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Considerations in Licensing High Burnup Spent Fuel in Dry Storage and Transportation

Comment On: NRC-2015-0047-0001

Considerations in Licensing High Burnup Spent Fuel in Dry Storage and Transportation

Document: NRC-2015-0047-DRAFT-0005

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Submitter Information

4

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General Comment

See attached file(s)

Essential to stop making radioactive waste as there is not yet a known safe way to store it over the lifetime of said high burnup spent fuel. All current methods of dry cask storage are short term and experimental. Please see attached Powerpoint Presentation regarding accidents that can happen during and after the creation of said spent fuel. Current dry cask storage technology is short term and experimental. Earthquakes, corrosion, cracks, blockage of passive cooling by snow, rodents, tsunamis, terrorism, all have the potential to cause widespread dispersion of high burnup spent fuel. Experimental dry cask storage of high burnup fuel in Southern California is a threat to the 22 million people who live there.

Attachments

Diablo Powerpoint 6

SUNSI Review Complete

Template = ADM - 013

E-RIDS= ADM-03

Add= H. Akhavanik (hx92)

**Potential Economic Damages To
California After Diablo Canyon
Nuclear Power Plant Meltdown And
Fuel Pool Fires Using Chernobyl
Damages And Fallout Pattern As A
Reference Base**

Chernobyl Radioactive Cesium -137 Ground Deposition and Fallout Pattern Over Europe After Nuclear Meltdown. Source: International Atomic Energy Agency (IAEA) Map 2006. Areas Affected From England, Norway, Italy to Greece. IAEA States Economic Costs, " Two Decades at Hundreds of Billions of Dollars".

