APPLICATION OF SOUTHERN CALIFORNIA GAS COMPANY FOR ANGELES LINK PHASE 1 REASONABLENESS REVIEW (DATA REQUEST CalPA-SCG-01)

Date Requested: November 14, 2025, Submitted: December 9, 2025

QUESTION 1: Does the Demand Study or the Demand Study Technical Appendix cite to any data or resources that were not already publicly available? If so, specify.

RESPONSE 1:

SoCalGas objects to this request under Rule 10.1 of the Commission's Rules of Practice and Procedure to the extent it seeks the production of information that is neither relevant to the subject matter involved in the pending proceeding nor is likely reasonably calculated to lead to the discovery of admissible evidence. Subject to and without waiving the foregoing objection, SoCalGas responds as follows.

The Demand Study or the Demand Study Technical Appendix does not cite data or resources that were not already publicly available.

QUESTION 2: In the preparation of the Demand Study and the Demand Study Technical Appendix, did SoCalGas collect any data from potential off-takers of the Angeles Link Project? If so, specify what data was collected, from whom, and the method of data collection (e.g. survey, interview, etc.).

RESPONSE 2:

In accordance with D.22-12-055, the Phase 1 Demand Study was conducted at a feasibility level. Accordingly, SoCalGas did not collect data from potential off-takers of Angeles Link in the preparation of the Demand Study and the Demand Study Technical Appendix.

QUESTION 3: The Demand Study forecasts clean renewable hydrogen demand for SoCalGas's service area (Demand Study at 8), which includes Los Angeles, Burbank, Long Beach, Ontario, and Orange County (Demand Study Technical Appendix at 25). However, in the Final Project Options & Alternatives Study, SoCalGas defines a region for the L.A. Basin to be a 40-mile centered at the Port of Los Angeles and Port of Long Beach (Alternatives Study at 28).

a: Did SoCalGas evaluate the anticipated demand for hydrogen within L.A. Basin region, as defined in the Alternatives study? If so, provide a description of the boundary used in the analysis and the estimated demand for hydrogen across the three scenarios (Conservative, Baseline, and Ambitious) and across the three industry segments (Mobility Sector, Power Generation, and Industrial). If not, describe the rationale for not doing so.

RESPONSE 3:

No. The Demand Study calculated anticipated demand within the SoCalGas service territory, which included the LA Basin. Ordering Paragraph (OP) 6(d) of D.22-12-055 required SoCalGas to consider and evaluate project alternatives, including a localized hydrogen hub. The Localized Hub was defined as the 40-mile area centered at the Port of Los Angeles and Port of Long Beach with production, pipelines for distribution, and above-ground liquid storage located in the LA Basin. The description of the Localized Hub boundary can be found in, Localized Hub Definition, in the Alternatives Study.[1]

[1] Angeles Link Alternatives Study, Section 7.1.1 at 115 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Project-Options-&-Alternatives.pdf.

APPLICATION OF SOUTHERN CALIFORNIA GAS COMPANY FOR ANGELES LINK PHASE 1 REASONABLENESS REVIEW (DATA REQUEST CalPA-SCG-01)

Date Requested: November 14, 2025, Submitted: December 9, 2025

QUESTION 4: The Angeles Link Phase 1 Demand Study Technical Appendix Final Report ("Technical Appendix") describes a methodology to model associated hydrogen vehicle adoption rates as a percentage of zero emission vehicle ("ZEV") adoption rates by evaluating vehicle classes across four "adoption factors," Technology Feasibility, Commercial Availability, Business Readiness, and Policy & Regulation, and assigning a scaling percentage value for each (e.g., Technological Feasibility subfactors range from 0% for "Very Low" to 100% for "Very High", Commercial Availability ranges from 5% for "Far from Parity" to 150% for "Much Cheaper", etc.). (Technical Appendix at 32).

a. Describe how these percentage values were developed for each valuation "score" (e.g., "Far from Parity" for Commercial Availability = 5%) for each of the four adoption factors, shown in the first paragraph on Technical Appendix page 34 and Table 12, Table 13, and Table 15 of the Technical Appendix.
b. Describe the methodology used to assign the valuation scores for "Business Readiness" across the Low, Medium, and High Scenarios shown in Table 14 in the Technical Appendix.
c. Describe the methodology used to assign the valuation scores for "Policy & Regulation" across the Low, Medium, and High Scenarios shown in Table 14 in the Technical Appendix.
d. Provide the scoring for each factor that composes the Technical Feasibility score (e.g., range requirement, load requirement, etc.) for each vehicle class evaluated in the Demand Study.
    i. Describe the methodologies used to assign these scores.
    ii. Did this scoring vary across the Conservative, Moderate, and Ambitious Scenarios?
    iii. If not, did SoCalGas incorporate any margin of error within these hydrogen demand estimates?
e. Describe how the percentage values for the Industrial Adoption Rates factors ("Technology," "Alternatives," and "Commercial Availability") were developed for the "Low," "Medium," and "High" scenarios described in Table 23 of the Technical Appendix.

RESPONSE 4:

SoCalGas objects to the request in that it seeks information that may be outside the scope of this proceeding. Subject to and without waiving the foregoing objection, SoCalGas responds as follows.

