California Adjusts

By John Benson

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1. Introduction

The past is mostly known, but the future is generally unpredictable. The latter is true even under the best of circumstances, but our path recently has become increasingly unstable. This is primarily due to alterations in our environment caused by human-actions.

California is aggressively attempting to mitigate one of the alterations: climate change. Because our state's goals are very audacious, any obstacles that appear in our path require us to adjust. Although we have met all major climate-related goals to date, as challenges appear, wise project/program managers will develop contingency plans, which is exactly what my state is doing. This paper will lay out the obstacles we have encountered in the last few years, and a few contingency plans that we have begun to define.

2. Obstacles

First there is a general issue, we have never been down this road before. The road I'm talking about is climate change in general. Without going into details, remedying climate change will require many decades to centuries. Thus we have no choice but to ride this out, no matter how rough the ride becomes. In the last few years our climate has become more damaging to our infrastructure via drought leading to wildfires and water rationing, and storms leading to flood and wind damage. Making these effects worse are recent changes in climate patterns.

2.1. Triple-Dip La Nina

La Nina, the potent weather event linked to more drought and wildfires in the western United States and more Atlantic hurricanes, doesn't appear to be leaving us any time soon.[1]

In fact, there is now an increasingly likely chance that the current La Nina pattern could stick around for a third fall and winter season – a rare "triple dip" phenomenon that's only happened twice since 1950, according to Emily Becker, a climate prediction expert and author of the National Oceanic and Atmospheric Administration's (NOAA) ENSO blog.

In a June 9 update, Becker says the models now show a 59% chance of La Nina by early winter.

La Nina is a natural and cyclical cooling of parts of the equatorial Pacific that changes weather patterns worldwide, as opposed to El Nino's warming. Often leading to more Atlantic hurricanes, less rain and more wildfires in the West and agricultural losses in the middle of the country, studies have shown La Nina is more expensive to the United States than the El Nino. Together El Nino, La Nina and the neutral condition are called ENSO, which stands for El Nino Southern Oscillation. They have one of the largest

[1] Nexstar Media Wire and Jeremy Tanner, The Hill, "Rare 'triple dip' La Nina appears more likely," June 18, 2022, https://thehill.com/homenews/nexstar_media_wire/3528411-rare-triple-dip-la-nina-appears-more-likely-what-that-could-mean-for-you/

natural effects on climate, at times augmenting and other times dampening the big effects of human-caused climate change from the burning of coal, oil and gas, scientists said.

"They really have a very, very strong" effect, research scientist Azhar Ehsan, who heads Columbia University's El Nino/La Nina forecasting, told the Associated Press in late May. "So a third consecutive La Nina is not at all a welcome thing."

The current La Nina formed in the late summer of 2020 when the Atlantic set a record for the number of named storms. It strengthened in the winter when the West's drought worsened and in the early summer of 2021 it weakened enough that NOAA said conditions were neutral. But that pause only lasted a few months and by early fall 2021 La Nina was back, making it a double dip.

Normally second years of La Nina tend to be weaker, but in April this La Nina surprised meteorologists by setting a record for intensity, which is based on sea surface temperatures, Ehsan said.

Becker wrote that, instead of subsiding during the spring, May of 2022 was the "second-strongest La Nina month on record" with the easily the coolest water temperatures on record since 1950 when it comes to two-year La Nina events.

Should La Nina stick around for a third winter season it would mean a higher chance of prolonged drought in the western half of the country, as well as a greater number – and more powerful – storms during hurricane season.

Author's comment: The "...*prolonged drought in the western half of the country…"* Means that our hydro generation (already well below normal) will probably suffer more from further lowered reservoir levels. Below is an updated forecast.

