriate to consider both the likelihood of the event as well as the consequences. This is because the consequences are not definite, but dependent on the particular event - in this case a terrorist attack - actually occurring. *New York City*, 715 F.2d at 746. In this manner, the significance of environmental consequences are assessed by their risk, which accounts for both the probability of the event and the potential consequences. The Staff followed this approach in the Diablo Canyon environmental assessment of terrorism, concluding that there is a low risk of significant environmental impacts based on the Staff's belief that the probability of a terrorist attack is low and the Staff's finding of high assurance that if a terrorist attack were to occur it would not result in significant radiological impacts to the nearest resident. As explained in the Staff's affidavit, the Staff accounted for the contribution of land contamination to dose in assessing the environmental consequences of a terrorist attack and concluded that the dose would result in a low likelihood of developing discernable health effects. Aff. 1 at ¶¶ 36, 51; Aff. 2 at ¶¶ 8-9.

For the reasons described above, SLOMFP has not raised a material issue of fact with regard to either prong of the risk determination. Specifically, SLOMFP has not raised any material factual dispute concerning the Staff's assessment that the probability of a terrorist attack is low. Additionally, SLOMFP has not raised any litigable issue regarding the Staff's assessment of dose and the Staff's conclusion regarding the risk of health effects resulting from that dose. Contrary to SLOMFP's claims, the Staff did not rely on early fatalities, but instead calculated a dose to the nearest resident to determine potential public health consequences in the event that a terrorist attack occurs. Aff. 1 at ¶¶ 49, 51; Aff. 2 at ¶ 8. Additionally, the Staff has explained that land contamination was considered to the extent that it contributed to dose. Aff. 1 at ¶ 36; Aff. 2 at ¶ 9. While SLOMFP asks the Commission to litigate whether the Staff considered the appropriate terrorist scenarios and source terms, the Commission has rejected

this prospect.

CONCLUSION

For the reasons stated above, there are no genuine and substantial disputes of material fact or of law as to Contention 2 as admitted by the Commission that require the introduction of evidence in an adjudicatory proceeding for resolution.

Respectfully submitted,

/RA/

Lisa B. Clark
Molly Barkman
Counsel for NRC Staff

Dated at Rockville, MD
This 14th day of April, 2008

April 10, 2008

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of	)	
	)	
PACIFIC GAS AND ELECTRIC COMPANY	)	Docket No. 72-26-ISFSI
	)	
(Diablo Canyon Power Plant Independent Spent Fuel Storage Installation)	)	ASLBP No. 08-860-01-ISFSI-BD01
	)	

AFFIDAVIT OF ELIZABETH A. THOMPSON

I, Elizabeth A. Thompson, being duly sworn, do hereby state as follows:

1. Elizabeth A. Thompson, have been employed by the U.S. Nuclear Regulatory Commission (NRC) since 2003. My current position is Senior Health Physicist in the Division of Spent Fuel Storage and Transportation. My responsibilities include performing shielding and radiation protection reviews for transportation and/or storage containers, defining the methodology used for various consequence analyses, performing consequence analyses, and participating on the agency's emergency response team. I have a master's degree in Radiation Health from the University of Pittsburgh. I am also certified through 2011 by the American Board of Health Physics in the comprehensive practice of health physics. A statement of my professional qualifications is attached.

2. The purpose of this affidavit is to address SLOMFP Contention 2, "Reliance on hidden and unjustified assumptions," as set forth in the Commission Memorandum and Order dated January 15, 2008.

3. I calculated the potential environmental impact of a successful terrorist attack against the Diablo Canyon Independent Spent Fuel Storage Installation (ISFSI) using methods that are in common use among health physicists to assess the radiological consequences of potential accidents involving radioactive material stored in containers.

4. Specifically, for this study (the supplement to the environmental assessment for the Diablo Canyon ISFSI), the environmental impact that I analyzed is the total effective dose to the resident living nearest to the Diablo Canyon ISFSI. I calculated a hypothetical radiation dose, which included the contribution of 4 days of exposure to contaminated ground, as a result of the unlikely release of radioactive material from spent fuel stored in HI-STORM 100SA casks. The remainder of my testimony addresses the methodology that I used.

5. Spent fuel is nuclear reactor fuel that has been used to the extent that it can no longer effectively sustain a nuclear chain reaction (Ref. 20. At the Diablo Canyon Power Plant (DCPP), spent fuel is removed from the reactor during routine re-fueling outages and placed in on-site spent fuel pools. Spent fuel pools are underwater storage and cooling facilities for spent fuel. At the DCPP, the licensee plans to remove cooled spent fuel from the pools and store the fuel in HI-STORM 100SA spent fuel dry storage casks at the nearby Diablo Canyon ISFSI.

6. At the DCPP, the core of each nuclear reactor is composed of an array of 193 fuel assemblies, each containing 264 fuel rods configured within a square array of 17 x 17 potential rod locations. These rods are composed of uranium dioxide pellets enclosed in zirconium alloy tubes that are about 3/8 inch in diameter with welded end plugs. Each assembly is about 13 feet long. All fuel rods are pressurized with helium during fabrication to reduce stress and strain. (Ref. 15, Ch. 4, Figures)

7. When a nuclear reactor at the DCPP is operating, atoms within the uranium fuel are split. The splitting of uranium atoms, or fission, is driven largely by the presence of uranium-235 in the fuel. At the DCPP, uranium-235 may comprise up to 5% of the mass of the uranium in the fuel (Ref. 1, p. 3.1-2). Uranium-235 is fissile, which means that this isotope of uranium can be split, or fissioned, by thermal (or slow) neutrons. Nuclear fission within the uranium fuel releases heat that is used to heat water in each DCPP reactor, which, in turn, is used to produce steam. The resulting steam pressure is used to turn steam turbines that are connected

to electric generators. Electricity is transmitted through an electricity distribution network to the regional customers of Pacific Gas & Electric.

8. Over a period of several years, the fissile uranium-235 in a fuel assembly is gradually depleted. Over this time, fission products and actinides build up in the fuel. Fission products are formed as heavy atoms absorb neutrons and split, while actinides form as heavy atoms absorb neutrons without splitting. Both fission products and actinides are subject to further transformations as atoms decay, absorb neutrons, or are split. At some point, the combination of both uranium-235 depletion and the buildup of neutron-absorbing fission products and actinides cause the fuel to no longer be effective at sustaining a chain reaction.

9. Both reactors at the DCPP are currently operating on 18- to 21-month refueling cycles. As noted in the Diablo Canyon ISFSI Environmental Report “Typically, 76 to 96 spent fuel assemblies are permanently discharged from each unit after a refueling.” and “The spent fuel pool for each unit presently has sufficient capacity for the storage of 1,324 fuel assemblies.” (Ref. 1, p. 1.1-1)

10. The radioactive materials that are present in spent fuel at the DCPP ISFSI include the uranium, fission products, actinides, activation products, and decay products. A material is said to be radioactive when it spontaneously emits ionizing radiation from the nuclei of unstable atoms contained within the material. The radiation is emitted from the nucleus when it undergoes a transformation from an unstable state to a more stable state. At an ISFSI, the types of ionizing radiation associated with a postulated release consist of subatomic alpha particles, beta particles, gamma rays, x rays, and neutrons that are capable of producing damage in living tissue. Amounts of radioactive material are measured in terms that describe how many nuclear transformations occur within a period of time. One becquerel of radioactive material is an amount in which one transformation of a nucleus occurs each second. Radioactive material is also commonly measured in units of “curie,” or Ci. One curie (Ci) is equal to 37,000,000,000 becquerel.

11. In general, the amount of radioactive material in a given spent fuel assembly depends chiefly on two factors: The amount of time that a fuel assembly was used in a reactor, which is described in terms of fuel burnup; and the amount of time that the fuel assembly has cooled since being used to produce power in a reactor. The burnup of the fuel is the total amount of thermal energy that each unit mass of fuel has produced, which is most often expressed as megawatt-thermal-days per metric ton of uranium (MWD/MTU).

12. At the DCPP, the proposed HI-STORM 100SA could be loaded with a multi-purpose canister containing up to 32 fuel assemblies (MPC-32), each with a maximum average burnup of less than or equal to 45,000 megawatt days per metric ton of uranium and no less than 5-year cooling time (Ref. 2).

13. The HI-STORM 100SA casks at the proposed Diablo Canyon ISFSI would contain spent fuel that contains radioactive isotopes of uranium and radioactive fission and activation products, including over one-hundred different radioactive isotopes of various elements. Examples include cobalt-60, strontium-90, cesium-137, and americium-241.

14. The first step in assessing the environmental impact of a successful terrorist attack on the Diablo Canyon ISFSI HI-STORM 100SA casks was to study reports that contained information on the means by which spent fuel casks of common makes and manufacture could be attacked (Refs. 3-8). The purpose of our initial study was to identify which, if any, types of plausible attacks on the HI-STORM 100SA casks at the Diablo Canyon ISFSI would result in releases of radioactive material. The estimate of the amount of radioactive material released to the environment is referred to as the source term. In order to obtain a conservative estimate of environmental impacts, I chose the type of plausible attack that results in the largest release of radioactive material.