4a. As discussed in the Demand Study Technical Appendix, each factor was evaluated as Very Low (0%), Low (25%), Medium (50%), High (75%), or Very High (100%) to indicate likelihood of H2 adoption. The percentages were further reviewed through the PAG and CBO stakeholder engagement process. Please refer to the Demand Study Technical Appendix's Factors [2] for a brief description of [3] each factor's conservative, moderate and ambitious potential ranking. Each factor has its own specific description and evaluation methodology [4]:

- Technical Feasibility
- Commercial Availability

---

[2] Angeles Link Demand Study Technical Appendix, Adoption Factors at 31 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Demand-Study-Technical-Appendix.pdf.

[3] Angeles Link Demand Study Technical Appendix, Table 6 at 33 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Demand-Study-Technical-Appendix.pdf.

[4] Angeles Link Demand Study Technical Appendix, Adoption Factors at 33-43 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Demand-Study-Technical-Appendix.pdf.

- Business Readiness
- Policy & Regulations

4b. As discussed in the Business Readiness Section of the Demand Study Technical Appendix[5], business readiness is a multiplying factor used to reflect the impact of companies or firms accelerating (or decelerating) their adoption of FCEV technology. For example, many global organizations have set decarbonization targets and may be early adopters of FCEV or BEV technology. If FCEV technology is adopted, this would accelerate Hydrogen adoption. Business Readiness assigned a percentage value for each of the evaluation criteria as noted in Table 13 based on simplifying assumptions developed for the Demand Study, and were further reviewed through the PAG and CBO stakeholder engagement process. As discussed in Table 14, in the Low scenario, all evaluations across time periods and applications were evaluated as Market Driven, meaning the multiplier would be 100% and H2 adoption rates would not be impacted by business readiness. For Medium and High scenarios, standard evaluation was used across most applications.

4c. Table 14 of the Technical Appendix corresponds to the Business Readiness assessment, not assessments associated with Policy and Regulation. The methodology used for the valuation scores for Policy and Regulation shown in Tables 15 and 16 are explained and were based on simplifying assumptions developed for the Demand Study, and were further reviewed through the PAG and CBO stakeholder engagement process[6].

4d. Technical Feasibility evaluation metrics, based on multiple factors, are described in the Technical Appendix, which includes[7]:

- The methodology is described on pages 33 and 37.
- The technical feasibility assessment was evaluated per vehicle application group but held constant across the scenarios (Technical Appendix, Table 6).
- See question 4(d)(i) above.

[5] Angeles Link Demand Study Technical Appendix, Business Readiness at 41-42 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Demand-Study-Technical-Appendix.pdf.

[6] Angeles Link Demand Study Technical Appendix, Policy & Regulation at 42-44 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Demand-Study-Technical-Appendix.pdf.

[7] Angeles Link Demand Study Technical Appendix, Technical Feasibility at 33-37 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Demand-Study-Technical-Appendix.pdf.

4e. Please refer to Table 22 of the Technical Appendix[8] highlighting the industrial adoption parameters for Technology, Alternatives, and Commercial Availability across the various high, medium, and low categories. These categories were each given a percentage out of 100%, with adoption rate parameter-specific percentages described below. Each adoption factor was weighted equally at 33%, and a hydrogen adoption rate for each subsector was determined based on a weighted average of the three adoption rate parameters. The methodology was based on simplifying assumptions developed by SoCalGas in coordination with consultants hired to perform the Demand Study and were further reviewed through the PAG and CBO process.

[8] Angeles Link Demand Study Technical Appendix, Table 22 at 70 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Demand-Study-Technical-Appendix.pdf.

QUESTION 5: SoCalGas states in the Demand Study that "the principal driver of mobility sector demand is the Advanced Clean Fleets (ACF) regulation" (Demand Study at 8). However, the California Air Resources Board ("CARB") withdrew its waiver request for the ACF regulation on January 1, 2025.[1]

a. Within the Demand Study scenarios, did SoCalGas include variations in its estimates that considered ZEV adoption rates lower than those anticipated under the ACF regulation?

FN 1: California Air Resources Board. January 13, 2025. "Withdrawal of California's Request for a Waiver… for the Advanced Clean Fleets (ACF) Regulation, Docket ID EPA-HQ-OAR-2023-0589." https://www.epa.gov/system/files/documents/2025-01/ca-acf-carb-withdrawal-ltr-2025-1-13.pdf

RESPONSE 5:

SoCalGas objects to this request as argumentative. Subject to and without waiving the foregoing objection, SoCalGas responds as follows.

No. SoCalGas's analysis was based on information that was available at the time the Demand Study was conducted.

QUESTION 6: SoCalGas states, "Capacity factors were not modelled and were instead input directly to understand what the potential demand could be across a range of different capacity factors… The probability of each capacity factor was not evaluated" (Demand Study at 65).

a. What was SoCalGas's rationale for not evaluating the probability of each capacity factor?

RESPONSE 6:

During the development of the Demand Study, SoCalGas presented the draft description of the scope of work and technical approach for PAG and CBOSG feedback.

