



Finding the ways that work

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Subject: Emergency Regulations for Natural Gas Storage Facilities

Dear Mr. Harris,

As the recent events at Aliso Canyon have shown, California's natural gas storage system and the regulatory system that oversees it sit at a precarious point. Just months before the start of a comprehensive update of the state's Underground Injection Control (UIC) program – including new rules for storage – well SS25, owned and operated by So Cal Gas, has resulted in one of the largest ever releases of hydrocarbons into the environment from a single well in the state's history. In response, even before SS25 is brought under control, and before a root cause analysis is completed, the Division has been tasked with expeditiously enacting emergency regulations to act as a stop-gap measure to protect against similar well failures, while setting the stage for longer term solutions.

As proposed by the Governor and your Department, a step-wise approach, in contrast to attempting to answer all questions for all time immediately, is both a practical necessity and a smart way to approach the problem. Through this event, it has become evident that a host of challenges exist in the effort to improve California's regulation of gas storage projects. And, quite apart from how questions are answered in the near-term, for regulation to be truly effective, it must keep up with changing understanding of the risks and emergence of new risk control options – what the Interstate Oil and Gas Compact Commission calls a process of continual improvement. This adaptive approach is especially critical with regard to regulating well integrity – a complex endeavor requiring oversight (with vigorous enforcement) of design, construction, operation, testing, routine maintenance, repair, and decommissioning of wells and related equipment. Regardless of how the Division resolves the subset of well integrity issues it is addressing at this juncture, more will be needed soon.

California can be sure that the world is watching to see if the state can keep the Aliso Canyon disaster from happening again. Given the local impacts and climate significance of the release, the fact that California has 13 other natural gas storage facilities, and the fact that the rest of the country has over 400, none of the Division's required responses to Aliso Canyon are insignificant. As with the efforts to date to close the well, the Division's emergency regulations will be watched as an example of the type of rapid response protections necessary to prevent such incidents from happening again.

The Governor’s Emergency Proclamation provides that the Division is to take “all appropriate steps to prevent uncontrolled releases, blowouts, and other infrastructure-related accidents.” While Environmental Defense Fund (EDF) supports much of what has been included thus far in the Emergency Regulation, the current draft clearly does not include “all appropriate steps.” As we recognized above when supporting a step-wise process of continual improvement, to some extent the limited nature of the emergency rule is understandable – it will require several rulemakings to implement “all appropriate steps” and even then additional improvements will be needed with time. At the same time, however, we urge the Division to take as many of the appropriate steps as possible before finalizing the emergency rule.

EDF believes more needs to be done now. We therefore appreciate the opportunity to comment on the draft emergency rule – an effort we hope and expect will ensure the state’s new rules deliver intended results and are seen as a positive model for others to learn from.

The remainder of today’s comments is divided into three parts: (1) a description of clarifications to the emergency rule we are suggesting at this time and why these changes are critical; (2) a partial list of issues that EDF believes must be addressed as soon as possible, either through emergency rulemaking, permanent rulemaking, or through other agency rules or directives; and (3) a redline incorporating the amendments we are suggesting today.

(1) In order to make the emergency rule clear, consistent, and protective, the Division should:

1. **Clarify what is meant by “as applicable” in section 1724.9(a) in order to avoid conflicts or uncertainty as to whether provisions in certain other sections do or do not apply, and provides guidance as to the quality of the data to be provided to the agency.** EDF is concerned that ambiguity in the section as written could lead to lack of conformance with important rules in other sections of regulations, and to underreporting of key information that the Division needs to make decisions about gas storage projects. EDF’s edits provide certainty to both the industry and the Division on these issues, while making explicit that data quality (level of detail and degree of certainty) must be suited to the Division’s needs
2. **Enhance requirements for describing storage reservoir geology, especially storage capacity confining layers, by clarifying technical data requests [1724.9(a)(1)-(2)].** EDF’s edits use industry standard language to help ensure that the Division will receive data in a uniform manner that will provide appropriate geotechnical information for key decision-making about well design and pressure management.
3. **Improve description of safety aspects of project engineering, including safety devices and conversion wells, required to be submitted to Division [1724.9(a)(3)].** There are two key improvements in EDF’s suggested edits. The first is to clarify that the information call applies to existing in addition to proposed “devices, tests, and precautions,” thus more clearly covering wells and well equipment related to conversions from oil production to gas storage, as was the case with SS-25. The second clarifies the intention of this provision by ensuring that the information provided demonstrates that each well in the project has been or will be designed, constructed, and maintained in a way that makes them suitable for gas storage.

