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This Week

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Shaking Up Diablo Canyon

Pacific Gas & Electric faces mounting pressure that ultimately could lead it to close its 30-year-old 2,240 MW Diablo Canyon Power Plant, California's last operating nuclear generating station.

Of all the nation's nuclear plants, Diablo raises the greatest concern about intense seismic shaking and potentially disastrous consequences following a quake along the fault-laced coast of San Luis Obispo County where it sits on the shore.

PG&E maintains the plant is seismically sound according to a recent analysis, said utility spokesperson Blair Jones.

However, and surprising to some, pressure to double down on seismic safety emanates not only from environmental organizations and state and federal regulators, but also the nuclear power industry.

In the wake of an updated seismic assessment for the plant showing an earthquake could unleash vibrations that exceed the facility's design strength, the

Summer Break

California Current staff is taking a two-week break in August while the state Legislature is on recess. The last issue of *Current* before the break will be on July 31. Publication will resume on Aug. 21.

Nuclear Regulatory Commission in May ordered PG&E to carry out a comprehensive seismic risk evaluation by 2017.

PG&E was not alone. NRC ordered evaluations at plants across the nation after they were required to submit updated seismic hazard evaluations with the agency over the last year.

What's unique about Diablo Canyon is that its high shaking potential catapults the plant into a class of its own among the nation's 99 nuclear power plants. Severe shaking of the plant, if it caused enough damage, ultimately could lead to radioactive leaks or even a meltdown if the situation got out of control.

The nuclear industry maintains that's not a realistic prospect because of the many steps reactor operators and regulators have taken to ensure the safety of the nation's nuclear plant fleet, Diablo Canyon included.

Yet, both regulators and the industry are calling for new seismic safety assessments after updated earthquake hazard assessments have been completed over the last year.

"The basic concern is potential ground motions at some sites are higher than previously thought," said John Richards, Electric Power Research Institute principal technical leader.

He and other industry seismic experts and engineers agree that in terms of destructive shaking potential, Diablo Canyon is at the very top of the list.

The shaking potential at Diablo Canyon has moved the Nuclear Energy Institute to recommend PG&E pursue analyses of potential mitigation measures, including any needed equipment and structural upgrades.

PG&E needs to study potential seismic mitigation measures, explained Nuclear Energy Institute Senior Project Manager Andrew Mauer. He noted its new seismic hazard assessment filed with NRC in March shows it exceeds the design basis for the plant.

The design basis, which is included in the plant's operating license, is supposed to insure the plant is strong enough to avoid substantial earthquake damage that leads to an uncontrollable nuclear reaction that could pose a threat to human health and contaminate property with radiation.

The specific concern, nuclear experts say, is maintaining the ability to shut down the plant reactor cores and keep them cool, as well as keep spent fuel cool.

NRC Japan Lessons Learned Branch Chief Mohamed Shams said that any identified mitigation measures could involve such things as additional anchors, pipe bracings, tie-ins for ceiling tiles, and reinforcement of masonry walls.

Jones said PG&E has built the plant soundly enough that "we do not expect that any significant modifications will be necessary."

Damage causing a loss of cooling capabilities could lead to uncontrollable nuclear fission in the reactor core or a spent fuel pool fire that could cause a cloud of radiation triggering a mass evacuation in San Luis Obispo County.

Almost 150,000 people—half the county's population—live within the emergency planning evacuation zone for the plant, according to Ron Alsop, county emergency services director. In addition, he noted that during summer the area hosts up to 100,000 tourists on any given day.

If an uncontrollable earthquake accident at the plant became as serious as the meltdown of the Japanese reactor at Fukushima in 2011, the radiation released could poison people downwind and contaminate substantial amounts of property in San Luis Obispo County. The

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UnBalanced Sheets

Listening to private utilities gripe about their costs during debates over a higher alternative energy standard while seeking increased ratepayer revenue elsewhere brings to mind loved ones, and not so loved ones, who freely take, but balk at giving.

In personal relationships we call them free loaders. In business dealings they're called free riders.

During legislative hearings on raising the renewable mandate from 33 percent to 50 percent by 2030, Pacific Gas & Electric, Southern California Edison and San Diego Gas & Electric insisted they be allowed to count towards their renewable portfolio standard the power from their customers' solar rooftops to placate ratepayers and lower costs.

