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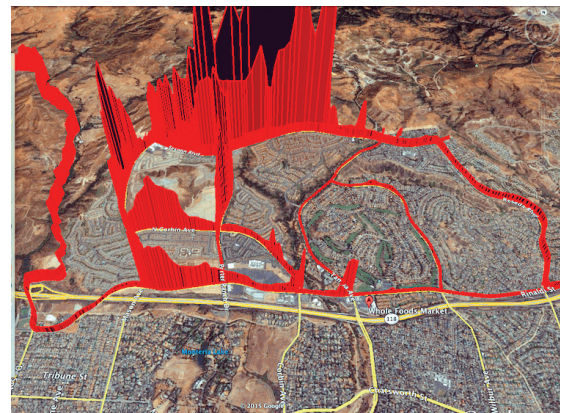
Plugging the Aliso Canyon Leak and the Critical Role of Berkeley Lab Scientists

Worst Natural Gas Release in U.S. History

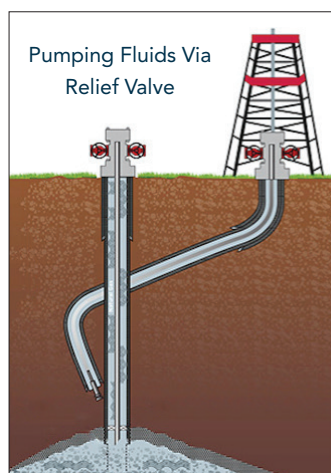
The October 2015 leak at the Aliso Canyon underground natural gas storage facility in Southern California released 97,100 metric tons of methane into the atmosphere, the climate-warming equivalent of 572,000 cars on the road in a year. More than 7,000 nearby residents were displaced from their homes. Eight kill attempts over four months failed to stem the leak before a relief well was finally successful in stopping the blowout.

California Calls in “The Lab Team”

The state brought in an interdisciplinary team of Department of Energy national lab scientists and engineers from Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory, and Sandia National Laboratories. The team included well drilling and completion experts, reservoir engineers, risk experts, and geoscientists.



A map of methane measurements taken in Porter Ranch during the gas leak by the Home Energy Efficiency Team.



Using Science to Diagnose the Problem

Using a software tool called T2Well developed at Berkeley Lab to simulate the flow of water, vapor, non-condensable gas, and heat in porous materials and wells, the Berkeley Lab team simulated the “top kills” based on information provided by SoCalGas. (Top kill involves pumping heavy drilling muds, fluids, and other material into the leaking well in an attempt to plug it from above.)

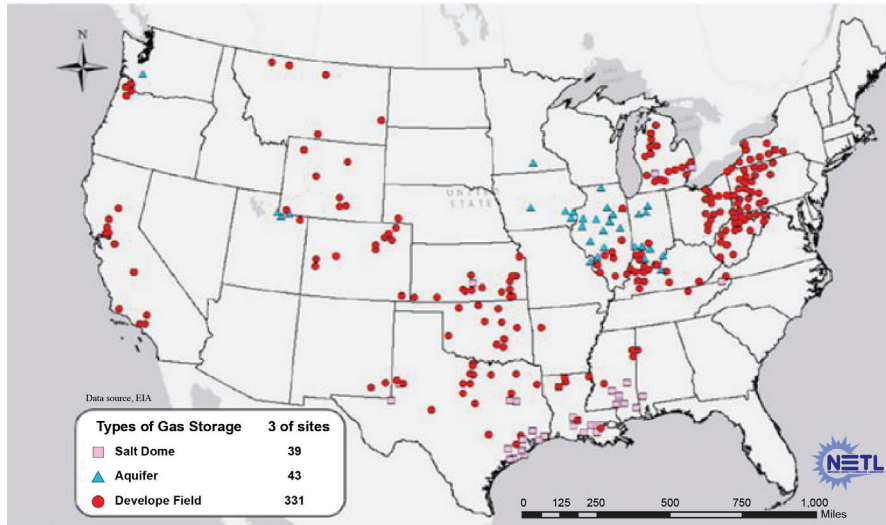
Leak Killed

What the scientists found was that the well’s complex geometry contributed to the eight failed top-kill attempts. Their modeling also showed that the relief-well kill would be effective. As the model suggested, the blowout stopped within 10 minutes using the relief-well bottom-kill approach.

How Berkeley Lab Is Making Underground Natural Gas Storage Safer

Faster Response to Future Incidents

Berkeley Lab has updated the code in T2Well so it can now more accurately model complex well flow geometries, such as those found in the Aliso Canyon well. Should there be future well blowouts, engineers will be able to much more efficiently simulate the behavior of top-kill fluids and figure out if they will work or not.



Incorporating Lessons Learned for Tougher Safety Rules

At the state level, the national lab team provided technical expertise for the development of new beefed-up safety regulations for natural gas storage wells in California, which are expected to be the most stringent in the nation.

At the federal level, Berkeley Lab scientists were key contributors to the task force assembled after the disaster, co-led by the Department of Energy. The task force issued more than a dozen recommendations to improve well integrity and ensure safer operations. Whereas there had

previously been no federal safety regulations for the thousands of underground gas storage wells in the U.S., some more than 100 years old, the federal government has now adopted some of the recommendations and issued interim rules to address critical safety issues, thus reducing the risk of future incidents.

Ongoing Research to Safeguard Human Health and the Environment

Berkeley Lab is leading a \$3-million project to develop a cutting-edge risk management system that will merge advanced monitoring technologies with scientific models to continuously assess risks and provide early leakage detection for California's aging underground gas storage facilities. The project is funded by the California Energy Commission.

Additionally, Berkeley Lab is working with the California Council on Science and Technology on a state-funded report to assess the long-term viability of underground gas storage in California.

"The [Berkeley Lab] staff made significant contributions to the safe resolution of the leak and reducing the likelihood of such a disaster in the future. This was a great immediate relief to the people of Southern California and will prove a benefit to the Nation in the future."



—Kenneth A. Harris Jr.
State Oil & Gas Supervisor
California Dept. of Conservation
Division of Oil, Gas, and Geothermal Resources

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