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Largely invisible network of pipelines, gas storage presents regional methane risk 02 06 16

The attached set of three articles published this weekend germane to the Aliso Canyon Storage Facility (ACSF) "Standard-Sesnon 25" (SS-25) natural gas well leak - and to the natural gas storage and distribution infrastructure in northern California should be incorporated into the 2015 IEPR, even if they tend to undermine the industry-funded narrative of "Clean Natural Gas."

For the convenience of the California Energy Commission members and staff, I have also appended a pair of spreadsheets regarding ACSF well SS-25. The first is a summary of the operations regarding well SS-25 from October, 1953 to 10 November 2015. The second summarizes test data found in the DOGGR record for well SS-25. As expected, there are seasonal variations in the ACSF pressure. Note the highlighted maximum pressure tabulated on 06 November 1998 of 2,680 PSI. The date that the SS-25 well was discovered leaking was 23 October 2015, near the likely seasonal peak pressure for ACSF.

The final page summarizes the environmental benefits of Diablo Canyon Power Plant (DCPP.)

The calculated estimated total methane leakage of 92,400 tons, per the Sacramento Bee article dated 06 February 2016 is highlighted. I believe there is an underestimate of the cumulative methane leakage in the 07 February 2016 SFGate article.

Since the SS-25 natural gas leak discovery on 23 October 2015, the Diablo Canyon Power Plant (DCPP) has not released any greenhouse gases into the atmosphere during its operation as California's largest electric power generator, by far. In fact, the same may be said for the entire DCPP operational period from 1984 to present.

Given the important role of the 2015 IEPR in serving as a legislative framework for California - and an important reference for policy makers, the currently released version of the IEPR should undergo significant revision to properly highlight the ongoing ACSF natural gas leak and underscore that DCPP is California's "Clean Air Champion." For those reasons, the CEC should table the motion to approve the currently released version until those needed changes are made.

Sincerely,
Gene A. Nelson, Ph.D.
Government Liaison
Californians for Green Nuclear Power http://CGNP.org

Additional submitted attachment is included below.

THE SACRAMENTO BEE

FEBRUARY 6, 2016 4:01 PM

Largely invisible network of pipelines, gas storage presents regional methane risk

Underground gas storage sites, pipelines cover Sacramento area

Much of infrastructure leaks methane as part of normal operations

Ongoing Aliso Canyon leak in Southern California points to risks

In this Jan. 7, 2016, file photo, a sign declares the boundary line of the Southern California Gas Co. gas fields where a gas well was leaking methane daily near the community of Porter Ranch in Los Angeles. Michael Owen Baker AP

By Edward Ortiz eortiz@sacbee.com

http://www.sacbee.com/news/investigations/the-public-eye/article58903053.html

The thousands of miles of pipelines and seven underground natural gas fields in the Sacramento region offer little surface-level evidence of the billions of cubic feet of natural gas under storage.

Some of the infrastructure sits close to schools and houses. A few of the underground storage fields are abandoned oil or gas repositories refitted to hold natural gas. The

largest field, PG&E Corp.'s McDonald Island facility near Stockton, **can hold 82 billion cubic feet of natural gas in a sandy formation reservoir more than 5,000 feet deep.**

That sprawling and aging energy network is now receiving tighter scrutiny by environmental and watchdog groups as a major gas leak at the Aliso Canyon storage facility in Southern California spews tons of methane, a potent greenhouse gas, into the atmosphere. **Experts say the state's natural gas infrastructure is largely safe, but the Aliso Canyon accident demonstrates the ever-present risk.**

"The public needs to know the possibility of engineering failures and how important maintenance is," said Rosa Dominguez-Faus, a researcher with the UC Davis Institute of Transportation Studies. "So the culture needs to change, and if it doesn't change from within, then external pressure is necessary in the form of regulation and enforcement."Studies have found that such pipelines, valves and other above-ground infrastructure regularly leak measurable, but safe, amounts of methane even when they are operating normally. Methane is a major component of natural gas and extremely flammable. It also affects breathing in high concentrations, according to the National Institutes of Health. For household use, methane is commonly mixed with the gas mercaptan, which gives methane a distinctive odor to help people sense leaks but can also sicken in high doses.