4. **Strengthen leak detection protocol requirements by clarifying how operators need to develop plans, including consideration of maximum technological feasibility and clarification of types of equipment to be monitored, and to make explicit which CA agencies should coordinate in the review and implementation of these plans [1724.9(e)].** Rapid detection of leaks is critical as a diagnostic of serious problems and as a warning system for emergencies underway. Leak detection is a rapidly evolving field in terms of technological advances, state and federal rules, and industry practice. In order to maximize the utility and responsiveness of the protocols that the Division will receive under this provision, EDF's revisions provide a standard by which industry should develop and the Division should evaluate the plans and clarify which equipment must be covered by the plans. Since leak detection is an area of considerable jurisdictional overlap, EDF's revisions clarify which California agencies should be involved in coordinating appropriate policy on this critical issue.
5. **Provide specificity as to procedures for master valve and wellhead pipeline isolation valve testing to ensure uniform and robust evaluation of these critical safety devices [1724.9(f)].** The surface valves discussed here are key components in the interface between wells and the transmission infrastructure. They must be regularly tested to ensure good operation and integrity against leakage. Appropriate evaluation of these valves includes manual monthly on/off function testing and annual pressure isolation testing. Because EDF's revisions are limited to clarifications of the proposed emergency rule language, here we give flexibility to the Division in prescribing particular protocols for the annual testing required in the provision. In the absence of EDF's revision, operators are left without guidance as to how to test these valves, running the risk that they could remain less than fully evaluated.
6. **Ensure that company-submitted Risk Management Plans are additional to, and not in lieu of, strong, specific regulations on issues like annual well integrity testing [1724.9(g)].** Risk Management Planning is an appropriate, high priority activity for the natural gas storage industry. While clearly well-intentioned, EDF is concerned about the role of Risk Management Plans as currently structured in the emergency rule. As currently written, large and central portions of the natural gas storage regulatory framework will be crafted by the industry through the Risk Management Plans, and ratified by the Division. Some of these central issues include corrosion monitoring, casing and cement integrity testing, "area of review" evaluation and monitoring – even the frequency with which risk assessments are updated and plans submitted to the Division. The Division should clarify that these and other issues outlined in the Risk Management Plan provision will be directly and explicitly regulated by the Division and not outsourced to industry. Furthermore, the protocols developed in these Plans should not trump any rules the Division has on the same subject. While we agree it is good for regulation to include both performance-based and prescriptive elements, and we support the idea that regulation can be made more flexible and adaptive through the use of innovative collaborations between regulators and regulated entities, we are concerned that the emergency rule as currently written seems to inadvertently strike the wrong balance between agency oversight and industry self-regulation.

In order to rectify these potential problems, EDF proposes language to clarify that the protocols developed in the Risk Management Plan are additional to what is prescribed in the rules, and not a replacement, and makes Plan protocols approved by the Division

binding on the operator. In future rulemakings, EDF urges the Division to directly and explicitly regulate as many of the issues outlined in the Risk Management Plan as feasible.

(2) In addition to the six items above that were limited to clarifications of existing provisions within the proposed emergency rulemaking, EDF urges the Division to develop strong regulations and guidance around the critical safety and environmental topics such as the following as quickly as possible:

1. Leak detection protocols, in addition to those in the emergency regulations and including guidance on minimum technological requirements, which are developed in concert with both the California Air Resources Board and Public Utilities Commission;
2. Robust Area of Review (AOR) requirements to find and mitigate potential conduits from the gas storage zone to protected water or the surface;
3. Annual physical inspection of review of wells in the area of influence defined by the AOR;
4. Regular calibration of Subsurface Safety Valves, if installed, to ensure proper pressure settings;
5. Additional Mechanical Integrity Testing requirements like minimum pressure thresholds, failure criteria, and remediation protocols;
6. Timing of notification when annular pressure anomalies are detected in order to ensure prompt response by industry and the Division;
7. Monthly reporting requirements for injection/withdrawal rates and volumes, and injection pressures, where this information is not currently reported;
8. Annual geophysical logging (temperature, noise, etc.) requirements using a combination of tools to assess corrosion, well integrity, and fluids migration;
9. Emergency response and remediation plan development, including employee training;
10. Well designs, including safety equipment, for both new and converted wells, ratified by a signed and sealed certification from a Professional Engineer;
11. Monthly manual open/close testing of master valve and wellhead pipeline isolation valve in addition to annual isolation pressure testing of those valves;
12. Decommissioning and plugging procedures specific to gas storage projects to protect against methane and fluid migration over time – relevant in the near-term because some number of gas storage wells in California may need to be plugged and abandoned in the not-too-distant future;

