SOUTHERN CALIFORNIA GAS COMPANY

AUTHORITY TO ESTABLISH A MEMORANDUM ACCOUNT FOR THE ANGELES LINK PROJECT

(A.22-02-007)

(DATA REQUEST FROM PUBLIC ADVOCATES – PAO-1)
Date Received: April 7, 2022; Date Responded: April 21, 2022

Introductory Statement:

As described in the Memorandum Account Application, the Angeles Link project is in its earliest planning stages. Details about the Project will be developed as part of the planning process described in the Memorandum Account Application. Specifically, SoCalGas intends to conduct phased activities to facilitate Project study and development. SoCalGas would commence with refined supply, demand, pipeline configuration, and storage analyses to support a pre-FEED (front end engineering and design) analysis for options for the green hydrogen transport system ("Phase 1"). As preliminary results of Phase 1 are reviewed, SoCalGas may move forward with design, engineering, and environmental studies for the preferred pipeline system, including a FEED study ("Phase 2"). SoCalGas would then use the materials generated in Phase 2 to prepare necessary permit applications, including an application to the Commission ("Phase 3"). Accordingly, not all details about the Project requested in this Data Request have been developed at this time.

SoCalGas acknowledges that the Data Request instructions and Question 1 request that SoCalGas provide responses on an ongoing basis. SoCalGas objects to the Data Request to the extent that it seeks continuing responses.

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QUESTION 1:

Provide any discovery responses that SoCalGas sends to other parties to A.22-02-007 to Cal Advocates on an ongoing basis.

RESPONSE 1:

SoCalGas has not sent discovery responses to any other parties to A.22-02-007 as of the date of tendering this data request response. All discovery in this proceeding will be available on SoCalGas's public website at www.socalgas.com/regulatory/angeleslink unless otherwise subject to a protective or confidentiality order or non-disclosure agreement.

QUESTION 2:

SoCalGas states it estimates Phase 1 to cost $26 million and last 12-18 months, phase 2 to cost $92 million and last 18-24 months, and Phase 3 to cost hundreds of millions of dollars and last 18-30 months (Application, pp. 24, 27, and 28).

a. Provide a detailed breakdown of all components of estimated costs for each Phase, including any workpapers and supporting information.

b. Provide any workpapers and supporting information explaining the estimated duration of each Phase.

RESPONSE 2:

a. Workpapers and supporting information are attached to this response, and include the following files:
   - Basis of Estimate
   - Estimate by Phase
   - Level 0 Schedule and Associated Annual Cash Flow for Phase 1 and Phase 2

   SoCalGas provides the following detailed breakdown of all components of estimated costs for each Phase.

   Angeles Link is comprised, at a minimum, of four unique components: production planning, compression, system storage, and transmission pipeline. Each of these has unique preliminary engineering design and project planning activities.

   SoCalGas analyzed actual and estimated costs for compressor stations and pipeline projects completed within the last seven years, with actual costs broken down by percentage for each of the following categories:
   - Engineering Design Contractor
   - Company Labor
   - SCG Contractor
   - Environmental
   - Land/Rights-of-Way (ROW)

Contingency and loaders were then applied as a percentage to the above direct cost categories, as follows:

- Contingency set to 20% for each Phase to accommodate cost for execution of undefined Project scope.
- Company loaders have been set to 35% for each Phase and include Allowance for Funds Used During Construction (AFUDC), Property Tax, and Company labor indirect costs.

The **Phase 1** scope of work, as described in the Memorandum Account Application, includes the development of a Basis of Design which consists of several activities including, but not limited to, an evaluation of supply and demand, and other project activities that influence the Basis of Design. Given the early stage of this project, SoCalGas applied a Rough Order of Magnitude (ROM) level of effort and cost, based on the judgement of experienced personnel, to these activities. The estimate for Phase 1 pre-Front End Engineering Design (FEED) design scope and feasibility analysis include the following components, which will be further refined during Phase 1:

Assessment of Hydrogen Production Potential
Assessment of hydrogen production potential is based on assumed full time equivalent (FTE) resources for the duration of Phase 1.