A range of capacity factor scenarios were evaluated as part of Angeles Link Phase 1 analysis to determine the expected power generation from hydrogen in 2045. The capacity factor assumptions were not explicitly modelled, rather these factors were based on deterministic assumptions of 10-30%. Modeling capacity factor assumptions for future power generation is inherently complex, as it must account for an evolving resource mix, shifting demand patterns, and the need to maintain adequate capacity while upholding system reliability. Integrating hydrogen-based power generation into the electric grid adds further layers of technical and operational nuances, requiring careful evaluation of infrastructure readiness, transmission availability, interconnection pathways, and capacity factor analysis under varying operating conditions. Ensuring compliance with reliability standards (such as the North American Electric Reliability Corporation (NERC)) provides a critical foundation for capacity factor modeling assumptions that safeguard grid stability. Because capacity factors are shaped by multiple variables, including electric load growth, imports, cost dynamics, reliability needs, and ramping requirements, modeling scenario-based capacity factors will be part of Angeles Link Phase 2 analysis.

QUESTION 7: SoCalGas states, "Interviews with OEMs and operators suggest that hydrogen capacity factors could reach 8-10% by 2045, driving the conservative case" (Demand Study at 65).

a. Did SoCalGas consider capacity factors lower than this projected value for the Demand Study?
b. With what degree of certainty does SoCalGas expect hydrogen capacity factors to reach 10% by 2045?
c. Did SoCalGas consider scenarios where hydrogen capacity factors would only reach the lower bounds of OEM estimations

RESPONSE 7:

SoCalGas objects to this request under Rule 10.1 of the Commission's Rules of Practice and Procedure to the extent it seeks the production of information that is neither relevant to the subject matter involved in the pending proceeding nor is likely reasonably calculated to lead to the discovery of admissible evidence. Subject to and without waiving the foregoing objection, SoCalGas responds as follows.

7a. No. The Demand study considered a range between 10-30% for conservative, moderate and ambitious scenarios.[9] Modeling scenario-based capacity factors and associated probability assumptions could be part of future considerations as part of Angeles Link Phase 2.

7b. Please refer to Response 6a.

7c. Please refer to Response 7a.

[9] Angeles Link Demand Study, Section 3.2.3.2 at 65 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Demand-Study.pdf.

QUESTION 8: In the Alternatives Study, SoCalGas asserts that "Angeles Link is the best suited option to meet the evaluation criteria for the delivery of clean renewable hydrogen at scale across Central and Southern California, including the L.A. Basin" (Alternatives Study at 11). However, SoCalGas's evaluation focuses on the 1.5 Mtpa hydrogen throughput volume, defined as the "Ambitious" scenario in the Demand Study. (See "Scalability" in Alternatives Study at 37).

a. Did SoCalGas evaluate the project alternatives against the selected criteria at lower production volumes, such as the "Conservative" or "Moderate" scenario throughputs of 0.5 Mtpa and 1.0 Mtpa or lower?

b. If so, what were the results of that evaluation? Provide the scorings for each alternative across all selected criteria.

RESPONSE 8:

8a. During the development of the Alternatives Study SoCalGas presented the draft description of the scope of work and technical approach for PAG and CBOSG feedback. The Alternatives Study only compared Angeles Link to the alternatives using the screening criteria at the 1.5 MTPA throughput scenario. However, the High-Level Economic Analysis and Cost Effectiveness Study (Cost Effectiveness Study) did compare Angeles Link to the hydrogen delivery alternatives on a cost basis at the 0.5 and 1.0 MPTA throughput scenarios. Please refer to Table 41 in the Cost Effectiveness Study.[10]

8b. Please refer to Response 8a.

[10] Angeles Link Cost Effectiveness Study, Section 7.4.1 Table 41 at 122 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-High-Level-Economic-Analysis-&-Cost-Effectiveness.pdf.

QUESTION 9: In the Alternatives Study, SoCalGas states, "Energy efficiency is a partial decarbonization solution on its own and cannot be evaluated on a standalone basis relative to Angeles Link and other alternatives from an energy equivalency perspective" (Alternatives Study at 33).

a. Did SoCalGas consider any scenarios where energy efficiency improvement was evaluated in conjunction with other hydrogen or non-hydrogen project alternatives?

RESPONSE 9:

During the development of the Alternatives Study, SoCalGas presented the draft description of the scope of work for PAG and CBOSG feedback. As discussed in Table 1 of the Alternatives Study,[11] Energy Efficiency was identified as part of a portfolio of alternatives but was not selected for final analysis on a standalone basis. Energy efficiency of equipment at a systems level was considered while assessing Angeles Link and other alternatives.

[11] Angeles Link Alternative Study, Table 1 at 9 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Project-Options-&-Alternatives.pdf.

QUESTION 10: In the Ease of Implementation section of the Alternatives Study, SoCalGas notes a downside of the Angeles Link project that "New pipeline construction requires planning and coordination with hydrogen production and demand components of the developing hydrogen value chain, which may require a longer development timeline" (Alternatives Study at 50).

a. Has SoCalGas conducted any efforts to estimate or evaluate a timeline to which hydrogen producers could realistically acquire land rights, acquire permits, develop facilities, and begin producing hydrogen at the scales necessary to support the Angeles Link project (0.5 Mtpa – 1.5 Mtpa)? If so, what were the results of this analysis?