The advocacy group Environmental Defense Fund argues that utilities and regulators are not doing enough to prevent methane leaks.

Timothy O'Connor, an environmental policy expert with the group, said **storage facilities are exempt from state greenhouse gas emission limits, which makes enforcement tougher. The fund has also demanded the state require utilities to install automatic valves that shut off the flow of natural gas at storage facilities in case of accidents.**

"These facilities have no obligations to inspect and reduce emissions, and they do not do it because they are not obligated to do it," O'Connor said.

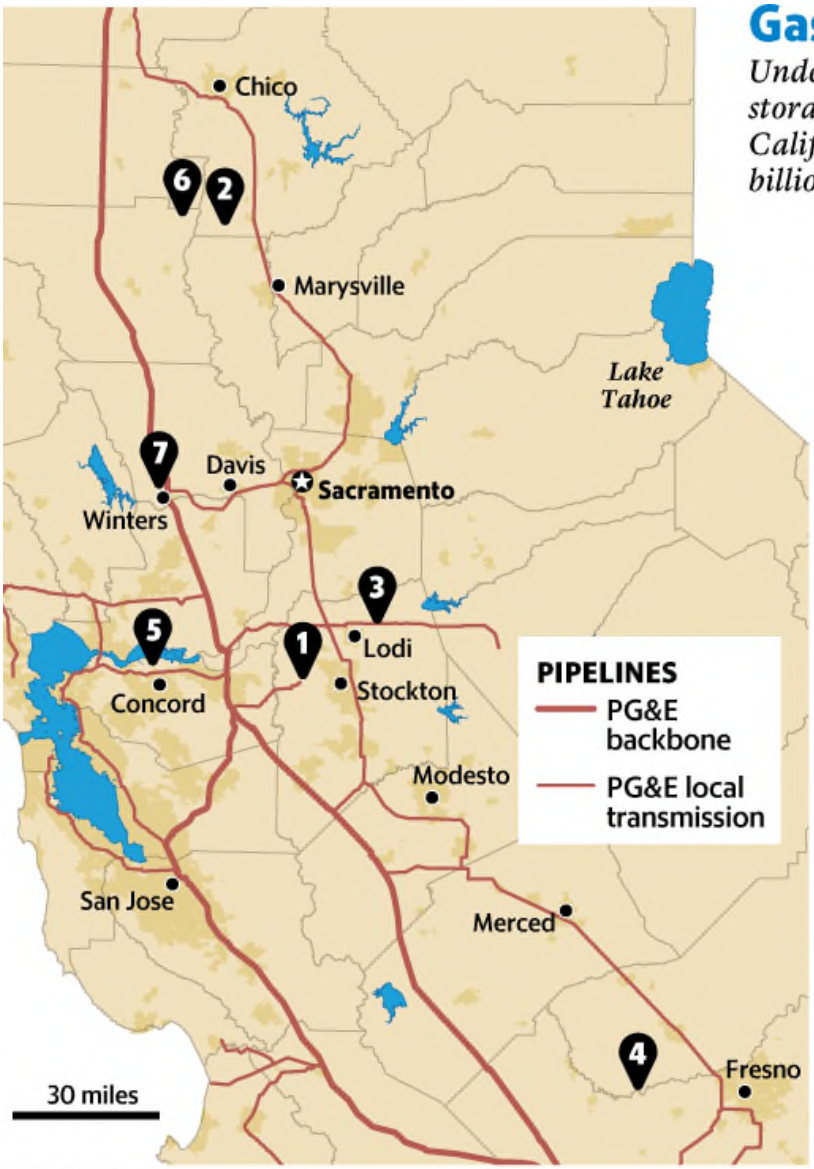
The cause of the leak at Aliso Canyon has not been established, giving officials little indication whether similar storage facilities around the state could be at risk.