…The forecaster consensus also predicts La Niña to persist during the remainder of 2022, with odds for La Niña remaining at 60% or greater through early winter. Lowest odds occur during the next few months with a 60% chance of La Niña and a 39% chance of ENSO-neutral during July-September 2022. Subsequently, chances of La Niña increase slightly during the fall and early winter. [2]

In summary, La Niña is favored to continue through 2022 with the odds for La Niña decreasing into the Northern Hemisphere late summer (60% chance in July-September 2022) before increasing through the Northern Hemisphere fall and early winter 2022 (62-66% chance).

The last sentence is important because the "fall and early winter" is when California gets about half of its rainfall in an average year.

2.2. Pandemic, etc.

The Pandemic pretty much screwed up everything. The most important for California's climate change mitigation goals and our future electric generation are:

- The supply-chain issues for renewables,

[2] National Weather Service, Climate Prediction Center, "El Niño/Southern Oscillation (ENSO) Diagnostic Discussion, 14 July 2022, https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/ensodisc.shtml

- The trade battle between China (et al) and the US, and
- The reduced availability of workers to deploy new renewable generation projects.

2.3. Net Result

The bottom line from the above is that for the next few years we will have a shortfall of renewable generation (including hydro), and thus could suffer from low peak generation availability. We have implemented many tools to deal with this reduction, including:

- Increasing system peak demand-responsive tariffs,
- Adding out of state resources via the Western Energy Imbalance Market,[3]
- Other forms of demand response (including the use of distributed storage),
- Very high use of distributed power including through microgrids, and
- Public response programs like Flex Alerts.[4]

But these may not be enough given the severity of the situation. Thus my state is implementing contingency planning to make sure we have enough power during peak demand periods.

3. Contingency Plans

Some will see the steps below as rollbacks of prior environmental commitments. This is partially true, but these may not be used if (1) the above described obstacles are not as serious as they might be, and/or (2) alternative sources of generation and/or demand response can be identified and implemented.

Also, this appears to be a two-year problem, because:

We appear to be recovering from the Pandemic – Currently the COVID-19 Variant and sub-variants that are circulating in the U.S. are Omicron / BA4 and BA5. Between now and October 2022, three boosters will probably be released that are designed to be effective against these. California has a strong record of following public health warnings, and it is expected that our public health officials will strongly recommend that that our populace get boosted with these, especially if they have not yet contracted these varients.

A triple-dip La Niña is exceedingly rare, and I would assume that a quad-dip La Niña is unprecedented. Thus I would guess that we will emerge from La Niña after this winter, and there is a huge amount of heat that is baked into the oceans (a.k.a. energy imbalance). Per my favorite climatologist (Dr, James Hansen) in a recent email:

…The world is headed inexorably toward hotter conditions, as the cooling effect of the current strong La Niña barely got global temperature down to the increasing trend-line of global temperature. The 12-month running-mean temperature is already heading toward the next global record that will occur in conjunction with the next El Niño.[5]

[3] See https://www.energycentral.com/c/iu/caiso-part-6a-%E2%80%93-expansion-update
[4] https://www.flexalert.org/
[5] Dr. James E. Hansen, Recent Communication, June 17, 2022: May Temperature Update: Carbon Dioxide Is a Pollutant. Please Help Establish That Fact, http://www.columbia.edu/~jeh1/

Assuming we swing from the strong La Niña into a strong El Niño after this winter as Dr. Hansen suggests, these conditions (strong El Niño) are known for record high-precipitation in California, which would help ease our situation.

3.1. Gas Plants

California has about 20 natural gas-fueled combined-cycle power plants, and I'm unaware of any plans to shut a significant number of these down. However we also have coastal simple-cycle plants that use once-through cooling via sea water.

California Gov. Gavin Newsom signed a controversial measure yesterday that would delay the closure of natural gas plants and expedite energy generation projects in an effort to avoid blackouts over the next five summers.[6]

The legislation aims to beef up supply on the state's electrical grid, as it faces a potential shortfall in times of extreme heat. The language came as part of a raft of late bills attached to the $308 billion state budget.

The move angered environmental advocates and groups representing lower-income communities, who said the legislation was rushed through without scrutiny or public input — and could harm the state's green goals and public health.