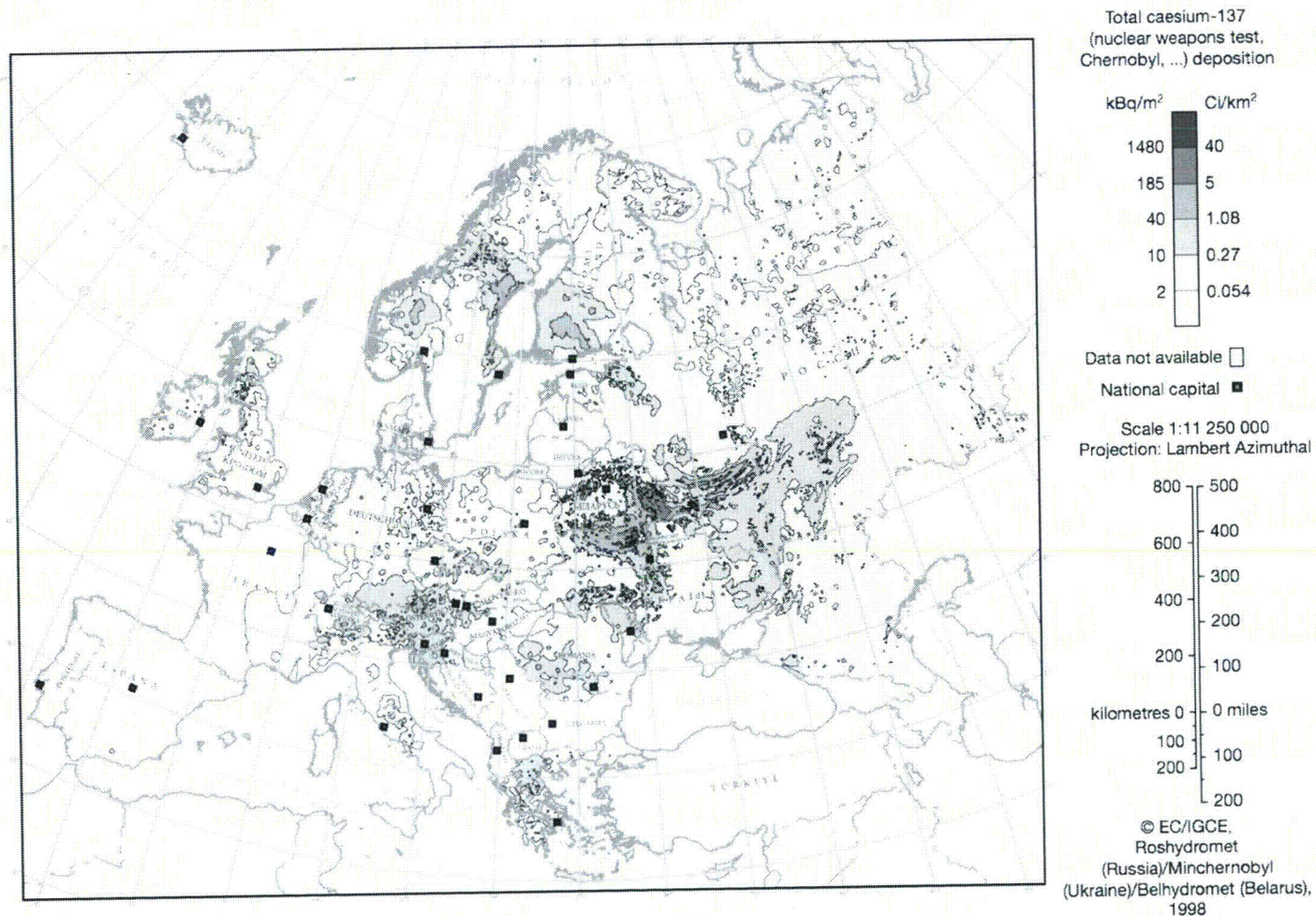


FIG. 3.5. Surface ground deposition of ¹³⁷Cs throughout Europe as a result of the Chernobyl accident [3.13].

**Chernobyl Radioactive Cesium-137 Ground Deposition Fallout Pattern Pulled
From International Atomic Energy Agency (IAEA) 2006 Map**



United States Before Diablo Canyon Nuclear Power Plant Meltdown And Fuel Pool Fires.



Areas Potentially Affected Economically After Meltdown And Fuel Pool Fires At Diablo Canyon Nuclear Plant Using Chernobyl Fallout Pattern At Same Scale. ***Worst Case Is Much Worse.*** If The Fuel Pools Burned Completely, **Multiply Fallout Concentration Or Fallout Area Below By 40 Times.**



California Before Diablo Canyon Nuclear Meltdown And Fuel Pool Fires.



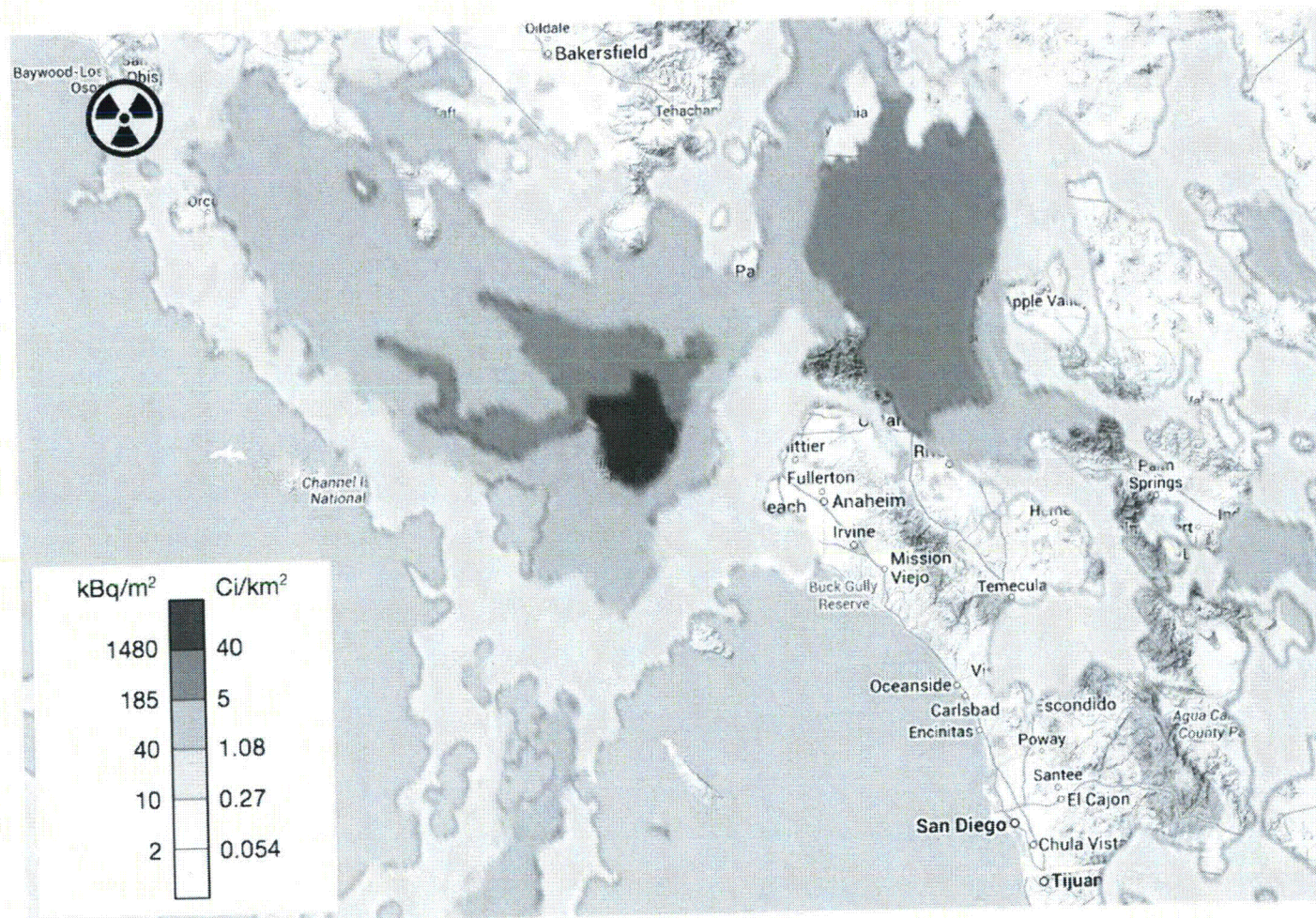
Potential California Areas That Could Suffer Economically After Meltdown And Fuel Pool Fires At Diablo Canyon Nuclear Plant, Using Chernobyl Fallout Pattern At Same Scale. ***Worst Case Is Much Worse.*** If the Fuel Pools Burned Completely, **Multiply Fallout Concentration Or Fallout Area Below By 40 Times.**



