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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE COMMISSION

In the matter of
Pacific Gas and Electric Company
Diablo Canyon Nuclear Power Plant
Unit Nos. 1 and 2
Independent Spent Fuel Storage Installation

Docket # 72-26

SAN LUIS OBISPO MOTHERS FOR PEACE'S
REPLY TO NRC STAFF AND PG&E SUBPART K PRESENTATIONS

Introduction

As permitted by the U.S. Nuclear Regulatory Commission's ("NRC's" or "Commission's") June 6, 2008, Order, San Luis Obispo Mothers for Peace ("SLOMFP") hereby replies to legal arguments in 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 (April 14, 2008) ("NRC Staff Brief") and Summary of Facts, Data and Arguments on Which Pacific Gas and Electric Company Will Rely at the Subpart K Oral Argument on Contention 2 (April 14, 2008) ("PG&E Brief""). The Staff and PG&E have failed to satisfy their burden under the National Environmental Policy Act ("NEPA") of demonstrating the reasonableness of the Staff's Finding of No Significant Impact ("FONSI") with respect to the environmental impacts of an attack on the proposed Diablo Canyon Independent Spent Fuel Storage Installation ("ISFSI").

Discussion

SLOMFP's Contention 2 challenges the NRC Staff's failure to address a very serious and reasonably foreseeable adverse environmental impact of an intentional attack on the proposed

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Diablo Canyon ISFSI: significant and widespread land contamination and its attendant health, environmental and socioeconomic effects. The NRC Staff's Supplement to the Environmental Assessment and Final Finding of No Significant Impact Related to the Construction and Operation of the Diablo Canyon Spent Fuel Storage Installation (August 2007) ("Final EA Supplement") contains no acknowledgement of the potential for these severe impacts.

In response to Contention 2, the Staff claims to have considered "the terrorist attack with the most serious potential consequences," and determined that "the 50-year total effective dose equivalent to the closest resident to the site would be less than 5 rem," a negligible impact. NRC Staff Brief at 15. It is clear from the NRC Staff's Brief and accompanying declarations, however, that in fact the Staff did *not* consider the attack scenario with the most serious consequences. As reflected in both the Final EA Supplement and the NRC Staff's Brief and accompanying declarations, the Staff completely ignored the reasonably foreseeable potential that an attacker would successfully induce a fire in the zirconium alloy (zircaloy) fuel cladding surrounding the fuel pellets inside a storage module, causing a significant portion of the volatile cesium-137 inventory to vaporize and escape to the environment. Second Declaration of Dr. Gordon R. Thompson on Behalf of San Luis Obispo Mothers for Peace in Support of Contention 2 Regarding the Construction and Operation of he Diablo Canyon Independent Spent Fuel Storage Installation, Section V (April 14, 2008) ("Second Thompson Declaration") (attached as Exhibit 3 to SLOMFP's Brief); Gordon R. Thompson, *Assessing Risks of Potential Malicious Actions at Commercial Facilities: The Case of a Proposed Independent Spent Fuel Storage Installation at the Diablo Canyon Site* at 34 (June 27, 2008) ("Thompson Report") (attached as Exhibit 2 to SLOMFP's Brief). By puncturing the multi-purpose canister ("MPC") at the top and bottom, and relying on the cask's anchors to ensure that it would remain upright even after a

powerful assault, the attacker could take advantage of the "chimney effect," a basic element of the storage module's design for passively cooling the fuel during normal operation. Thompson Report at 34. Depending on the prevailing winds, a cesium-laden plume from a zircaloy fuel cladding fire could render uninhabitable an extremely large area of land due to radioactive contamination, causing tens of billions of dollars of economic losses due to illness, loss of food and water supplies, relocation of populations, abandonment of real estate, and other social and economic impacts. *Id.* at 37.