Transmission Pipeline
Project components for pipeline pre-FEED design are based on previous pipeline projects conducted by SoCalGas within the last seven years.

System Storage
Project components for storage pre-FEED design is based on assumed FTE resources for the duration of Phase 1.

Compression
Project components for compression pre-FEED design is based on historical actuals and estimated costs from previous compressor projects conducted by SoCalGas in the last seven years.

Phase 1 Supplemental Cost
An additional $1.7M was budgeted as a direct cost to account for supplemental Outside Counsel and Outreach activities anticipated to occur during Phase 1. This support is expected to be provided by third-party contractor(s) and is included in the SoCalGas Contractor portion of the Phase 1 cost estimate.

The **Phase 2** scope of work**,** as described in the Memorandum Account Application, would develop a preferred project option and advance engineering design to approximately 30%. It is assumed that by Phase 2, a third-party developer unaffiliated with SoCalGas will be responsible for designing and implementing hydrogen production project(s) (which is outside the scope of SoCalGas's proposal), and therefore that component is not included in the Phase 2 cost estimate. Phase 2 will focus on FEED for the point of receipt, compression, system storage, and transmission pipeline. The estimate for Phase 2 includes the following FEED components:

Transmission Pipeline
Project components for pipeline FEED design are based on previous pipeline projects conducted by SoCalGas within the last seven years. A scaled ratio was applied to accommodate engineering design to approximately 30%, possible routes the Angeles Link transmission pipeline, pipeline materials and other factors which will be further evaluated and refined during Phase 1 and Phase 2 activities.

System Storage
Recent FEED actual costs for complex facility compressor projects were utilized as a basis for determining the FEED cost for System Storage. The estimated cost was scaled upward to accommodate the potential for multiple System Storage facilities located along the Angeles Link transmission pipeline. System storage will be further evaluated and refined during Phase 1 and Phase 2 activities.

Compression
Recent FEED actual costs for complex facility compressor projects were utilized as a basis for determining the FEED cost for Production Compression and Intermediate Compression. System compression will be further evaluated and refined during Phase 1 and Phase 2 activities.

The **Phase 3** scope of work, as described in the Memorandum Account Application, will advance engineering design to a level of detail appropriate to inform a Certificate of Public Convenience and Necessity (CPCN) application. Phase 3 would build off of the deliverables and information generated in Phase 2. Thus, the Phase 3 cost estimate will be developed when the pipeline system length and complexity are more defined following the completion of Phases 1 and 2.

Notwithstanding, SoCalGas developed a very preliminary ROM cost estimate for Phase 3 based on an understanding that detailed engineering (FEED completion to "Issued for Construction," or "IFC" design drawings) may be estimated at 6X FEED costs. Since Phase 3 will only advance engineering design to approximately 60% design for the transmission pipeline, and to a lesser design completion percentage for the compressor and system storage components, and not to IFC, this ROM cost estimate was factored down by 50%. As noted in the Memorandum Account Application, however, the extent of the costs in Phase 3 would depend on the length and complexity of the identified preferred option for the project, and the Phase 3 cost estimate will need to be subsequently updated.

b. The estimated duration of each Phase is estimated based on the judgment of experienced personnel with a basis of actual design duration on compressor station and pipeline projects SoCalGas has executed within the last seven years. The duration of each Phase was scaled upward by approximately 50% to accommodate the inherent complexity of the Angeles Link project and additional time for outreach and regulatory updates.

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QUESTION 3:

SoCalGas claims that the Angeles Link Project will support the "state's objective of closing Aliso Canyon while preserving energy reliability and affordability" (Application, p. 30).

a. Provide any supporting documentation or analysis demonstrating how the Angeles Link Project will act as a replacement to Aliso Canyon to meet the LA Basin's reliability needs and requirements.

b. Provide any Commission decision or authority, or any other regulatory document showing that the Angeles Link Project is needed to address a closure of Aliso Canyon.

c. Provide any supporting documentation or analysis demonstrating how the Angeles Link project will preserve affordability.