15. In general, when estimating the source term for an accident involving a container filled with radioactive material, the first step is to estimate the total amount of radioactive material in the container. This quantity of radioactive material is referred to as the “material-at-risk.” For

this study, the material-at-risk is the total amount of radionuclides that contribute significantly to dose that would be contained in all spent fuel assemblies of a HI-STORM 100SA cask proposed for use at the Diablo Canyon ISFSI. The inventory of radioactive material in the HI-STORM 100SA casks is provided in several reports (Refs. 3-8). For the purpose of this study, the subset of radionuclides that contribute significantly to dose are a subset of all radionuclides that would be present in the casks, which, when ordered as a list from those that contribute most to radiation dose to a person standing downwind to those that contribute least, account for essentially all (99.9%) of the total radiation dose.

16. The next step in calculating the source term was to multiply each radionuclide represented in the material-at-risk by a number between zero and one, which represents the fraction of the material that is expected to be released to the atmosphere. This is referred to as the "atmospheric release fraction." The estimates of atmospheric release fraction used in this study are provided for several groups of radionuclides (Refs. 3-8). For this study, I used the release fractions for the HI-STORM 100, as this design is very similar to the HI-STORM 100SA casks proposed for use at the Diablo Canyon ISFSI (Refs. 2, 3, 4, 5) and the differences between these designs are not expected to impact the release fractions. For the purposes of estimating atmospheric release fractions in this study, radionuclides are grouped according to their common physical properties, such as whether they are gases, solids, or volatile solids. Atmospheric release fractions are also provided for CRUD, "a colloquial term for corrosion and wear products (rust particles, etc.) that become radioactive (i.e., activated) when exposed to radiation. Because the activated deposits were first discovered at Chalk River, a Canadian nuclear plant, 'crud' has been used as shorthand for Chalk River Unidentified Deposits." (Ref. 20) For the purposes of this study, volatile solids are solids at normal temperatures, but may behave like a gas at elevated temperatures associated with various types of attack. In general, atmospheric release fractions are often estimated from data collected from experiments (Ref. 9).

17. At this stage in the study, the total source term was estimated for each radionuclide using the formula:

Total source term, Ci = (material-at-risk, Ci) • (atmospheric release fraction). Eq. 1

18. The total source term described above consists of the radioactive particles that can be made airborne. However, only particles of about 10 micrometers in aerodynamic diameter or less are generally viewed as being "respirable," or small enough to enter the lungs. Therefore, the total source term described above has two components, a portion of the source term that contains respirable particles, or the "respirable source term," and the "non-respirable source term."

19. To calculate the dose from the inhalation of particles, the respirable source term is calculated by multiplying the total source term by a "respirable fraction," a number between zero and one (Refs. 3-8).

Respirable S.T., Ci = (material-at-risk, Ci) • (atmospheric release fraction) • (respirable fraction). Eq. 2

The non-respirable source term is:

Non-respirable S.T., Ci = [Total source term, Ci] – [Respirable S.T., Ci] Eq. 3

20. The next step in the study was to review the Diablo Canyon ISFSI environmental report to determine where members of the public live in the vicinity of the DCPP (Ref. 10). The reason for determining which persons live closest to the facility is that radiation exposures from a postulated release of radioactive material are generally highest for people living closest to the point of release. I determined that the nearest residence is approximately 1.5 north northwest of the DCPP.

21. Knowing both the source term and the location of the nearest residence, I concluded that the only plausible way for radioactive material in the source term to affect a member of the public 1.5 miles away would be if the radioactive material were carried aloft by the wind from the ISFSI to the residence.

22. I chose HOTSPOT version 2.06[1], a computer code developed by Lawrence Livermore National Laboratory, to perform the calculations (Ref. 11). HOTSPOT is based on the Gaussian plume model, a widely used model for emergency preparedness and nuclear safety analysis. The calculations performed by HOTSPOT are described below.

23. The Gaussian plume model is a mathematical model of the behavior of pollutants in the atmosphere that are blowing downwind from some upwind source. It is widely used to estimate downwind concentrations of pollutants in air and on the ground resulting from an instantaneous release of pollutants upwind. It may be used for both continuous releases and instantaneous releases. It is described in various health physics texts and government publications (Refs. 12-13), and is widely viewed as a simple, valid, and conservative approach to estimating downwind concentrations of radioactive material following either continuous or instantaneous releases.

24. As its name suggests, the Gaussian plume model is a statistical model based on the Gaussian, or normal, probability density function.

25. A simple form of the Gaussian plume model for ground-level releases is:

$$\chi = \frac{Q}{2 \cdot \pi \cdot u \cdot \sigma_y \cdot \sigma_z} \cdot e^{-\frac{y^2}{2 \cdot \sigma_y^2}} \cdot \left[e^{-\frac{(z-H)^2}{2 \cdot \sigma_z^2}} + e^{-\frac{(z+H)^2}{2 \cdot \sigma_z^2}} \right] \qquad \text{Eq. 4}$$

where χ (the Greek letter "chi") is the average concentration of radioactive material in air at some downwind location, x, in units of Ci per cubic meter, Q is the source term in Ci per second, the value of π is approximately 3.14159, *y* is the distance along the ground perpendicular to the plume centerline in meters, *z* is the distance in the air above the plume centerline in meters, and *H* is the effective height above the ground in meters from which the release occurs (Ref. 11). The plume centerline is an imaginary line that extends along the ground surface (for a ground-level release) from the point of release through all points in a straight line in the downwind direction. Other variables (σ_y and σ_z) are further described below.

[1] I also used Hotspot version 2.061, which is identical to Hotspot version 2.06 except for a slightly modified plotting routine.

26. The Gaussian plume model (Eq. 4) is often expressed in a normalized fashion, so that the left-hand side of the equation represents the downwind concentration of radioactive material in air for each unit of source term. This is accomplished by dividing both sides of the equation by Q, the source term, which results in the expression:

$$\frac{\chi}{Q} = \frac{1}{2 \cdot \pi \cdot u \cdot \sigma_y \cdot \sigma_z} \cdot e^{-\frac{y^2}{2 \cdot \sigma_y^2}} \cdot \left[e^{-\frac{(z-H)^2}{2 \cdot \sigma_z^2}} + e^{-\frac{(z+H)^2}{2 \cdot \sigma_z^2}} \right] \qquad \text{Eq. 5}$$

27. In the form described above, the Gaussian plume model calculates the average radionuclide concentration downwind for a unit source term (i.e., 1 Ci per second), where lower concentrations are calculated for locations to either side of the plume centerline and at elevations other than the effective release height. Equation 5 is sometimes referred to as the "Chi-over-Q" equation.

28. The Gaussian plume model has inherent limitations. It does not, in its simple form, model complex physical phenomena such as wind turbulence around buildings (i.e., building wakes), the effects of highly complex terrain, or shifting winds following an instantaneous release. However, where prospective dose assessments are required, the utility of more complex models is also limited by the large amount of input data that is required to use those models. The values for these input data often can not be precisely estimated in a prospective analysis. As a result, in a prospective assessment, large, complex, and time consuming models are often no more accurate than using a simple Gaussian plume model (Ref. 14).

29. The information that is needed to estimate downwind concentrations of radioactive material using the Gaussian plume model in the form shown in Eq. 4 are the source term (Q), the effective height of the point of release above ground level (H), the wind speed (u), the amount of turbulence present in the atmosphere at the time of the release (σ_y and σ_z), and the distance to the downwind location (x). The calculation of σ_y and σ_z, which are both functions of the downwind location, are addressed later in my testimony.

30. Adjustments to the simple form of the Gaussian plume model are also available in HOTSPOT v. 2.06 that can account for complex source effects such as the behavior of gases and particles that are affected by fires or explosions. I used these adjustments, as necessary, consistent with the threat scenario that I analyzed, which I will not discuss further in public testimony.

31. The amount of turbulence in the atmosphere affects the amount of mixing that occurs between air contaminated with radioactive material and uncontaminated air downwind. Higher atmospheric turbulence causes more mixing, which, in turn, results in lower concentrations of radioactive material in air downwind. The amount of turbulence is described in terms of Pasquill-Gifford stability classes. Stability Class A means the atmosphere is very unstable, B means the atmosphere is unstable, C means the atmosphere is slightly unstable, D means the atmosphere is neutral (i.e., neither stable nor unstable), E means the atmosphere is slightly stable, and F means the atmosphere is stable.