RESPONSE 10:

SoCalGas objects to this request on the grounds that it assumes facts that do not exist and mischaracterizes the contents of the Alternatives Study. Subject to and without waiving the foregoing, SoCalGas responds as follows.

As explained in the Production Study, construction of a 200 MW hydrogen production facility is expected to take 3 years in a supply chain balanced market. A 375 MWdc solar facility is anticipated to require the same construction timeline, and may be constructed concurrently to the electrolyzer facility. Site development activities including permitting and regulatory approvals are highly site-specific and would occur after land acquisition.[12]

The scope of the Production Study did not include an evaluation of the timeline to acquire land rights or permits prior to construction commencing.

[12] Angeles Link Production Study, Section 9.2.9 at 57 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Production-Planning-&-Assessment.pdf.

QUESTION 11: Figure 20 of the Alternatives Study displays the cost-effectiveness of the Angeles Link Pipeline System, measured by the levelized cost of hydrogen delivery ("LCOH", $/kilogram of hydrogen) compared to the six hydrogen delivery alternatives under Scenario 7, which utilized the 1.5 Mtpa hydrogen throughput.

a. Did SoCalGas evaluate the cost-effectiveness of the hydrogen delivery alternatives at other throughput capacities (e.g., 1 Mtpa, 0.5 Mtpa, or lower)? If so, what were the results of those analyses?
b. Under the scenario with 1.5 Mtpa of hydrogen throughput by 2045, what is the average cost effectiveness of the Angeles Link project and hydrogen delivery alternatives as production scales between 2030 and 2045?
c. At what annual throughput of hydrogen does the Angeles Link pipeline become the most cost-effective when compared to the other hydrogen delivery alternatives, using the rest of the parameters from Scenario 7?
    i. What is the delivery cost at that threshold?
    ii. Below that threshold, which hydrogen delivery option(s) are more cost effective?
d. What are the total anticipated costs for the hydrogen delivery alternatives compared to the Angeles Link project, as opposed to the hydrogen delivery costs in $/kg?

RESPONSE 11:

SoCalGas objects to the request in that it seeks information that may be outside the scope of this proceeding. Subject to and without waiving the foregoing objection, SoCalGas responds as follows.

11a. Yes. Please refer to Response 8a.

11b. SoCalGas objects to this request under Rule 10.1 of the Commission's Rules of Practice and Procedure to the extent it seeks the production of information that is neither relevant to the subject matter involved in the pending proceeding nor is likely reasonably calculated to lead to the discovery of admissible evidence. Subject to and without waiving the foregoing objection, SoCalGas responds as follows.

Not Applicable. SoCalGas assessed a Levelized Cost of Delivered Hydrogen (LCOH) for 2045. SoCalGas did not perform an assessment of LCOH on a production scale timeline between 2030-2045.

11c. Pursuant to Ordering Paragraph 6(a) of the Decision (D.22-12-055), the Demand Study helped identify the hydrogen demand for Angeles Link.

Based on the demand identification, 0.5, 1.0 and 1.5 MPTA throughput volumes for the SoCalGas service territory were considered for the demand scenario analysis, and the Production and Design Studies identified eight scenarios for hydrogen production and delivery. The Cost Effectiveness Study used these scenarios to measure the cost effectiveness between Angeles Link and the alternatives.

Table 5 in the Cost Effectiveness Study[13] displays the variability in throughput and transport distance across the 8 scenarios. The results of the cost effectiveness analysis for each scenario are summarized in Table 41,[14] and demonstrate that for the 0.5 – 1.5 MPTA throughput levels, Angeles Link is the most cost effective. The objective was to determine the cost effectiveness for hydrogen delivery based on the demand throughput levels and delivery methods. Determining the throughput level at which Angeles Link becomes the most cost-effective hydrogen delivery alternative was outside the scope of these studies.

11c(i). Please refer to Response 11c.

11c(ii). Please refer to Response 11c.

11d. Please refer to Section 7.3[15] of the Cost Effectiveness Study Final Report detailing the Capital and O&M related assumptions for Angeles Link and the hydrogen delivery Alternatives.

[13] Angeles Link Cost Effectiveness Study, Table 5 at 42 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-High-Level-Economic-Analysis-&-Cost-Effectiveness.pdf.

[14] Angeles Link Cost Effectiveness Study, Table 41 at 122 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-High-Level-Economic-Analysis-&-Cost-Effectiveness.pdf.

[15] Angeles Link Cost Effectiveness Study, Section 7.3 at 99 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-High-Level-Economic-Analysis-&-Cost-Effectiveness.pdf.