13. Requirement that gas storage wells be equipped with tubing and packer inside the production casing, subject to exception, to provide an added layer of protection against environmental intrusion, and provide additional well integrity verification options;
14. Equipping all gas storage wells to monitor annular pressure between casing and tubing strings during both injection and production to ensure that operators are capable of being alerted to pressure anomalies during all operations;
15. Protocols for operator response when annular pressure anomalies are detected that might indicate unexpected gas flow behind the casing with potential to interact with the environment;
16. Requirement that all gas storage wells be equipped with automatic, fail-safe shut-off systems designed for each well's particular circumstances, regularly tested and calibrated, and approved by the Division; and
17. Appropriate use of radial cement evaluation tools to investigate well integrity risks and guide remediation as needed.

(3) Track changes version of the draft emergency rules

See attached markup of draft emergency rules.

Thank you for this opportunity to comment on the draft emergency rule. EDF looks forward to working with the Division over the coming months as it more fully fleshes out a robust regulatory framework for natural gas storage and underground injection control. If you wish to follow up on any of the items discussed in this letter or attachments, please feel free to contact us by email at sanderson@edf.org, or by phone at 512-691-3410.

Respectfully submitted,

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REQUIREMENTS FOR UNDERGROUND GAS STORAGE PROJECTS

TEXT OF PROPOSED REGULATIONS

Added text in is shown in underline.

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CHAPTER 4. DEVELOPMENT, REGULATION, AND CONSERVATION OF OIL AND GAS RESOURCES

Subchapter 1. Onshore Well Regulations

Article 3. Requirements

1724.9. Underground Gas Storage Projects

~~The data required by the Division prior to approval of a gas storage project include all applicable items listed in Section 1724.7(a) through (e), and the following, where applicable:~~

(a) For all underground gas storage projects, the operator shall provide the data required under Section 1724.7, ~~as applicable~~, and the operator shall comply with the requirements of Section 1724.10, ~~as applicable~~, unless the Division advises the operator that the requirements are not applicable or where requirements are clearly inapplicable without such advice. In addition to the data required under Section 1724.7, the operator of an underground gas storage project shall provide the Division with the following at a level of detail and with a degree of certainty satisfactory to the Division:

(1) ~~(a)~~ Characteristics, fluid chemistry, petrophysical properties, mechanical properties, and maps of the ~~cap rock~~ confining rock layers directly above the gas storage zone, ~~such as including~~ areal extent, ~~average isopach~~ thickness, ~~structure contour~~, formation fracture gradient, porosity, primary and secondary permeability, lithology and lithologic variation, ~~and threshold pressure~~, and locations and characteristics of faults and fractures within the area of influence of the gas storage field.

(2) ~~(b)~~ Oil and gas reserves of storage zones prior to start of injection, including calculations, to indicate the storage capacity volume of the depleted oil and gas

reservoir being considered for conversion to gas storage.

(3) (e) List Description of existing or proposed surface and subsurface safety devices, tests, and precautions to be taken to ensure safety of the project, including information demonstrating that each well in the project has been or will be designed, constructed, and maintained in a way that makes them suitable for gas storage.

(4) (d) Proposed waste water disposal method.

(b) The Project Approval Letter for an underground gas storage project shall state the maximum and minimum reservoir pressure and include data and calculations supporting the bases for the pressure limits. The pressure limits shall account for the following:

(1) The pressure required to inject intended gas volumes, particularly at total inventory, shall not exceed the design pressure limits of the reservoir, wells, wellheads, piping or associated facilities.

(2) The minimum reservoir pressure shall not be designed less than historic minimum operated pressure unless reservoir geo-mechanical competency can be demonstrated to the Division's satisfaction.

(c) In addition to the mechanical integrity testing requirements under 1724.10(j), when a well that is part of an underground gas storage project is not being used for production the operator shall monitor for presence of annular gas by measuring and recording annular pressure and annular gas flow at least once a day. The operator shall evaluate any anomalous annular gas occurrence and report it to the Division. The operator shall begin complying with this requirement within one month of the effective date of this section.

(d) Where installed, the operator of an underground gas storage project shall function test all surface and subsurface safety valve systems within three months of the effective date of this section, and at least every six months after that. The tests shall be conducted in accordance with manufacturer's recommendations to confirm operational integrity and mitigate any integrity isolation findings. The appropriate district office shall be notified at least 48 hours before performing testing so that Division staff may witness the operations, and documentation of the testing shall be maintained and available for Division review. A closed storage well safety valve system shall be manually re-opened at the site of the valve after an inspection and not opened from a remote location. Within 90 days of finding that a surface or subsurface safety valve is inoperable, the operator shall either repair or remove the safety valve or temporarily plug the well. A longer timeframe for addressing an inoperable surface or subsurface safety valve may be approved by the Division.