32. In the Gaussian plume model, the extent to which the cloud of radioactive material spreads out from the plume centerline to either side and above and below the centerline is directly related to the Pasquill-Gifford stability class of the atmosphere. Narrow plumes with relatively high concentrations of radioactive material are associated with Pasquill-Gifford stability class G and low atmospheric turbulence. Wide plumes that rapidly disperse radioactive material and result in low average concentrations of radioactive material downwind are associated with Pasquill-Gifford stability class A and high atmospheric turbulence. For this study, I used Pasquill-Gifford stability class D, which represents neutral meteorological conditions and is not inconsistent with conditions observed at the DCPP site, and a windspeed (u) of 4 meters per second, which is conservatively below persistent winds at the site that range between 10 and 15 miles per hour (4.5 to 6.7 meters per second) (Ref. 15).

33. In general, once having selected a Pasquill-Gifford stability class which is representative of the conditions under which the release occurs, the next step is to calculate the value of two

variables, identified as $\sigma_{y,}$ and σ_z, that are part of the Gaussian plume model. These values are calculated using Briggs equations for standard terrain, as follows, where x is the distance downwind, in meters:

Briggs equations (Ref. 11)

standard terrain	$\sigma_{y,}$, meters	σ_z, meters
Class A	$0.22 \cdot x \cdot (1+0.0001 \cdot x)^{-1/2}$	$0.20 \cdot x$
Class B	$0.16 \cdot x \cdot (1+0.0001 \cdot x)^{-1/2}$	$0.12 \cdot x$
Class C	$0.11 \cdot x \cdot (1+0.0001 \cdot x)^{-1/2}$	$0.08 \cdot x \cdot (1+0.0002 \cdot x)^{-1/2}$
Class D	$0.08 \cdot x \cdot (1+0.0001 \cdot x)^{-1/2}$	$0.06 \cdot x \cdot (1+0.0015 \cdot x)^{-1/2}$
Class E	$0.06 \cdot x \cdot (1+0.0001 \cdot x)^{-1/2}$	$0.03 \cdot x \cdot (1+0.0003 \cdot x)^{-1}$
Class F	$0.04 \cdot x \cdot (1+0.0001 \cdot x)^{-1/2}$	$0.016 \cdot x \cdot (1+0.0003 \cdot x)^{-1}$

34. HOTSPOT v. 2.06 calculates the downwind airborne concentration (χ) of each radionuclide downwind for respirable and non-respirable particles using the source term (Q), the effective height of the point of release above ground level (H), the wind speed (u), the amount of turbulence present in the atmosphere at the time of the release (σ_y and σ_z), and the distance to the downwind location (x). Other specific input parameters are withheld from this testimony so as not to reveal information regarding the attack scenario that I analyzed.

35. Several specific input parameters were not changed from the default parameters used in HOTSPOT v. 2.06, including sample time, source geometry, mixing layer thickness, source altitude, rainout, breathing rate, and holdup time because the default values are generally appropriate.

36. In general, the contamination of land downwind is calculated using a modification to the Gaussian plume model that accounts for gravitational settling of the particulate matter released during the event. In HOTSPOT v. 2.06, the user may select separate gravitational settling (deposition) velocities for respirable and non-respirable particles. Non-respirable particles are particles with aerodynamic diameters of greater than 10 micrometers and respirable particles are particles with an aerodynamic diameter of 10 micrometers or less. The general equation for calculating ground contamination downwind is:

$$\omega(x,y) = \chi'(x,y,z=0) \bullet v_d \qquad \text{Eq. 6}$$

where: $\omega(x,y)$ is the ground contamination in units of curie per square meter at some downwind distance x, and a crosswind distance y; $\chi'(x,y,z=0)$ is the center-line concentration of radioactivity in air at some downwind distance x and crosswind distance y, which is reduced by a plume depletion factor that accounts for the radioactive material that has deposited at upwind locations between the point of release and the downwind distance x; and v_d is the deposition velocity of the radioactive material. The default values in HOTSPOT v. 2.06 are a deposition velocity of 8 centimeters per second for the non-respirable particles, and 0.3 centimeters per second for respirable particles, which I did not change (Ref. 11).

37. The plume depletion factor is described in HOTSPOT v. 2.06 and is based on the work of Van der Hoven ("Deposition of Particles and Gases," in Meteorology and Atomic Energy-1968, D.H. Slade, Ed. (U.S. Atomic Energy Commission, Report TID-24190, National Technical Information Service), pp. 202-207 (1968)) (Ref. 11).

38. I calculated both downwind concentrations of radioactive material in air [$\chi(x,y,z=0)$'] and radioactive material concentration on the ground [$\omega(x,y)$] using HOTSPOT v. 2.06, which is based on the methodology described above. The next step, which is also performed using HOTSPOT v. 2.06, is to calculate a radiation dose to a person.

39. The radiation dose that I calculated for the nearest resident following the release of radioactive gases and particulate matter has three main components: (1) the beta and gamma radiation emitted by the passing cloud of gases and particulate matter; (2) the alpha, beta, and gamma radiation emitted by radioactive material inhaled by the person; and (3) the beta and gamma radiation emitted by the radioactive material deposited on the ground around the person.

40. Radiation absorbed dose is expressed in terms of the amount of radiation energy deposited in a unit mass of material. The common unit of measurement of radiation absorbed dose is the rad, which is equal to 100 ergs per gram of material. One erg is the amount of

41. For this study, I used the dosimetric principles based on the International Commission on Radiological Protection Reports Numbers 60 and 68 (ICRP 60/68).

42. Since different types of radiation cause different amounts of biological damage per unit of absorbed dose, radiation protection is based on the "equivalent dose." Equivalent doses are calculated by multiplying the absorbed dose by a radiation weighting factor. For the purposes of the environmental assessment, relevant radiation weighting factors are 20 for alpha particles, and 1 for x-rays, gamma-rays, and beta radiation. Equivalent doses are calculated for individual organs in the body.

43. An effective dose is calculated for the whole body by weighting the contribution of the dose to each organ through the use of tissue weighting factors.

44. A 50-year committed effective dose (CED) is calculated for the whole body by weighting the dose equivalents to the different organs through the use of tissue weighting factors, and adding the organ doses together, which includes calculating the dose from radioactive material that remains in each organ for up to 50 years.

45. A total effective dose is the 50-year CED from internally-deposited radionuclides plus the equivalent dose received from radionuclides outside the body (i.e., from the passing cloud and ground contamination).

46. HOTSPOT calculates the equivalent dose to a person exposed to the passing cloud using dose conversion factors derived from Federal Guidance Report No. 13 (Ref. 17). Dose conversion factors are numerical values that, when multiplied by the concentration of radioactive material in air, provide an estimate of the equivalent dose to a person standing in the contaminated air (i.e., submersion dose).

47. HOTSPOT also calculates the CED attributable to radioactive material that a person inhales using dose conversion factors. As with equivalent dose, the factors used in HOTSPOT for committed effective dose are those which are derived from Federal Guidance Report No. 13.

48. Finally, HOTSPOT calculates the equivalent dose to a person standing on contaminated land using the factors which are derived from Federal Guidance Report No. 13. This dose component is referred to as "ground shine." I included 4 days of ground shine in the calculation of the total effective dose, which is consistent with the FRMAC assessment manual, which uses a default value of 4 days for the early phase of an accident or emergency (Ref. 18). The early phase is the period at the beginning of a nuclear incident when immediate decisions for effective use of protective actions are required.

49. Using the methodology and assumptions described above, I calculated that the total effective dose to the nearest resident, who lives 1.5 miles NNW of the Diablo Canyon ISFSI, would be less than 5 rem.

50. When I performed the original analysis, I estimated that using site-specific meteorological parameters the projected dose consequences could be a factor of 10 to 100 lower than those calculated using generic meteorology represented by Pasquill-Gifford stability class "D" and a windspeed of 4 meters per second. This was based on the χ/Q values published by Pacific Gas & Electric for the Diablo Canyon site (Ref. 10), which represent site-specific meteorology. However, upon further review of the χ/Q values in the Environmental Report (Ref. 10), I realized they were long-term values that were not appropriate to use for short-term releases. Based on that fact, it is my professional opinion that the projected dose would be less than 5 rem but not by the factors that I originally calculated.

51. The likelihood of an individual developing any discernible health effect from a radiation dose on the order of 5 rem is very small. This view is consistent with an August 2004, Health Physics Society (HPS) revised Position Statement titled "Radiation Risk in Perspective." In its paper, the HPS recommends that "in accordance with current knowledge of radiation health

risks, the Health Physics Society recommends against quantitative estimation of health risks below an individual dose of 5 rem in one year or a lifetime dose of 10 rem above that received from natural sources." The Health Physics Society goes on to state that, "There is substantial and convincing scientific evidence for health risks following high-dose exposures. However, below 5-10 rem (which includes occupational and environmental exposures), risks of health effects are either too small to be observed or are nonexistent." (Ref. 19) Additionally, since preparing the supplement to the environmental assessment, the NRC's Advisory Committee on Reactor Safeguards has stated: "It seems clear that the health detriments at radiation levels below 5 rem are so small that they cannot be detected by epidemiological studies." (Ref. 21)

References.

