

As gas plants struggle, California seeks new flexible capacity strategies

With up to 6 GW of gas plants at risk of closure, energy planners are scrambling for new compensation techniques

By Herman K. Trabish
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Accelerating clean energy and climate goals in California have policymakers thinking in unprecedented ways about how to manage the state's power system.

California's utilities already face a 50% renewable energy mandate to hit by 2030, and now lawmakers are debating even more ambitious targets.



A [pending bill in the state Assembly](#) would institute a 60% renewables mandate by 2030, a 40% emissions reduction, and set a 100% renewable energy target for state planning purposes. It's already been passed by the Senate.

But California's grid operator, the California Independent System Operator (CAISO), says the state faces a [complicated energy trilemma](#) in reaching those goals: Renewables over-generation, excess natural gas capacity, and a potential shortfall of flexible generation.

Policymakers are just beginning to understand how to deal with it.

"We're not going to be able to achieve our long term carbon reduction goals without reducing natural gas," said Laura Wisland, senior energy analyst at the [Union of Concerned Scientists](#) (UCS). "We will have to replace a lot of the natural gas generation that provides energy and reliability services with non-carbon resources like renewables, energy storage, load shifting, and targeted energy efficiency."

Today's system is much different than Wisland's vision. Natural gas generation was 53.8% of [the CAISO installed power mix](#) in April. Renewables were 29% of the mix, with solar providing 14% of demand and wind 8.5%. CAISO [forecasts](#) natural gas generation will serve 61% of the state's peak demand this summer, with 13.7% to come from solar and 2.5% from wind.

Jan Smutny-Jones, CEO of the generator trade group [Independent Energy Producers Association](#), said California must move "in a rational way" toward its goals.

Natural gas will not "abruptly disappear" because "that would be very bad for reliability and affordability," he said. And more gas capacity could even be added through "peaking facilities that specifically address local reliability requirements."

Robert Laffoon-Villegas, spokesperson for utility Southern California Edison, summed up the situation.

"As renewables become a bigger factor, California will need less natural gas," he said. But, for now, it provides "critical support to the electric grid."

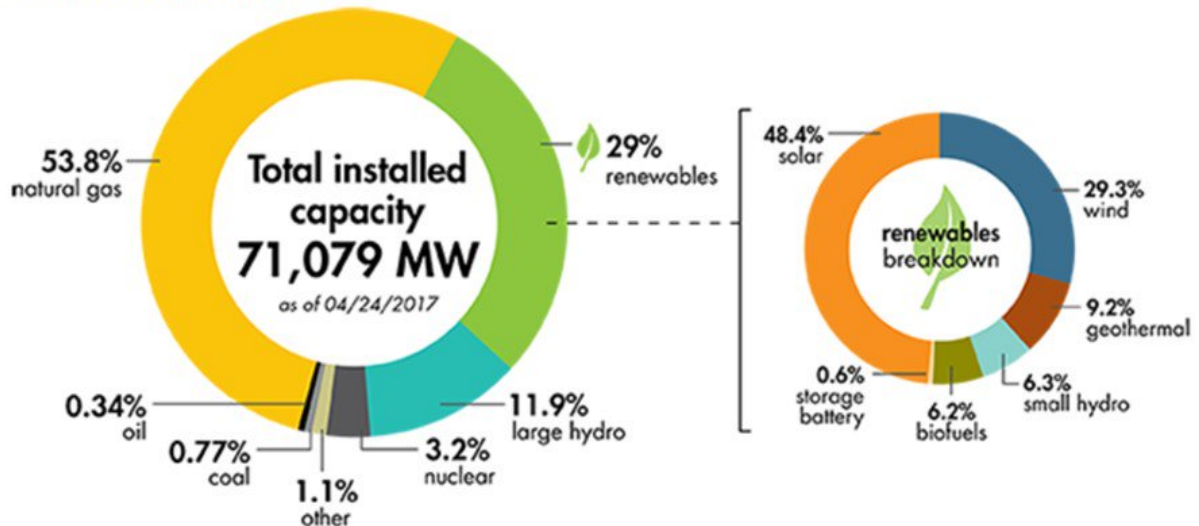
All that means California needs "a plan for the orderly phase out of natural gas generation," said David Olsen, a member of the [CAISO Board of Governors](#). Without it, stakeholders, especially those in the natural gas industry, "are confused."