PG&E spokesman Nick Stimmel said the Northern California utility has been proactive in safeguarding the integrity of its wells.

"During the nearly 60 years that PG&E has been operating its three underground storage facilities, we have found and fixed nine leaks on our well equipment," Stimmel said.

He added that the utility is piloting a leak-monitoring system in collaboration with the industry-led Pipeline Research Council International, using state-of-the-art technology to gauge higher levels of methane and other emissions from storage facilities.

Nonetheless, the California Air Resources Board found that the amount of methane in the air over the Central Valley in 2013 was 30 percent to 70 percent higher than expected ambient levels. In 2012, the Environmental Protection Agency estimated that natural gas systems contributed to about 23 percent of annual U.S. methane emissions.



Gas storage

Underground natural gas storage facilities in Northern California, with capacity in billions of cubic feet:

1. **McDonald Island**
   82 Bcf | San Joaquin
   PG&E
2. **Wild Goose**
   77 Bcf | Butte County
   Independent
3. **Lodi Storage**
   30 Bcf | San Joaquin
   Independent
4. **Gill Ranch Storage**
   23 Bcf | Madera
   75% independent; 25% PG&E
5. **Los Medanos**
   17 Bcf | Contra Costa
   PG&E
6. **Central Valley Storage**
   9 Bcf | Colusa
   Independent
7. **Pleasant Creek**
   2 Bcf | Yolo
   PG&E

Source: Pacific Gas and Electric Co.

NATHANIEL LEVINE nlevine@sacbee.com

The state Division of Oil, Gas and Geothermal Resources had anticipated problems in the industry when it announced a new plan two weeks before the Aliso Canyon leak for regulations on underground storage facilities. **Rules on natural gas storage have since been turned into emergency regulations slated to go into effect this month, said division spokesman Don Drysdale.**

Despite the attention drawn by the Aliso Canyon accident, a bulk of the state's pipelines are found in Northern California, especially around the Central Valley, with 7,100 miles of pipes connecting hundreds of natural gas wells and pipelines entering from the Pacific Northwest.

An additional 20 active wells are part of the PG&E-run Los Medanos storage facility in the eastern Bay Area city of Concord, holding up to 17 billion cubic feet of gas in a location near four schools.

Amy Jaffe, director of energy and sustainability at the UC Davis Institute of Transportation Studies, said studies have found that methane leakage happens along the entire gas supply chain, such as at drilling sites and pipelines. The McDonald Island facility, with almost as much capacity as the Aliso Canyon field, was cited for minor violations in 2013 by the state Public Utilities Commission.

Still, Jaffe said, the Aliso Canyon leak is a rare event not likely to repeat in the Sacramento region.

“Honestly, I cannot recall a similar incident at a deep storage facility in recent years,” she said.

More than 84 million kilograms (92,400 tons - GN) of methane have escaped from well SS-25 in Aliso Canyon, equivalent to the amount of greenhouse gas emitted by 440,000 cars in one year. The leak has prompted Gov. Jerry Brown to declare a state of emergency. The Southern California Gas Co. said it expects to bring the leak under control by late February.

Investigators are exploring whether the age of well SS-25, which dates back to the 1930s (? The notice of intention to drill a new well was 10 01 1953 - GN), may have been a factor in the leak. State inspectors have found methane leaks at another 15 wells at Aliso Canyon, according to the governor’s Office of Emergency Services.

In a meeting with The Sacramento Bee, Southern California Gas President Dennis Arriola said the company had stopped the leaks at the other 15 wells at Aliso Canyon, even as it worked to contain the main methane release.

“Leaks happen all the time through the system, and the problem is typically with the materials and the age of the materials, both in well casings and in smaller distribution pipelines,” Dominguez-Faus said.

At McDonald Island, some initial wells were drilled in 1936, when the field was owned by Standard Oil.

Already, the industry is taking action because of Aliso Canyon. On Jan. 26, the Public Utilities Commission, along with the Division of Oil, Gas and Geothermal Resources, directed owners and operators of underground gas storage facilities throughout the state to inspect their facilities.