The NRC Staff attempts to deflect attention from the Final EA Supplement's gross error by three principal means. First, the Staff claims that the features of the Holtec HI-STORM dry cask storage system that are designed to protect the casks from natural phenomena will also protect it against attack. NRC Staff Brief at 15. *See also* PG&E Brief at 10-11. In fact, however, the HI-STORM cask is vulnerable to attack with devices that may be obtained without special access to government-supplied equipment or classified information. Second Thompson Declaration, pars. V-8, V-9; Thompson Report at 34-36. In fact, the very features that are designed to protect the Holtec cask system against natural phenomena, such as passive cooling and anchoring of the casks to the pad, can be used to enhance the potential for combustion of the fuel cladding and propagation of a fire. Second Thompson Declaration, par. V-6, Thompson Report at 34.

Second, the Staff suggests that it did consider the potential for a zircaloy cladding fire and rejected the scenario as incredible, but that the information is "sensitive" and therefore "the Staff is unable to publicly refute Dr. Thompson's postulated scenario." NRC Staff Brief at 17. The Staff's argument is disingenuous. During the discovery process on SLOMFP's Contention 1(b), the Staff disclosed enough information from the Final EA Supplement's reference documents to

give a general outline of the types of attacks that the Staff considered in making its FONSI. For instance, the redacted version of a 2004 Sandia National Laboratories study relied on by the Staff in the Final EA Supplement, which was released to the public in February of 2008, states that the authors evaluated the effects on a dry storage module of the crash of a fully loaded commercial jetliner. Second Thompson Declaration, par. VI-2, citing Smith, et al., *Results of a Large Airplane Impact Into a Field of Holtec HI-STORM Spent Nuclear Fuel Storage Casks* (Sandia National Laboratories: 2004) ("Sandia Report"). The released portion of the Sandia Report showed that its authors had evaluated the effects on the storage module of a short-duration fire in a co-located pool of aircraft fuel. *Id.*

Given the nature and amount of information disclosed in the Sandia Report, it is reasonable to expect that the NRC Staff would have disclosed a comparable amount of information if the Staff or its contractors had studied the potential for induction and propagation of a zircaloy cladding fire by puncturing the MPC at the top and bottom, by using incendiary devices to start a fire, and by relying on convective air currents to sustain and propagate the fire. No such report addressing that potential is identified, however. Instead, as discussed in the Thompson Report at 33 and the Second Thompson Declaration at pars. VI-2 through VI-4, the EA Supplement assumes that an attack by large-fuel-laden commercial aircraft or a small truck bomb would pose the greatest threat to the proposed Diablo Canyon ISFSI.

While visually dramatic, the type of attack considered by the Staff would not necessarily lead to any significant release of radiation to the environment. Second Thompson Declaration, par. V-11. The NRC Staff's Brief does not provide any new information to indicate that the Staff considered a less visually dramatic event, but one with far more devastating impacts: a large cesium release caused by a zircaloy cladding fire. If, in fact, the Staff gave any consideration

whatsoever to the zircaloy cladding fire scenario, that consideration is based on secret and arbitrary assumptions, not on documented technical analyses. To rely on such secret assumptions constitutes a blatant violation of NEPA. *South Louisiana Envtl. Council v. Sand,* 629 F.2d 1005, 1011-12 (5th Cir. 1980).

Finally, the NRC Staff attempts to defend its untenable position by attacking the qualifications of SLOMFP's expert, Dr. Gordon Thompson, to testify on security-related matters. NRC Staff Brief at 12-13. According to the Staff, Dr. Thompson lacks both access to "sensitive" information and the necessary expertise to evaluate the probability of an attack on the proposed Diablo Canyon ISFSI. *Id.* In making this argument, the Staff completely ignores the documentation of Dr. Thompson's extensive experience in assessing nuclear security issues that is provided in his June 27, 2007, declaration (Declaration by Dr. Gordon R. Thompson in Support of San Luis Obispo Mothers for Peace's (SLOMFP's) Contentions Regarding the Diablo Canyon Environmental Assessment Supplement) and curriculum vitae, which are attached as Exhibit 1 to SLOMFP's Brief.