The new law shifts power for buying emergency generation projects to the state Department of Water Resources (DWR), allocating at least $2.2 billion to the task. The California Energy Commission (CEC) will conduct environmental reviews and can bypass approvals from other state and local agencies that normally would review developments.

DWR can use the money to pay for the construction of new plants that use "zero-emissions" fuel like solar, wind and battery storage. For the next year, the agency can buy diesel-powered generators.

DWR can also buy power from coastal natural gas power plants that were slated to close between next year and 2029. The law puts no expiration date on that ability.

Newsom's office said DWR will buy generation as part of a "Strategic Reserve" that will only be used "when we face potential shortfall during extreme climate-change driven events (e.g. heatwaves, wildfire disruptions to transmission)."

"The state's energy plan is focused on ensuring reliability in the face of climate change and affordability for Californians while we accelerate our transition to clean energy," Erin Mellon, a Newsom spokesperson, said in an email.

…California State law requires the grid to use 60 percent renewable sources by 2030.

3.2. Diablo Canyon

Tucked against picturesque bluffs along California's central coast, the aging facility known as Diablo Canyon began operating in 1985. It was designed for a different era, with analog knobs and systems that no longer comply with the state's environmental standards. The plant has faced controversies over its impact on underwater ecosystems,

[6] Anne C. Mulkern , Energy Wire, "Calif. gives 'new life' to gas plants in emergency overhaul," July 1, 2022, https://www.eenews.net/articles/calif-gives-new-life-to-gas-plants-in-emergency-overhaul/

the production of toxic waste and its proximity to earthquake fault lines – and its planned closure by 2025 seemed an all-but-certain step in California's ambitious journey toward a greener future.[7]

But with just three years to go, the fate of Diablo Canyon now looks less assured.

See the figure below:

California is facing steep energy challenges that are only expected to worsen as the climate crisis intensifies. The plant still provides roughly 9% of the state's energy – the largest single source of electricity and enough to supply more than 3 million residents. The state is still far from finding a reliable and climate-friendly replacement, and concerns are rising that it will fall back on fossil fuels to fill the gap.

Now, decades-old discussions about whether the plant should continue to play a role in California's renewable energy transition are being rehashed. A diverse league of advocates – including energy officials, scientists, California's governor Gavin Newsom, and even the musician Grimes – are pushing for renewed life for Diablo Canyon. Critics, meanwhile, say keeping the plant open would only be a step backward.

Diablo Canyon has come to signify broader questions about the state's energy future, and whether it's ready to leave nuclear power behind. It's an issue also lingering in the thoughts of officials across the US. Half of the country's clean energy comes from nuclear power plants – but in many areas, it is being phased out…

California regulators had cracked down on the system used at Diablo Canyon in 2010, a process known as "once-through cooling" for its impact on marine life. Roughly 2.5bn gallons of seawater slosh through the plant's enormous intake tubes each day, cooling hot steam heated by nuclear reactors. The warmed water flushed back into the sea has

[7] Gabrielle Canon, The Guardian, "The last nuclear plant in California – and the unexpected quest to save it," June 23, 2023, https://www.theguardian.com/us-news/2022/jun/23/california-last-nuclear-power-plant-save

had profound effects on ocean ecosystems and animals, including fish, sea lions, turtles, and other creatures are killed by the millions each year by the systems themselves, according to the California water board…

Facing requirements for expensive upgrades and retrofits, estimated at roughly $4.5bn, and an increasingly competitive energy market centered around renewables, the plant's owner and operator PG&E agreed to a settlement in 2016 with environmental groups and labor organizations not to seek renewal on the licenses for its two reactors, which expire in 2024 and 2025 respectively…

Author's comment: The earlier post, described and linked below, describes the process for retiring Diablo Canyon Nuclear Plant in detail.

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

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

Energy officials warned it will be especially difficult to navigate seasons when climate disasters hit all at once, potentially leaving millions of Californians without power during peak times of need in the coming years.