California's energy stakeholders — including utilities, regulators, the system operator and vendors — must work together to develop that plan, Olsen said. It must include "a mechanism for maintaining the financial viability of the owners of natural gas plants," because the state continues to need them.

But stakeholders also have to figure out "how to get to [a very low carbon system](#)," Olsen added. "That will require a lot more resource diversity, including more renewables. And demand side resources will be a very big part of the mix."

As California's energy community works through those questions, their plans could well provide a model for other states as they look to deep decarbonization.

Power mix by fuel type



Note: "Installed capacity" refers to the total amount of generation capacity, but does not reflect the total generation available for dispatch at any given time.

Credit: [CAISO website](#)

How much gas is too much?

[Recent headlines](#) raise questions about California's natural gas dependence.

When the Aliso Canyon natural gas storage facility went offline in late 2015, it "dramatized the insecurity of relying on natural gas," Olsen said. A leak in the facility outside Los Angeles put fuel supplies for gas generators at risk, leading regulators to [approve expedited battery deployments](#), push customer-sited efficiency, and allow some gas plants to burn diesel during peak hours.

Security problems, liability problems, and emissions problems "have always been there" in the gas system, Olsen said, "and the state has chosen to ignore them."

In 2016 two large natural gas plants shuttered in California — the 578 MW Sutter Energy Center and the 1,200 MW La Paloma plant — because they could not make sufficient revenues in the CAISO wholesale markets.

Other markets have issued warning signs for gas generators as well. In May, Panda Temple Power's 758 MW Texas natural gas plant [declared bankruptcy](#). It reflected a

continuing downward trend in natural gas asset value. According to UBS, Calpine's 432 MW Bosque plant sold for \$528/kW in the ERCOT market in 2012. In 2015, Energy Future Holdings sold two plants with a total capacity of 637 MW for only \$440/kW.

GenOn Energy, recently purchased by NRG Energy in 2012 for an estimated \$1.7 billion, [just filed for bankruptcy](#) with debt of \$1.8 billion. Its 15 GW of generating capacity is 61% natural gas-fired. Independent power producers and power market experts across the country say a natural gas capacity glut is [likely to drive further plant shutterings](#).

Already, some in California appear to be recognizing the risks of an over-reliance on gas. This month, the Los Angeles Department of Water and Power announced it will [reconsider a \\$2.2 billion natural gas investment plan](#), and prioritize “renewable resources to meet demand.”

LADWP's reversal followed a major [Los Angeles Times investigation of California generation](#). It found the state will have the capacity to generate “at least 21% more electricity than it needs by 2020.” That over-capacity costs utility customers \$6.8 billion more for power than they paid in 2008, when they used 2.6% more electricity, the Times reported.

California's residential electricity rate now averages \$0.154/kWh, up 12% since 2008. The U.S. rate averages \$0.104/kWh, down 3% in the same period.

The system was overbuilt to protect reliability, California Public Utilities Commission (CPUC) President Michael Picker told the Times. The [required operating reserve margin](#) is 15%. CAISO's summer 2017 forecast puts its reserve margin at 19.5%.

"4000 MW to 6000 MW of gas plants are at significant risk of early economic retirement" in California.

Jim Caldwell
Senior Consultant, CEERT

In testimony to the California Energy Commission (CEC), Jim Caldwell, senior technical consultant at the [Center for Energy Efficiency and Renewable Technologies](#) (CEERT) illustrated the issue. Citing what he said was a conservative estimate from a CAISO study, he told regulators the state has as much as 9,000 MW of unneeded natural gas capacity.

Because those 9,000 MW are not needed for energy or capacity, the resources are not eligible for the state's Resource Adequacy (RA) program, Caldwell wrote. “Since prices in the energy market are projected to decline as zero marginal cost renewables make

up a growing share of the energy supply, 4000 MW to 6000 MW of gas plants are at significant risk of early economic retirement.”

“The California fleet is undergoing massive [reorganization](#),” Caldwell told Utility Dive in an interview. “In the last year, about 1,600 MW of relatively new gas plants, less than 10 years old, have shuttered, including Sutter, La Paloma, and two eight-year-old 50 MW peaking plants.”