RESPONSE 3:

a. SoCalGas notes that the request misstates SoCalGas's Memorandum Account Application, which does not claim the Angeles Link Project will act as a complete replacement to Aliso Canyon to meet the LA Basin's reliability needs and requirements. Rather, as described in the Memorandum Account Application (p. 30), the Angeles Link Project would support (along with other clean energy projects and reliability efforts, such as those being studied in the SB 380 Proceeding) the State's objective of closing Aliso Canyon while preserving energy reliability and affordability.

   SoCalGas would assess the feasibility of certain project designs in Phases 1 and 2 in order to inform a CPCN application for a specific Angeles Link project as part of Phase 3. Analysis demonstrating how the Angeles Link Project will support the LA Basin's reliability needs and requirements will occur during project development in Phases 1 through 3. Additionally, please see response 3(b).

b. SoCalGas notes that SoCalGas's Memorandum Account Application does not claim the Angeles Link Project specifically has been identified by the Commission or a regulatory authority as needed to address a closure of Aliso Canyon. Nevertheless, several regulatory documents indicate and discuss that, without Aliso Canyon, there is

a forecasted energy shortfall that must be met to meet reliability requirements. Angeles Link provides a potential infrastructure pathway to address this shortfall and facilitate supporting the state's goal of ultimately closing Aliso Canyon while preserving energy reliability and affordability by delivering green hydrogen that, among other end-uses, would serve as an alternative to and reduce demand for natural gas. See, for example:

- https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/natural-gas/aliso-canyon/i_1702002_phase2modelingreport_3-8-21_unredacted.pdf
- https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/natural-gas/aliso-canyon/summaryphase2modelingreports-onepager_2021-01-26.pdf
- https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/natural-gas/aliso-canyon/fti-aliso-canyon-i1702002-phase-3-report.pdf
- https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/natural-gas/aliso-canyon/summary-of-phase-3-report.pdf
- https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/natural-gas/aliso-canyon/aliso-canyon-2027-and-2035-shortfall-memo-revised.pdf
- https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/natural-gas/aliso-canyon/aliso-canyon-2027-and-2035-shortfall-memo.pdf
- https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M449/K511/449511926.PDF

c. Analysis of the impact of the Angeles Link Project on affordability will occur during Phases 1 through 3. As provided in the Memorandum Account Application, "To further the vision of a broad hydrogen economy in the Los Angeles Basin, the HyDeal Los Angeles initiative, which SoCalGas has joined, aims to achieve at-scale green hydrogen procurement at $1.50/kilogram in the Basin by 2030." (Memorandum Account Application at 18, internal citations omitted). Development of Angeles Link could facilitate such at-scale green hydrogen delivery.

In addition, the U.S. Department of Energy has announced the Energy Earthshot – Hydrogen Shot, which seeks to reduce the cost of clean hydrogen to $1/kilogram in one decade. See DOE Press Release (June 7, 2021), available at https://www.energy.gov/articles/secretary-granholm-launches-hydrogen-energy-earthshot-accelerate-breakthroughs-toward-net.

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QUESTION 4:

Provide any presentations given to shareholders regarding the Angeles Link Project.

RESPONSE 4:

SoCalGas understands the term “shareholders,” as used in the above question, to mean persons or entities owning shares of common stock in Sempra Energy (SRE), SoCalGas’s corporate parent, and otherwise not an employee or officer of either SoCalGas or Sempra Energy. Using this definition, no presentations have been given to shareholders regarding the Angeles Link Project.

