SB 463: Chemical Inventory and Root Cause Analysis Regulations

Economic Impact Assessment

1. Introduction

In 2019, Governor Newsom signed into law Senate Bill 463 (Stern, Chapter 773, Statutes of 2019) (SB 463) which requires the Department of Conservation's Geologic Energy Management Division (Division) to develop regulations to implement recommendations made following an independent investigation into the root causes of the Aliso Canyon well blowout in 2015, and to require a chemical inventory of all chemicals that could be emitted from a gas storage well in the event of a reportable leak.

Underground gas storage (UGS) involves the injection of natural gas into underground reservoirs for storage and future withdrawal for sales to consumers (i.e., residential, commercial, industrial, and natural gas power plants).[1] The Division regulates underground gas storage facilities to ensure that integrity concerns with a gas storage well are identified and addressed before they become a threat to life, health, property, the climate, or natural resources.[2]

On October 23, 2015, a natural gas leak was discovered from an injection and withdrawal well in the Aliso Canyon Natural Gas Storage Facility in Los Angeles County. The leak triggered the adoption of emergency regulations by the Division, with permanent regulations becoming effective in October 2018. Those regulations require operators to create and update regularly comprehensive risk management and emergency response plans, collect and manage storage project data, ensure integrity and that no single point of failure poses an immediate threat of loss of control of fluids, and perform regular mechanical integrity testing and monitoring of wells within the project.[3] Compliance with well construction requirements that will ensure no single point of failure is currently being completed, as provided in the regulations. Consequently, it is anticipated that full compliance with no single point of failure construction requirements will be achieved within the next few years.

The California Public Utilities Commission, in consultation with the Division and the federal Pipeline and Hazardous Materials Safety Administration, retained Blade Energy Partners (Blade) to perform an independent root cause analysis of the Aliso Canyon

[1] PRC section 3180 (a); Natural gas explained, Delivery and storage of natural gas, U.S. Energy Information Administration, accessed July ,2023, https://www.eia.gov/energyexplained/natural-gas/delivery-and-storage.php.

[2] PRC section 3180 (d)(1).

[3] Underground Gas Storage, California Department of Conservation, accessed on July 24, 2023, https://www.conservation.ca.gov/calgem/Pages/UndergroundGasStorage.aspx.

incident. Blade issued its analysis of the Aliso Canyon blowout on May 17, 2019, as a main report with four supplemental volumes (Blade Report). The Division's 2018 regulations had, by that time, already addressed many of the root causes that the Blade Report identified. Nonetheless, SB 463 requires the Division to review and, if necessary, revise its natural gas storage well policy and regulations to address the root causes identified. The Division has completed a thorough review and determined that additional regulations are necessary to fully implement several of the Blade Report recommendations and to establish requirements to implement Public Resources Code section 3186.3 for operator creation, maintenance and submittal of an inventory of chemicals that could be emitted from a well in the event of a reportable leak.[4]

The proposed regulations meet the mandates and goals of SB 463 by expanding risk management planning; revising existing and adding expanded and new requirements for well corrosion evaluation, mitigation, and monitoring; adding requirements for investigating, tracking and reporting off-normal occurrences; updating emergency response plans to include well control plans and methods to detect chemicals in the event of a reportable leak; and requiring the development, maintenance and reporting of underground gas storage well chemical inventories, so public health professionals will have data to inform the determination of public health impacts in case of a reportable leak.

The purpose of this document is to provide discussion and quantification of the economic impacts resulting from the proposed regulations. The quantified estimates are based on the Division's available internal data sources and consultation with the Division's technical experts.

2. Current Underground Gas Storage Operations in California

California's natural gas is stored in depleted natural gas or oil fields close to consumption areas. Underground gas storage facilities are operated by both public utility corporations and independent service providers. Operators are not necessarily owners of the natural gas held in storage.[5]

California currently has six operators running a total of 14 projects at 12 facilities that include approximately 400 active, idle, and recently permitted underground gas storage wells (the number of wells active at any one time fluctuates). Two operators are utility companies, Southern California Gas Company (SoCalGas) and Pacific Gas and Electric Company (PG&E), and four operators are independent service providers, Wild

[4] https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200SB463.

[5] The Basics of Underground Natural Gas Storage, U.S. Energy Information Administration, accessed July, 2023, https://www.eia.gov/naturalgas/storage/basics/

Goose Storage, LLC, Lodi Gas Storage, LLC, Gill Ranch Storage, LLC, and Central Valley Gas Storage, LLC. Table 1 shows the percentage of wells serving an underground gas storage project for each operator as a percentage of the state total. Together, PG&E and SoCalGas operate 74 percent of the underground gas storage wells.

The 14 UGS projects in the state total around 604 billion cubic feet of total capacity. Total gas capacity is the maximum volume of natural gas that can be stored in an underground gas facility including base and working gas.[6] Table 1 shows the total gas capacity by operator. PG&E and SoCalGas together store 73 percent of total capacity for gas in the state.