The Staff also proposes an inappropriate criterion for establishing the qualifications of an expert witness with respect to security matters: that he or she must have access to "sensitive" information in order to identify credible means of attacking the Diablo Canyon ISFSI. The Staff misses the point that a key purpose of the NRC's security program is to defend against entities that do not themselves have access to government information but who are able to use publicly available information and equipment to cause great damage to nuclear facilities. Dr. Thompson has demonstrated a high level of ability to identify the vulnerabilities of the proposed Diablo Canyon ISFSI and to evaluate commonly available means of exploiting those vulnerabilities. In any event, as discussed above, the NRC has disclosed enough information in this case to confirm

that it has not conducted any studies of the potential for a zircaloy cladding fire caused by an attack: no document with a relevant title has been provided. Dr. Thompson is highly qualified to testify regarding the significance of the Staff's omission.

Most importantly, the NRC Staff ignores the fact that Dr. Thompson's work on the vulnerability of spent fuel and its cladding to catastrophic fire was the key factor that forced the NRC to re-assess the security of high-density pool storage of spent fuel. In 2000, Dr. Thompson submitted an expert report in a license amendment proceeding for the Shearon Harris nuclear power plant, in support of a contention asserting that before approving the expansion of high-density spent fuel storage capacity at Shearon Harris, the NRC should prepare an Environmental Impact Statement ("EIS") to consider the environmental impacts of a fire in the fuel storage pools. Thompson, *The Potential for a Large, Atmospheric Release of Radioactive Material From Spent Fuel Pools at The Harris Nuclear Power Plant: the Case of a Pool Release Initiated by a Severe Reactor Accident* (November 20, 2000) (filed on November 20, 2000, in Docket No. 50-400, in support of Detailed Summary of Facts, Data and Arguments And Sworn Submission on Which Orange County Intends To Rely At Oral Argument To Demonstrate The Existence of a Genuine and Substantial Dispute of Fact With the Licensee Regarding the Proposed Expansion of Spent Fuel Storage Capacity at the Harris Nuclear Power Plant With Respect to the Need To Prepare an Environmental Impact Statement to Address the Increased Risk of A Spent Fuel Pool Accident (Contention EC-6) (November 20, 2000; corrected November 27, 2000) (ADAMS Accession No. ML 003772525). In his report, Dr. Thompson identified sabotage and acts of malice as contributors to the potential for a catastrophic pool fire. *Id.* at 10.

The NRC Staff mocked Dr. Thompson's assertion that high-density pool storage of spent fuel at the Harris plant poses the risk of a catastrophic fire if the fuel is uncovered, asserting that

"Dr. Thompson's is the only opinion of which the Staff is aware that holds that fuel five years or more out of the reactor is susceptible to zircaloy fire-exothermic reaction." NRC Staff Response to Intervenor's Request for Admission of Late-Filed Environmental Contentions at 21 (Docket No. 50-400LA, March 3, 2000). Eight months later, when Dr. Thompson presented his conclusions to the NRC's Advisory Committee on Reactor Safeguards ("ACRS"), the NRC Staff announced it had changed its position and conceded that the blockage of air flow caused by partial drainage of the fuel pool (*i.e.,* the "adiabiatic heatup case") would permit aged fuel to reach ignition temperatures. 477th ACRS Meeting, Transcript at 28-30 (November 2, 2000) (ADAMS Accession No. ML003770226). Moreover, the Staff stated that it considers the probability of a fire in aged fuel to be within the same range as the probability of severe reactor accident as predicted by NUREG-1150. *Id.*, Tr. at 17-18 (Staff opinion that although the risk of a fire in fuel aged ten years is "low," it "could still be in the ball park of operating reactors.")