1. Diablo Canyon Independent Spent Fuel Storage Installation License Application – Final Safety Analysis Update, PG&E. June 8, 2004. ADAMS Accession No. ML041680537 (pp. 1.1-1 and 3.1-2)

2. Diablo Canyon Independent Spent Fuel Storage Installation License - Technical Specifications, March 22, 2004. ADAMS Accession No. ML040780229

3. "Results of a Large Airplane Impact into a Field of Holtec HI-STORM Spent Nuclear Fuel Storage Casks." Smith, J.A., et al. Sandia National Laboratories, Albuquerque, NM. 2004. ADAMS Accession No. ML080440139.

4. "Response of the HI-STORM Spent Nuclear Fuel Storage Cask to a Large Explosive Charge Blast." Kipp, M.E., et al. Sandia National Laboratories, Albuquerque, NM. 2004. ADAMS Accession No. ML080440144.

5. "NRC Spent Fuel Source Term Guidance Document." Yoshimura, R.H., et al. Sandia National Laboratories, Albuquerque, NM. 2004. ADAMS Accession No. ML080440180.

6. Memorandum from L. Reyes to the Commission, "Completion of Security Assessment of Spent Fuel Storage Casks for Land-Based Terrorist Threats," September 15, 2005. ADAMS Accession Nos. ML052490378, ML080440115.

7. Memorandum from L. Reyes to the Commission, "Completion of Security Assessment of the Crash of a Large Plane into Spent Fuel Storage Casks," September 15, 2005. ADAMS Accession Nos. ML052490377, ML080440116.

8. Memorandum from J. Strosnider to R. Zimmerman, “Framework Assessments of Spent Fuel Storage Casks and Radioactive Material Transportation Packages,” December 9, 2005. ADAMS Accession Nos. ML053290260, ML080440117.

9. DOE Handbook, “Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities,” December 1994, DOE-HDBK-3010-94

10. Diablo Canyon Independent Spent Fuel Storage Installation License Application – Environmental Report, PG&E. December 2001 and Amendment 1, October 2002. ADAMS Accession Nos. ML020180196, ML020180173, ML022950304

11. Homann, S.G., 1994: HOTSPOT Health Physics Codes for the PC, UCRL-MA-106315, Lawrence Livermore National Laboratory, California, and “Help” files included with Hotspot code. Available at http://www.osti.gov/collections.html (search for title).

12. United States Nuclear Regulatory Commission, “Radiological Assessment: A Textbook on Environmental Dose Analysis,” NUREG/CR-3332, September 1983

13. Eisenbud, Merril, and Thomas Gesell, “Environmental Radioactivity: From Natural, Industrial, and Military Sources,” Fourth edition, Academic Press, 1997.

14. OFCM [Office of the Federal Coordinator for Meteorology] Directory of Atmospheric Transport and Diffusion Consequence Assessment Models, http://www.ofcm.gov/atd_dir/pdf/frontpage.htm

15. Diablo Canyon Power Plant Final Safety Analysis Report Update, PG&E. November 2006. ADAMS Accession Nos. ML063260260 and ML063260263 (pp. 2.3-26 and 2.3-27, and Figures in Ch. 4)

16. Turner, D.B., “Workbook of Atmospheric Dispersion Estimates.” U.S. Environmental Protection Agency, Washington, D.C., 1970

17. Eckerman, K. F., R. W. Leggett, C. B. Nelson, J. S. Puskin, and A. C. B. Richardson, Cancer Risk Coefficients for Environmental Exposure to Radionuclides, Federal Guidance Report No.13, Environmental Protection Agency, 1999, EPA 402-R-99-001.

18. Sandia National Laboratories, “FRMAC Assessment Manual: Methods: The Federal Manual for Assessing Environmental Data During a Radiological Emergency,” Vol. 1, April 2003 (p. 30).

19. Health Physics Society, “Radiation Risk in Perspective: Position Statement of the Health Physics Society,” Revised August 2004.

20. U.S. Nuclear Regulatory Commission Glossary, http://www.nrc.gov/reading-rm/basic-ref/glossary.html

21. Memorandum to Chairman Dale E. Klein, NRC, from Chairman William J. Shack, Advisory Committee on Reactor Safeguards, "State-of-the-Art Reactor Consequences Analyses (SOARCA) Project," February 25, 2008, web address: http://www.nrc.gov/reading-rm/doc-collections/acrs/letters/2008/soarca-feb-2008.pdf (accessed on March 28, 2008).

Elizabeth A. Thompson

Elizabeth A. Thompson

Subscribed and sworn to before me
This 10 day of April, 2008

Circe E Martin
Notary Public

My commission expires: March 1, 2011

CIRCE E. MARTIN
NOTARY PUBLIC STATE OF MARYLAND
My Commission Expires March 1st 2011

ELIZABETH A. THOMPSON
Phone: (301) 492-3334

EDUCATION

M.S. Radiation Health, University of Pittsburgh, 1984
DOE Health Physics Fellow

B.S. Mathematics, University of Illinois, 1976
Phi Beta Kappa

CERTIFICATION

American Board of Health Physics

EXPERIENCE

10/03 to present Senior Health Physicist – U.S. Nuclear Regulatory Commission

(09/04 to present) As a health physicist in the Technical Review Directorate of the Division of Spent Fuel Storage and Transportation, I am responsible for defining the methodology used for various consequence analyses, performing consequence analyses, and performing shielding and radiation protection reviews for transportation and/or storage containers. I also participate on the agency's emergency response team.

(10/03 to 09/04) I served as a health physicist in the Fuel Manufacturing Section. My duties included serving as a project manager for fuel manufacturing licensees and reviewing licensee applications. Specifically, I coordinated activities related to amendment applications or other requests submitted by licensees, performed reviews of the radiation protection section of license/amendment applications, and reviewed and evaluated emergency planning or environmental submissions.

11/01 to 9/03 Consulting Health Physicist

I worked as a consultant, primarily in emergency response and consequence management, but encompassing other areas of health physics as well. My accomplishments included continuing work on the Federal Radiological Monitoring and Assessment Center (FRMAC) Assessment Manual and developing a training course to cover the revisions in the manual. I also served as an evaluator for FEMA for graded emergency response exercises.

8/98 to 10/01 Principal Engineer – Westinghouse Safety Management Solutions LLC

My greatest accomplishment while working for Westinghouse was updating the FRMAC Assessment Manual. In addition to that, I provided health physics expertise to various projects as needed. In support of the development of safety documentation, I performed radiological consequence assessments for releases from nuclear facilities. As part of an emergency planning project, I developed ingestion pathway

assessment methodologies for the Savannah River Site. I also served as an evaluator for FEMA for graded emergency response exercises.

6/97 to 7/98 Research Associate - Texas A&M University, Department of Nuclear Engineering

I was part of a team that performed a risk and hazards assessment review of a proposed plutonium processing facility and a MOX fuel fabrication facility. My primary area of emphasis for this review was performing the pathway assessments for accident scenarios using the then-current federal and international guidance.

8/93 to 12/94 Health Physicist - U.S. Department of Energy, Chicago Operations Office

In this position I served as the Chicago Operations Office (CH) representative to DOE's Radiological Control Coordinating Committee. I provided independent oversight of the health physics programs of DOE/CH contractors and laboratories. This involved performing appraisals of health physics programs, writing reports on these appraisals, and following up on corrective actions. I was the point of contact at DOE/CH for questions on implementation of the RadCon Manual and 10 CFR 835.

7/90 to 8/93 Physical Scientist - U.S. Department of Energy, Nevada Operations Office

The majority of my work at DOE/NV supported arms treaty verification. I provided technical oversight for DOE-funded projects. I responded to environment, safety, and health concerns for deployments and ensured that the DOE deployment team had proper training and preparation in these areas. I was the point of contact for all health physics issues related to DOE/NV verification activities. I chaired an interagency working group that dealt with specific technical issues. Other duties that I had included preparing and reviewing reports and other documents, preparing and presenting briefings, and gathering and providing information for headquarters or the laboratories. I also provided health physics support to other divisions. For example, I had an extended assignment to the operational health physics group at the Nevada Test Site, and I was involved in FRMAC-93 as the Manager for Overview.

1/88 to 7/90 Health Physicist - U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory

I supported DOE weapons testing in the areas of health physics, dose assessment, and field monitoring. This entailed interpreting model results, briefing the test panel, directing field monitors, and performing field measurements. I was the EPA representative to an interagency working group that coordinated software used at the control point in support of weapons testing. I provided oversight for computer applications. This included developing specifications for new software, interfacing with contractors for software development and maintenance, and providing guidance for purchase of new hardware and software. I was responsible for reviewing laboratory results from several of EPA's offsite monitoring networks, including tritium in air, noble gases, and the long term

hydrological monitoring program. I participated in FRMAC working groups to develop procedures and guidelines for FRMAC operations. I also participated in emergency response exercises as a player and/or a controller/planner.

