

Nukes, part 7 – Western Revivals

By John Benson

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1. Introduction

I've mentioned before that when I worked for Landis & Gyr Systems (1980 to the late 1990s, when it was gobbled up by Siemens), PacifiCorp was one of our best customers. They bought many SCADA Systems from us and one Energy Management System for the Salt Lake City Control Center.

Thus when a came across the reference 1 article about how they are considering converting their coal-fired power plants to nukes, I had to write a short paper on this.¹

Then after I basically had completed and scheduled the above described paper's posting, another nuclear revival took a large step forward. PG&E's Diablo Canyon Nuclear Plant was scheduled for closure in 2025, but a sudden change-of-heart by our Governor Newsom, with a recent boost by his friend, President Biden, put this Nuke on the path to redemption.

This post is about the advanced reactors being considered by PacifiCorp for replacing their coal-fired plants, and the latest twist in the Diablo Canyon epic saga.

2. Mr. Gates & Terra Power

A Bill Gates-backed developer and one of the largest utilities in the Western United States announced Thursday they were launching a study to determine if up to five coal plants could be equipped with advanced nuclear reactors.

The move further cemented the relationship between TerraPower, a nuclear developer, and PacifiCorp, a six-state utility headquartered in Portland, Ore. The pair agreed last year to build a 345-megawatt Sodium nuclear reactor at the site of a retiring coal plant in western Wyoming.

Author's comments: I wrote an earlier post on the above reactor design. This post is briefly described and linked below. Also note that TerraPower (Bellevue, WA), PacifiCorp (HQ: Portland, OR) and Mr. Gates' main Corporation, Microsoft (HQ: Redmond, WA) are in the Pacific Northwest. Microsoft's HQ was in Bellevue until 1986.

I have said that I'm not going to review any advanced reactor designs in Nukes, unless they are able to define a true breakthrough design that I can believe."

I just spent several hours researching TerraPower, and feel like they have the resources to pull off a successful design, certification and first project, and this post will review this innovative design.

<https://energycentral.com/c/qn/nukes-%E2%80%93-part-6>

The deal signals the emergence of a new energy transition strategy in the West, where PacifiCorp has had to balance the climate goals of its customers in Washington and Oregon with the wishes of its Wyoming consumers, who want to keep the company's

¹ Benjamin Storrow, Scientific American, "Utility Explores Converting Coal Plants into Nuclear Power," Oct 28, 2022, <https://www.scientificamerican.com/article/utility-explores-converting-coal-plants-into-nuclear-power/>

coal plants open in their state. Nuclear power brings with it the prospect of jobs and zero-carbon electricity, potentially meeting the climate goals of political leaders and ratepayers in Washington and Oregon.

Yet the new focus on nuclear energy also comes with risks. The first reactor at the Naughton Power Plant in Kemmerer, Wyo., where the two companies hope to demonstrate that a coal-to-nuclear conversion is viable, has yet to have its design approved by the Nuclear Regulatory Commission and is projected to cost \$4 billion. It's unclear how much of those costs would be borne by ratepayers.

3. Nukes or Job Loss?

"PacifiCorp has a difficult challenge not just technically, but politically with a diverse set of stakeholders," said Robert Godby, a professor who tracks energy markets at the University of Wyoming.

Nuclear had long been anathema for many in Wyoming, the country's top coal-producing state. But that has begun to change in recent years, as coal plants across the country have closed and PacifiCorp began to plan retiring its fleet of four coal plants in the state.

The proposal to convert the Kemmerer plant into a sodium-cooled Natrium reactor has been embraced by Wyoming Gov. Mark Gordon, a Republican.

"I think a lot of people in Wyoming are open to considering nuclear's benefits and costs and seeing if it pencils out," Godby said.

Thursday's announcement is part of a broader effort to scale up TerraPower's technology. The company's first project is expected to begin operating in 2028. And advanced planning is needed to bring additional projects online afterwards, said TerraPower president and CEO Chris Levesque.

Those future projects could help establish the supply chain needed to build additional reactors. That energy is needed desperately as coal plants shutter across the country and to complement the build-out of renewables, he said.

Nuclear also has the potential to provide two things that renewables cannot: power that can be dispatched at any time and an abundance of jobs. Wind and solar facilities often employ only a handful of people once they're fully constructed. TerraPower estimates its facility will require a workforce of 250 people.

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4. Additional Information

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More specific to the above, both Nuclear and Coal Power Plants are designed to be base-load plants. That is, once they are started up, they should run for days, weeks and months. Although both designs can vary their outputs to follow load.

The U.S. Department of Energy, Idaho National Labs has also studied the issue of Nuclear Reactors replacing coal-fired plants, and has issued the report linked below. An excerpt from this report's Abstract is below the link.