Table 1. California's Working Gas and Active, Idle, and[7] Recently Permitted Gas Storage Wells by Operator as of 2022[8]

Operator	Total Gas Capacity (Mcf)	% of Total Gas Capacity	% of Total Wells
Pacific Gas & Electric Co.	173,035,500	29%	29%
Southern California Gas Co.	268,672,567	44%	45%
Central Valley Gas Storage, LLC	12,400,000	2%	4%
Wild Goose Storage, LLC	86,000,000	14%	6%
Lodi Gas Storage, LLC	40,440,000	7%	12%
Gill Ranch Storage, LLC	23,500,000	4%	5%
Total	**604,048,067**	**100%**	**100%**

Source: California Geologic Energy Management Division WellSTAR Database

Los Angeles and San Joaquin counties have nearly 70 percent of all gas storage wells in California. Table 2 shows the county location of gas storage wells. A total of 9 counties report having underground gas storage operations: 22 percent of gas storage wells are in Northern California counties; 34 percent in the San Joaquin Valley; and 45 percent in Southern California.[9]

[6] Ibid.

[7] Active means wells drilled, completed, and in use; Idle means wells that have not produced or been injected for 24 consecutive months; and Recently Permitted means wells recently permitted, but the wells have not been drilled or completed. WellSTAR Data Dashboard Glossary; PRC § 3008

[8] Percentages are rounded to the nearest whole number for simplicity and therefore do not add to 100% when taking an aggregate sum.

[9] Percentages are rounded to the nearest whole number for simplicity and therefore do not add to 100% when taking an aggregate sum.

Table 2. California's Active, Idle, and Recently Permitted Gas Storage Wells by County as of 2022[10]

County	% Share of Total
Butte	6%
Colusa	4%
Contra Costa	5%
Los Angeles	41%
Madera	5%
San Joaquin	29%
Santa Barbara	4%
Solano	6%
Yolo	2%
Total	**100%**

Source: California Geologic Energy Management Division WellSTAR Database

This analysis assesses the impacts of the proposed regulations relative to the current regulatory framework. Thus, it is assumed that the six underground gas storage operators in California already incurred or are incurring costs to comply with current regulatory requirements on risk management plans and emergency response plans; collect and manage UGS project data; ensure the construction of their wells meets the requirement for no single point of failure; and perform testing and monitoring for the approximately 400 wells associated with an underground gas storage project. It is also assumed that all six gas storage operators will incur incremental costs to adhere to the expanded requirements of the proposed regulations for the 14 projects; the estimated 400 active, idle, and recently permitted wells; and an anticipated average of six new underground gas storage wells annually for all underground gas storage fields. The next section offers details of such incremental costs across each provision of the proposed rulemaking.

To estimate future new underground gas storage wells, the analysis uses the Standardized Regulatory Impact Assessment (SRIA) completed for Underground Gas Storage regulations that became effective in 2018. That SRIA projected that gas storage operators would construct a total of 30 new wells over a five-year timeframe, which is an annual average of six new wells per year. The projection took into account the reasons an operator would need new storage wells (i.e., the number of wells that need a replacement for economic reasons and new structural requirements for gas

[10] Percentages are rounded to the nearest whole number for simplicity and therefore do not add to 100% when taking an aggregate sum.

storage wells).[11] CalGEM did not start to see new wells drilled until 2022 and expects replacement wells to continue to be drilled now that the work has started. This analysis assumes continuation of six wells per year for the next few years.

3. Direct Costs of Proposed Regulations

The proposed regulations expand risk management plan requirements for underground gas storage projects and require the development and maintenance of gas storage well chemical inventories. Underground gas storage operators will bear the direct costs in the form of additional expenses required to comply with these regulations. Consequently, the quantification of direct costs for the proposed regulations are estimated on an incremental basis across the new provisions of the rule relative to the current regulatory framework. Because the proposed regulations implement additional provisions and further clarify the statutory requirements and existing regulations, the Division assumes that operators may already do some of the work that will be required. Therefore, it is likely that some of the costs throughout this EIA are overestimated as operators may already perform some activities required by these proposed provisions.

The analysis follows a bottom-up approach in preparing costs of compliance for the proposed regulations. First, every new regulatory requirement was listed as a cost element. Second, the Division's technical experts determined the professional services and person-hours needed to comply with each cost element. Third, the analysis used the U.S. Department of Labor's O*NET OnLine tool to map the "standard occupation" for the professional services determined for each cost element. Finally, using the "standard occupation" for each cost element, the analysis relies on the latest Occupational Employment and Wage Statistics (OEWS) survey published by the California Employment Development Department (EDD) to determine the earnings per person-hour for each standard occupation.

The Division's experts also surveyed laboratories to collect information on costs for laboratory work as needed to compute cost elements. The next sections break down each cost element with the detailed description of the occupational services, the number of person-hours, and the earnings per person-hour (or laboratory fees) determined for each monetary calculation.

