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The Key Technology for GHG Reduction is Nuclear Power Generation - Part 2

Nuclear policy expert James Conca, Ph.D. summarizes the problems in California meeting its GHG emissions goals that were caused by the premature forced closing of San Onofre Nuclear Generating Station (SONGS) in January, 2012 as the consequence of a vocal minority of anti-nuclear power advocates. Since the article was written, Governor Brown issued an executive order mandating further GHG reductions in California. The only means to achieve this goal is to expand the use of nuclear power in California while curtailing the imports of dirty coal power into the state.

Additional submitted attachment is included below.

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Are California Carbon Goals Kaput?

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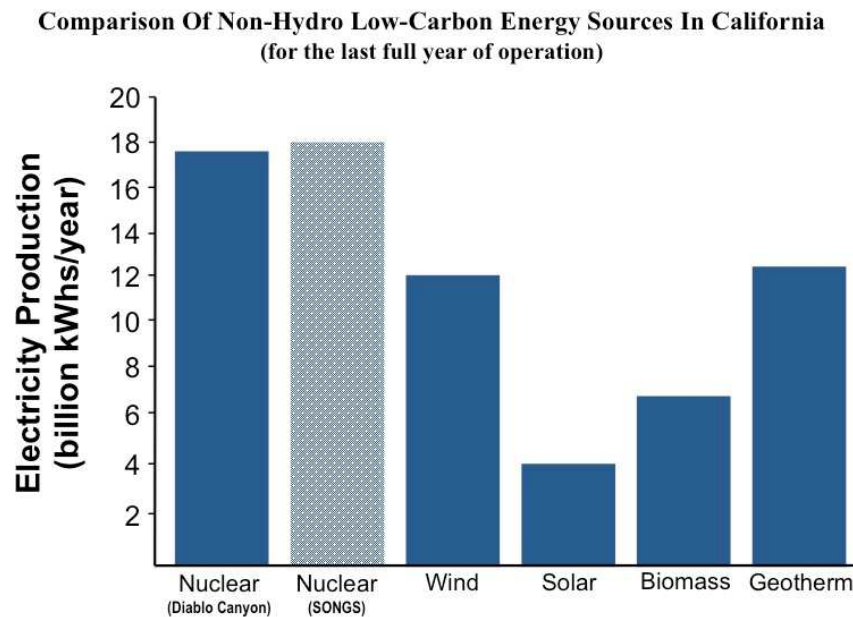
In one fell swoop, the unnecessary closing of the San Onofre Nuclear Generating Station (SONGS) in San Diego negated nearly all the low-carbon electricity generation from all the wind and solar installed in California. The plant's retirement is equivalent to rolling back the clock on twenty years of solar and wind deployment in the Golden State.

Also lost were 1,500 local jobs and over [\\$400 million](#) in lost revenue and increased costs to Southern California. But that may be closer to a \$billion if you add the three huge new transmission projects recommended to deal with the SONGS closure as well as the new pipelines to supply the new gas plants replacing SONGS ([CAISO](#)).

Until now, California has led the country in progress toward a low-carbon energy future. The state has one of the nation's most ambitious renewable energy mandates – 33% of its electricity must be carbon free by 2020 – and an even more ambitious greenhouse gas (GHG) reduction plan.

Although California failed to meet its 2010 goal of being 20% renewable, the state has installed wind and solar arrays that produced about 20 billion kWhs of low-carbon electricity last year, the most in America. Its geothermal and biomass production has stayed steady at 12 billion and 6 billion kWhs. Solar produced almost 4 billion kWhs ([Energy Almanac](#); [DOE EERE](#)).

California also had four nuclear reactors that produced, on average, 35 billion kWhs a year of low-carbon electricity and avoided over 20 million tons of carbon emissions per year.



In one fell swoop, the unnecessary closing of San Onofre Nuclear Generating Station in San Diego wiped out the low-carbon energy equivalent of almost all the wind and solar installed in California, reversing the state's 20-year progress in low-carbon energy. Wind and solar are the only low-carbon energy sources growing in California. Geothermal, biomass and hydro have been flat for 10 years.

But all that has changed in the aftermath of the SONGS closure (see figure below). That closing cut California's low-carbon electricity production by about 25%, an amount greater than the production from all wind and solar in the state ([CA Energy Commission](#)).

California has a goal of 80% reduction in CO₂ emissions by 2050, as required by its Global Warming Solutions Act of 2006 and a 2005 executive order. This means going from 493 million metric tons CO₂ in 2004 to 85 million metric tons CO₂ in 2050, with most of those cuts coming from the energy sector. The short-term goal is to reach 1990 levels by 2020, now incredibly difficult without SONGS.

