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General Comment

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Please see attached PDF, and...

8/31/2015

Dr. A. Cannara
Menlo Park, Calif.
650-400-3071

To: US Nuclear Regulatory Commission

Copy: Governor Brown, Senator Hill, Assemblyman Gordon, SF chronicle Environmentla Editor

Comments on 6 August NRC Public Meeting on Diablo Canyon NPP (DCNPP).

I concur with the decisions NRC has recently made regarding DCNPP's safety...
www.pennenergy.com/articles/pennenergy/2015/08/federal-regulators-reject-challenge-to-nuclear-power-plant-safety.html

And, the Breakthrough Institute has made statements that I fully support...

http://thebreakthrough.org/index.php/issues/nuclear/diablo-canyon-nuclear-power-shutdown-risk

California has unfortunately boxed itself in regarding clean energy, largely because of the political strength of natural-gas combustion interests in our state, plus the lack of political will to educate our electorate properly on environmental science and the benefits of nuclear power.

For example, every windmill installed demands gas generation in the amount of at least Nameplate-Power x (1 - CF) to be at the ready. Since wind's CF is <<1, this makes what our California Energy Commission terms "renewable" energy mostly gas-combustion energy.

This reality is compounded by the fact that California has not included nuclear power in its RPS requirements for utilities, and our ISO (CAISO) has not committed nuclear power to a proper position in our Loading Order for generators. Fortunately, other states have not been so foolish. The capstone of our state's unfortunate fumbling is the law preventing new nuclear-power construction until the federal government has provided a home for used nuclear fuel. This naivete effectively has made California an anti-nuclear-power and a pro-combustion-power state.

Thus, my statements are in support of renewal of DCNPP's license and its continued operation as the largest source of truly clean power in Califiornia.

At the 5 June hearing, various incorrect statements were made by opponents of DCNPP renewal, ranging from earthquake/tsunami susceptibility through Pacific waters/fisheries effects. None were based on evidence, but I'll comment on a few below

(see attached PDF).

While c) above is likely unrelated to the NRC's criteria for license extension, it is a commonly-raised attack on DCNPP.

Thank you for the opportunity to comment on the 5 August NRC proceedings in San Luis Obispo.

Dr. Alexander Cannara
Menlo Park, Calif.
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Attachments

NRC5Aug2015

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a) Earthquake danger – the paleo-history of non-Sierra California is that our Central Valley and coastal regions are dominated by former ocean-sediment beds, punctuated by volcanic intrusions (e.g., Pinnacles, Mt. Diablo...). West of the Valley and San Andreas fault, these former sediments have been pushed sideways and lumped into coastal hills we know as the Coast Range. Tens of millions of years ago, they were part of western Mexico, and have moved with the western slip of the San Andreas by about 2cm/year, in a north-northwest direction. In other words, coastal California is permeated by slip faults. They don't generate large vertical motions when they fail.

   Our state's coastal lands are thus poorly-consolidated, fractured material with low ability to propagate earthquake energy. The location of DCNPP on an area hosting several such faults is taken by some, who don't apparently understand earthquake engineering, to mean the plant is in danger. Quite the opposite -- the number of faults in any coastal region of our state is high – we can't walk 1000m in any east-west direction without crossing a slip fault. This makes coastal California very different from regions like the US Northeast, or Japan, where underlying bedrock is very strong and able to transmit earthquake energy great distances. For instance, the New Madrid quake in the 1800s rang church bells in Boston, despite the epicenter being below the southern tip of Illinois. It was felt over an area of about 1 million square miles. In contrast, the 1906 San Andreas quake was felt only within about 7000 square miles.

   The thorough PG&E earthquake study of DCNPP's local illustrates both the low energy-transfer capacity of our coastal strata, but the confirming evidence of data recorded at DCNPP during known regional quakes, such as the 2003 San Simeon event. We can couple all this with the engineering reality of nuclear-plant design geometries – reinforced cylinders, hemispheres, etc. to illustrate why DCNPP is earthquake safe. We can even use the August 23, 2011, 5.8 quake in Virginia (in eastern bedrock, to explain why the North Anna nuclear plant there, only 11 miles from the quake's center, suffered no damage and only needed to file the 2nd lowest importance (Notice of Unusual Event) report to the NRC.

b) Related to earthquakes, when they occur on the ocean floor or within shoreline substrata, are tsunami. The Tohoku quake off Japan in 2011 created one of the largest tsunami on record, which reached north-eastern Japan and raised shoreline waves of about 15 meters. This quake was on an undersea subduction interface, where the Pacific tectonic plate drives under the Asiatic plate upon which Japan rides. These are not slip faults. Their motions release what are among our planet's strongest forces. New Madrid pales in comparison to the Tohoku event, which allowed Japan to move some meters closer to North America and its eastern shores to drop a few meters in elevation. The record quake magnitude of about 9.0 in coastal Japan didn't ruin any of its many nuclear reactors, despite well exceeding the shaking N. Anna felt.

Only the tsunami, which was as high as any of those recorded earlier in Japanese coastal history, was able to subdue a nuclear plant. And that plant had been known to need better protection, even on its 1st day of operation decades earlier. Plants constructed at better elevation or with better seawalls, survived well. Fukushima Dai-Ichi was fated to fail via poor regulation.

What tsunami risk ahs DCNPP, in comparison? There re no tectonic subduction zones within 600 miles of the plant. Closest is the 3-part Juan de Fuca Plate, which released a quake of about 9 in 1700 and a tsunami that reached Japan. But, this plate complex isn't oriented to direct a large tsunami down coastal California and DCNPP is far above sea level. So, let's find a better tsunami source to aim at DCNPP – the 1964 9.3 quake near Anchorage Alaska was felt around the world and raised a 27-foot tsunami that caused damage around the northern Pacific. But even it would not have affected DCNPP because of the plant's elevation.

Some people mentioned evidence of 100+ foot tsunami in Oregon and California coastal cliff strata. These are actually evidence of ancient sea levels – beaches – when global warming had eliminated glaciers and polar ice. That's a part of our planet's history that DCNPP can help us avoid repeating.

c) Pacific fishery effects – California Fish and Game estimates that 1.5 trillion sea-creature larvae are in some way damaged by DCNPP's final cooling system each year. The plant pumps about 2 billion gallons of seawater through this final stage each day. Thus, 1.5 trillion divided by 365 and divided by 2 billion yields about 2 larvae per gallon of water DCNPP pumps. Given the far higher density of larvae in the breeding grounds outside DCNPP's intake bay, this threat seems miniscule. This is borne out by testimony presented to NRC by a retired marine biologist who discussed 490 years worth of data on the subject, and by local fishermen, who, when interviewed, say fishing has never been better in the region, and they have no trouble meeting their catch limits each day.

   A statement made by one DCNPP opponent on 5 June was that the plant's output water was warming the entire US Pacific Coast's waters. The maximum energy delivered via outflowing water is about 6 billion Watts thermal; the Pacific Ocean holds about 200 billion billion gallons. Suppose the California Current (eastern segment of the Japan Current) carries just 1 millionth of the Pacific's water past our coast each year: 1) DCNPP's heated water will be carried southward, leaving northern waters unaffected; 2) DCNPP's heated water will be 365 x 2 billion gallons/year, or 730 billion gallons/year, while the passing current will total 200,000 billion gallons, or about 1/3 of 1%. Variations in solar ocean heating, deep-water upwelling, evaporation and wind effect make the heat content of DCNPP's water outflow irrelevant.

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