Relative to the current regulatory framework, the proposed regulations would result in direct costs of compliance of $1.15 million during the first year of implementation and

[11] The analysis uses the Standardized Regulatory Impact Analysis (2016) (SRIA) completed for the rulemaking action entitled "Requirements for California Underground Gas Storage Projects," that was noticed on May 19, 2017, and which became effective on October 1, 2018, to project future gas storage wells constructed. On page 19, the SRIA projects that gas storage operators will construct 30 new wells over a five-year timeframe, which is an annual average of six wells per year.

annualized recurring costs of $808 thousand per year. Table 3 breaks down direct costs of compliance for each of the proposed regulations' components: 1) expansion of risk management plan protocols and 2) gas storage well chemical inventory. The incremental costs from expanded risk management plan protocols are $1.1 million during the first year of implementation and $805 thousand in successive years.

Table 3. Direct Costs of Proposed Regulations by Major Cost Component

Cost Element	First Year of Implementation	Annualized (undiscounted) Recurring Costs, Y2-Y10
Expansion of Risk Management Plan	$1,098,957	$805,394
Gas Storage Well Chemical Inventory	$55,825	$3,348
Total Direct Cost to Operators	**$1,154,781**	**$808,741**

3.1 Expanded Requirements for Risk Management Plans

The proposed regulations expand requirements for risk management plans for underground gas storage operations related to 1) emergency response plan elements; 2) corrosion evaluation, mitigation, and monitoring protocols; and 3) new protocols for defining, investigating, tracking, and reporting to the Division any off-normal occurrence that could affect an operator's facilities or operations.

Table 4 breaks down total direct costs for each of the expanded regulatory elements. The additional three requirement areas for the emergency response plan will cost $263 thousand during the first year of implementation, with annualized recurring costs of $10.6 thousand. The expansion of corrosion evaluation, mitigation, and monitoring protocols will cost $44 thousand during the first year of implementation, with annualized recurring costs of $5 thousand. Finally, new protocols for investigating, tracking, and reporting off-normal occurrences will cost $793 thousand during the first year of implementation, with annualized recurring costs of $790 thousand. The subsequent subsections further break down each of these cost elements.

Table 4. Direct Costs from Expanded Requirements of Risk Management Plans by Cost Elements

Cost Element	First Year of Implementation	Annualized (undiscounted) Recurring Costs, Y2-Y10
Emergency Response Plan	$262,665	$10,573
Corrosion Evaluation, Mitigation and Monitoring	$43,712	$5,061
Investigating, Tracking, and Reporting Off Normal Occurrences	$792,580	$789,760
Expansion of Risk Management Plan	$1,098,957	$805,394

3.1.1 Emergency Response Plans

The proposed regulations add three additional requirements to Emergency Response Plans for underground gas storage operations: 1) review and update the whole emergency response plan and make necessary updates at least once per year, 2) incorporate well-specific control plans, and 3) incorporate methods to be utilized to detect chemicals of concern in a reportable leak. Accordingly, each of the six underground gas storage operators will incur direct costs to comply with these new requirements.

Table 5 breaks down the cost elements for each of the new requirements. Reviewing each emergency response plan and making necessary updates will cost $8.5 thousand during the first year of implementation, with annualized recurring costs of $7.3 thousand. Preparing well-specific control plans will cost operators $253 thousand during the first year of implementation, with subsequent annualized recurring costs of $3.3 thousand derived from newly constructed wells. Preparing methods to detect chemicals in a reportable leak will cost operators $1 thousand during the first year of implementation, without further recurring costs.

Table 5. Direct Costs from Emergency Response Plans by Cost Elements

Cost Element	First Year of Implementation	Annualized (undiscounted) Recurring Costs, Y2-Y10
Review and Update the Emergency Response Plan Once Per Year	$8,534	$7,272
Well-Specific Control Plans	$253,110	$3,301
Methods to Detect Chemicals in a Reportable Leak	$1,020	-
Emergency Response Plan	$262,665	$10,573

To estimate additional costs for annual reviews and updates, this analysis calculates the anticipated time to review and update existing emergency response plans during the first year of implementation and subsequent years. During the first year of

implementation, the time spent to update existing emergency response plans would include well-specific control plans and methods to detect chemicals in a reportable leak. However, in subsequent years, these costs would not be necessary and are therefore excluded from the cost calculation. For all years, time to review and update existing emergency response plans must include the required consultation with local emergency response entities.

For the first year of implementation, it is anticipated that each operator and its respective local emergency response entities would spend a total of 25 hours [12] of services equivalent to the tasks of a health and safety engineer with an average hourly wage of $58.76.[13] For subsequent years, it is assumed that each operator and its respective local emergency response entities would require the same professional services at the same average hourly wage, but the workload would go up to 29 hours to review the two new items required in the emergency response plan: well-specific control plans and methods to detect chemicals in a reportable leak.[14]

To incorporate the well-specific control plans, the analysis assumes that each operator[15] would require eight hours of petroleum engineering services per each of their

[12] To calculate the anticipated person-hours required for reviewing and updating emergency response plans, the analysis firstly listed the 17 required items for an emergency response plan, including the 2 newly required items of well-specific control plans and methods to detect chemicals in a reportable leak. Then, for each of the 17 items, the analysis intuitively assigns either 1 hour or ½ hour to denote the time each operator would spend in reviewing and updating each item. Accordingly, the analysis assigned 1 hour to 12 items and ½ hours to the remaining 5 items. Well-specific control plans and methods to detect chemicals in a reportable leak get 1 hour each, but these two items are excluded for the first year of implementation because existing emergency response plans are assumed to not include them yet. Consequently, the time anticipated for the first year of implementation totals 12.5 hours. These number of hours are multiplied times 2, assuming local entities (i.e. county authority for emergency response) would approximately spend a similar amount of time reviewing the emergency response plan for each operator.