The state has done a poor job of meeting these emissions goals. From 2000 to 2012, the emissions rate barely changed ([CA GHG Inventory](#)), starting at 466 million tons of CO₂-equivalent, peaking at about 490 tons in 2004 and dropping back to 458 million tons. Almost all of the drop resulted from the Great Recession of 2008, not any pro-active achievements in technologies or strategies.

Since California does not count nuclear or hydro as being renewable or low-carbon energy sources, they never mattered to the energy mandates, but the huge increase in carbon emissions from the loss of SONGS will impact its GHG-emissions goal. Wind and solar are the only low-carbon energy sources growing in California. Geothermal, biomass and hydro have been flat since the last century.

Instead, natural gas has filled in the gap left by closing the nuclear plant. In addition, two new natural gas plants are being built – one [north of San Onofre](#) and the other [south of the plant](#).

California has a large and growing population and a flourishing economy, with a major high-technology sector that demands reliable base-load electricity generation. Electricity demand has been rising steadily for years, but no major new plant had been built for 15 years, even in the wake of the Enron-caused [California electricity crisis](#) in 2000. That crisis resulted in rolling black-outs across the state, bankrupted Pacific Gas & Electric, and cost the state \$40 billion.

California's population is approaching 40 million. It is expected to reach 55 million by 2050. Its economy is larger than that of most nations. It produces 13% of America's gross domestic product (GDP). The state now imports a [third of its total electricity consumption](#), with no control on its carbon footprint.

California should buy even more of our hydro and nuclear from up here in the Pacific Northwest, we're the least carbon-intensive state in the Union.

So why did the nuclear plant close?

Simply put, [a strong anti-nuke ideology](#) beat a strong anti-carbon ideology by exploiting a minor, but easily resolved, engineering flaw. It is a growing trend in this country to close perfectly good nuclear plants for any reason ([Nuclear Matters](#)).

Three years ago Mitsubishi Heavy Industries sold four new steam generators to SONGS in which the steam generators for just one of the two nuclear reactors contained a manufacturing feature that resulted in a *perfect pitch* harmonic vibration at 100% steam flow. They were too perfectly designed. Vibration amplitudes in a few hundred steam tubes, out of nearly 10,000, were large enough to make contact between them.

This unexpected vibration and contact resulted in only *one* tube failing ([SONGS Root Cause Analysis](#)). Running at only 70% steam flow eliminated the problem completely. These tubes carry nothing radioactive. No radiation or other safety issue is a concern with this problem, and the reactor could be run safely and easily at 70% power for the next 20 years.

The other reactor was fine.



San Onofre Nuclear Generating Station in San Diego, now idled for political, not technical, reasons. Source: NEI

However, the Nuclear Regulatory Commission (NRC) decided that a lengthy public comment period was necessary before any action could be taken. Why? The plant could have run at 70% power during this discussion and would have obtained critical data on operations and the engineering issue, and shown this fix was easy.

Instead, the utility company decided that being shut down for one or two more years wasn't worth it. Fighting the huge political forces against nuclear in the state wasn't worth it, all the way up to the Governor's office and the Congressional delegations.

Why can't America make simple engineering and scientific decisions anymore? All we had to do was decrease that one reactor's output by 20% to solve the problem, which would have dropped total output of SONGS by only 8%. So instead of putting out 16 billion kWhrs of carbon-free, steady electricity each year, SONGS would have put out over 14 billion kWhrs each year.

Instead, SONGS is shut forever and we now have to find an additional 280 billion kWhs of low-carbon electricity just to break even on carbon over the next 20 years.

This was not a well-thought out decision.

So California is struggling to find a way to reach its energy and climate goals in the aftermath of losing SONGS, and is finding out that it cannot reach them without new nuclear builds. California's carbon emissions actually increased more than 10 percent since the shut down of SONGS ([NPR](#)).

Independent analysis, from the International Energy Agency to the World Energy Council to our own EPA and the Energy Information Administration, confirms that any credible program to reduce carbon emissions must include a significant contribution from nuclear energy, 30% or more.

A 2011 [study from the California Council on Science and Technology](#) called for a ten-fold increase in the state's nuclear capacity by 2050. Without new nuclear generation, there is little hope of cutting carbon emissions to the state's 2050 goal ([SWITCH](#); [Berkeley](#); [UC Davis](#)).

A well-thought-out mix of new nuclear and renewables would allow California to grow without increased carbon or energy supply concerns. But there are no plans to restart San Onofre, or to build new GenIII nuclear in the state.

We really aren't serious about carbon. Even in California.

Follow Jim on <https://twitter.com/JimConca> and see his and Dr. Wright's book at <http://www.amazon.com/gp/product/1419675885/sr=1-10/qid=1195953013/>

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