Edward Ortiz: 916-321-1071, @edwardortiz

San Jose Mercury News
BUSINESS

State orders inspections, new rules for gas wells after SoCal gas leak

By George Avalos gavalos@bayareanewsgroup.com
POSTED: 02/07/2016 08:06:49 AM PST UPDATED: 02/07/2016 05:59:17 PM PST
HTTP://WWW.MERCURYNEWS.COM/BUSINESS/CI_29487761/STATE-ORDERS-INSPECTIONS-AND-NEW-RULES-GAS-WELLS

SAN BRUNO -- State regulators, alarmed by a nonstop leak of a gas well in Southern California, have issued emergency regulations and orders for inspections of all gas wells in California, including those owned by PG&E, which said Sunday that it is in compliance with most of the new rules.

The inspections will include wells in three gas storage centers owned and operated by PG&E, all in Northern California. PG&E's gas storage complexes are the Los Medanos facility in the Bay Point community of Contra Costa County, the Pleasant Creek complex near Winters in Yolo County and the McDonald Island gas storage facility west of Stockton in San Joaquin County. PG&E also is a 25 percent owner of the Gill Ranch gas storage center in Madera County.

"These regulations are in effect immediately and require all gas storage companies to complete enhanced inspections and testing at every gas well in California," said Ken Harris, state oil and gas supervisor with the California Department of Conservation.

A state of emergency due to a natural gas leak at the Aliso Canyon gas storage complex prompted state conservation officials to issue the new rules and inspection requirements. The well complex, located in the San Fernando Valley community of Porter Ranch near Los Angeles, is operated and owned by utility firm Southern California Gas. Concerns over the safety of California's vast web of aging natural gas systems have intensified in the five years since the fatal explosion of a PG&E gas pipe in San Bruno.

"We intend to make these emergency regulations a permanent requirement in California and are committed to strong oversight measures that help ensure the health and safety and environmental protection of this state," Harris said in a prepared release.

The state agency is requiring gas well and storage system operators to comply with six new safety and reliability measures.

The new rules include daily inspections of gas storage well heads, ongoing verification of the mechanical integrity of gas storage wells, ongoing measurement of gas pressure or gas flow within the wells, regular testing of safety valves used in wells, establishment of minimum and maximum pressure limits for each gas storage facility in California, establishment of comprehensive risk assessment plans for each gas storage complex.

San Francisco-based PG&E said it has instituted five of the six requirements that comprise the new rules. "PG&E will continue to work closely with the Department of Conservation's Division of Oil, Gas and Geothermal Resources, the state Public Utilities Commission and other stakeholders on these new directives," said Donald Cutler, a PG&E spokesman.

San Francisco-based PG&E, however, has not complied with one of the new emergency regulations: The utility giant has yet to establish ongoing measurement of gas pressure or gas flow within its storage wells, according to Cutler. PG&E expects to implement the state directive related to measurement of gas flow within 30 days, Cutler said.

Large quantities of methane continue to escape from a well in the Aliso Canyon gas storage complex. The owner of the well is a unit of San Diego-based Sempra Energy. Until his retirement last November, Jessie Knight, a former commissioner of the state PUC, was a longtime chairman and key executive with Sempra. Critics say a revolving door between the PUC and the power companies the agency regulates are a symptom of a culture of cozy ties and lazy oversight by the PUC of big utility operators, including PG&E.

"While we currently meet or exceed applicable state regulatory requirements related to underground natural gas storage wells, we are fully embracing all of the new regulations," said Jesus Soto, PG&E's senior vice president of gas operations.

Contact George Avalos at 408-859-5167. Follow him at Twitter.com/georgeavalos.