[13] After consulting literature on emergency response planning for underground gas storage operations, it is inferred that operators and their respective local emergency response entities would generally require professional skills to execute tasks related to industrial safety and risk assessment to update and review emergency response plans. Subsequently, using O*Net OnLine of the U.S. Department of Labor, these tasks were matched to health and safety engineer, the closest standard occupational classification used for official public statistical sources on employment. According to the latest OEWS survey, health and safety engineers report a mean hourly wage of $58.76.

[14] Person-hours and hourly wage rates are the same as the first year of implementation with one exception. Ongoing years include additional time for reviewing and updating items on 1) well -specific control plans and 2) methods to detect chemicals in a reportable leak. It is inferred these two additional requirements would add four more hours per operator and its respective local emergency response entities. Thus, for ongoing years, each operator and its respective local emergency response entities would spend a total of 29 hours reviewing and updating the existing emergency response plan for underground gas storage operations.

[15] The analysis assumes that all six operators would need to create inflow performance relationship (IPR) curves for their gas storage wells, which are needed to prepare well control plans. Estimates of the number of person-hours and type of professional services required have been determined by the Division's technical experts.

underground gas storage wells during the first year of implementation. Also, operators will need to create inflow performance relationship (IPR) curves before preparing well control plans for each of its gas storage wells, a process that includes organizing production data and modeling. Consequently, the Division estimates that each operator will spend an additional 80 hours of petroleum engineering services to create IPR curves during the first year of implementation.[16] It is assumed that all six operators would pay an average hourly wage of $68.78 for the services of engineers.[17]

Operators would subsequently incur recurring costs to prepare well control plans for newly constructed underground gas storage wells, which are assumed to be six wells per year. For each newly constructed well, eight hours of petroleum engineering services are assumed, with wages of $68.78 per hour.[18]

To incorporate the methods to detect chemicals in a reportable leak, the analysis assumes that each of the six operators would incur onetime expenses including three hours of chemical engineering services to select appropriate chemical identification methods that would be used during a leak. It is assumed that the additional costs for identifying methods to detect chemicals identified by the Division would be negligible and are encapsulated in this cost calculation. Chemical engineering services are estimated to cost $56.68 hourly[19]. Sampling, testing, and analyzing chemical components at the Division's request is not included in this estimate.

3.1.2 Corrosion Evaluation, Mitigation, and Monitoring

The additional corrosion evaluation, mitigation, and monitoring requirements trigger additional costs to operators through 1) expanded requirements in the corrosion risk assessment per well[20], 2) expanded requirements for corrosion mitigation strategies per

[16] The Division's technical experts determined that operators will need around 80 person-hours to create IPR curves, data, and modeling for the required well control plans.

[17] The Division's technical experts determined the need for Petroleum Engineers to prepare well control plans. Petroleum Engineers in California earn an average hourly wage of $68.78, according to the 2022 OEWS survey.

[18] Ibid.

[19] The Division's technical experts determined that each operator would need three person-hours with engineering expertise to comply with this requirement, that each operator only needs to do this identification once, and that operators can include the same section in their emergency response plans for each facility provided all chemicals are included. Additionally, the analysis determined that Chemical Engineers, with an average hourly wage of $56.68, provide the services needed to comply with this requirement, based on O*NET OnLine and the OEWS survey. Additionally, the analysis determined that Chemical Engineers, with an average hourly wage of $56.68, provide the services needed to comply with this requirement, based on O*NET OnLine and the OEWS survey.

[20] It is assumed that the expansion of the risk assessment requirement to additional components would trigger incremental costs of additional analysis and documentation per well.

well,[21] and 3) reevaluation requirements of corrosion mitigation strategies per well after each casing wall thickness test or every time corrosion data suggests doing so.[22]

Table 6 breaks down the three cost elements for the expanded protocols of corrosion evaluation, mitigation, and monitoring, both during the first year of implementation and, if applicable, in subsequent years. First, the expanded requirements for corrosion risk assessment will cost around $22 thousand during the first year of implementation, with annualized recurring costs of $328 from newly constructed underground gas storage wells. Second, the expanded requirements for corrosion mitigation strategies would cost around $22 thousand during the first year of implementation, with annualized recurring costs of $328 from newly constructed wells. Finally, after one year of implementation, the reevaluation of corrosion mitigation strategies will generate annualized recurring costs of $4.4 thousand. The next paragraphs detail the assumptions used to compute each of these cost elements.