"Our customers are feeling the pain and are angry," Mitch Mitchell, Sempra lobbyist, told the Assembly Natural Resources Committee July 13 during a hearing on Senate President Pro Tem Kevin de Leon's SB 350.

The utility representatives noted how ratepayers' photovoltaic systems contribute to the state's carbon reduction goal and create jobs. They also pointed out that solar rooftop owners were helped by ratepayer and taxpayer subsidies.

Not a word was said by utility representatives about who paid the vast majority of the costs of those expensive PV systems: the underlying homeowner or business.

Nor was any mention made of the direct benefits utilities reap from solar rooftops their customers installed on their own dime.

Those unadvertised benefits include lower utility loads, decreased generation tabs, revenue from connecting the solar system to the utility power lines, as well as fewer transmission and distribution losses. In addition, utilities don't have to pay solar owners for power fed into the grid beyond what system owners consume over a year. So, if the rooftop panels produce more power than used in the home they're out of luck.

Also noticeably absent from the legislative discussion of ratepayers' cost for growing levels of renewables has been the billions of dollars the three utilities plan to charge them to significantly increase their distributed resources as proposed in plans filed at the California Public Utilities Commission July 1 (*Current*, July 3, 2015).

Utilities have real costs arising from solar rooftops on the customer side of the meter in a changing utility industry paradigm. But, constantly presenting only one side of the balance sheet is like my annoying pal who's happy to meet for lunch, but insists on splitting the tab after inviting me out to eat.

Consider that the earnings of PG&E and SDG&E's parents' soared the first quarter of this year. PG&E's hit $418 million, compared to $251 million the first quarter of 2014. Sempra's earnings in the first quarter of 2015 were $437 million, compared to $242 million a year earlier. Edison reported incomplete earnings the last quarter (*Current*, May 21, 2015).

The utility mantra is that those who are able to install PV systems avoid paying their fair share of fixed utility costs, raising rates for the have-nots. This claim, however, is challenged in a recent paper by the Lawrence Berkeley National Lab.

When looking at two sides of the ledger, the lab's report released earlier this month, Net Metering and Market Feedback Loops, found that allowing PV owners to reap higher retail energy rates for excess solar fed into the grid under net metering could well lead to more solar installations, further pushing up rates. "However, a separate and opposing feedback loop could offset this effect: increased PV deployment may lead to a shift in the timing of peak-period electricity prices that could reduce the bill savings received under net metering where time-varying retail electricity rates are used, thereby dampening further PV adoption."

State regulators voted in their rate revision decision to have residential time-of-use rates in place in 2019.

As notable is that utilities not only want to reap the benefit of something they didn't pay for, but also change the rules of the existing renewables game to allow that to happen.

That includes urging lawmakers to let them estimate the amount of power from their customers' solar rooftops they hope to add into their renewable portfolios.

"It is too expensive to count house by house," said Fong Wan, PG&E senior vice president. That may be true, but estimating output is a novel concept, and a questionable one to boot.

"We don't estimate in the energy business," said Jan Smutny-Jones, Independent Energy Producers executive director.

It also would conflict with the existing renewable law (see sidebar).

While utility lobbyists do their job to protect their companies financially and stem loss of market share, they and their bosses should be made to realize there's no free lunch.

—Elizabeth McCarthy

Stirring Up the State Renewables Law

PG&E and the two other investor-owned utilities' proposals to tap into the renewable attribute of their customers' solar rooftop output entail overhauling the existing Renewable Portfolio Standard. That presents potential problems for a law, which in spite of its complexities and flaws, has withstood the test of time.

To get around legal challenges during the creation of the 33 percent renewable energy standard, in particular avoiding creating hurdles for out-of-state renewables to bid into the market, three "buckets" of resources were established by the California Public Utilities Commission.

The first category is renewable supplies that connect directly into California via one of its balancing authorities or sends power into the state within an hour of scheduled delivery. By 2016, 65 percent of energy portfolios are to include this category, with that amount rising to 75 percent.