New State gas well rules

State officials have required new emergency rules for inspections and operations of natural gas storage complexes and wells:

- Require at least a daily inspection of gas storage well heads, using gas leak detection technology such as infrared imaging.
- Require ongoing verification of the mechanical integrity of all gas storage wells.
- Require ongoing measurement of annular gas pressure or annular gas flow within wells.
- Require regular testing of all safety valves used in wells.
- Establish minimum and maximum pressure limits for each gas storage facility in the state.
- Require each storage facility to establish a comprehensive risk management plan that evaluates and prepares for risks at each facility, including corrosion potential of pipes and equipment.

Source: State Department of Conservation

SFGATE

UC Davis pilot flies into gas plume to monitor L.A. methane leak

By Kevin Schultz

Published 3:15 pm, Sunday, February 7, 2016 http://www.sfgate.com/news/article/UC-Davis-pilot-flies-into-gas-plume-to-monitor-6814021.php

Image 1 of 3
Pilot and UC Davis atmospheric scientist Stephen Conley provided the first data on the methane gas leak in Los Angeles.
Photo: Joe Proudman, Joe Proudman / UC Davis

Image 2 of 3
And aerial image of Aliso Canyon natural gas storage facility shot from UC Davis scientist Stephen Conley's airplane, which provided the first estimates of methane emissions from an ongoing leak at the facility in the San Fernando Valley.
Photo: Stephen Conley / UC Davis

Image 3 of 3
Pilot and UC Davis atmospheric scientist Stephen Conley flies toward the Aliso Canyon natural gas storage facility to measure the methane emissions from a leak.
Photo: Joe Proudman, Joe Proudman / UC Davis

UC Davis pilot flies into gas plume to monitor L.A. methane leak

Once a week since the beginning of November, when skies are clear with northern winds, Stephen Conley revs up a small, single-engine airplane and takes to the sky out of a hangar in Placer County.

The white and blue aircraft is equipped with a set of tubes along its underbelly and a backseat full of computing equipment but otherwise appears as an ordinary, albeit speedy, two-passenger plane.

It's not until about two hours into his trek, over an area of Southern California, when Conley takes a turn toward the unusual: He switches to pollution-detection mode and begins sweeping the plane in and out of a giant, invisible plume of methane gas at gradually higher altitudes until the plane reaches the top.

His purpose is to monitor and measure the amount of methane coming from the Aliso Canyon natural gas leak, which started spewing methane-heavy natural gas in October, displacing thousands of residents from upscale, gated communities in the Porter Ranch neighborhood of northern Los Angeles. Gov. Jerry Brown has declared a state of

emergency in the area for what is now being called the largest recorded leak of natural gas in California history.

State of emergency in place

The methane leak, first reported Oct. 23, has gradually slowed within the past few weeks. However, the state of emergency — with thousands displaced — remains in place as the gas company, SoCalGas, continues its attempt to plug the hole in the deep underground pipe suspected to be responsible for the leak.

Conley, a UC Davis atmospheric scientist and owner of the aerial survey company **Scientific Aviation,** was contracted for the flyovers by the California Energy Commission, which was looking to track the amount of greenhouse gas emissions expelled into the atmosphere by the leak.

Through his flyovers, Conley has recorded about 1,200 tons of leaked methane per day — equal to about 100,000 pounds per hour. To date, he estimates the leak has emitted 80,000 tons of methane — roughly equal to the weight of an aircraft carrier.

"The rate of methane we were seeing at the beginning ... was about equal to the total emissions of the entire Los Angeles basin at any given hour," he said. **"If you assume this leak will be stopped by March, then it will likely amount to 10 percent of California's total methane emissions for the year. Just this leak on its own."**

Methane gas is flammable, and an additive in the natural gas gives it a rotten egg-like smell that some Porter Ranch residents complained made them nauseated or gave them headaches or nose bleeds. Authorities gave the residents a choice to evacuate or stay, and roughly 3,000 of them elected to leave.

Those who evacuated are allowed to return as they please, but officials say most have told them they will wait until the leak is plugged and methane and other gases have time to mix into the atmosphere and move out of the area.

The extent of the methane emissions wasn't known until Conley took his first flight, two weeks after the start of the leak, to get a handle of its scale and impact.