“There’s more to come,” Caldwell said. “It’s time to start executing a new plan.”

The writing on the wall is clear to two of the state’s dominant electricity suppliers. San Diego Gas and Electric Spokesperson Colleen Windsor said natural gas generation is now “essential.” But the utility sees “a future where renewable energy, energy storage, and natural gas work in a supportive manner to reduce emissions while enhancing reliability.”

SCE’s Laffoon-Villegas agreed. The utility “supports further investigation and market enhancements to ensure that needed gas-fired generation resources are able to continue to safely and reliably operate,” he said. But “as California increases its reliance on [non-GHG emitting resources](#), there will be less reliance on gas-fired generation.”

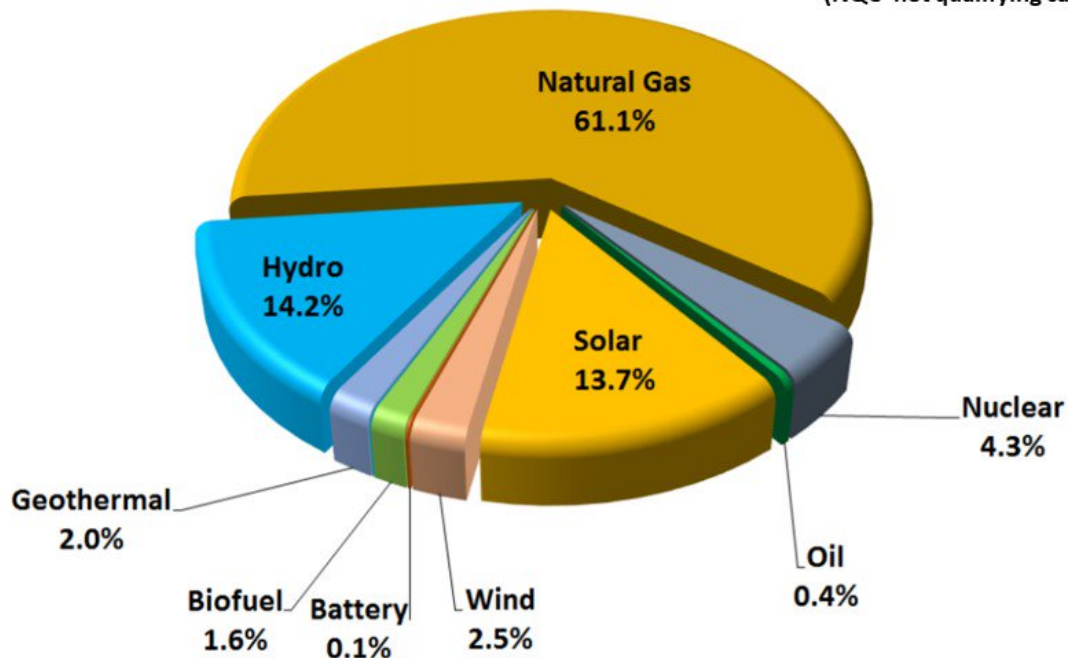
CEERT’s Caldwell said it more succinctly. “If there are four gas guys in a room today, half of them are going to be gone in 15 years.”

Caldwell has been studying potential strategies to draw down California’s gas dependence for two years.

“The question is ‘how do we reduce emissions?’” he said. The answer is, ‘it depends on how the gas fleet is run.’ California needs quick-start, sure-start facilities, in the right location.”

2017 ISO Summer On-Peak NQC by Fuel Type

(NQC=net qualifying capacity)



Credit: [CAISO 2017 Summer forecast](#)

Solutions great and small

Ralph Cavanagh, energy program co-director at the Natural Resources Defense Council, believes the best and simplest solution, across all the states in the West, is to [expand the CAISO](#) system.

Turning the 38 separate balancing authorities of the U.S. Western Interconnection “into [one integrated efficient marketplace](#) is the most important single thing we can do,” Cavanagh said. Then “it becomes a matter of market economics and it would be a much bigger and more diverse marketplace.”