The second category encompasses firmed and shaped energy supplies. These resources are accompanied by a guaranteed commitment to provide a set amount of electricity over a set period of time to California consumers.

The third bucket includes renewable energy credits, or the green attribute of the

supply. Use of these credits was capped at 25 percent of eligible supplies, dropping to 10 percent eventually.

The private utilities' proposal seeks to change the law so they can count their ratepayers' solar systems toward bucket one resources.

That could upend the carefully crafted buckets, which to date have avoided Commerce Clause attacks. That Constitutional provision prohibits the discrimination against out-of-state suppliers in interstate commerce.

According to the Independent Energy Producers, including state-only solar rooftop resources in bucket one would discriminate against out-of-state solar because all the utilities' customers are in California. Thus, counting only their own customers' solar output towards their 50 percent renewable mandate in effect discriminates against imported solar resources because they are not included in the proposed overhauled bucket one.

—Elizabeth McCarthy

CPUC Okays Utility Demand Response Auction Pilot

State energy regulators July 23 unanimously approved a new joint utility demand response auction, which sets a 22 MW floor but no ceiling.

"This creates a viable competitive alternative to utility demand response programs," said California Public Utilities Commissioner Mike Florio. He said he hoped the demand response auction mechanism will make way for new entrants into the field and access "largely untapped demand response potential."

The Commission's vote okays the first year of Pacific Gas & Electric's, Southern California Edison's and San Diego Gas & Electric's two-year pilot, at a "non-binding" cost of $9 million.

The five regulators approved the alternate proposal by Commissioner Catherine Sandoval, which differs from the unsuccessful proposed decision by banning fossil fuel back up generation from demand response auctions. She was concerned that allowing traditional generation to bid into the demand response auction next year would "create perverse incentives to turn on fossil fuel backup generation," worsening air quality and conflicting with the state's clean energy loading order.

Commission President Mike Picker also worried about the pollution from fossil backup generators, noting how they were heavily used during the 2000-01 energy crisis, exacerbating air pollution.

The approved two-year demand response auction mechanism requires that 20 percent of the bids be from residential demand response. That would be 4.4 MW if the total amount of demand response bid in to the three utilities is 22 MW.

The approved pilot, which begins next year with demand response resources available in 2017, also includes a pro forma power purchase contract.

In other news, Picker noted that the agency's strategic planning process launched in response to ongoing criticism about commission back-door dealings with utilities is expected to be completed within 12 months. It is to include defining "who we are and what we do, in particular in relation to changes in the world."

—Elizabeth McCarthy

PG&E Fined in Workplace Injury Case

The California Public Utilities Commission staff fined Pacific Gas & Electric $450,000 for alleged violations resulting in a City of San Jose employee being burned when hitting a 21 kV underground line while replacing a sewer line.

The accident occurred Nov. 7, 2014, the commission said July 22. The employee suffered facial burns in the incident, as well as burns to the arms.

Commission staff who investigated the incident claim the accident occurred because PG&E had not properly marked the line and had installed it too close to other underground facilities, including sewer lines.

PG&E has until Aug. 20 to appeal the citation.

—W.J. Kelly

Congress Refines Energy Legislation

Sen. Lisa Murkowski (R-AK) announced July 22 the release of a draft bipartisan energy package hammered out over months.

The comprehensive Senate measure is similar to one a House subcommittee revised the same day.

"By focusing on areas where agreement was possible, we have assembled a robust bill with priorities from many senators that will promote our economic growth, national security, and global competitiveness," Murkowski, chair of the Senate Energy & Natural Resources Committee, stated.

The Senate Energy Policy Modernization Act of 2015, coauthored by Sen. Maria Cantwell (D-WA), includes provisions that:

- Increase energy efficiency in homes, other buildings and manufacturing facilities;
- Modernize and increase protections for the electric grid and pipelines;
- Expand renewable and fossil resources;
- Protect taxpayer investments; and
- Improve coordination in the water-energy area.

The measure is to be revised by the Senate Committee July 28 and 30.

A House Energy & Commerce Subcommittee revised a wide ranging legislative package that also aims to update the country's energy policies.

"As we work to put our policies of energy scarcity behind us, we remain focused on maximizing our energy abundance in this new era," said Rep. Ed Whitfield (R- KY) subcommittee chair.