Value of air measurements

The energy commission solicited him for the first two flyovers, he said, because his plane was one of a few throughout the state capable of running such tests, and he was already working with the organization on a separate research project. He has subsequently conducted regular weekly flyovers for the California Air Resources Board, which took over the project from the energy commission with funding from SoCalGas. Conley said taking measurements from the air is necessary because testing from the ground would be difficult, complex and time consuming.

“It’s rough terrain,” he said. “The well site is up in the hills. It’s difficult to get to where you need to be to take estimates.”

Conley’s plane pulls in the gas through the set of uptake tubes that test for gases such as carbon dioxide and methane. It measures the amount of each gas and the wind velocity at the time, and from that information he can calculate methane concentrations.

“We fly roughly 2 miles downwind of the leak site. We give the gas time to mix in the atmosphere before we grab it,” Conley said. “We fly into the plume, back out of it, climb up and then do it again. We climb up until we stop seeing the increase in the methane level. We can see all of this in real-time.”

Conley — who usually flies alone, but has brought an occasional guest — was the only scientist cleared to perform the mission initially, but said NASA’s Jet Propulsion Laboratory sent a specially equipped air vehicle into the plume last month to measure the gas.

Methane is a special concern as a greenhouse gas because it is about 25 times more powerful than carbon dioxide, said Dave Clegern, spokesman for the California Air Resources Board.

“We want to know how much has been emitted so we know how we can best deal with this once it is done,” he said.

And, Conley noted, a leak such as this is significant to people around the world, whether they realize it or not.

“This is not going to be some ‘L.A. getting hotter’ kind of problem,” he said. “This is a global issue. That total amount of gas (that he has measured so far) has already left L.A. It’s going out to the state, country and rest of the world and gets mixed into the global methane budget.”

Officials from SoCalGas have promised to fix the leak by March, saying it will take time to locate and plug the responsible pipe.

Seeking to prevent leaks

In Washington, California Sens. Barbara Boxer and Dianne Feinstein have written an amendment to an energy bill being considered in the Senate that calls for the Energy Department to review the situation and recommend any immediate steps the federal government might take to assist in solving the leak and in preventing and responding to future similar leaks.

Meanwhile, Conley said each additional flyover has found lower levels of methane, but there are not yet any plans to stop his flyover measurements until the leak is fixed.

And while he has enjoyed having a part in the project, he said the need remains for a formalized plan to respond to leaks like this in the future.

“For a country so concerned with greenhouse gas emissions, how can we not have something in place to measure these events when they do occur?” Conley said.

Kevin Schultz is a San Francisco Chronicle staff writer. E-mail: kschultz@sfchronicle.com Twitter: @KevinEdSchultz