The grid has grown more efficient and reliable due to renewables coming online and upgrades in systems, but the state's energy agencies projected a significant shortfall that matches the energy lost when Diablo Canyon ceases to contribute. Meanwhile, energy costs will continue to rise.

"This is a challenge," said Lucas Davis, an expert on energy economics and professor at the University of California Berkeley. "When a major generation source closes there is less supply so that pushes up wholesale prices," he said. The timing is bad. With cities mandating the phase-out of natural gas and more consumers switching to electric cars, demand for electricity is also expected to increase, driving up the price further.

There are growing concerns that the state will be forced to fall back on polluting forms of energy, including natural gas, once the Diablo Canyon goes dark. As things stand currently, California would have to increase renewable energy by 20% over the next two years, as hydroelectric power wanes, the chances of which experts said were "increasingly dim".

If decarbonization is not escalated quickly, California stands to emit an additional 15.5m metric tons of greenhouse gasses with the closure of Diablo Canyon, according to an analysis by the Union of Concerned Scientists published last year.

Alex Trembath, of the Breakthrough Institute, says the fact that Diablo's closure could create more emissions rather than reduce them provides a powerful test of California's commitment to clean energy. Keeping the plant would not hinder new sources of renewable energy, he says, rather those new sources could go toward providing more energy for the grid, rather than just plugging the gap left by Diablo.

"If the plant closes it won't mean that California can't keep making progress," he said. "It will just be an indication that no matter how dire or ambitious our rhetoric is about our climate goals – if we close the plant that's a signal that it's just rhetoric."

The day before this paper was scheduled to post a news article appeared with some additional information. An excerpt from this is below.

An aggressive push toward renewable energy has run headlong into anxiety over keeping the lights on in California, where the largest utility is considering whether to try to extend the lifespan of the state's last operating nuclear power plant...[8]

Now environmentalists find themselves at odds with someone they usually see as an ally: Democratic Gov. Gavin Newsom, a green energy advocate who supported the 2016 agreement calling for the Diablo Canyon Nuclear Power Plant to close by 2025 but now is a leading voice to consider a longer operating run…

In a statement, Newsom communications director Erin Mellon didn't address the question of politics but said the governor is focused on maintaining reliable energy for households and businesses while accelerating state efforts to meet his aggressive goals for reducing carbon pollution. He continues to support shuttering Diablo Canyon "in the long term..."

PG&E CEO Patricia "Patti" Poppe told investors in a call last month that state legislation would have to be enacted by September to open the way for PG&E to reverse course. She said the utility faced "a real sense of urgency" because other steps would be required to keep the plant running, including ordering more reactor fuel and storage casks for housing spent fuel that remains highly radioactive.

Extending the plant's operating life "is not an easy option," Poppe said. "The permitting and relicensing of the facility is complex and so there's a lot of hurdles to be overcome…"

PG&E is considering applying for a share of $6 billion in federal funding the Biden administration established to rescue nuclear plants at risk of closing. The utility announced the move after Newsom suggested a longer operating run would help the state deal with potential future electricity shortages.

The Energy Department recently recast rules at the request of the Newsom administration that could open the way for an application from Diablo Canyon. But some environmentalists question if those changes conflict with the federal law that provided the funds.

As part of the closure deal, the state granted PG&E a short-term lease for submerged ocean water intake and discharge structures through 2025, which also would have to be extended to keep the plant operating.

Author's final comment: I have always been proud to be a Californian. One of many reasons for this is, when confronted with a problem, we always have thoughtful, inclusive discussions followed by a reasonable attempted solution. We don't always immediately solve all of our problems, but do generally follow reasonable processes, and keep trying.

This post includes some of the discussions we are currently having regarding the above issues.

[8] Michael R. Blood, Associated Press, "Not so fast: California's last nuke plant might run longer," Aug 7, 2022, https://www.msn.com/en-us/news/us/not-so-fast-californias-last-nuke-plant-might-run-longer/ar-AA10qjhR