Marked up midweek were bill sections that focus on improving the electric grid and transmission and gas pipelines, advance energy efficiency, cybersecurity and workforce training.

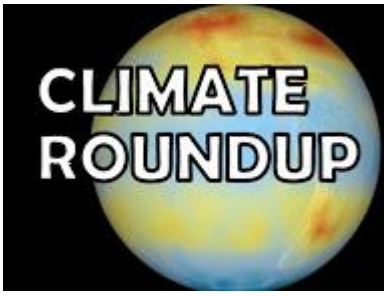
A key issue is the funding of the legislative mandates, including for replacing aging energy infrastructure.

"We all know that we need to repair, replace and upgrade our nation's aging

infrastructure," said Rep. Joe Pallone (D-NJ). "Deteriorating, leaky gas pipelines are a public safety and environmental hazard, as well as wasteful and inefficient."

—Elizabeth McCarthy

Brown Wants Shipping Industry Cleaned Up



Gov. Jerry Brown called on California's massive $700 billion-a-year freight industry to move to **zero emissions technology** in an executive order issued July 17.

Brown directed the California Air Resources Board, Department of Transportation, and other state agencies to develop a joint "action plan" by next summer. It is to set targets to better the freight industry's efficiency and eventually transition the enormous fleet of big rig trucks, trains, cranes, ships, and other equipment used to import and export freight at the state's bustling ports to zero emissions.

The ports serve as the biggest gateways for international trade in the nation, with the state's freight industry generating 5 million jobs.

Brown's order could mean more electrification of port and goods movement operations—from onshore power for ships in port to electric trains and more electric forklifts in warehouses. Greater use of alternate fuels also is anticipated, potentially including liquefied natural gas to power heavy-duty trucks and other equipment.

* * * * *

Gov. Jerry Brown visited the Vatican July 21 where he implored **mayors** attending a conference to work from the ground up to combat global warming.

"Mayors, you are at the bottom of this power chain and you have got to light a fire," Brown said, referring to a lack of adequate action by national leaders to control greenhouse gas emissions. "We have to make a change. It's up to us to make it happen."

The conference was aimed at spurring local action on global warming.

* * * * *

The Utility Reform Network is opposing a proposed settlement agreement filed at the California Public Utilities Commission regarding San Diego Gas & Electric's proposal to invest $200 million of ratepayer money in a network of **electric vehicle charging stations.**

Under the plan, some 5,500 chargers would be installed at 550 locations in the utility's service area. Electricity used to charge vehicles would be billed on the vehicle owners' monthly utility bills.

The intention is to support the state's goal of seeing 1 million electric vehicles on the road by 2020 and 1.5 million by 2025 to help reduce greenhouse gases and smog.

Pacific Gas & Electric and Southern California Edison have filed similar proposals, which the commission is handling in separate proceedings.

The settlement agreement between SDG&E, electric vehicle charging company ChargePoint, automakers, environmental

organizations, and others was filed with the commission late last month. It seeks to clarify a role for third-party companies to prevent utility monopolization of electric vehicle charging. It also provides that 10 percent of the charging sites are to be placed in disadvantaged communities.

However, TURN maintains the utility's claim the plan would provide benefits to ratepayers may be pie in the sky. To benefit ratepayers, according to TURN, the number of electric vehicles in the utility's service territory would have to grow from 12,000 today to 180,000 by 2028.

TURN wants the commission to downsize the proposed program and focus it on multi-unit dwellings on grounds that most electric vehicle charging occurs at home, rather than on the road.

A similar settlement proposal was filed earlier this month in the Edison proceeding. No settlement has been proposed in PG&E's case.

A decision is not expected until fall on any of the utility proposals.

—*William J. Kelly*

Turning Greenhouse Gas into Useful Products

An Orange County company, Newlight Technologies, is making waves and gaining contracts with its technology that turns methane emitted by energy facilities, landfills, sewage treatment plants, and farms into plastic without using oil or natural gas.

The company just entered two contracts, one with the Houston-based chemical company Vinmar on July 10 and the other with The Body Shop last month. Under the agreements it is providing its product, known as AirCarbon, which consists of polymers produced by its patented biocatalyst technology.