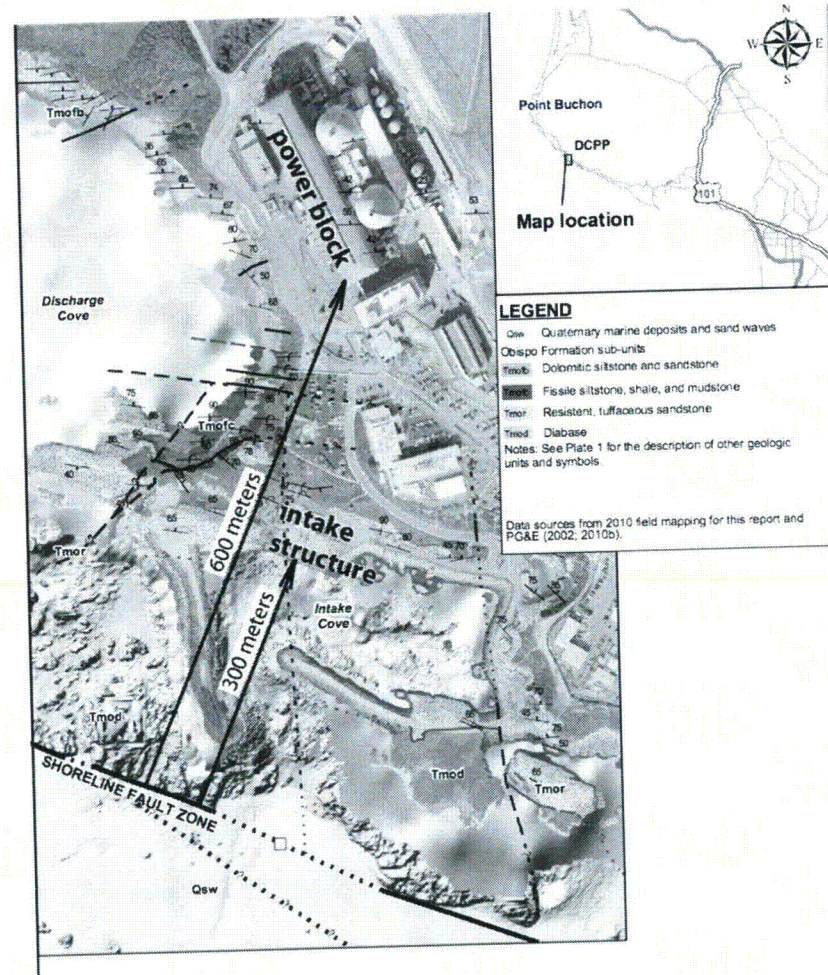
Southern California Before Diablo Canyon Nuclear Meltdown And Fuel Pool Fires.



Areas Potentially Affected Economically In Southern California After Nuclear Meltdown
And Fuel Pool Fires At Diablo Canyon Nuclear Plant Using Chernobyl Fallout At Same
Scale. **Worst Case Is Much Worse.** If the Fuel Pools Burned Completely, **Multiply
Concentration Or Fallout Area Below By 40 Times.**



PG & E Map Clearly Showing Diablo Canyon Nuclear Plant Cold
Water Intake Only 300 Paces From Active **Shoreline Earthquake**
Fault. Source From PG & E Website.



Potential Economic Damages After Diablo Canyon Nuclear Meltdown and Fuel Pool Fires.