Table 6. Direct Costs from Expanded Requirements for Corrosion Evaluation, Mitigation, and Monitoring by Cost Elements

Cost Element	First Year of Implementation	Annualized (undiscounted) Recurring Costs, Y2-Y10
Expanded requirements in corrosion risk assessments	$21,856	$328
Expanded requirements for corrosion mitigation strategies	$21,856	$328
Reevaluation of corrosion mitigation strategies	-	$4,405
Corrosion Evaluation, Mitigation, and Monitoring	$43,712	$5,061

First, it is assumed that expanded corrosion risk assessments would need one hour of work per well from an engineer with an average hourly wage of $54.64.[23] This would be a one time expense for each of the approximate 400 active, idle, and recently permitted gas storage wells. For subsequent years, the analysis assumes that operators would incur recurring expenses from newly constructed wells, which are anticipated to

[21] It is assumed that operators will incur incremental costs to document supporting evidence on how the corrosion risk mitigation strategies considered for each well were evaluated and why each specific strategy, including cathodic protection, was implemented or not implemented based on the evaluation.

[22] Monitoring/reevaluation requirements would generate recurring costs to reevaluate corrosion mitigation strategies.

[23] The analysis determines that Material Engineers do the professional services needed to comply with this regulatory requirement using O*NET OnLine's occupational mapping tool. To obtain the most updated average hourly wage for Material Engineers in California, the analysis relied upon the 2022 OEWS survey. The number of person-hours per well needed to comply with the requirement is determined using the same number—1 hour—recommended by the Division's technical experts for the other two corrosion cost elements.

[23] Ibid.

be six wells per year.[24] Each of the newly constructed wells would need an hour of work per well from an engineer with an average hourly wage of $54.64.[25]

Second, it is assumed that complying with expanded requirements for corrosion mitigation strategies will require one hour of engineering services per well with an average hourly wage of $54.64.[26] This would be a onetime expense among the 400 active, idle, and recently permitted wells. Then, operators would incur recurring expenses for all newly constructed wells. To comply with expanded requirements for corrosion mitigation strategies, each newly constructed well would require one hour of engineering services with an average hourly wage of $54.64.[27]

Third, it is assumed that operators would incur recurring costs of compliance because of the proposed reevaluation requirements. All 400 gas storage wells would need to have their mitigation strategies reevaluated when testing is performed, and any time data indicates reevaluation is needed.[28] The Division estimates that these 400 existing wells and the 6 estimated annual constructed wells are expected to be reevaluated on average, about every four to eight years. So, when multiplying by the cost drivers of labor, the analysis divided the annual total well count by a lower bound of 4 years and an upper bound of 8 years to demonstrate a range of potential reevaluation costs. The lower and upper bounds of these annual estimates are $2,937 and $5,874 respectively. The average of this range of $4,405 was utilized in Table 6 and throughout this EIA. In computing incremental costs due to the reevaluation requirements, the analysis assumes that operators would need one hour of engineering services per well reevaluated. The average hourly wage of such engineering services is assumed to be $54.64.[29]

[24] Assumption extracted from Underground Gas Storage SRIA, 2016.

[25] The analysis determines that Material Engineers, with an average hourly wage of $54.64, do the professional services needed to comply with this requirement. The sources this determination relies upon are O*NET OnLine and the OEWS survey. The one person-hour per well needed to comply with the requirement is determined by the Division's technical experts.

[26] Ibid.

[27] Ibid.

[28] UGS well corrosion testing intervals are based on well-specific corrosion rates. The Division does not currently have sufficient information establish future testing intervals, as all wells are currently following the default two-year testing regime. It is likely that many wells will have longer testing intervals based on their established corrosion rate in the coming years. As the Division does not have enough information to estimate the future testing intervals, the Division conservatively anticipates testing interval of two years.

[29] The analysis determines that Material Engineers, with an average hourly wage of $54.64, do the professional services needed to comply with this requirement. This determination relies upon O*NET OnLine and the OEWS survey. The person-hours per well are inputs of the Division's technical experts.

3.1.3 Investigating, Tracking, and Reporting Off-Normal Occurrences

Requirements for investigating, tracking, and reporting off-normal occurrences generate added costs to operators, which are broken down into two elements: 1) developing a plan describing protocols for defining, investigating, tracking, and reporting any off-normal occurrence; and 2) investigating, tracking, and reporting any off-normal occurrence to the Division.

Table 7 reports the estimates for requirements on investigating, tracking, and reporting off-normal occurrences. Preparing the protocols for investigating, tracking, and reporting off-normal occurrences will cost $2.8 thousand during the first year of implementation. This is a onetime cost incurred by all underground gas storage operators. Reporting any off-normal occurrence to the Division would cost operators $790 thousand during the first year of implementation, as well as for ongoing years.