Under the deal with Vinmar, it will provide the company with 19 billion pounds of AirCarbon over 20 years. Under the contract with the Body Shop, it will provide caps and containers for beauty products.

"We are replacing oil with carbon that would have otherwise become part of the air and changing the role of materials in society," said Newlight Chief Executive Officer Mark Herrema.

Newlight, founded in 2003, began commercial-scale production in 2013. It also has contracts to supply its product to Dell, which uses it for computer packaging, and to Sprint and Virgin, which use it for cell phone cases.

Newlight's manufacturing process involves capturing methane emissions and diluting the gas with air and feeding it into a system where it contacts a patented biocatalyst. The catalyst extracts carbon and oxygen molecules out of the air and methane stream and reassembles them into a thermoplastic molecule.

The plastic molecules are extruded in long strands, cooled, and cut into pellets that are used to make a variety of consumer products that are as strong as those made with oil-based plastics, according to the company, but are less expensive and better for the environment.

Newlight was one of 24 companies recognized as leading technology pioneers by the World Economic Forum in 2014.

—*William J. Kelly*

Diablo Canyon

Continued from page 2

total assessed value of real estate in the county alone is more than $40 billion, according to County Assessor Tom Bordonaro, not to mention the contents of structures and value of crops.

Under the Price-Anderson Act, the nuclear industry has a total accident insurance pool of about $13.6 billion nationwide, according to the Nuclear Energy Institute. Liabilities beyond that level in any accident must be picked up by the taxpayer.

The potential for such serious consequences stemming from an earthquake at Diablo Canyon has resulted in the Nuclear Energy Institute placing the plant into a unique category under its five-path mitigation evaluation plan, known as Appendix H. The institute presented its study plan to NRC earlier this month.

Diablo Canyon, according to Mauer, is the only plant that falls into path five, the level that requires the deepest look into the need for potential mitigation.

NRC is expected to endorse the Nuclear Energy Institute's evaluation plan, after which plant operators across the nation will have to perform additional studies, especially PG&E. Those evaluations would come on top of the seismic risk assessment already ordered for PG&E's plant by NRC.

Ongoing concern about catastrophic earthquake damage at Diablo Canyon comes after PG&E claimed its updated seismic hazard assessment showed the plant is sound enough to withstand any likely earthquake without any health-threatening release of radioactivity.

"Safety is and always will be the top priority for PG&E and Diablo Canyon," stated Ed Halpin, utility senior vice president and chief nuclear officer, when the updated assessment was released. "These updated findings are the culmination of years of study and analysis, and further confirm the safety of the plant's design."

Jones said that the "plant safety-related equipment required for safe shut down can withstand an even greater level of shaking" than could occur in the area.

"Diablo Canyon was built and evaluated to withstand high ground motions," he said.

Utility assurances aside, the ongoing concern also comes after the utility—following the Fukushima plant meltdown in Japan—purchased portable generators, pumps, and other equipment to provide power and cooling water to the plant in the event of an accident. Plant components that need to be cooled have been retrofitted with quick connection points for the portable equipment, notes the Nuclear Energy Institute. Lack of the ability to cool plant components is what caused the Japanese reactor accident to spin out of control.

After that accident, NRC ordered purchase of portable equipment at Diablo and other reactors across the nation to maintain cooling capabilities a total cost of $4 billion. The average cost per plant is $40 million, though the costs differ depending on particulars at each site.

In addition, portable pumps and generators that could be shipped to any plant have been placed in Arizona and Tennessee to supply additional backup capacity in the event of any emergency, according to NRC spokesperson Lara Uselding.

The Commission further required PG&E to install additional monitoring equipment to track cooling water levels in the reactor core and in pools at the plant where spent fuel is held while it's still hot.

PG&E based its conclusion that the updated hazard assessment demonstrated the plant's safety on a revised assessment method it devised in 1991, long after the plant was built. That method downgraded its estimate of how different sized earthquakes would translate into vibrations at the plant, according to Sam Blakeslee, a professional geologist at Cal Poly San Luis Obispo and a Republican who formerly represented the area in the state Senate (see below).