12/86 to 12/87 Nuclear Safety Information Systems Specialist - Illinois Department of Nuclear Safety

At IDNS I participated in testing atmospheric dispersion and dose assessment models. As a member of the Computer Operations and Support Section, I prepared information to assist users of computer systems. I also developed and presented training on health physics instruments. In order to meet the requirements of this and other state agencies, I prepared financial and administrative planning documents. In addition, I was a member of the department's emergency response staff, and participated in the FRMAC during a Federal Field Exercise.

10/85 to 11/86 Reactor Health Physicist - University of Illinois

As the Reactor Health Physicist for the Nuclear Engineering Department, I was in charge of the day-to-day radiation protection operations at the Nuclear Reactor Laboratory. In addition, I assisted in teaching both the graduate and undergraduate health physics laboratory courses. I also developed programs (for a PC) to perform the routine calculations required for record-keeping.

12/84 to 6/85 Principal Engineer - Impell Corporation

I developed and implemented many enhancements to the MESOREM computerized atmospheric dispersion and offsite dose assessment system. My participation included work on both the IBM PC and VAX 11/780 versions. I also developed the user's manual and other documentation for the system. In addition to this project, I was involved in the development of hazard assessment software for chemical accidents. I was also involved in the review of emergency plans for nuclear power plants.

6/84 to 9/84 DOE Health Physics Fellow - Oak Ridge National Laboratory

During my practicum at ORNL I conducted radiation surveys, participated in health physics operations during reactor refueling and maintenance, performed environmental surveillance, and investigated beta dosimetry and spectroscopy techniques. My duties also included performing decontamination and decommissioning surveys and documenting the results. While working with the Uranium Mill Tailings Remedial Action Project in Colorado, I performed radiological surveys, developed training material, and performed a program evaluation. I also participated in an emergency response exercise at a TVA nuclear power plant.

5/82 to 6/83 Computer Programmer - Carnegie-Mellon University

11/78 to 10/81 Senior Analyst/Project Manager - Analysis & Technology, Inc.

1/78 to 9/78 Engineering Technician - U.S. Coast Guard Research and Development Center

MEMBERSHIP

Health Physics Society (HPS) - Plenary Member
Baltimore-Washington Chapter of the Health Physics Society
American Academy of Health Physics
Phi Beta Kappa

SELECTED PUBLICATIONS

Thompson, J.M.; Thompson, E.A.; Hamilton, I.S. An Approach to Evaluating the Societal Risks and Agricultural Impacts from a Proposed Plutonium Processing Facility. Operational Radiation Safety (Health Physics 77 (Supplement 1)) :S32-S39; 1999.

Thompson, E. A. and Thompson, J. M. Relocation Impacts of an H-Separations Coil and Tube Failure. Aiken, SC; Westinghouse Savannah River Company; WSRC-TR-99-00104, Rev. 1; June 1999.

Thompson, E. A. and Thompson, J. M. Relocation Impacts of a Major Release from SRTC. Aiken, SC; Westinghouse Savannah River Company; WSRC-TR-99-00105, Rev. 1; June 1999.

Thompson, J. M. and Thompson, E. A. Savannah River Site Ingestion Pathway Methodology Manual for Airborne Radioactive Releases. Aiken, SC; Westinghouse Savannah River Company; WSRC-TR-2000-00348, Rev. 0; September 2000.

Thompson, J. M. and Thompson, E. A. WSRC Technical Basis for the Savannah River Site Emergency Planning Zone. Aiken, SC; Westinghouse Savannah River Company; WSRC-TR-97-0124, Rev. 2 DRAFT b; November 2000.

Thompson, E. A. et al. FRMAC Assessment Manual (Volumes 1 and 2 - primary author and revision editor; Volume 3 - nuclear power plant accident). Albuquerque, NM; Sandia National Laboratories, SAND2003-1071P, SAND2003-1072P, SAND2003-1073P; April 2003.

AWARDS AND RECOGNITION

University of Illinois, Edmund J. James Scholar, 1972 - 1975
DOE Health Physics Fellow, 1984
University of Pittsburgh, University Scholar, March 1985
EPA Special Achievement Award, March 1989
EPA Special Achievement Award, 1989
Letter of Appreciation from David McNelis, Health Physics Society Topical Symposium arrangements, November 1990
DOE Monetary Award for Superior Job Performance, October 1991
DOE Quality Step Increase, October 1992
DOE Monetary Award for Superior Job Performance, October 1993
DOE Performance Award, August 1994
Letter of Appreciation from John Hageman, Health Physics Society Local Arrangements Committee, August 1997

NRC Time-Off Award, September 2004
NRC Special Act Award, July 2005
NRC Time-Off Award, October 2005
NRC Performance Award, December 2005
NRC Certificate of Appreciation (Special Act Award), January 2006
NRC – NMSS Employee of the Month, January 2006
NRC Group Award (2), August 2006
NRC Performance Award, December 2006
NRC Group Award, September 2007
NRC Performance Award, December 2007

SELECTED TRAINING COURSES

May 1988	Radiological Accident Assessment – FEMA
June 1988	Protective Measures Response Technical Training – NRC/FEMA
June 1989	Pathway Analysis and Risk Assessment – HPS Summer School
Jan. 1991	ABHP Part II Certification Exam Review – Ken Skrable (REECo)
Feb. 1991	Total Quality Management (TQM) Overview – DOE
Mar. 1991	Tiger Team Training – DOE
June 1991	OSHA Training (10 hours) – REECo
Oct. 1991	Tunnel Safety Training – REECo
Jan. 1992	Internal Dosimetry – Ken Skrable (REECo)
Feb. 1992	Environmental Laws & Regulations – DOE
Aug. 1992	Trainer Liability Seminar – DOE
Aug. 1992	Professional Liability Seminar – DOE
Feb. 1993	Basic Instructor Training – DOE
Mar. 1993	Conduct of Radiological Operations – DOE
Aug. 1998	RESRAD Workshop – DOE
June 1999	Health Physics Applications Using the Monte Carlo Program MCNP – AAHP
Dec. 2000	Radiological Emergency Preparedness Exercise Evaluation Course – FEMA
Oct. 2001	Radiological Emergency Preparedness New Exercise Evaluation Methodology Short Course – FEMA
May 2002	RASCAL 3.0 Training Course – NRC
Dec. 2003	Introduction to Risk Assessment in NMSS – NRC
Feb. 2004	General Health Physics Practices for Fuel Cycle Facilities – NRC
Apr. 2004	Fuel Cycle Processes – NRC
July 2004	Protecting the Public from Nuclear, Chemical, and Biological Terrorism – HPS
Oct. 2004	Introduction to MCBEND – ANSWERS Software Service
Jan. 2005	RESRAD Workshop – ANL
Apr. 2005	SCALE 5 Source Terms & Shielding – ORNL
July 2005	Workshop for Managers in Nuclear Criticality Safety – University of New Mexico
Oct. 2005	Transportation of Radioactive Materials – NRC
July 2006	Practical MCNP for the Health Physicist, Medical Physicist, and Radiological Engineer – LANL
Oct. 2007	SCALE: ORIGEN-ARP/TRITON – ORNL

April 14, 2008

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE COMMISSION

In the Matter of	)	
	)	
PACIFIC GAS AND ELECTRIC COMPANY	)	Docket No. 72-26-ISFSI
	)	
(Diablo Canyon Power Plant Independent Spent Fuel Storage Installation)	)	ASLBP No. 08-860-01-ISFSI-BD01
	)	

AFFIDAVIT OF PAUL KELLEY, JR., JAMES RANDALL HALL,
ROBERTA WARREN AND SCOTT FLANDERS

Paul Kelley, Jr., James Randall Hall, Roberta Warren and Scott Flanders, being duly sworn, do hereby state as follows:

1. I, Paul Kelley, Jr. (PK), have been employed by the U.S. Nuclear Regulatory Commission (NRC) since 2003. My current position is Security Specialist with the Materials, Waste, and International Security Branch, Waste Security Team, in the Office of Nuclear Security and Incident Response. I participated in the preparation of the "Supplement to the Environmental Assessment and Final Finding of No Significant Impact Related to the Construction and Operation of the Diablo Canyon Independent Spent Fuel Storage Installation (ISFSI)" (Supplemental EA). A statement of my professional qualifications is attached. (Att. 1).

2. I, James Randall Hall (JRH), have been employed by the U.S. Nuclear Regulatory Commission (NRC) since 1981. My current position is Senior Project Manager, Division of Spent Fuel Storage and Transportation, Office of Nuclear Material Safety and Safeguards. I am the project manager for the Diablo Canyon ISFSI, and oversaw the preparation of the Supplemental EA. A statement of my professional qualifications is attached. (Att. 2).