QUESTION 12: The Demand Study omits fuel price when comparing hydrogen to alternative technology options, instead assuming that hydrogen achieves cost parity with the baseline fuel (e.g., natural gas, diesel, electricity) on an energy basis. For example, SoCalGas assumes the cost of hydrogen used in hydrogen combustion turbines to be $0.289/kg to "have the assumption of price parity with $/mmbtu of natural gas" (Technical Appendix at 50). However, the Alternatives Study projects that the Angeles Link Pipeline System would deliver hydrogen at a cost of $5.50/kg (Alternatives Study at 86).

a. Did SoCalGas consider revisiting the draft Demand Study with variations to this hydrogen cost assumption that would encompass this $5.50/kg value?
b. What would be the anticipated impact on demand if the $5.50/kg of hydrogen were used in place of the fuel cost parity assumption?
    i. Provide updated Total Cost of Ownership ("TCO") values for the Commercial Availability adoption factor for the Mobility Sector, updated Hydrogen Adoption Rates as shown in Figure 3 of the Technical Appendix, and an updated demand from the Mobility Sector across the Conservative, Moderate, and Ambitious scenarios.
    ii. Provide updated projected hydrogen turbine capacity as shown in Figure 9 of the Technical Appendix and updated demand from the Power Sector across the Conservative, Moderate, and Ambitious scenarios.
    iii. Provide a description of how technology costs were considered as a part of the Industrial Sector analysis for hydrogen adoption, as well as a description of how hydrogen fuel costs would impact the projected demand from the industrial sector.

RESPONSE 12:

SoCalGas objects to this request as argumentative. Subject to and without waiving the foregoing objection, SoCalGas responds as follows.

12a. No, the demand analysis incorporated simplifying assumptions for the purpose of meeting the study objectives at a feasibility level. During the development of the Demand Study SoCalGas presented the draft description of the scope of work for PAG and CBOSG feedback. As discussed in Section 1.4.3 of the final Demand Study,[16] the forecasted cost of clean renewable hydrogen was not factored into the potential demand analysis in order to understand the total potential of hydrogen as a fuel in the SoCalGas territory. The forecasted cost of clean renewable hydrogen is an important factor in projecting adoption and will need to be assessed in Phase 2 of Angeles Link. Although analysis and forecasts of delivered levelized cost of hydrogen (LCOH) were outside the scope of this Demand Study, the LCOH analysis was evaluated in the Cost Effectiveness Study and may be further refined in future Angeles Link phases.

SoCalGas objects to this request under Rule 10.1 of the Commission's Rules of Practice and Procedure to the extent it seeks the production of information that is neither relevant to the subject matter involved in the pending proceeding nor is likely reasonably calculated to lead to the discovery

[16] Angeles Link Demand Study, Section 1.4.3 at 21-22 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Demand-Study.pdf

of admissible evidence. Subject to and without waiving the foregoing objection, SoCalGas responds as follows.

12b. SoCalGas will utilize updated forecasts of clean renewable hydrogen costs to refine the demand impacts in future phases.

QUESTION 13: In the Alternatives Study, SoCalGas states, "For the cement sector analysis, the capital costs associated with hydrogen kiln retrofits and CO2 capture equipment were not considered, nor were the costs of incremental energy to power the capture equipment" (Alternatives Study at 94).

a. Describe the rationale for why these costs were not considered in the Alternatives Study, Cost-Effectiveness Analysis or the Demand Study.

RESPONSE 13:

As discussed in the Cost Effectiveness Study Final Report,[17] the cost effectiveness analysis focused exclusively on the fuel costs (as a cost metric for comparisons) associated with operating the equipment and does not consider the capital costs of equipment replacement or other non-fuel operating costs other than an assumed CO2 transport and sequestration tariff added to fuel costs for the CCS alternative.

A direct comparison of fuel costs on a $/MMBtu basis was performed, with sensitivity ranges added to reflect the range of uncertainty in the cost of fuel and the cost of carbon transport and sequestration.

[17] Angeles Link Cost Effectiveness Study, Section 4.2.2.2 at 65-66 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-High-Level-Economic-Analysis-&-Cost-Effectiveness.pdf.

QUESTION 14: Appendix B of the Angeles Link Phase 1 Production Planning & Assessment Final Report ("Production Study") describes that there is "uncertainty in the commercial application of depleted oil and gas reservoirs for [underground hydrogen storage]" and that "there are currently no permitted examples of UHS in depleted reservoirs, and engineering and geological requirements for UHS are currently not defined" (Production Study at 95 and 100). Depleted Oil and Gas fields comprised of 296 of the 304 underground storage options evaluated for the project, with a significant majority of receiving composite adequacy values of less than 50% (Production Study at 117).

a. Did SoCalGas consider a sensitivity analysis within the Cost Effectiveness and Alternatives Studies for which the Angeles Link project would be serviced by aboveground storage rather than underground storage?
b. What would the difference in hydrogen delivery costs be if the Angeles Link were serviced by aboveground storage?

RESPONSE 14:

14a. No, however, as stated in the note for Figure 2 in the Cost Effectiveness Study,[18] "For Angeles Link and the trucking alternatives (gaseous and liquid), identified routes allowed for access to underground storage sites, therefore, underground storage costs were assumed. Above ground hydrogen storage could be potentially used in the initial phases of demand growth for hydrogen, particularly at a smaller scale. As the hydrogen economy matures and scales over the long term, commercially advanced underground options may provide dependable large-scale hydrogen storage solutions. Even if above ground storage costs were the main medium of storage, Angeles Link remains the lowest cost option when evaluated against the hydrogen delivery alternative options."

14b. SoCalGas objects to this request under Rule 10.1 of the Commission's Rules of Practice and Procedure to the extent it seeks the production of information that is neither relevant to the subject matter involved in the pending proceeding nor is likely reasonably calculated to lead to the discovery of admissible evidence. Subject to and without waiving the foregoing objection, SoCalGas responds as follows.