Even then, the updated assessment shows ground motions and structural shaking at the plant could occur at levels about a third higher than the original design was certified to withstand. In some cases, shaking could even exceed an exception NRC granted for earthquakes triggered by one fault, known as Hosgri, discovered after the plant's construction was approved.

The analysis shows that the exception to the design standard—granted just for earthquakes caused by the Hosgri fault, some maintain—could be exceeded during both high frequency and low frequency vibrations triggered by an earthquake. Low frequency shaking tends to damage structural elements, while high frequency shaking tends to damage electronic equipment needed to monitor, control, and operate plant safety systems, according to Mauer.

PG&E would have until 2020 to carry out the Nuclear Energy Institute's evaluation plan.

Meanwhile, unless NRC orders it to shut down in the interim, the plant can continue to operate.

—William J. Kelly

Editor's Note: *Next week,* Current *will focus on what's involved in extending the operating license of the plant 20 years beyond 2025 or closing it down.*

Diablo's Shifting Seismic Safety Methodologies

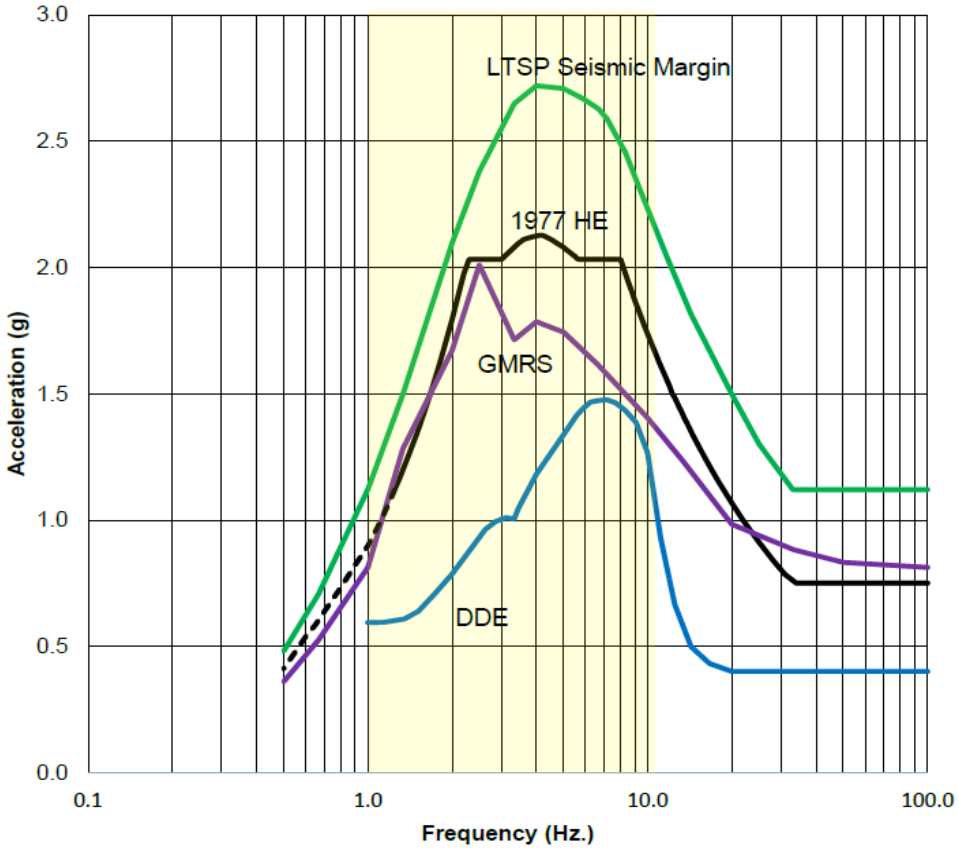
Seismic safety at the Diablo Canyon reactor along the coast of San Luis Obispo County has been a moving target since the Atomic Energy Commission approved construction of the plant in 1968.

One year later the Hosgri fault off the coast of the reactor was discovered, after which Pacific Gas & Electric got an exception to the seismic safety design basis for the plant in 1977. Under its license, the design basis—considered the maximum amount of ground acceleration the plant could face in the event of an earthquake and still be able to be safely shutdown—was 0.40 the force of gravity, according to an analysis Cal Poly San Luis Obispo geologist Sam Blakeslee presented to the U.S. Senate Environment & Public Works Committee late last year.