Such a marketplace would allow the balance of supply and demand across the West. That would improve grid reliability, minimize curtailments, smooth renewables variability, and drive GHG reductions, according to [a recently-released Yale Environmental Protection Clinic paper](#).

UCS’s Wisland agreed. “Establishing a regional grid is one of the most important tools that we can use to reduce our reliance on natural gas over the long term.”

V. John White, executive director at CEERT also agreed that the “first and best answer” is a western regional grid. But the initiative to make it happen has stalled for political reasons that have little to do with the value of the concept, he said.

California Gov. Jerry Brown (D) put CAISO expansion on hold last summer amid concerns about governance over the expanded grid operator. CAISO's Energy Imbalance Market, which allows power trading with surrounding balancing authorities, continues to expand, but full-fledged expansion talks are still stalled.

Meanwhile, "California can get more for less by replacing natural gas," White said. "But it has to face this other set of problems about reliability."

The future of the natural gas industry depends on it becoming "a compelling part of the flexibility solutions the system needs," White said. "It has always been the least-cost baseload generation but [the system does not need baseload generation anymore](#) — it needs flexibility and reduced emissions."

Policymakers have begun working on how natural gas plant owners can be compensated "for the things the system still needs," White said.

CAISO's Olsen expanded on the concept. It is a priority to eliminate slow-starting natural gas plants that must be kept idling all day to be ready for the late afternoon ramp, he said. But some may be replaced with combustion turbines that do not need to be kept idling and do not contribute to emissions and over-generation.

IEPA's Smutny-Jones said existing turbines can be retrofitted to Olsen's standards if policymakers extend the term of California's [resource adequacy](#) contracts for providing local reliability.

"Retrofits may require \$10 million to \$15 million," Smutny-Jones said. "It's very difficult to recover all of that in one year, so we're pushing for a multi-year contract."

Regulators are beginning to see the trend and realize that "owners of plants that do not make money will eventually do [the economically rational thing](#), which is to shut them down," he said.

UCS's Wisland wants a balanced policy to ensure reliability. "Natural gas plants provide the flexibility [we have depended on](#)," she said. "But we need a fine-tuned understanding of the services the grid needs and then clear market signals that create markets for technologies that provide them."

Smutny-Jones said a longer-term RA contract meets Wisland's standard. Natural gas plants, storage applications, or demand response could also win such a contract, he said. "It is a clear signal so that all types of resources can participate."

Olsen said longer-term RA contracts may be part of the solution. But "for California to get to a low or no carbon grid, [flexible demand](#) is likely to be as important as flexible supply."

To drive the growth of flexible demand, “there needs to be a way to pay demand instead of paying natural gas generation,” Olsen said. That policy would match load to when renewables generate and minimize the need for RA, he added.

[FERC Order 745](#) ruled that rates cannot be just and reasonable if supply and demand side resources are not paid equitably, Olsen said. But the principle still needs to be more fully incorporated into procurement practices.

With that implemented, new technologies could offer a way to meet local reliability needs where natural gas plants were traditionally built, Olsen said. Competitively-priced distributed solar and battery energy storage on a more decentralized grid equipped with synchronous condensers and smart inverters could meet reliability needs without new natural gas generation, he said.

A study now being done by CAISO staff could determine whether the CEC will issue [permits for the Puente natural gas plant](#) that SCE wants to build to meet local reliability needs, he said. The study will show state regulators and policymakers whether SCE can meet local reliability needs at the same or a lower cost with new technologies.

CEERT's Caldwell said California will not get to its emissions reduction goals if natural gas remains its grid's “first line of flexibility.” He endorsed the CAISO push for planning to avoid ending up with “the wrong plants retired and the wrong plants in the wrong place with the wrong characteristics.”

Most stakeholders agree that “a multi-year RA contract for the right plants with the right attributes in the right locations is needed,” he said. But that is only part of the solution. “The system we have isn't working for anybody and we could end up with an unreliable system that is too expensive and doesn't reduce emissions enough.”

California needs a proactive planning process that begins with stakeholders and turns its integrated resource planning (IRP) proceeding “upside down,” Caldwell said.

It also needs a new approach to natural gas that makes room for the emerging technologies, he added. “And we need to reward the natural gas plants that start quickly and start reliably when they are needed.”