The difference in hydrogen delivery costs for Angeles Link when using above-ground storage can be estimated using the cost data in Table 4 of the Cost Effectiveness Study[19]. For the cost-effectiveness analysis, underground storage was assumed for Angeles Link and trucking alternatives, while all other hydrogen delivery options in Table 4 were assumed to use above-ground storage. The difference in hydrogen delivery costs can be found by replacing underground storage cost for Angeles Link ($\$0.28/kgH_2$) with above-ground storage costs $\$1.65/kgH_2$ or $\$2.31/kgH_2$ as estimated for liquid hydrogen or methanol shipping alternatives, respectively.

[18] Angeles Link Cost Effectiveness Study, Section 1.3.1 Figure 2 at 16-17 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-High-Level-Economic-Analysis-&-Cost-Effectiveness.pdf.

[19] Angeles Link Cost Effectiveness Study, Section 4.1.1 Table 4 at 38 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-High-Level-Economic-Analysis-&-Cost-Effectiveness.pdf.

QUESTION 15: Since the filing of A.25-06-011, has SoCalGas considered how the Department of Energy's decision to eliminate the $1.2 billion in federal funding to the Alliance for Renewable Clean Hydrogen Energy Systems ("ARCHES")[2] and ARCHES subsequent decision to pause hydrogen hub activities in California[3] might impact the viability of an Angeles Link Pipeline System, the total cost of the project, projected hydrogen production, and projected demand for hydrogen in the state?

FN 2: ARCHES. October 1, 2025. "ARCHES CEO Angelina Galiteva on DOE's decision to cut federal funding for California hydrogen hub." https://archesh2.org/arches-ceo-angelina-galiteva-on-does-decision-to-cut-federal-funding-for-california-hydrogen-hub/

FN 3: ARCHES. November 4, 2025. "California Pauses Hydrogen Hub Activities Amid Federal Funding Changes." https://archesh2.org/california-pauses-hydrogen-hub-activities-amid-federal-funding-changes/

RESPONSE 15:

SoCalGas objects to this request under Rule 10.1 of the Commission's Rules of Practice and Procedure to the extent it seeks the production of information that is neither relevant to the subject matter involved in the pending proceeding nor is likely reasonably calculated to lead to the discovery of admissible evidence. Subject to and without waiving the foregoing objection, SoCalGas responds as follows.

If SoCalGas is authorized to proceed to Angeles Link Phase 2 as proposed, SoCalGas plans to build upon the information developed during Angeles Link Phase 1 and consider new information pertaining to the development of clean renewable hydrogen. The State's position[20] is that hydrogen is an important component in advancing California's decarbonization goals while supporting the long-term reliability of our integrated energy system. Angeles Link is instrumental to scaling a hydrogen economy in California and could help decarbonize hard-to-electrify sectors, strengthen grid reliability, and support thousands of well-paying jobs for skilled workers.

[20] Governor Newsom statement on Trump administration's decision to cut hydrogen hub funding, accessible at: https://www.gov.ca.gov/2025/10/01/governor-newsom-statement-on-trump-administrations-decision-to-cut-hydrogen-hub-funding/

QUESTION 16: Did SoCalGas consider the profitability of hydrogen production facilities in the Production Planning and Assessment Study ("Production Study")?

RESPONSE 16:

Yes. As discussed in the Production Study, profitability to third-party producers was considered as part of Estimated Project Cost (EPC).[21]

[21] Angeles Link Phase 1 Production Study, Section 11.2 (first bullet point) at 63 available at https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Production-Planning-&-Assessment.pdf.

QUESTION 17: SoCalGas cites that "North America is expected to expand its electrolyzer production capacity from 550 MW (2022) to an estimated 2 GW by 2030" (Production Study at 24).

a. What total electrolysis capacity is needed for this project?
b. When would construction for these electrolyzer facilities need to begin to align with the Angeles Link timelines?
c. Did SoCalGas consider potential competing demands for hydrogen electrolysis capacity buildout, such as other national Hydrogen Hubs initiatives, when evaluating if the production demand for the Angeles Link project could be met within project timelines?

RESPONSE 17:

SoCalGas objects to this request under Rule 10.1 of the Commission's Rules of Practice and Procedure to the extent it seeks the production of information that is neither relevant to the subject matter involved in the pending proceeding nor is likely reasonably calculated to lead to the discovery of admissible evidence. Subject to and without waiving the foregoing objection, SoCalGas responds as follows.

17a. As stated in Table 11.1 of the Production Study, approximately 27 GW of electrolyzer capacity is needed to support 1.5 MMTPY of clean hydrogen production.[22]

17b. As stated in Figure 5 of the Cost Effectiveness Study, hydrogen production is assumed to begin in 2030.[23]

17c. SoCalGas conducted analysis within the state's geographical boundaries and did not consider the potential competing demands for hydrogen electrolysis capacity buildout, such as other national Hydrogen Hubs initiatives.

[22] Angeles Link Phase 1 Production Study, Table 11.1 at 64 available at https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Production-Planning-&-Assessment.pdf.

[23] Angeles Link Phase 1 Cost Effectiveness Study, Figure 5 at 36, available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-High-Level-Economic-Analysis-&-Cost-Effectiveness.pdf.