Blakeslee, a Republican and former state senator representing San Luis Obispo, explained that the exception was based on "less-conservative assumptions" than those used to calculate the design basis. The exception allowed NRC to consider the plant seismically sound when facing an earthquake from Hosgri that would create 0.75 g of ground motion.

Later in 1991, NRC modified the Hosgri exception to create another analysis tool, known as the LTSP, or Long-Term Seismic Program, however Blakeslee notes that it never became part of the plant's actual operating license.

Diablo Canyon Earthquake Potential



Above is a complex graph presented by Pacific Gas & Electric to the Nuclear Regulatory Commission showing the intensity of the shaking projected for its Diablo Canyon Power Plant. The vertical axis measures spectral acceleration in terms of gravity force at various frequencies of vibration. Spectral acceleration is a measure of shaking that occurs in structures during an earthquake. The horizontal access shows the frequency of vibrations that could occur.

- The lowest line, which is blue and labeled **DDE** (double design earthquake), is the so-called **original design basis** for the plant, which represents the maximum degree of shaking the plant was deemed capable of withstanding during a quake and still remain capable of being safely shut down.
- The black line labeled **HE** (Hosgri exception) is the seismic standard exception NRC granted while the plant was being constructed after the first fault, the Hosgri, was found near the facility. NRC found the plant could withstand that level of shaking from the fault, based on the unique type of movement the fault could create and its location.
- The purple line labeled **GMRS** (ground motion response spectra) represents the type of vibration that could occur as found in **PG&E's March assessment.** Note that it exceeds both the design basis (DDE) for the plant, plus the Hosgri exception (HE).
- The green line at the top labeled **LTSP** (long-term seismic program) represents **a 1991 claim by PG&E** about how much safety margin the plant has above the design basis in its license. To date, the LTSP has never accepted by NRC as a new design basis in that license.

Today, NRC maintains that the March 2015 assessment shows the earthquake potential is beyond the facility's design basis, which is why it is requiring further studies that could lead to mitigation measures.

Former Nuclear Regulatory Commission Senior Resident Inspector at the plant Michael Peck noted in 2012 that legally under the facility's operating license the Hosgri exception applies only to earthquakes that occur on that fault and not others.

The problem was that after Hosgri was discovered a number of other faults were found near the plant, including most recently the Shoreline fault in 2008, which runs even closer to the plant than Hosgri.

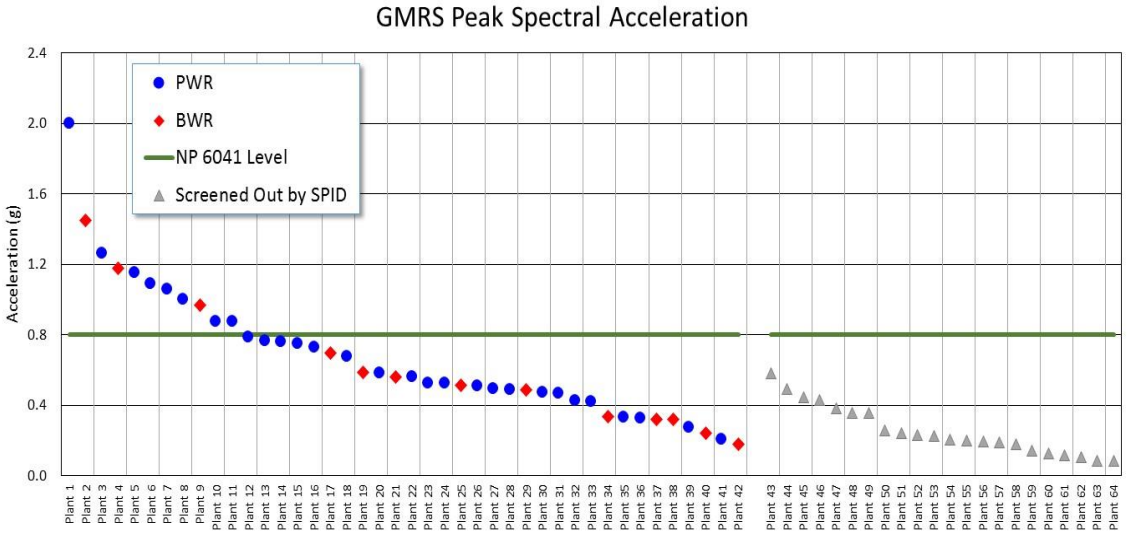
In its latest seismic hazard assessment (see graph below), PG&E based its conclusion that the plant could withstand any earthquake on the Long-Term Seismic Program, rather than the Hosgri exception and the original design basis for the plant, noted Blakeslee.