Table 7. Direct Costs from Investigating, Tracking, and Reporting Off-Normal Occurrences by Cost Elements

Cost Element	First Year of Implementation	Annualized (undiscounted) Recurring Costs, Y2-Y10
Developing Protocols for Investigating, Tracking, and Reporting Off-Normal Occurrences	$2,820	-
Investigating, Tracking, and Reporting Off-Normal Occurrences to the Division	$789,760	$789,760
Investigating, Tracking, and Reporting Off-Normal Occurrences	$792,580	$789,760

To estimate direct costs to develop protocols for investigating, tracking, and reporting off-normal occurrences, the analysis assumes that the six underground gas storage operators would incur onetime expenses to prepare such protocols. In addition, it is assumed each operator would require eight hours of current staff time with skills equivalent to health and safety engineering services, with an average hourly wage of $58.76.[30] To investigate, track, and report off-normal occurrences to the Division, the analysis assumes operators would require that each of their 12 fields (14 projects) hire one data analysis position with an annual average salary of $66 thousand[31] per year, starting with the first year of implementation.

[30] The analysis determines that Health and Safety Engineers, with an average hourly wage of $58.76, do the professional services needed to comply with this requirement. The sources this determination relies upon are O*NET OnLine and the OEWS survey. The person-hours per well are determined by the Division's technical experts.

[31] The analysis determines that Social Science Research Assistants (or other environmental/safety technicians), with an average hourly wage of $31.55, do the services needed to comply with this requirement. The sources this determination relies upon are O*NET OnLine and the OEWS survey. The person-hours per well are determined by the Division's technical experts.

3.2. Gas Storage Well Chemical Inventory

The proposed regulations require underground gas storage operators to prepare, maintain and report gas storage well chemical inventories. To comply with the requirements, the six underground gas storage operators would incur expenses associated with five elements: 1) preparing a workplan for chemical testing, 2) preparing protocols for reporting the chemical inventory, 3) one-time sampling, testing, and analyzing chemical components per project, 4) building and populating data inventory templates, 5) maintaining and reporting the gas storage well chemical inventory list over time, and 6) updating chemical inventories including well kill fluids and supplier information in the event of a reportable leak.

The gas storage well chemical inventory requirement will cost a total of $56 thousand in the first year of implementation with annualized recuring costs of $3 thousand as follows:

- First, preparing a workplan for chemical testing will cost $1.8 thousand without recurring annualized costs.
- Second, preparing protocols for reporting the chemical inventory will cost $263 without annualized recurring costs.
- Third, sampling, testing, and analyzing chemical components for all gas storage projects will cost $25 thousand during the first year of implementation without annualized recurring costs.
- Fourth, building and populating the data inventory templates will cost $25.6 thousand in the first year of implementation without recurring annualized costs.
- Fifth, maintaining and reporting the gas storage well chemical inventory list will cost $3 thousand during the first year of implementation with annualized recurring costs of $3 thousand.
- Finally, in the event of a reportable leak, operators will need to update their chemical inventory including well kill fluids and supplier information. Because this is expressly required by the statute, these costs are not included here.

Table 8 describes the assumptions used to compute each of the previously listed cost estimates.

Table 8. Assumptions Supporting Direct Cost Element Calculations for New Gas Storage Chemical Inventory Requirements

Cost Element	Assumptions used in the Cost Calculation
Preparing a Workplan for Chemical Testing[32]	• Each gas storage operator will incur onetime costs. • Operators would require four hours of data analysis per each of the 14 reservoirs. • The workplan does not require technical skills in the chemical field. A data analyst position has sufficient skills to prepare the workplan. The average hourly wage of a data analyst is determined to be equivalent to the $31.55 hourly wage of a statistical assistant occupation reported under the 2022 Occupational Employment and Wage Statistics (OEWS survey).
Preparing Protocols for Reporting the Chemical Inventory[33]	• Each gas storage operator will incur onetime costs. • Each gas storage operator would require two hours of office and administrative support services; hourly wage is reported to be $25.08 under the 2022 OEWS survey.

[32] The Division's technical experts identified the type of professional services and person-hours needed to comply with this requirement. Then, using O*NET and OEWS, the analysis determined the standard occupation and the respective hourly wage.

[33] The Division's technical experts informed these assumptions. Additionally, using O*Net and the OEWS survey, this analysis determined the occupation and hourly wage needed to outline the procedures to maintain the chemical inventory.

Cost Element	Assumptions used in the Cost Calculation
Sampling, Testing and Analysis of Chemical Components per Well[34] [35]	• Gas storage operators will incur initial costs only. • Gas storage operators will pay laboratories a $75 per hour fee for sampling, and the laboratory would spend 15 minutes to take a sample per each of the 14 gas storage reservoirs. • For chemical testing and analysis, it is assumed that gas storage operators will pay laboratory fees of $1,752 per each of the 14 reservoirs, a fee including these types of chemical tests: BTEX, ASTM 1945 Gas Analysis, ASTM S5504 Sulfur Analysis, H2S, Radon-222, and Title 22 Metals[36]. It is assumed that the 14 underground gas storage reservoirs would be tested through the first year of implementation of the regulation.
Building and Populating Data Inventory Template[37] [38]	• Each gas storage operator will incur onetime costs. • Each of the six gas storage operators will incur costs for two person-hours of data analyst staff time to create the template and around two person-hours of data analyst staff time per each of their underground gas storage wells to populate the template the first time. • A data analyst position provides sufficient data collection skills to create and populate the data inventory template. • A data analyst is assumed to get a compensation equivalent to the average hourly wage for a statistical assistant, which is $31.55 according to the 2022 OEWS survey.