QUESTION 18: SoCalGas cites that "After considering existing uses of woody biomass in the state of California, the remaining available amount is estimated to be 14.3 million bone dry tons per year (MBTDT/year)" (Production Study at 27). However, the listed citation is a 2013 projection from the California Biomass Consortium.

a. How do more recent estimates of biomass availability in the state compare to this evaluation?
b. Did SoCalGas consider the potential impact of other statewide planning initiatives, such as CARB's Natural Working Lands initiative, on future biomass availability in the state?

RESPONSE 18:

18a. While no recent study was found that replicates the exact methodology of the 2013 California Biomass Collaborative for estimating available woody biomass, more recently published statewide biomass assessments indicate higher total woody and biomass resource volumes than the 14.3 million bone-dry tons per year estimate published by the California Biomass Consortium in 2013. For example, the California Energy Commission (CEC) reports an overall statewide biomass resource potential of approximately 47 million bone-dry tons per year[24] across forest, agricultural, and urban biomass categories, while a 2023 UC Davis research summary similarly cites statewide biomass resources of up to roughly 54 million dry tons annually[25], including all feedstock types. In addition, the 2022 GO-Biz[26]Interagency Biomass Market Development Framework estimates that California generates approximately 29 million bone-dry tons per year of woody feedstock from forests, farms, and orchards, though less than 20 percent of this material is currently aggregated for commercial use.

18b. No. SoCalGas did not consider the potential impacts of other statewide planning initiatives, such as CARB's Natural Working Lands initiative. During the development of the Production Study SoCalGas presented the draft description of the scope of work and technical approach for PAG and CBOSG feedback.

24 https://www.energy.ca.gov/data-reports/california-power-generation-and-power-sources/bioenergy/biomass-energy-california

25 https://www.ucdavis.edu/climate/news/researchers-examine-good-and-bad-uses-biomass-california

26 https://business.ca.gov/wp-content/uploads/2022/02/GO-Biz-Interagency-Biomass-Market-Development-Framework.pdf

QUESTION 19: Figure 6.4 of the Production Study provides a relative scale of the LCOH between different solar and battery storage combinations, identifying the lowest LCOH to be a 375 MW solar facility with no storage, as shown in Table 6.3 (Production Study at 41). According to Table 9.1, the annual hydrogen production per facility is 11,400 tons per year ("tpy") (Production Study at 54).

a. How many total solar-only facilities would be needed to meet the modeled production demand given seasonal variations in demand and the usage of hydrogen storage, as outlined in Sections 8 and 9 of the Production Study?
b. How many facilities would be needed if the lowest LCOH solar + BESS facility option was selected instead (1,000 MW solar + 400 MW storage, per Table 6.3)?
c. How do these numbers change under lower Angeles Link production volume estimates (e.g., 0.5 Mtpy or lower)?

RESPONSE 19:

SoCalGas objects to this request under Rule 10.1 of the Commission's Rules of Practice and Procedure to the extent it seeks the production of information that is neither relevant to the subject matter involved in the pending proceeding nor is likely reasonably calculated to lead to the discovery of admissible evidence. Subject to and without waiving the foregoing objection, SoCalGas responds as follows.

19a. Based on data provided in Table 9.1 of the Production Study[27], 1.5 MMTPY, 1.0 MMTPY, and 0.5 MMTPY of clean renewable hydrogen throughput requires approximately 132, 88, and 44 third party production facilities, respectively.

19b. If the lowest LCOH configuration with solar plus battery storage (1,000 MWdc solar and 400 MW BESS per Table 6.3 of the Production Study[28]) were selected instead of the solar-only option, the number of facilities required would decrease significantly because battery storage improves electrolyzer utilization. The solar-only case operates at about 36% utilization (see Table 9.1), producing roughly 11,400 tpy per facility based on a maximum design throughput of 3.6 tonnes per hour (tph). Adding BESS raises the utilization factor to approximately between 60% and 80%, as indicated by Figure 6.3[29], which means annual output could range from about 19,000 to 25,000 tpy per facility. To meet a 1.5 MMTPY throughput target, this translates to roughly 60–80 facilities, compared to about 132 facilities for the solar-only case.

19c. Please see Responses 19a and 19b.

---

27 Angeles Link Phase 1 Production Study, Table 9.1 at 54-55 available at https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Production-Planning-&-Assessment.pdf.

28 Angeles Link Phase 1 Production Study, Table 6.3 at 41 available at https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Production-Planning-&-Assessment.pdf.

29 Angeles Link Phase 1 Production Study, Figure 6.3 at 40 available at https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Production-Planning-&-Assessment.pdf.

QUESTION 20: In the Production Study, the Mobility Sector hydrogen demand is assumed to match gasoline retail fuel sales trends (Production Study at 44).

a. When evaluating fuels sales trends, did SoCalGas utilize total gasoline fuel sales in the state or in SoCalGas's service territory? Did SoCalGas evaluate the fuel sales specific to the vehicle classes identified in the Demand Study to be viable to transition to hydrogen?
b. Did SoCalGas evaluate trends in diesel or natural gas fuel sales, considering that heavy-duty vehicles are primarily fueled by diesel or natural gas as opposed to gasoline?