On top of that, he told the committee, the utility has "significantly changed" calculations it uses to assess how earthquakes translate into ground motion. The equations are known as ground motion prediction equations.

The result, according to Blakeslee, is that even though "newly discovered or re-interpreted faults are progressively understood to be larger and more dangerous than previously believed the newly derived methodologies adjust shaking downward just sufficiently to accommodate the new threat."

—William J. Kelly

Ground Motion Response Spectrum Acceleration For the Nation's Nuclear Power Plants



The above graph shows spectral acceleration—a measure of structural shaking in an earthquake—that unnamed nuclear power plants across the nation could experience based on updated seismic hazard assessments filed with the Nuclear Regulatory Commission over the past year. To the right, the grey triangles represent plants deemed seismically sound based on screening, prioritization, and implementation details (SPID), an evaluation methodology ordered by NRC. To the left of those, are plants where further evaluation is needed. Plants under the green line, which represents the 0.8 g spectral acceleration level (g equaling the force of normal gravity), are expected to pass muster. Because of that, their required studies are comparatively minimal to those required for plants above the green line. Plants plotted above the green line face the need to do more rigorous analysis. PG&E's Diablo Canyon Plant is the blue dot all the way to the left and at the top of the chart, which places it into a unique category when it comes to studies being required. No other nuclear plant will have to perform such detailed studies. The blue dots represent pressurized water reactors and the red triangles represent boiling water reactors. (**Source:** EPRI, 2015.)

Hermosa Beach is striving to be carbon neutral in less than five years. The city hired a consultant, Brendle Group, to develop a carbon reduction plan to achieve that goal. At the top of the to-do list is replacing all streetlights and city lighting with energy-efficient options. It also wants to buy electric vehicles for parking-enforcement officers and staff who carpool to the office. In addition, the Brendel Group concluded the surfing city needs to invest in renewable energy and buy up to $420,000 in carbon offsets. "Our biggest areas of carbon emissions are transportation, our employees commuting and electricity use in buildings and streetlights," City Manager Tom Bakaly told The *Beach Reporter.*

Tax incentives for energy efficiency were extended under a draft tax package center stage at a U.S. Senate Finance Committee July 21 markup session. "This is the first time in 20 years where a new Congress has started with extenders legislation having already expired, and given that these provisions are meant to be incentives, we need to advance a package as soon as possible," said Sen. Orrin Hatch (R-Utah). Under the legislation, An Original Bill to Extend Certain Expired Tax Provisions, eligibility for tax credits extends to all roof and roof products that meet Energy Star program guidelines, including installation costs. It also extends tax credit eligibility for windows, skylights, and doors that meet Energy Star version 6.0 standards; natural gas, propane, or oil tank-less water heaters with an energy factor of at least 0.9 or a thermal efficiency of at least 90 percent; natural gas, propane, or oil storage water heaters with an energy factor of at least 0.8 or a thermal efficiency of at least 90 percent; storage water heaters with a capacity of greater than 20 gallons but less than or equal to 55 gallons; and biomass fuel stoves with a thermal efficiency of 75 percent.

Tax credits for solar panels, weatherization and electric vehicles have primarily benefitted well-to-do Americans, according to a paper by UC Berkeley's Haas Energy Institute. "The bottom three income quintiles have received about 10 percent of all credits, while the top quintile has received about 60 percent," concludes *The Distributional Effects of U.S. Clean Energy Tax Credits* released this week. "The most extreme is the program aimed at electric vehicles, where we find that the top income quintile has received about 90 percent of all credits." Households across the county have reaped more than $18 billion in federal income tax credits for clean energy since 1996.