

**NRCREP - Comments on Docket NO. 72-26, re. Diablo Canyon dry casks**

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5/31/07  
72 FR 30398  
25

Dear Sir/Madam: Please accept the attached comments, and let me know that you received it - as the deadline is today.

Sincerely  
Joseph Mangano, MPH MBA  
Executive Director  
Radiation and Public Health Project  
609-399-4343  
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COMMENTS REGARDING THE U.S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS  
DIVISION OF SPENT FUEL STORAGE AND TRANSPORTATION  
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  
DOCKET NO. 72-26  
PACIFIC GAS AND ELECTRIC COMPANY

Chief, Rulemaking, Directives, and Editing Branch  
Mail Stop T6-D59, U.S. Nuclear Regulatory Commission, Washington DC 20555-0001  
Attention: James R. Hall, Senior Project Manager

July 2, 2007

Dear Mr. Hall:

The Supplement to the NRC Environmental Assessment (EA) essentially ignores the potential harm to human health posed by storing high-level waste in above-ground dry casks at the Diablo Canyon site. Please accept the following comments supporting this contention.

Risk of Large-Scale Radioactive Releases from Dry Casks. About 1000 metric tons of waste already exist at the site, with another 1000 expected to be produced in the next two decades. The fact that a centralized repository will not begin accepting waste from U.S. nuclear plants until 2018 at the very earliest – and perhaps never – means that Diablo Canyon must store this enormous amount of waste for many years, perhaps permanently.

Exposure to large amounts of radioactivity from dry casks could occur from an accident or act of sabotage, which would constitute the worst environmental disaster in U.S. history. The terrorist attacks of September 11, 2001 have made U.S. nuclear plants one target for future attacks. Dry casks, which are placed outside the reactor buildings, make an inviting target for terrorists.

Even without a terrorist attack, the process of moving waste from indoor pools and maintaining it in casks require fool proof performance. Because dry casks have only been used at U.S. plants since 1984, this technology is still relatively primitive, and a meltdown from technical problems raises the possibility of a large-scale release.

The health consequences of such a release are staggering. In 1982, the Sandia National Laboratories estimated that a core meltdown at either Diablo Canyon reactor would result in 10,000 deaths and 12,000 non-fatal cases of radiation poisoning within 17.5 miles, along with 12,000 cancer fatalities within 35 miles. (1) These figures are low estimates due to subsequent sharp increase in local population. Moreover, casualties would occur well beyond the most proximate residents. In 2001, the U.S. Nuclear Regulatory Commission estimated fatalities after an accident to spent fuel pools at nuclear plants.

The NRC estimates included populations up to 500 miles from the plant in question; cancer fatalities 100-500 miles from the plant were 10 times greater than those 0-100 miles from the plant. (2)

Risk of Low-Level Radioactive Releases from Dry Casks. In addition to large-scale releases, dry casks also pose the threat of exposing humans through routine, lower-dose exposures. Workers who maintain the casks can be subjected to occupational exposures. In addition, local residents could absorb radioactivity that may leak through the casks.

The casks hold dozens of radioisotopes, each with long half lives. If not contained in the casks, these isotopes enter the body through breathing and the food chain. Once in the body, these chemicals injure and kill otherwise healthy cells, leading to cancer and other immune-related diseases. Strontium-90 attaches to bone, and may penetrate into the bone marrow, where the white blood cells crucial to the immune system are formed. Cesium-137 is distributed throughout the soft tissues, including the reproductive organs. These radioisotopes are especially toxic to the developing fetus, infant, and child, whose cells are dividing at a rate much more rapid than that of adults.

Historical Emissions from Diablo Canyon Reactors. Even before the casks are installed at Diablo Canyon, information exists on how much radioactivity has been emitted from the site's reactors, how much entered human bodies, and what potential health effects on humans have resulted. Utilities are required to report annual airborne emissions from reactors to the NRC; the following documents total emissions from both reactors for the first decade of Diablo Canyon's operation; dates of initial criticality for the two reactors are April 29, 1984 and August 19, 1985. (3)

<u>Year</u>	<u>Emissions*</u>
1984	11
1985	240
1986	1440
1987	2360
1988	1290
1989	975
1990	59
1991	590
1992	2570
1993	51

\* Iodine-131 and particulates, or all isotopes with half lives over eight days. Numbers expressed as microcuries; a microcurie is one-millionth of a curie.

Annual emission totals vary greatly. In four of the ten years, total emissions exceeded 1000 microcuries, while in three other years the total was under 100.

Radioactivity Levels in Bodies of Local Residents. In the history of U.S. nuclear power, there has been no program of how much of the emissions have entered human bodies. In the late 1990s, the Radiation and Public Health Project (RPHP) began a study measuring

levels of Strontium-90 in baby teeth near nuclear plants. The RPHP study was based on a similar study of Sr-90 from atomic bomb test fallout in baby teeth of St. Louis children during the 1960s. RPHP contracted with REMS Inc. of Waterloo, Ontario, Canada (a radiochemistry laboratory) to measure Sr-90 concentration of each tooth.