[34] The Division's technical experts informed the assumptions on chemical sampling, after consulting laboratories about chemical sampling methods and tools. It was concluded that it would take 15 minutes to take a sample for testing chemicals in each reservoir.

[35] The Division's technical experts gathered information from laboratories to inform the assumptions for this cost element. Six types of chemical testing were reported: BTEX, ASTM 1945 Gas Analysis, ASTM S5504 Sulfur Analysis, H2S, Radon-222, and Title 22 Metals. Except for Radon-222, the Division's technical experts obtained prices for each chemical testing service from the laboratories contacted. To obtain a fee for Radon-222 testing, this analysis relied on the midrange price reported through public sources, which is $424 per sampled reservoir. Subsequently, a $1,328 per reservoir fee is computed from the sum of all five chemical test fees.

[36] Title 22 Metals include the following chemical elements: As, Ag, Ba, Be, Cu, Cd, Co, Cr, Hg, Mo, Ni, Pb, Se, Ti, V, and Zn.

[37] The Division's technical experts determined that each operator would need two person-hours of professionals with basic understanding of data and tables to fulfill this requirement. Thus, this analysis determines that statistical assistants, with an average hourly wage of $31.55, can perform the professional services needed. O*NET OnLine and the OEWS survey are the sources used for this determination.

[38] The Division's technical experts determined that two person-hours per well would be needed to comply with this requirement. This analysis also determined that statistical assistants, with an average hourly wage of $31.55, perform the professional services needed to comply with this requirement, according to information reported under O*NET OnLine and the OEWS survey.

Cost Element	Assumptions used in the Cost Calculation
Maintaining and Reporting the Gas Storage Well Chemical Inventory List[39]	• Gas storage operators will incur initial and recurring costs. • Operators would require one-half work year hours of a data analyst for initial and recurring costs. • The average hourly earnings of the data analyst are determined to be equivalent to the $31.55 hourly wage for a statistical assistant occupation reported under the 2022 OEWS survey.
Updating Chemical Inventory Including Well Kill Fluids and Supplier Information	• A cost is not associated with this element because it is expressly required by the statute.

4. Benefits of Proposed Regulations

SB 463 directs the Division to review and, if necessary, revise its natural gas storage well regulations to address the root causes identified for the Alison Canyon blowout by the Blade Report and to require a gas storage well chemical inventory, to ensure that public health professionals will have data to better assess health risks in the case of a reportable leak. The proposed regulations reflect such statutory requirements. In general, this rulemaking action will increase the transparency of the Division's regulatory standards and expectations for underground gas storage projects. It will also reduce threats to life, health, property, the environment and natural resources, and protect surface and underground waters, and the public welfare. (Pub. Resources Code, §§ 3181.5 and 3186.3.) These benefits cannot be specifically quantified but should increase economic, health, and environmental outcomes for all residents of the California communities who may live or work near natural gas storage projects.

5. Fiscal Impacts

The Division will experience fiscal impacts associated with the implementation of the proposed regulations. New requirements for investigating, tracking, and reporting off-normal occurrences and developing and maintaining gas storage well chemical inventories would require the Division to incur additional staff time for oversight of operator compliance.

[39] Gas storage operators are required to report updated well chemical inventories every 12 months or within 30 days of key changes—i.e., new chemicals being introduced due to well work, such as well completion, well maintenance, or well testing. This analysis lacks sufficient information to determine the frequency and workload needed to fulfill potential key changes to underground gas storage wells, as well as other likely reporting and procedural needs that operators could recurrently incur to comply with new chemical inventory requirements. Consequently, given the fiscal and financial planning purposes of this analysis, it is conservatively assumed that the operators would need to recurrently manage and review their inventory, using a database or other data management tool. To fulfill this need, it is determined that each operator would require one-half work year hours of a statistical assistant services, with an average hourly wage of $31.55. This determination relied upon O*NET OnLine and the OEWS survey respectively.

Table 9 reports the total fiscal impact to the Division from the new requirements of the proposed regulations. During the one-year implementation period, the Division will be required to allocate a total of $242 thousand in staff time, approximately $121 thousand for the investigating, tracking, and reporting of off-normal occurrence requirements and $121 thousand for reviewing gas storage well chemical inventory submissions. In subsequent years, the Division will need to allocate a total of $181 thousand in annualized recurring expenses related to staff time, approximately $121 thousand for the investigating, tracking, and reporting of off-normal occurrence requirements and $60 thousand for reviewing gas storage well chemical inventory submissions.