QUESTION 5:

Provide the technical specifications of the Angeles Link Project and how it will be operated. Where exact specifications are not known, provide the estimates, ranges or alternatives being used for planning. Include any inputs, assumptions, and methodologies (such as equations used) on which calculations and analysis are based. Please include the following in your response:

a. Pipeline Construction
   i. Pipe material
   ii. Pipe wall thickness
   iii. Maximum Allowable Operating Pressure
   iv. Pipe Internal Roughness
   v. Total length of pipeline
   vi. Pipe Internal diameter(s)

b. Pipeline Operations
   i. Pressure leaving hydrogen production station
   ii. Pressure leaving compressor station
   iii. Delivery pressure (end use)
   iv. Flow rate (please specify units, including higher or lower heating value if expressed as energy flow, and standard conditions definition if expressed as volumetric flow rate at standard conditions)
   v. Temperature range
   vi. Will the pipeline be underground?

c. Assumptions/ properties used in calculations
   i. Hydrogen viscosity
   ii. Hydrogen compressibility
   iii. Hydrogen Higher- and Lower Heating Values
   iv. Pressure loss equations

d. Compressors
   i. Type of compressors used
   ii. Compressor station spacing
   iii. Compressor head rise

RESPONSE 5:

As described in the Memorandum Account Application, preliminary engineering for the Angeles Link Project will be conducted during Phases 1 and 2. Nonetheless, SoCalGas provides its present thinking about conceptual design criteria in the requested categories, to the extent they have been contemplated to date. SoCalGas will supplement this response with estimates, ranges, or alternatives to be used for Phase 1 planning.

a. Pipeline Construction

i. Pipe material

Pipe material will adhere to strength requirements for a given system design set forth by the American Society of Mechanical Engineers (ASME) B31.12 Standard on Hydrogen Piping and Pipelines.

Tables IX-5A, IX-5B, and IX-5C from ASME B31.12 - Hydrogen Piping & Pipelines | Digital Book - ASME provide information on the design of carbon steel, alloy piping, and pipeline systems.

ii. Pipe wall thickness

The following table summarizes typical pipe wall thickness at 1500 PSI Maximum Allowable Operating Pressure (MAOP) using X-65 grade piping. Pipe wall thickness is presently estimated to follow ASME B31.12 and depend on pipe grade, MAOP, flange rating, and other design factors. Nominal Pipe Size (NPS) diameter may vary by system to meet flow demand requirements to be defined in future Phases of the project.

Pipe Selection Table (ASME B31.12)				
Pipe Wall Thickness Selection Table for 1500 PSI MAOP, X-65 Pipe				
NPS	Class 1	Class 2	Class 3	Class 4
16	0.344	0.406	0.500	0.625
20	0.438	0.500	0.625	0.750
24	0.500	0.625	0.719	0.906
30	0.625	0.750	0.906	1.125
36	0.750	0.906	1.094	1.344
42	0.875	1.063	1.250	1.563

iii. Maximum Allowable Operating Pressure

The Maximum Allowable Operating Pressure is a function of pipeline design and considers end-use demand, pipeline length and diameter, and other pipeline characteristics that will be evaluated during Phases 1 through 3. Present estimates of MAOP range from 750 – 1500 PSI.

iv. Pipe Internal Roughness v. Total length of pipeline

Pipe internal roughness is a function of pipeline design that will be evaluated during Phases 1 through 3. Transmission pipeline length will depend on the production location, end user locations, and system storage location(s). These considerations will be assessed as part of Phases 1 through 3. Present estimates of internal roughness are approximately 0.0018".

vi. Pipe Internal diameter(s)

The Internal Diameter (ID) of pipe will depend on the NPS and pipe class less wall thickness.

b. Pipeline Operations

i. Pressure leaving hydrogen production station

Pressure will be determined based on the discharge specification of the electrolyzer units and will be evaluated during Phases 1 through 3. Present estimates of pressure are up to 1400 psig.

ii. Pressure leaving compressor station

Pressure leaving the compressor station is a function of pipeline and compressor facility design that will be evaluated during Phases 1 through 3. Present estimates of pressure leaving the compressor station range from 1200-1300 psig.

iii. Delivery pressure (end use)

Delivery pressure is a function of pipeline design and end-use demand that will be determined during Phases 1 through 3. Present estimates of delivery pressure are approximately 400 psig.

iv. Flow rate (please specify units, including higher or lower heating value if expressed as energy flow, and standard conditions definition if expressed as volumetric flow rate at standard conditions)

Flow rate will depend on demand, among other factors, and will be evaluated during Phases 1 through 3.

v. Temperature range

The temperature range will be evaluated during Phases 1 through 3. Present estimates of temperature range from 140 degrees F for design temperature and 100-120 F for delivery temperature.

vi. Will the pipeline be underground?