California was one of six states in which RPHP tested at least 100 teeth. There are two major findings from the study in California. First, RPHP found that San Luis Obispo County children born after Diablo Canyon startup had an average Sr-90 concentration 50% greater than those born before startup (below):

<u>Birth Year</u>	<u>No. Teeth</u>	<u>Average Sr-90*</u>
1979-85	15	1.35
1986-94	19	2.02
% change		+50%

\* Defined as picocuries of Sr-90 per gram of calcium in a baby tooth at birth.

Later in the study, using a more sophisticated testing machine that was able to detect greater amounts of Sr-90, RPHP made another significant finding. The average Sr-90 level in teeth of 50 San Luis Obispo and Santa Barbara children was 31% greater than in teeth from other California children (below). This pattern was consistent with findings near nuclear plants in Florida, New Jersey, New York, and Pennsylvania. Thus, the RPHP tooth study documented high and rising levels of radioactivity in bodies of children living near Diablo Canyon, suggesting that emissions from the reactors were likely the major cause for these patterns. (4)

<u>Area</u>	<u>No. Teeth</u>	<u>Average Sr-90*</u>
SLO/SB Counties	50	3.44
Other California	88	2.63
% SLO/SB higher		+31%

\* Defined as picocuries of Sr-90 per gram of calcium in a baby tooth at birth.

Increasing Cancer Rates in Children Near Diablo Canyon. While these findings raise a number of issues, perhaps the most important is whether they caused any damage to local residents, especially the very young, who are most vulnerable to radiation exposure's effects. Cancer cases were only reported by the California cancer registry beginning in 1988. However, from 1988-90 (the early years of Diablo Canyon) to 1991-98, cancer incidence in children under age five in San Luis Obispo and Santa Barbara Counties increased 31%, while the national rate was unchanged (below). (5)

<u>Period</u>	<u>Cancer Cases 0-4</u>	<u>Cases/100,000 Persons</u>
1988-1990	18	14.5
1991-1998	69	19.0
% Change		+31%

In addition to incidence, mortality data is available on the county level. The death rate from cancer to children age 0-19 in the two counties flanking Diablo Canyon has risen 64% since the late 1980s (below). During the same period, the rate fell 19% in the U.S. The local rate, which was previously about half of the national rate, now exceeds it, raising the question of whether greater radioactive emissions (and greater in-body radioactivity levels) from Diablo Canyon resulted in more local children developing cancer and dying from the disease. (6)

<u>Area</u>	<u>Deaths/100,000 (deaths 0-19)</u>		
	<u>1985-89</u>	<u>1990-2004</u>	<u>% Change</u>
SLO/SB Counties	2.15 (16)	3.53 (92)	+64%
U.S.	4.05 (14350)	3.30 (38462)	- 19%

The 650,000 residents of San Luis Obispo and Santa Barbara Counties have no obvious demographic characteristics that would predispose its children to cancer. Its adults are better educated, its median household income is above the U.S., and its poverty rate is below the U.S. (7) Thus, the record of radioactive emissions from Diablo Canyon and in-body levels of radioactivity to local residents should be taken seriously as a potential cause of harm to public health. Even though these exposures are relatively low-dose, a recent expert panel concluded that there is no safe threshold for health hazards posed by radiation exposure. (8)

Any decision involving dry cask storage of large amounts of waste should consider all potential risks. The NRC Environmental Assessment thus is deficient, and the issues of environmental and health threats should be re-evaluated.

Sincerely yours,

Joseph Mangano, MPH MBA  
 Executive Director  
 Radiation and Public Health Project  
 609-399-4343

1. Calculation of Reactor Accident Consequences (CRAC-2) for U.S. Nuclear Power Plants. Sandia National Laboratories, U.S. House of Representatives Committee on Interior and Insular Affairs, November 1, 1982.
2. TE Collins, G Hubbard. Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants. NUREG-1738. Washington DC: Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, February 2001.
3. Tichler J, Doty K, and Lucadamo K. Radioactive Materials Released from Nuclear Power Plants, annual reports. NUREG/CR-2907. Brookhaven National Laboratory, Upton NY, 1984-1993.

4. Mangano JJ et al. An unexpected rise in Strontium-90 in US deciduous teeth in the 1990s. *The Science of the Total Environment* 2003;317:37-51.
5. California Cancer Registry, Sacramento CA.
6. U.S. Centers for Disease Control and Prevention, <http://wonder.cdc.gov>, underlying cause of death. Includes ICD-9 codes 140.0-239.9 from 1985-1998, and ICD-10 codes C00-D48.9 from 1999-2004.
7. U.S. Bureau of the Census, [www.census.gov](http://www.census.gov), your gateway to the 2000 census, state and county quick facts. In 2000, the percent of adults over age 25 with a high school diploma in San Luis Obispo and Santa Barbara Counties was 85.6% and 79.2%, respectively, compared to the U.S. rate of 80.4%. The 2000 percent of four-year college graduates was 26.7% and 29.4%, compared to 24.4%. The 2004 median household income was \$46,225 and \$46,706, compared to \$44,334. The 2004 percent of residents living below poverty was 10.4% and 12.5%, compared to 12.7%.
8. National Academy of Sciences. Report of the Committee on the Biological Effects of Ionizing Radiation (BEIR VII), June 29, 2005.