Subsequently, in NUREG-1738, *Final Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants* (January 2001), the Staff issued written confirmation of its conclusion that regardless of the age of the fuel in a pool, it must be assumed that the fuel will burn shortly after the tops of the fuel assemblies are uncovered. *Id.* at 2-1 – 2-2. The National Academy of Sciences ("NAS") subsequently confirmed the security implications of the vulnerability of zircaloy cladding to fire in a report entitled *Safety and Security of Commercial Spent Nuclear Fuel Storage* (National Academies Press: 2006). And in a follow-up report to the U.S. Congress, the Commission asserted that it had ordered licensees to "develop specific guidance and strategies to maintain or restore [spent fuel pool] cooling capabilities" in "circumstances associated with the loss of large areas of the plant due to large fires and explosions." NRC Report to Congress on the National Academy of Sciences Study on the Safety

and Security of Commercial Spent Nuclear Fuel Storage at 21 (March 2005) (ADAMS Accession No. ML050410377). Thus, not only is the Staff's attack on Dr. Thompson's credentials completely baseless, but ignores the fact that the Staff previously was proved embarrassingly wrong about Dr. Thompson's qualifications in the Shearon Harris case.

The Staff's failure to acknowledge that it was forced to change its position regarding the risks of zircaloy fuel cladding fires in the face of Dr. Thompson's expert analysis should be cause for alarm to the Commissioners, because the issue addressed by Dr. Thompson in the Shearon Harris case – the vulnerability of zircaloy cladding to fire – is essentially the same in both cases. The Commission should not tolerate the Staff's attempt to ignore the issue in the current instance, but instead should ensure that no permit for the Diablo Canyon ISFSI is issued until the potential for ignition and propagation of a zircaloy fire is adequately investigated. In the absence of such an inquiry, the Staff has no basis for claiming to have met the "hard look" standard imposed by NEPA. *Marsh v. Oregon Natural Resources Council,* 490 U.S. 360, 374 (1989).

Conclusion

It is a well-accepted part of government security analysis that a potential attacker will attempt to take advantage of existing vulnerabilities of a facility in order to do the maximum and most dramatic damage possible. Second Thompson Declaration, par. III-2, Thompson Report at 14-15. In this case, the Staff has completely ignored both the most obvious vulnerabilities of the Diablo Canyon ISFSI and the most obvious means by which an attacker could maximize the damage achieved by an attack. First, the NRC Staff disregards the fact that the design of the fuel storage units at the proposed Diablo Canyon ISFSI, with its use of convective air cooling and the anchoring of casks to the pads, creates the potential to ignite and propagate a fire in the combustible fuel cladding that surrounds the fuel. Second, the NRC Staff disregards the fact that

the most severe and costly consequences that could be caused by an attack would be widespread contamination of one of the primary agricultural regions in the United States. The NRC Staff disclosed a significant amount of information in the course of discovery in this proceeding, but the record contains no evidence that the NRC Staff gave any consideration whatsoever to the potential for an intentionally caused zircaloy cladding fire.

As asserted in Contention 2, it appears that the NRC's otherwise inexplicable failure to address the obvious risk of a cladding fire results from some unstated and hidden assumption. The record contains extremely strong evidence, for example, that at the outset the Staff arbitrarily excluded consideration of attacks that would result in any consequences other than immediate human fatalities. It may also be the case that the Staff arbitrarily excluded scenarios that would result in a zircaloy cladding fire, on the ground that it does not consider such fires to be credible. If that is so, however, the record contains not a shred of evidence that the NRC Staff gave reasoned consideration to the potential for a zircaloy cladding fire. Not even the *title* of a relevant document is identified. The Staff's lack of a documented basis for its assumptions regarding the environmental impacts of an attack on the Diablo Canyon ISFSI violates NEPA and therefore requires that the Commission reject the Final EA Supplement as inadequate. In any event, whatever hidden assumptions may underlie the Staff's FONSI, the FONSI must be rejected because it so arbitrarily and irrationally ignores the clear potential for an attack on the proposed Diablo Canyon ISFSI that results in ignition of the zircaloy cladding inside an MPC, propagation of a fire, and widespread contamination of the environment.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I certify that on June 16, 2008, copies of San Luis Obispo Mothers for Peace's Reply to NRC Staff and PG&E Subpart K Presentations were served on the following persons by e-mail and first-class mail:

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