Date	Operation
11/10/2015	Testing the blowout prevention equipment
11/5/2015	Kill the well - Drill called and approved on 11/05/2015
11/4/2015	Rework Standard Sesnon 25. **Casing record** below:
	11-3/4", 42#, H-40 at 990' (Cemented to this depth), 7", 23#, 26#,29#,J-55, N-80 at 8585' (cemented),
	WSO @ 8583', Perf w/4, 1/2" jspf from 8510'-8475;8538', 8542'-8559', 5-1/2", 20#, 1-55 from 8559'-8748',
	with 120 Mesh from 8592`-8748' / TD=8749' (7 inch steel casing to 8559')
11/4/2015	Pump glycol in 2 7/8" tubing .. Attempt to displace/wash to 467'
	Page 8 of 42 Note: The wellbore is slightly deviated/vertical
	Page 9 of 42 shows a well schematic. See Upper. On Feb. 16-20, 1979 the safety system was replaced
	Page 10 of 42 shows the 2/21/79 tubing details. Item 11 is a 2 7/8" diameter Camco SC-1 Safety System
	Page 11 of 42 shows the Shaffer Casing Head diagram prepared 12/20/1982. Parts rated 5,000 PSI.
	Page 14 of 42 shows well designation changed from SFZU SS-25 on 07/24/1991.
	Page 15 of 42 shows SFZU SS-25 was drilled 10/01/1953 and Altr Csg to Gas Storage 04/19/1973
	Page 16 of 42 shows conversion to 7" diameter gas well. On 07/02/1976, used 7" 29# casing scraper.
	Page 17 of 42 references B.O.P.E. = Blowout Prevention Equipment
6/17/1976	Page 18 of 42. Notice of Intention to Rework Well. Clean out to 8748'. Run packer, tubing and safety valve.
9/5/1973	Page 19 of 42. on 05/29/1973 tested 7" casing from 1000' to surface at 3,400 PSI for 33 minutes.
4/25/1973	Page 22 of 42. Four 1/2" holes at 8583 feet.
4/19/1973	Page 23 of 42. Jet perforate as required from 8487' to 8748' to convert to Gas Storage Well
9/23/1968	Page 25 of 42. Change designation from Standard-Sesnon SS-25 to SFZU SS-25.
2/25/1954	Page 26 of 42. Commenced oil production. 10 5/8" hole drilled, 7" casing to 8585'. +30 Days: 35 Mcf. Gas/day.
5/28/1954	Page 27 of 42. Drilling history of well. Describes concrete injected to surround 11 3/4" casing to 990'
11/9/1953	Page 27 of 42. Gas pocket at 4,781' noted while drilling.
	Page 33 of 42. Drilling history completed. Details of placing cement at depth included.
6/7/1954	Pages 34-36 of 42. Formations penetrated by well. Record starts at 3415' and ends at 6005'.
1/21/1954	Page 38 of 42. Report on proposed operations. Test for water shutoff at top of Upper Sesnon Zone.
1/18/1954	Page 39 of 42. Redrill of well.
11/17/1953	Page 40 of 42. Progress report on well drilling to 3628'
10/20/1953	Page 41 of 42. Report on proposed operations. Plan to drill to 4900'.
10/1/1953	Page 42 of 42. Notice of intention to drill new well. Elevation of ground above sea level: 2,927.02'

Date	Field or Tubing Pressure PSI	Bottom Pressure PSI	Tubing to Bottom Pressure Difference
11/7/1991	2,460		
9/16/1993	2,540		
9/21/1994	2,540		
11/5/1997	2,520		
11/6/1998	2,680		
8/7/2001	2,400		
7/27/2004	2,340		
8/10/2005	2,637		
7/25/2006	2,336		
7/25/2006	2,339	2,844	505
8/10/2006	2,637	3,197	560
10/5/2009	2,490		
5/29/2012	2,572		
10/2/2013	2,628		
10/21/2014	2,561		

Meet Diablo Canyon Power Plant, California's "Clean Energy Champion."

Photo credit:
The San Francisco Chronicle

- Diablo Canyon Power Plant (DCPP) emits no carbon while generating huge amounts of electric power. Note the lack of smokestacks in the above photo. The plant typically generates 18 billion kWH/year, enough energy for 3 million Californians to live and work. DCPP is the largest power generator in California.
- DCPP is a reliable, cost effective power generator, running 24/7, 365 days a year. The plant has operated safely for over 3 decades.
- DCPP's desalination plant could supply 825,000 gallons per day of surplus water to drought-parched San Luis Obispo County.
- In 2014, DCPP generated 131% of the power generated by all wind sources in California or 161% of all the California solar power.
- In 2013, per industry statistics, DCPP avoided 13.43 million metric tons (MMT) of CO2 emissions. This amount of CO2 emissions would be emitted annually by about 71.85 million automobiles. The ongoing natural gas leak at the Aliso Canyon Storage Field is projected to release the equivalent of 7 MMT CO2 before it is capped. Running DCPP for only 190 days would mitigate the leak.
- DCPP is California's most powerful weapon against global warming, which has curtailed more than half of California's hydroelectric power generation since 2011. Ocean acidification is causing massive coral die-offs and threatens oceanic food chains.

Californians for Green Nuclear Power

Supporting the continued safe operation of DCPP since 2013. http://www.CGNP.org