3. I, Roberta Warren (RW), have been employed by the U.S. Nuclear Regulatory Commission (NRC) since 1986. My current position is Branch Chief, Intelligence Liaison and Threat Assessment Branch, Office of Nuclear Security and Incident Response. I participated in

the preparation of the Supplemental EA. A statement of my professional qualifications is attached. (Att. 3).

4. I, Scott Flanders (SF), have been employed by the U.S. Nuclear Regulatory Commission since 1991. My current position is Deputy Director, Division of Waste Management and Environmental Protection, Office of Federal and State Materials and Environmental Management Programs (FSME). I supervised the individuals from FSME who participated in the preparation of the Supplemental EA. A statement of my professional qualifications is attached. (Att. 4).

5. (PK, JRH, RW, SF) The purpose of this affidavit is to address San Luis Obispo Mothers for Peace's (SLOMFP's) assertion in Contention 2, as set forth in the Commission Memorandum and Order dated January 15, 2008, that the Staff did not consider environmental effects on the surrounding land or non-fatal health effects in the environmental assessment addressing terrorism at the Diablo Canyon ISFSI.

6. (JRH, RW, SF) The Staff prepared a Supplemental EA addressing the impacts of terrorism in August 2007. (Ref. 1). Thereafter, the Staff prepared an addendum to the Supplemental EA which included additional references. (Ref. 2). As directed by the Commission, the Staff prepared the Supplemental EA to the extent practicable on information already available in agency records relevant to spent fuel storage facilities, including facility design, mitigative measures and security arrangements. The Staff concluded that the ISFSI design features and security measures will provide high assurance that substantial environmental impacts will be avoided and thereby reduced to a non-significant risk level. (Ref. 1 at 8). Because of the uncertainty inherent in assessing the likelihood of a terrorist attack, the Staff recognizes that under general credible threat conditions although the probability of such an attack is believed to be low it cannot be reliably quantified.

7. (SF) The Staff determined that it had high assurance that a terrorist attack would not result in significant health effects to the nearest resident based on the Staff's analysis of the

consequences of plausible threat scenarios (Ref. 4). This analysis is explained in the affidavit of Elizabeth Thompson. (Aff. 1).

8. (SF) The Staff determined that even if a terrorist attack were successfully carried out, the resulting radiological dose to the nearest resident would be below 5 rem. This calculation is described in the affidavit of Elizabeth Thompson. (Aff. 1). As explained in the affidavit, there is a low likelihood of an individual developing any discernable health effects from a radiation dose of less than 5 rem. (Aff. 1 at ¶ 51). Because of the nature of the radioactive material which would be released, which would disperse and settle as it goes downwind, members of the public beyond the nearest resident would be expected to receive lower doses and consequently have a lower likelihood of developing discernible health effects.

9. (SF) The Staff considered land contamination to the extent that it contributed to the calculated dose to the nearest resident. The Staff assumed that the nearest resident would be continually exposed to radiation emanating from radioactive material deposited on the ground from the release for four days. This is further explained in the affidavit by Elizabeth Thompson as the dose from ground shine. (Aff. 1 at ¶¶ 36-39, 48).

10. (SF) The Staff used the nearest resident to represent the maximally exposed member of the public. The radioactive material that could be released would disperse and settle as it goes downwind. Therefore, the nearest resident was assumed to be the most likely member of the public to be exposed to the highest concentrations of radioactive material and would be expected to receive the highest dose. It follows that members of the public beyond the nearest resident would receive lower doses.

11. (PK) The finding of high assurance is further supported by the security measures which will be in place at the site. The Staff reviewed and approved PG&E's proposed revision to its site security plan on February 3, 2004. (Ref. 6). That review concluded that the proposed revisions to the site security plan and facility design features meet the requirements of Part 73, "Physical Protection of Plants and Materials." Key features of the security programs for ISFSIs

include (1) physical barriers; (2) surveillance; (3) intrusion detection; (4) response to detection; (5) and offsite assistance from local law enforcement agencies. These measures contribute to the low likelihood of a terrorist attack that will result in significant offsite consequences by serving to deter and limit unauthorized access to the ISFSI. Additionally, the security measures serve to ensure that any unauthorized intrusion is promptly detected and assessed. To clarify the Staff's statement on page 5 of the EA Supplement, these factors are not intended to specifically resist an attack. However, mitigation of the potential radiological consequences will be accomplished by safeguards and emergency plan strategies as well as the response to the emergency levels required by the Security Orders. (Ref. 5, Att. 1 at 3).

12. (PK) On May 5, 2005, Staff issued an Order to PG&E for its Diablo Canyon ISFSI that imposes enhanced security measures, which must be fully implemented before the initial movement of spent fuel to the ISFSI. (Ref. 5). These measures include (1) increased security patrols; (2) augmented security forces and weapons; (3) additional security posts; (4) heightened coordination with local law enforcement, state and federal authorities; (5) enhanced screening of personnel; and (6) additional limitations on vehicular access. (Ref. 5, Att. 1).

13. (JRH) The Staff's finding of high assurance that a terrorist attack would not result in significant health effects to the nearest resident is also premised on the protection afforded by the cask design. The licensee plans to use a modified version of the HI-STORM 100 dry cask storage system manufactured by Holtec International which has been certified for general use by the NRC. (Ref. 3). This storage system uses vertical, ventilated cylindrical overpacks (casks) which provide a robust structure enclosing multi-purpose canisters ("MPCs") that contain the spent fuel. (Ref. 3 at § 1.3)

14. (JRH) The overpacks to be used at the Diablo Canyon ISFSI will be made of inner and outer carbon steel shells, filled with 30 inches of concrete, and weighing up to 180 tons when fully loaded. Each overpack surrounds an internal stainless steel canister, which in turn, confines and protects the solid ceramic fuel pellets contained in metallic-clad fuel rods. This

cask system is designed and evaluated to withstand severe natural phenomena, such as tornado winds, wind-driven missiles, and high energy lightning. The certified HI-STORM system includes a version, specifically designed for use in high seismic areas, in which the overpacks are anchored to the storage pad. The Staff approved a similar, but more extensive anchoring design in issuing a site-specific license for the Diablo Canyon ISFSI. (Ref. 3 at §§ 1.3, 4.2.1, 4.2.3).

References:

1. *Supplement to the Environmental Assessment and Final Finding of No Significant Impact Related to the Construction and Operation of the Diablo Canyon Independent Spent Fuel Storage Installation*. August 2007. (ADAMS Accession No. ML072400511, ML072400303 (package)).

2. *Addendum to References Listed in the NRC Staff=s Final Supplement To the Environmental Assessment For the Diablo Canyon Independent Spent Fuel Storage Installation.* November 7, 2007. (ADAMS Accession No. ML073040434).

3. Diablo Canyon Independent Spent fuel Storage Installation Safety Analysis Report (SAR), Pacific Gas and Electric Co. December 2001(ADAMS Accession No. ML020180341), Amendment 1, October 2002 (ML022950308), and Amendment 2, October 2003 (ML032900121)).

4. Memorandum from J. Strosnider to R. Zimmerman, “Framework Assessments of Spent Fuel Storage Casks and Radioactive Material Transportation Packages,” December 9, 2005. (ADAMS Accession Nos. ML053290260, ML080440117).

5. “In the Matter of Pacific Gas & Electric Co., Diablo Canyon Nuclear Power Plant Independent Spent Fuel Storage Installation, Order Modifying License (Effective Immediately).” (ADAMS Accession Nos. ML051310299, ML080440120).

6. “Diablo Canyon Independent Spent Fuel Storage Installation Application-Physical Security Program Changes,” February 3, 2004. (ADAMS Accession No. ML040350009).

Paul Kelley, Jr.

Subscribed and sworn to before me
This 14th day of April, 2008
Herald M. Speiser
Notary Public

HERALD M. SPEISER
Notary Public-Maryland
Montgomery County
My Commission Expires
November 01, 2009

My commission expires: _____

James Randall Hall

Subscribed and sworn to before me
This 14th day of April, 2008
Herald M. Speiser
Notary Public

HERALD M. SPEISER
Notary Public-Maryland
Montgomery County
My Commission Expires
November 01, 2009

My commission expires: _____

Roberta Warren

Subscribed and sworn to before me
This 14th day of April, 2008
Herald M. Speiser
Notary Public

HERALD M. SPEISER
Notary Public-Maryland
Montgomery County
My Commission Expires
November 01, 2009

My commission expires: _____

Scott Flanders

Subscribed and sworn to before me
This 14th day of April, 20__
Herald M. Speiser
Notary Public

HERALD M. SPEISER
Notary Public-Maryland
Montgomery County
My Commission Expires
November 01, 2009

My commission expires: _____

Paul Joseph Kelley, Jr.
Day Phone: 301-415-6101
Email: pjk1@nrc.gov

WORK EXPERIENCE:

United States Nuclear Regulatory Commission, Rockville, MD
Position: Acting Team Leader/Security Specialist
From: 6/2003 - Present

Support the U.S. Nuclear Regulatory Commission (NRC) mission in developing, monitoring, and implementing safeguards and security policy and programs. Provide security oversight and guidance in areas such as nuclear materials transportation, storage of spent nuclear material, review security plans related to the transportation and storage of many types of nuclear materials revise and update Orders and Compensatory Measures or Additional Security Measures, review SAFEGUARDS Security Classification Guide, participate as security representative for the Materials Security Steering Committee and Materials Security Working Group and member of the National Source Tracking Working Group. Support the planning and implementation of in house Leadership Operating Plans, provide analysis and problem solving experience concerning areas such as the transportation, storage, and disposition of Nuclear Materials. Provide written or oral comments to NRC Staff Members and/or Licensees.