The transmission pipeline routing and location will be evaluated during Phase 1 and Phase 2, but SoCalGas currently anticipates that transmission pipelines will be installed underground except where geographic circumstances may prevent underground installation, such as bridges and spans, and where aboveground facilities, such as compressor stations, system storage, and valve stations are located..

c. Assumptions/ properties used in calculations

i. Hydrogen viscosity

The Benedict-Webb-Rubin Equation of State may be used to model pure hydrogen with a base viscosity of 0.0084 centipoise.

ii. Hydrogen compressibility

From Hydrogen Tools Home | Hydrogen Tools (h2tools.org):

Hydrogen Analysis Resource Center: ***Hydrogen Compressibility Z at Different Temperatures (°F) and Pressures (psia)***

Temp (°F)	Pressure (psia) 5	50	100	500	1000	2000
-250	1.0001	1.0008	1.0017	1.0126	1.0373	1.1179
-200	1.0002	1.0019	1.0038	1.0213	1.0485	1.1188
-150	1.0002	1.0022	1.0045	1.0238	1.0508	1.1139
-100	1.0002	1.0023	1.0047	1.0240	1.0499	1.1071
-50	1.0002	1.0023	1.0046	1.0233	1.0477	1.0999
-10	1.0002	1.0022	1.0044	1.0224	1.0457	1.0945
0	1.0002	1.0022	1.0044	1.0222	1.0451	1.0931
10	1.0002	1.0022	1.0043	1.0220	1.0446	1.0918
50	1.0002	1.0021	1.0042	1.0210	1.0425	1.0868
100	1.0002	1.0020	1.0039	1.0198	1.0400	1.0811
150	1.0002	1.0019	1.0037	1.0187	1.0376	1.0759
200	1.0002	1.0018	1.0035	1.0176	1.0354	1.0712
250	1.0002	1.0017	1.0033	1.0166	1.0334	1.0670

iii. Hydrogen Higher- and Lower Heating Values

From Hydrogen Tools Home | Hydrogen Tools (h2tools.org):
LHV = 290 BTU/ft3
HHV = 343 BTU/ft3

iv. Pressure loss equations

The Colebrook-White Equation may be used to calculate friction loss for each pipeline segment.

Synergi Pipeline Simulator version 10.7 (Pipeline simulator and surge analysis software - Synergi Pipeline Simulator - DNV) may be used to model and simulate each pipeline network.

d. Compressors

i. Type of compressors used

SoCalGas presently anticipates that electric motor driven reciprocating compressors may be used. This will be evaluated during Phases 1 through 3.

ii. Compressor station spacing

Compressor station spacing will be evaluated during Phases 1 through 3 and would depend, generally, on system capacity, production locations, and pipeline routing.

iii. Compressor head rise

Compressor design will be evaluated in Phases 1 through 3. We understand compressor head rise to mean minimum suction pressure to maximum discharge pressure. Present estimates of minimum suction range from 400 - 800 PSI with 1200 - 1300 PSI discharge at compression site(s).

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QUESTION 6:

Will there be any purity requirements set for the hydrogen being transported in Angeles Link? Specifically, but not limited to:

a. Is there a limit on the number of contaminants?
b. Will the hydrogen be required to be at a purity level suitable for fuel cells?
c. Will any liquid or condensate be expected and/or allowed in the pipeline?