<https://fuelcycleoptions.inl.gov/SiteAssets/SitePages/Home/C2N2022Report.pdf>

A coal-to-nuclear (C2N) transition means siting a nuclear reactor at the site of a recently retired coal power plant. Three overarching questions from the C2N transition guide this research: where in the United States are retired coal facilities located and what factors make a site feasible for transition; what factors of technology, cost, and project timeline drive investor economics over such a decision; and how will C2N impact local communities?

The study team evaluated the siting characteristics of recently retired plants and those operating coal-fired power plant sites run by a utility or an independent power producer utilizing publicly available data to screen U.S. coal power plant sites to nuclear-feasible locations. After screening all retired coal sites to a set of 157 potential candidates and screening operating sites to a set of 237 candidates, the study team estimates that 80% of retired and operating coal power plant sites that were evaluated have the basic characteristics needed to be considered amenable to host an advanced nuclear reactor. For the recently retired plant sites evaluated, this represents a capacity potential of 64.8 GWe to be backfit at 125 sites. For the operating plant sites evaluated, this represents a capacity potential of 198.5 GWe to be backfit at 190 sites.

5. Diablo Revival

Although California has done an excellent job of meeting its climate-related, commitments to date, it still needs has a major barrier to overcome in getting to net-zero, a large number of natural gas-fired generators (mainly combined cycle) that need to be cleaned up or shut down. Many hope the former to take place by using biomethane or hydrogen in lieu of geologically-sourced natural gas. However a large number of tasks must happen to make the required clean fuels happen.

Having a 2.2 gigawatt zero-carbon base-load power plant that we didn't plan on will definitely help us fill any shortfalls should our best laid plans not quite work out.

PG&E Corp. formally asked federal regulators Monday to extend the life of Diablo Canyon, the last operating nuclear plant in California, as part of Gov. Gavin Newsom's effort to improve reliability of the electricity grid.²

The state's largest utility announced it applied to the U.S. Nuclear Regulatory Commission to renew Diablo Canyon's license and postpone the planned 2025 shutdown of the San Luis Obispo County plant, which supplies about 9% of the state's power.

² Dale Kasler, The Sacramento Bee via MSN, "PG&E formally moves to extend life of Diablo Canyon, the last nuclear plant in California," Oct 31, 2022, <https://www.msn.com/en-us/news/us/pgandampe-formally-moves-to-extend-life-of-diablo-canyon-the-last-nuclear-plant-in-california/ar-AA13B1m6>

Newsom, reversing his earlier opposition to prolonging Diablo Canyon's lifespan, signed legislation in September that would keep the plant open until 2030. The legislation also allows the state to loan PG&E as much as \$1.4 billion to make upgrades needed to postpone the plant's closure.

The governor appealed to lawmakers to keep Diablo Canyon alive to prevent rolling blackouts. The power grid is increasingly reliant on solar and other renewable energy sources. That makes it vulnerable to shortages during extreme heat waves, as in August 2020, when solar power fades in early evening but temperatures remain high...

PG&E had decided to close the 37-year-old plant because it didn't pencil out particularly well as cheaper energy sources such as wind and solar become more prevalent. But the utility relented as Newsom pressed for an extension. The governor's aides told lawmakers that without Diablo Canyon, the state's grid could become increasingly unstable.

"We are proud of the role Diablo Canyon plays in providing safe, reliable, low-cost and carbon-free energy to our customers and Californians," said Paul Gerfen, the company's chief nuclear officer, in a statement Monday. "This request to renew our licenses is another step to help California reliably achieve its bold decarbonization goals."

And what about President Biden?

The Biden administration on Monday said it's providing Pacific Gas & Electric Co. with a \$1.1 billion grant to help the company prevent the closure of Diablo Canyon, California's last nuclear power plant...³

The conditional funding, which comes from the bipartisan infrastructure law passed by Congress last year, creates a path forward for Diablo Canyon to remain open and could allow PG&E to pay back some of the \$1.4 billion loan for the plant that lawmakers approved.

A few years ago the decommissioning of Diablo Canyon appeared to be a done deal. See the post below for details on this process.

Destructive Restoration – Part 2, Nuclear: *This is the second in a three-part series on the right way to decommission electric generation plants where it is no longer economical to restore, repurpose, nor continue to use them.*

<https://energycentral.com/c/gn/destructive-restoration-%E2%80%93-part-2-nuclear>

However, worsening global warming has put these plans in question. Last summer a major heat wave in our state almost shut our grid down. See the post linked below for details.

<https://energycentral.com/c/gr/how-california-beat-heat>

³ Emma Newburger, CNBC via MSN, "Biden grants PG&E \$1.1 billion to keep Diablo Canyon nuclear plant open," Nove 21, 2022, <https://www.msn.com/en-us/news/other/biden-grants-pg-26e-2411-billion-to-keep-diablo-canyon-nuclear-plant-open/ar-AA14ndYA>