U.S. Army Research Laboratory, Adelphi, MD
Position: Security Specialist/Inspection Team Leader
From 11/1989 – 6/2003

Conducted over 100 Information Security Program Inspections of ARL sites (Watertown, MA, Ft. Monmouth, NJ, Woodbridge, VA, Gaithersburg, MD and Blossom Point, MD) and in-house Branches located in Adelphi, MD. Conducted numerous investigations of possible compromises of classified material, conducted annual training to over 1500 employees yearly, supervised and approved the construction of Sensitive Compartmented Information Facilities (SCIFs) and other open storage areas.

Defense Investigative Service, Arlington, VA
Position: Industrial Security Specialist/Inspection Team Leader
From: 7/1984 – 11/1989

Conducted over 500 individual and team inspections of cleared contractors who were participants in the Defense Industrial Security Program. These inspections were of large Fortune 500 Companies (TRW, Lockheed Martin, IBM, Mitre, SAIC, etc.) to small companies with less than ten employees. Areas inspected included Physical Security, Information Security, Communications Security, Information System Security, and Personnel Security.

Defense Investigative Service, Alexandria, VA

Position: Special Agent
From: 2/1982 – 7/1984

Conducted background investigations for individuals needing access to classified and sensitive classified information. Investigations were for military personnel, contractor employees, and other government employees needing access to classified information. Conducted these investigations to ensure the individual was suitable for access to classified information. Ensured their reliability and trustworthiness enabling them to apply or obtain a position of trust with the United States Government or cleared contractor involved in classified work with the U.S. Government.

U.S. Capital Police, Washington, D.C.
Position: Police Officer
From: 1/1980 – 2/1982

As a sworn police officer I was tasked to protect and to serve the public especially the President, Vice President of the United States, all Senators, Congressman and their staffs, and all visiting heads of State.

EDUCATION Westfield State College
Westfield, Massachusetts US
Bachelor's Degree - 5/1978
Major: Criminal Justice

JOB RELATED TRAINING SPECIALIZED TRAINING 1. Defense Security Institute, Richmond, VA 23297 a. Automated Information Systems (AIS) Post Specialist Course, 14-18 April 1986, 40 hrs b. Industrial Security Specialist Course, 24 February- 29 March 1985, 40 hrs/week c. Personnel Security Investigative Course, 21 June-9 July 1982, 40 hrs/week d. Information Security Management Course, 14-25 September 1992, 40 hrs/week 2. U.S. Capitol Police Academy, Washington, DC, 7-19 January 1980 and 17 March-25 April 1980, 40 hrs/week 3. Federal Law Enforcement Training Center (FLETC), PTD 247, 21 January-15 March 1980, 40 hrs/week. 4. Federal Bureau of Investigation Training Academy, Quantico, VA, 1-2 April 1980, 8 hrs/day firearms instruction, FBI Firearms Training Range. 5. COMSEC Custodian Training Course (CS-140), 14-18 November 1988, 40 hrs/week. 6. COMSEC Custodian Course, Ft. Gordon, GA, 15-26 February 1993, 40 hrs/week. 7. The National Computer Course, National Security Agency, Ft. Meade, MD, 10-14 May 1993, 40 hrs. 8. Introduction to Supervision, U.S. Office of Personnel Management, Washington, D.C., 7-11 March 1994, 40 hrs/week. 9. OP-300 Interagency Operations Security Fundamentals Course, National Security Agency, Ft. Meade, MD, 2-3 June 1994, 16 hrs. 10. OP-380 Interagency Operations Security Course, NSA, Ft. Meade, Maryland October 1994 11. Reactor Concepts Course (R-100), Rockville, MD 30-31 July 2003 12. NRC: What It Is and What It Does, Rockville, MD 23-24 September 2003 13. Regulatory Process, Rockville, MD 25-26 September 2003 14. Project Manager (Self Study Course), Rockville, MD August 2003 15. Irradiator Technology for Inspectors Montreal, Canada June 2007

James Randall Hall
Senior Project Manager

Education

Master of Engineering, Nuclear Engineering, University of Virginia, 1981
Bachelor of Science, Nuclear Engineering, University of Virginia, 1979

Employment

U.S. Nuclear Regulatory Commission, 1981- Present

1999 – Present Senior Project Manager, Licensing Branch, Division of Spent Fuel Storage and Transportation, Office of Nuclear Material Safety and Safeguards

Mr. Hall led the NRC licensing reviews for the Independent Spent Fuel Storage Installations (ISFSIs) at the Rancho Seco, Diablo Canyon and Humboldt Bay sites in California. He also managed the licensing review of the Idaho Spent Fuel Facility, to be used by the Department of Energy. His other duties currently include licensing coordination for the 34 ISFSIs at operating and decommissioning reactor sites authorized under the general license provisions of 10 CFR Part 72, and licensing project management oversight for dry cask storage system applications from NAC Corporation.

1994-1998 Senior Project Manager, Project Directorate IV-1, Division of Reactor Projects - West, Office of Nuclear Reactor Regulation (NRR)

Mr. Hall served as the Senior Project Manager for the Cooper Nuclear Station, serving as the NRR representative on the Cooper Restart Panel, in close coordination with Region IV management through an extended period of enhanced NRC oversight of the facility. In 1996, Mr. Hall served as the Group Leader for Licensing on the NRC's special inspection team for the Millstone and Haddam Neck facilities. He supervised the efforts of 5 inspectors throughout the 6 weeks of onsite inspection, and assisted in the development of the final reports.

1993 -1994 Technical Assistant to the Director, Division of Reactor Projects for Regions III, IV and V, NRR

Mr. Hall provided technical and policy advice to senior agency managers, and assisted in policy development on the issues of operability, Notices of Enforcement Discretion, and technical specification improvement. He also coordinated Division efforts with NRC Region III management, and supported Division management in budget development and resource management.

1987-1993 Senior Project Manager/Project Manager, Division of Reactor Projects – III/IV/V, NRR

Mr. Hall served as Project Manager and Senior Project Manager, responsible for the licensing activities for a number of operating reactor sites, including the Perry, Duane Arnold and Big Rock Point plants.

1984-1987 Nuclear Engineer/Systems Engineer, Three Mile Island Program Office, NRR

Mr. Hall performed technical reviews in support of the cleanup of the damaged TMI-2 reactor, and later performed project management functions in the reorganized TMI-2 Cleanup Project Directorate, coordinating activities between NRR's headquarters and TMI site offices.

1981-1984 Containment Systems Engineer, Containment Systems Branch, NRR

Mr. Hall performed technical reviews of containment isolation design features for older light water reactors, and supported operating license reviews in the areas of containment leak testing and containment pressure/temperature response.

Roberta S. Warren, Branch Chief

US Nuclear Regulatory Commission
Office of Nuclear Security and Incident
Division of Security Operations
Intelligence Liaison and Threat Assessment Branch

Ms. Warren has over thirty years of federal counterterrorism analysis experience having worked for the US Secret Service for 12 years and the US Nuclear Regulatory Commission for 21 years.

She currently manages a staff of intelligence analysts who provide both tactical and strategic threat assessment for the commercial nuclear and radiological facilities and materials regulated by the Nuclear Regulatory Commission. The branch is also responsible for providing the threat basis for the agency's security policy, in particular the development and maintenance of the Design Basis Threats (DBT). Ms. Warren is an internationally known expert on DBT development and has served as a consultant to the IAEA on the subject, as well as provided training to the international nuclear community. She has contributed to numerous national-level intelligence products and has participated in several Federal task forces related to Counterterrorism policy including the development of the 5-year plan under the Clinton administration and WMD threat under the current Bush administration.

Education: University of Maryland, College Park, B.A.

SCOTT CHARLES FLANDERS

Education:

UNIVERSITY OF MARYLAND College Park, MD
B.S. in Mechanical Engineering, 1990.