RESPONSE 6:

a. Gas quality specifications are generally developed separately from the necessary transportation infrastructure, and are subject to change from time to time. SoCalGas did not propose any purity requirements in the Memorandum Account Application, including a limit on the number of contaminants, but may develop such requirements in the future as a part of the planning process and in consultation with regulators and potential customers and producers.

b. Gas quality specifications are generally developed separately from the necessary transportation infrastructure, and are subject to change from time to time. SoCalGas did not propose any purity requirements in the Memorandum Account Application, including whether they will be at a level suitable to fuel cells, but may develop such requirements in the future as a part of the planning process and in consultation with regulators and potential customers and producers.

c. Gas quality specifications are generally developed separately from the necessary transportation infrastructure, and are subject to change from time to time. SoCalGas did not propose any purity requirements in the Memorandum Account Application, including allowances for liquid or condensate, but may develop such requirements in the future as a part of the planning process and in consultation with regulators and potential customers and producers.

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QUESTION 7:

What leakage rates are expected?

RESPONSE 7:

Leakage rates will be assessed in the future as part of Phases 1 through 3. The scope of activities included in the different phases of the Memorandum Account Application includes activities for project design to develop hydrogen transport infrastructure under the standards and protocols applicable to the industry.

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QUESTION 8:

Has SoCalGas calculated the impact of Angeles Link Project on Greenhouse Gas (GHG) emissions? If so, please provide the calculations in a live (formulas intact and functioning) excel spreadsheet.

RESPONSE 8:

SoCalGas will evaluate potential GHG emissions reductions during Phases 1 through 3 when it evaluates and refines project design. However, please see SoCalGas's response to Question 20 for workpapers supporting the estimates of CO2 emission reductions included in SoCalGas's March 16 briefing to the Public Advocates Office.

QUESTION 9:

Where and how will hydrogen be stored?

RESPONSE 9:

SoCalGas will evaluate possible hydrogen storage during Phases 1 and 2, and will further evaluate potential storage options in Phase 3 during the CPCN process. In particular, SoCalGas will assess storage requirements, characteristics, location, and capacity.

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QUESTION 10:

What is the expected pipeline transport efficiency (where transport efficiency is equal to hydrogen output divided by hydrogen input)?

RESPONSE 10:

SoCalGas will evaluate expected pipeline transport efficiency during Phases 1 and 2, and will further evaluate potential transport efficiency options in Phase 3 during the CPCN process. The scope of activities included in the different planning phases described in the Memorandum Account Application includes activities for project design to develop hydrogen transport infrastructure under the standards and protocols applicable to the industry.

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QUESTION 11:

What is the expected round-trip efficiency of electricity-to-hydrogen-to-electricity, considering losses in hydrogen production and transportation, as well as losses in electricity generation from hydrogen?

RESPONSE 11:

During Phases 1 through 3, SoCalGas will evaluate the expected round-trip efficiency of electricity-to-hydrogen-to-electricity, considering losses in hydrogen production and transportation, as well as losses in electricity generation from hydrogen. The scope of activities included in the different planning phases described in the Memorandum Account Application includes activities for project design to develop hydrogen transport infrastructure under the standards and protocols applicable to the industry.

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QUESTION 12:

Provide a definition for “green hydrogen” as will be used and applied by SoCalGas in the Angeles Link Project.

RESPONSE 12:

In the Memorandum Account Application (see page 2, footnote 2), SoCalGas explained that “green hydrogen” “generally refers to hydrogen produced through electrolysis using renewable energy.”

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QUESTION 13:

Will the Angeles Link Project implement any requirements for which method(s) and energy source(s) may be used to produce the hydrogen transported in the Angeles Link Project? Will there be specified limits on the volume of GHG emissions or short-lived climate pollutants (SLCPs) released because of the production of a unit of hydrogen transported through the Angeles Link system?

RESPONSE 13:

Aside from its stated intent to transport green hydrogen, the methods, or energy sources that may be used to produce the hydrogen transported by the Angeles Link as well as the volume of GHG emissions or SLCPs released, if any, would be further evaluated during Phases 1 through 3. The Memorandum Account Application does not contemplate SoCalGas owning and operating hydrogen production facilities as part of Angeles Link.

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QUESTION 14:

Provide any estimates used or relied upon by SoCalGas of the amount of fuel hydrogen that will be annually produced in the LA Basin in the next 5-10 years?