- The radioactive ground deposition in the fallout patterns from Chernobyl were equivalent to about 400 Hiroshima bombs or about 2 Mega Curies(Mci) according to IAEA. These were clearly superimposed over the previous maps.
- ***Worst Case Is Much Worse.*** If both Diablo Canyon reactors and ***all*** 1000 tons of spent-fuel completely burned, the fallout released could be as high as 82 Mega Curies(Mci) or about 40 Chernobyls worth of fallout which is about 16,000 Hiroshima bombs worth of fallout onto California. Fallout patterns will vary based on wind, rain and fog conditions.
- As a general rule of thumb, every 100 tons of spent-fuel when completely burned in a fire contains about 9 Mci of cesium 137 which equates to about 5 Chernobyls or about 2000 Hiroshima bombs worth of radioactive fallout. See, **Reducing the Hazards from Stored Spent Power-Reactor Fuel in the United States** , Robert Alvarez, Allison Macfarlane et al, Science and Global Security 2003. The report showed the average US fuel pool at the time contained about 400 tons of spent-fuel with an average age about 15 years contains about 35 Mci of cesium 137 which translates to about 9 Mci per 100 tons of spent-fuel.
- The unique geography of California's Central Valley and LA Basin create a natural trap for radioactive fallout and in a worst case costs could exceed California's GDP or over a trillion dollars. The Central Valley of California grows much of the nations fruits and vegetables.
- Exclusion Zones are defined as contaminated by Cesium 137 at levels of 15Ci/square kilometer or 555 kBq/ square meter according to IRSN. Much of California would become an Exclusion Zone according to this definition after worst case meltdown and fuel pool fires at Diablo Canyon after earthquake, mechanical failure, or human error.

Conclusion: California Exclusion Zones, Estimates of Economic Losses, Health Impacts, Liability and Sources

- A Radioactive Exclusion Zone is generally defined as an area over 555KBq/square meter of cesium 137. Information from the sources below can show that if fog, wind and rain carried all the fallout from a worst case meltdown or 1000 ton fuel pool fire onto an area the size of California, MANY PARTS OF CALIFORNIA WOULD BE DEFINED AS AN EXCLUSION ZONE and would suffer economically for many years to come. Independent and government studies shown below estimate worst case losses in different areas and scenarios from 500 billion to trillions of dollars.
- No insurance company will insure against a nuclear disaster. In a 1 trillion dollar nuclear accident the utilities would only have to pay about 1 percent of damages whereas the taxpayers would have to try and cover the other 99 percent via the Price Anderson Act which limits the liability to 12 billion dollars for any nuclear plant accident. Health effects from radiation would depend on how quickly the population in the fallout areas could evacuate.
- (1) **Radiological Terrorism: Sabotage of Spent Fuel Pools** Author: Hui Zhang, Journal Article, INESAP issue 22 pages 75-78. For calculating burning tons of spent fuel and resulting fallout using Chernobyl as a base reference to multiply. Showed worst case fuel pool fires in France would equal 67 Chernobyls.
- (2) **A Safety and Regulatory Assessment of Generic BWR and PWR Permanently Shutdown Nuclear Power Plants**, Brookhaven National Laboratories, NUREG/CR-6451; BNL NUREG-52498, 1997. Shows shutdown reactors with fuel pools are capable of massive radiological releases. Estimates 546 billion dollars economic loss excluding health effects, 138,000 latent fatalities, and 2100 square miles of land condemned in worst case fuel pool fire. This studies modeling was not done using the geography of California, which would lead to higher numbers if all the radiation was trapped in the LA Basin population centers or the California Central Valley Basin agricultural area.
- (3) **Environmental Consequences of the Chernobyl Accident and their Remediation – Twenty Years of Experience. International Atomic Energy Agency (IAEA) 2006**, for Chernobyl European fallout map. According to IAEA “Over two decades Chernobyl has cost hundreds of billions of dollars”. See IAEA “In Focus: Chernobyl” The IAEA says they do not know how many hundred billions it really was due to the breakup of the Soviet Union.
- (4) **Massive Radiological Releases Profoundly Differ From Controlled Releases** Author, Patrick Momal, IRSN, Institute De Radioprotection Et De Surete Nucleaire, Eurosafe Forum 2012 that showed cost for a meltdown would exceed half a trillion dollars. Unreleased leaked version of this report from *Le Journal de Dimanche* showed worst case costs from French nuclear reactor would be three time the GDP of France or over 4 trillion dollars. The study was done in 2007 and partly released at the Eurosafe Forum in 2012.
- (5) **The Health and Economic Impacts of a Terrorist Attack at the Indian Point Nuclear Power Plant**. Author, Edwin S. Lyman, Union of Concerned Scientists, 2004. Costs to the New York area would exceed 1 Trillion Dollars in worst case.