Experience:

March 2004-Present **UNITED STATES NUCLEAR REGULATORY COMMISSION**
Rockville, MD

Deputy Director, Division Waste Management and Environmental Protection, Office of Federal and State Materials and Environmental Management Programs

- Responsible for the management of four areas: Protection of the Environment, Low-Level Waste (LLW) Program, consultation with DOE on incidental waste determinations in accordance with the Ronald Reagan Defense Authorization Act for Fiscal Year 2005 (NDAA), and non-HLW Performance Assessment (PA) analyses. These responsibilities are discharged through the staff of the three Sections: (1) Environmental Review Section; (2) Low-Level Waste Section; and (3) Performance Assessment Section. The Directorate serves as the FSME and NMSS focus for the development of all office Environmental Impact Statements (EIS') and review of all office Environmental Assessments, and review of outside EIS'. Serves as the focus for implementation and overall coordination of the LLW program. Responsible for implementing the NRC responsibility under the NDAA. EPAD performs PA analysis and reviews using risk informed approaches for non-routine and complex cases to demonstrate compliance with regulatory standards for the Decommissioning and LLW programs, as well as DOE incidental waste determinations and other programs as practicable. Interacts with other NRC offices, Federal and State organizations, Indian tribes, and other jurisdictions on matters under its cognizance. Represents NRC in international low-level waste management and environmental activities. Coordinates with research to ensure regulatory commitments are achieved. Provides technical assistance to Agreement States on LLW issues and supports IMPEP, regulation, and new Agreement reviews.

July 2002-March 2004 **UNITED STATES NUCLEAR REGULATORY COMMISSION**
Rockville, MD

Section Chief, Office of Nuclear Material Safety and Safeguards

- Served as the Chief of the Environmental and Low-Level Waste Section. Led, managed, and supervised staff responsible for serving as the Center of Excellence for environmental review services for NMSS. The Section developed all NMSS environmental impact statements (EISs) for licensing and rulemaking actions; reviewed or developed all complex NMSS Environmental Assessments, and reviews other agency EISs. Provided environmental guidance and training for NMSS and the regions, and supplied technical support to other groups as requested. The Section was also responsible for developing and implementing NRC's Low-Level Waste (LLW) regulatory program. Coordinated with, and provided technical assistance to Agreement States on LLW issues. Represented NRC in international waste management activities and reviews of LLW-related import/export requests. Implemented an active interface program including ongoing consultation with Federal and state officials, Indian Tribes, and other entities to promote understanding of LLW issues and to resolve concerns in a timely manner. Coordinated with NMSS and regional staff on LLW issues.

May 2001-July 2002 **UNITED STATES NUCLEAR REGULATORY COMMISSION**
Rockville, MD

Technical Assistant, Office of Nuclear Material Safety and Safeguards

- Served as the technical assistant to the Director of the Office of Nuclear Materials Safety and Safeguards. As Technical Assistant to the Office Director I evaluated, coordinates, reviewed, monitored, and advised the Director and Deputy Director of the Office of Nuclear Material Safety and Safeguards (NMSS) on technical, policy, and administrative (including personnel) issues related to fuel cycle facilities, independent spent fuel storage installation, transportation of nuclear materials, high-level waste, low-level waste, decommissioning, and medical, industrial and commercial uses of nuclear materials. I prepared background material and talking points for the Director and Deputy Director. I was also responsible for maintaining a general technical and scheduler knowledge of major office work underway. I identified major issues requiring attention of the Office Director to improve office effectiveness in completing assigned work. I interfaced with NMSS Division Directors, Executive Director of Operations staff and other technical staff across the agency. As assigned, I coordinated issues between NRC program offices, the Commission staff, and recognized industry groups; represent NMSS on intra office, interoffice, or interagency Task Groups; and develop papers on both policy and technical issues. I

also directed, guided, and assisted technical staff on rotational assignments to the Director's office.

Feb 99-May 2001 **UNITED STATES NUCLEAR REGULATORY COMMISSION**
Rockville, MD
Project Manager, Office of Nuclear Material Safety and Safeguards

- Served as the Senior Environmental Project Manager in the Spent Fuel Project Office. I was responsible for managing the environmental review for the Private Fuel Storage application and preparing or reviewing environmental assessments prepared within the Spent Fuel Project Office. My role in the Private Fuel Storage environmental review, involved managing NRC and contractor staff responsible for reviewing the construction and operational environmental impacts of the proposed Private Fuel Storage Independent Spent Fuel Storage Installation, as well as preparing the Environmental Impact Statement. Responsible for developing project schedules, organizing and managing site inspections, completing required consultations, and preparing written correspondence. Serve as the technical monitor for multiple government contracts.

June 93-Feb 99 **UNITED STATES NUCLEAR REGULATORY COMMISSION**
Rockville, MD
Project Manager, Office of Nuclear Reactor Regulation

- Served as the Project Manager for the Shearon Harris Nuclear Power Plant. In this role, I was responsible for coordinating and performing the technical review of all licensee submittals; including amendments, exemptions, ASME relief request, and responses to NRC generic communications. I also conducted 10 CFR 50.59 reviews and inspections, FSAR (10 CFR 50.71(e)) reviews, and prepare input to licensee SALP reports. I was the primary liaison between the NRC and the licensee.

- Served as the agencies lead Project Manager for the Westinghouse Owners Group (WOG) and the Baltimore Gas and Electric Company (BGE) license renewal activities. I planned, scheduled, coordinated, and participated in the review of the license renewal activities for the WOG and BGE. These activities included both technical and environmental issues. I also managed the review of system and component technical reports such as pressurized water reactor containments, reactor pressure vessels, and component supports. Developed resource and budget estimations for first of a kind license renewal reviews.

- Led a 20 person government and contractor environmental team responsible for reviewing the operational environmental impacts of the

Watts Bar Nuclear Plant and preparing a supplemental final environmental impact statement. Responsible for developing project schedules, organizing and managing plant and site inspections, preparing written correspondence, providing environmental policy recommendations to upper level management, and organizing and participating in public meetings. Served as the primary liaison between the NRC and the license applicant.

May 91-June 93 **UNITED STATES NUCLEAR REGULATORY COMMISSION**
Rockville, MD
Reactor Engineer Intern, Office of Nuclear Reactor Regulation

- Completed an extensive on-the-job training program that included: 13 weeks of reactor technology training courses that included nuclear physics, nuclear technology, radiation protection, and plant operations; 7 weeks of training in NRC and government policy. Rotated through several NRC offices with individual responsibilities that included preparation of safety evaluations reports and license amendments, performing power plant inspections, assessing operating plant events, and briefing NRC senior management on plant events and other complex regulatory issues.

January 91-June 91 UNITED STATES DEPARTMENT OF COMMERCE
Crystal City, VA
Patent Examiner, U.S Patent and Trademark Office

- Reviewed the technical and legal content of patent applications to determine if the invention warranted a patent. Responsible for conducting patent searches, writing agency decision, negotiated patent claims with applicants and their counsel.

April 12, 2008

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
PACIFIC GAS & ELECTRIC CO.	)	Docket No. 72-26-ISFSI
	)	
(Diablo Canyon Power Plant Independent Spent Fuel Storage Installation)	)	ASLBP No. 08-860-01-ISFSI-BD01
	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF'S SUPPLEMENTAL RESPONSE TO SAN LUIS OBISPO MOTHERS FOR PEACE'S FIRST SET OF DISCOVERY REQUESTS" in the above-captioned proceedings have been served on the following by deposit in the United States mail; through deposit in the Nuclear Regulatory Commission's internal system as indicated by an asterisk (*), and by electronic mail as indicated by a double asterisk (**) on this 12th day of April, 2008.

E. Roy Hawkens * **
Chief Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Mail Stop: T 3-F23 *
Washington, D.C. 20555

Office of the Secretary *** ****
ATTN: Rulemakings and Adjudication Staff
U.S. Nuclear Regulatory Commission
Mail Stop: O-16G4
Washington, D.C. 20555
E-mail: HEARINGDOCKET@nrc.gov

Office of Commission Appellate Adjudication * **
U.S. Nuclear Regulatory Commission
Mail Stop: O-16G4
Washington, D.C. 20555
E-mail: OCAAMAIL@nrc.gov

Diane Curran, Esq. **
Harmon Curran Spielberg & Eisenberg, LLP
1726 M Street N.W., Suite 600
Washington, D.C. 20036
E-mail: dcurran@harmoncurran.com

David A. Repka, Esq. **
Tyson R. Smith, Esq.
Winston & Strawn
1400 L. Street, N.W.
Washington, D.C. 20005-3502
E-mail: drepka@winston.com
trsmith@winston.com

San Luis Obispo Mothers for Peace * **
P.O. Box 164
Pismo Beach, CA 93448
E-mail: beckers@thegrid.net
jzk@charter.net

Jennifer Post **
Pacific Gas and Electric Co.
77 Beale Street, B30A
San Francisco, CA 94105
E-mail: JLKm@pge.com

Erica LaPlante, Law Clerk * **
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Mail Stop: T 3-F23
Washington, D.C. 20555

/RA/

Lisa B. Clark
Molly L. Barkman
Counsel for the NRC Staff