RESPONSE 20:

20a. SoCalGas evaluated fuel sales volumes based on its service territory.[30] Hydrogen fuel consumption rates were determined by modelling the hydrogen equivalent of current diesel or gasoline consumption. For most applications such as on-road, off-road, and marine, the vast majority of fuel consumption is diesel, so the hydrogen equivalent to diesel consumption was calculated. If a vehicle listed both diesel and gasoline consumption, generally the diesel equivalent figures were used.[31]

20b. No, SoCalGas evaluated sales volumes and not sales trends. Please see Response 20a.

[30] Angeles Link Phase 1 Demand Study Technical Appendix, Mobility Methodology at 11, available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Demand-Study-Technical-Appendix.pdf.

[31] Angeles Link Phase 1 Demand Study Technical Appendix, Hydrogen Fuel Consumption Rates at 25, available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Demand-Study-Technical-Appendix.pdf.

QUESTION 21: SoCalGas's Production Land Assessment "does not consider existing structures and buildings not identified in the source filter, contiguous land areas of minimum size adequate for large scale production, population densities, state and local zoning and land use ordinances, land purchase values, and other technical, environmental, or economic constraints which may further prohibit renewable energy and/or hydrogen production development" (Production Study at 61-62).

a. Explain SoCalGas's rationale for the exclusion of these factors, particularly the land purchase values.
b. Does SoCalGas expect land purchase value to have a substantive impact on the cost of hydrogen production estimated in the Production Study?
c. What is the current land purchase value ($/acre) for parcels within San Joaquin Valley, Lancaster, and Blythe?
    i. What is the average land cost expected per facility given those purchase values for both the solar and solar + BESS facility options?

RESPONSE 21:

21a. The Production Study Phase 1 Land Assessment was based on conceptual analysis and high-level review of federal, state, and local jurisdictional lands.[32] The Phase 1 feasibility assessment scope was limited to desktop screening focused on SoCalGas's service territory to identify land areas suitable for hydrogen production.[33] The assessment did not include land purchase values, as such estimates would require site-specific data beyond the scope of Phase 1. During the development of the Production Study SoCalGas presented the draft description of the scope of work for PAG and CBOSG feedback.

21b. Land costs could vary depending on whether the land is purchased or leased and are heavily influenced by site-specific factors that were not defined during the desktop screening analysis of the Production Study. Various factors such as land surveys, water rights, proximity to transmission infrastructure, environmental and permitting risks, and broader market dynamics can all impact the final cost of securing and developing a project site.

21c. Please refer to Response 21a.

[32] Angeles Link Phase I Studies Consolidated Report, Section 4 at 13 available: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Consolidated-Report.pdf.

[33] Angeles Link Phase I Production Study, Section 10.2 at 58 available at https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Production-Planning-&-Assessment.pdf.

QUESTION 22: SoCalGas's Hydrogen Production Cost Estimates (Section 11) exclude hydrogen compression and onsite storage costs, water infrastructure and delivery to site, owner's costs (e.g., project development, permitting, staffing, owner's engineering, legal) and land costs among other exclusions. (Production Study at 63).

a. Explain SoCalGas's rationale for the exclusion of these factors.
b. Does SoCalGas expect these factors to have a substantive impact on the cost of hydrogen production estimated in the Production Study?

RESPONSE 22:

22a. The Production Study assessment includes an Association for the Advancement of Cost Engineering (AACE) Class V cost estimate that included factors that could be evaluated at the feasibility stage given the limitations of the study. For purposes of Phase 1 feasibility analysis, compression, storage, and volumetric water consumption costs for hydrogen production were considered as part of the LCOH calculation in the Cost Effectiveness Study.

During the development of the Production Study SoCalGas presented the draft description of the scope of work for PAG and CBOSG feedback.

22b. SoCalGas does not expect the balance of plant costs that were not considered in the Cost Effectiveness Study to have substantive impact. For land costs associated with third party production, please see response to question 21 above.

QUESTION 23: SoCalGas assumes that the annual operating expenses for third-party hydrogen producers are 0.7% of capital costs. (Production Study at 63-64).

a. Provide justification for this assumption.
b. Does SoCalGas anticipate annual operating costs to scale proportionally if the cost estimate exclusions listed in Section 11.3 were included in the facility capital costs?

RESPONSE 23:

23a. As noted in the Production Study, in collaboration with the third-party consultant, the estimated cost included capital costs of approximately $2,600/kW and operating costs of approximately $18/kW annually for the electrolyzer facility to develop an annual operating expense of 0.7% of capital for third-party hydrogen producers.[34] For further information, please refer to Section 11.1 - Cost Estimate Methodology – showing how costs were developed using information from electrolyzer technology providers with consultant in-house expertise.

23b. Operational expenses for third-party production could be influenced by a range of variable and asset-specific factors. Different equipment types within a production facility could incur distinct operational, maintenance, and replacement costs over time. In addition, site-specific attributes such as electricity prices, demand charges, water availability, and local labor conditions can influence total operational expenses independently.

[34] Angeles Link Phase I Production Study, Section 11.4 at 63 available at: https://www.socalgas.com/sites/default/files/alproject/Angeles-Link-Phase-1-Final-Production-Planning-&-Assessment.pdf.