(e) Within 21 days of the effective date of this section, the operator of an underground

gas storage project shall submit an inspection and leak detection protocol to the Division for review and approval. The protocol shall include inspection of the wellhead assembly and attached pipelines for each of the wells ~~used in~~ associated with an underground gas storage project, and the surrounding area within a 100' radius of the wellhead of each of the wells used in an underground gas storage project. The inspection protocol shall provide for inspection at least once a day, employing effective gas leak detection technology such as infrared imaging. The operator's selection and usage of gas leak detection technology shall take into ~~account~~ maximum technological feasibility for consideration of detection limits, remote detection of difficult to access locations, response time, reproducibility, accuracy, data transfer capabilities, distance from source, background lighting conditions, geography, and meteorology. The Division will consult with ~~all relevant state agencies, including~~ the California Air Resources Board ~~and the California Public Utilities Commission~~ when reviewing an inspection and leak detection protocol submitted under this subdivision.

(f) Within three months of the effective date of this section, and annually thereafter, the operator of an underground gas storage project shall test, ~~in a manner specified by the Division,~~ the operation of the master valve and wellhead pipeline isolation valve for proper function and verify ability to isolate the well. The operator shall submit documentation of the results of testing done under this subdivision within 10 days of completing the testing, but shall immediately notify the Division if testing indicates a lack of function.

(g) Within six months of the effective date of this section, the operator of an underground gas storage project shall submit a Risk Management Plan to the Division for review and approval. The Risk Management Plan shall identify potential threats and hazards to well and reservoir integrity; assess risks based on potential severity and estimated likelihood of occurrence of each threat; identify the preventive and monitoring processes employed to mitigate the risk associated with each threat; and specify a process for periodic review and reassessment of the risk assessment processes. The Risk Management Plan shall specify a schedule for submission of risk assessment results to the Division. All Risk Management Plans shall ~~establish risk assessment and prevention protocols that are consistent with, but additional to, rule requirements, and which the company shall follow unless otherwise directed by the Division. The Plans shall include:~~~~include at least the following~~ risk assessment and prevention protocols:

(1) Ongoing verification and demonstration of the mechanical integrity of each well used in the underground gas storage project and each well that intersects the reservoir used for gas storage. The protocols for verifying and demonstrating well integrity shall

not be limited to compliance with the mechanical integrity testing requirements under Section 1724.10(j), and shall include consideration of the age, construction, and operation of each well.

(2) Corrosion monitoring and evaluation including the following:

(A) Evaluation of tubular integrity and identification of defects caused by corrosion or other chemical or mechanical damage;

(B) Corrosion potential of wellbore produced fluids and solids, including the impact of operating pressure on the corrosion potential of wellbore fluids and analysis of partial pressures;

(C) Corrosion potential of annular and packer fluid;

(D) Corrosion potential of current flows associated with cathodic protection systems;

(E) Corrosion potential of all formation fluids, including fluids in formations above the storage zone;

(F) Corrosion potential of uncemented casing annuli; and

(G) Corrosion potential of pipelines and other production facilities attendant to the underground gas storage project.

(3) Protocols for evaluation of wells and attendant production facilities that include monitoring of casing pressure changes at the wellhead, analysis of facility flow erosion, hydrate potential, individual facility component capacity and fluid disposal capability at intended gas and liquid rates and pressures, and analysis of the specific impacts that the intended operating pressure range could have on the corrosive potential of fluids in the system.

(4) Ongoing verification and demonstration of the integrity of the reservoir including demonstration that reservoir integrity will not be adversely impacted by operating conditions.

(5) Identification of potential threats and hazards associated with operation of the underground gas storage project including the following:

(A) Evaluation of likelihood of events and consequences related to the events;

(B) Determination of risk ranking to develop preventive and mitigating measures to monitor or reduce risk;

(C) Documentation of risk evaluation and description of the basis for selection of preventive and mitigating measures;

(D) Provision for data feedback and validation; and

(E) Regular, periodic risk assessment reviews to update information and evaluate risk management effectiveness.

(6) Prioritization of risk mitigation efforts based on potential severity and estimated

likelihood of occurrence of each threat.

AUTHORITY:

Note: Authority cited: Sections 3013 and 3106, Public Resources Code. Reference: Section 3106, 3220 and 3403.5 Public Resources Code.