Table 9. Fiscal Impacts to the Division Associated with the Proposed Regulations, by Cost Element

Cost Element	First Year Costs	Annualized (undiscounted) Recurring Costs, Y2-Y10
Investigating, Tracking, and Reporting of Off-Normal Occurrences	$120,981	$120,981
Reviewing Gas Storage Well Chemical Inventories	$120,981	$60,491
Total Fiscal Costs to the Division	**$241,962**	**$181,472**

To estimate the associated costs for investigating, tracking, and reporting of off-normal occurrences, the analysis conservatively assumes that the Division would recurrently be required to allocate one personnel-year—equivalent to Research Data Analyst I—with basic data analysis skills to review, manage, and analyze the recurrent off-normal events reported by operators. Thus, using California Department of Human Resources classifications and staffing cost calculations (i.e., salaries, benefits, operating expenses, and equipment), the analysis determined that the Division would need to allocate staffing resources totaling $121 thousand annually due to the additional workload[40].

To estimate the associated costs for review of gas storage well chemical inventories, it is assumed that the Division would need staff with basic data analysis skills to recurrently audit and manage the new dataset of well chemical inventories. Accordingly, using California Department of Human Resources classifications and staffing cost calculations, the analysis determined that the Division would need to allocate one personnel-year equivalent to a Research Data Analyst I, estimated at $121 thousand through the first year of implementation. For subsequent years, the Division would

[40] The Division's technical experts determined that the requirement for reporting off-normal occurrences would require staff time to review and analyze data reported by gas storage operators. Accordingly, this analysis takes a conservative approach and assumes that the Division would need additional staff work equivalent to the standard occupational duties of a Research Data Analyst I. The analysis used the California State Civil Service classifications to match the new data and analysis needs of the Division with the standard duties of the Research Data Analyst I.

require one-half personnel year equivalent to a Research Data Analyst I, estimated at $60 thousand annually.[41]

In addition to the Division needing to fund and allocate Research Data Analyst I staff resources, the work required by the regulations would also require the services of an Associate Oil and Gas Engineer (AOGE); the work from this AOGE is already funded in the State budget. Thus, the workload of this AOGE is absorbable within the Department's existing staff resources and would not impose an additional fiscal impact.

6. Conclusion

The entities directly affected by the proposed regulations will be California underground gas storage operators. These currently include a total of six underground gas storage operators with 14 projects at 12 facilities that contain the approximately 400 active, idle, and recently permitted underground gas storage wells throughout the state. Two operators are utility corporations, SoCalGas and PG&E, and four operators are independent service providers, Wild Goose Storage, LLC, Lodi Gas Storage, LLC, Gill Ranch Storage, LLC, and Central Valley Gas Storage, LLC. A total of 9 counties report having underground gas storage operations, among which Los Angeles and San Joaquin counties have more than two-thirds of the total underground gas storage wells.

The total costs associated with the proposed regulations include the direct costs incurred by operators from expanded requirements to risk management plans and new gas storage well chemical inventories, as well as the additional expenses incurred by the Division to implement and oversee these new requirements.

Table 10 reports the costs estimated for the proposed regulations: $1.4 million during the implementation year and anticipated annualized recurring costs of $990 thousand. During the implementation year, total direct costs break down into $1.1 million for new risk management plan requirements, $56 thousand for gas storage well chemical inventory requirements, and $242 thousand for the Division expenses incurred to implement and oversee the new requirements.

The annualized recurring costs break down into $805 thousand for new risk management plan requirements, $3 thousand for gas storage well chemical inventory

[41] Gas storage operators must report to the Division updated well chemical inventories every 12 months or within 30 days of key changes. This requirement creates the need for the Division to review and manage new data in its existing data repository. To execute these tasks, this analysis conservatively assumes that the Division would need additional staff work equivalent to a Research Data Analyst I (i.e., one personnel year for the initial year of implementation and half of a personnel year for subsequent years). This determination was obtained by matching the data needs triggered by this reporting requirement with the standard duties of the Research Data Analyst I classification of the California State Civil Service.

requirements, and $181 thousand for the Division's oversight expenses for the new regulations.

Table 10. Total Direct Costs Associated with the Proposed Regulations

Cost Element	First Year of Implementation	Annualized (undiscounted) Recurring Costs, Y2-Y10
Direct Cost for Operators		
Expansion of Risk Management Plan	$1,098,957	$805,394
Gas Storage Well Chemical Inventory	$55,825	$3,348
Fiscal Costs to the Division	$241,962	$181,472
Total Costs (Direct + Fiscal)	**$1,396,743**	**$990,213**

As a result of the cost burden being spread across the State, the Division has made the following determinations about the impact of these new requirements:

- May affect the creation of new jobs within the State of California.
- Will not create new business nor eliminate businesses within the State of California.
- Will not affect expansion of businesses currently doing business within the state.
- Will benefit the health and welfare of California residents, worker safety, and the environment.
- Will most likely not affect the ability of businesses within California to compete with businesses in other states.

Compliance with the proposed regulations will mitigate threats to life, health, property, the environment, and protect surface and underground waters, and the public welfare. This would help address public health and environmental concerns of Californians living or working near underground gas storage operations.