RESPONSE 14:

SoCalGas understands the term “fuel hydrogen,” as that term is used in the above question, to mean hydrogen used as fuel. Potential estimates of hydrogen production that will be annually produced in the LA Basin and other areas during the next 5-10 years will be evaluated as part of Phases 1 through 3.

QUESTION 15:

Provide any evidence of existing or growing customer interest in the LA Basin in hydrogen fueling resources.

RESPONSE 15:

SoCalGas understands the term "hydrogen fueling resources," as that term is used in the question above, to refer to interest from potential users in procuring hydrogen for power. Hydrogen has gained tremendous momentum globally and in the USA. HyDeal Los Angeles, a multistakeholder effort led by the Green Hydrogen Coalition, conducted in 2021 an assessment of the potential of hydrogen use in the Los Angeles Basin. The scope of this assessment included potential users of hydrogen, expected demand levels of hydrogen, and estimated levelized cost for hydrogen. Based on these findings several critical sectors were identified as potential users of hydrogen, including power generation, the transportation sector, and industrial end-users in the Los Angeles Basin. HyDeal Los Angeles has identified 0.6 to 2.2 million tonnes of qualified demand for green hydrogen in the Los Angeles Basin. The presentation with these findings for HyDeal Los Angeles can be accessed here: https://static1.squarespace.com/static/5e8961cdcbb9c05d73b3f9c4/t/61395af7e252d140fd159522/1631148798127/2021-09-08+HyDeal+Presentation+Slides%2C+DOE+Hydrogen+Shot+Summit.pdf.

As further evidence of customer interest in hydrogen in the Los Angeles Basin, on August 5, 2021, the Los Angeles Department of Water and Power ("LADWP") issued a Request for Information seeking information on the planning, design, and deployment of hydrogen infrastructure to meet its clean energy objectives. By 2035, LADWP estimates a need for up to 5,765 tonnes of hydrogen per year for its Harbor, Haynes, Scattergood, and Valley generating stations, increasing to 67,817 tonnes of hydrogen per year by 2045. Information on the LADWP Request for Information can be accessed here: https://labavn.force.com/LABAVN/s/opportunity-details?id=0066g00003Xo6F5AAJ.

Finally, the National Renewable Energy Laboratory "LA100: The Los Angeles 100% Renewable Energy Study" ("LA100 Study") estimated that, in order to meet Los Angeles' goal of 100% renewable energy by 2045, between 4,335 and 67,817 tonnes of hydrogen would be needed annually in the Los Angeles Basin to power hydrogen-fueled turbines. Combined,

these turbines could produce between 51,862 and 811,308 megawatt/hours annually. The LA100 Study can be accessed here: https://maps.nrel.gov/la100/report

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QUESTION 16:

Provide any evidence that the Angeles Link infrastructure will stimulate the market for hydrogen-fueled technology.

RESPONSE 16:

SoCalGas understands the term "hydrogen-fueled technology," as that term is used in the above question, to mean various technologies that employ hydrogen as fuel. HyDeal Los Angeles identified the need for infrastructure development to transport green hydrogen from production areas into the Los Angeles Basin to serve the identified demand in the study and achieve the expected levelized cost of hydrogen. As indicated in the Memorandum Account Application, SoCalGas will evaluate the feasibility and need for a green hydrogen pipeline to transport green hydrogen into the LA Basin as identified in the HyDeal findings.

Further, as discussed in Response 15, in August 2021, LADWP issued a Request for Information seeking information on the planning, design, and deployment of hydrogen infrastructure to meet its clean energy objectives. LADWP's Request for Information demonstrates interest in the use of hydrogen for electricity generation in the Los Angeles Basin. The Angeles Link Project would stimulate the market for hydrogen-fueled generation by providing the infrastructure required for such generation.

In addition, the DOE Energy Earthshot – Hydrogen Shot referenced in Response 3.b aims to "accelerate innovations and spur demand of clean hydrogen." As described in the Memorandum Account Application (p. 31), the DOE estimates that the nation's hydrogen industry has the potential for 700,000 jobs by 2030.

SOUTHERN CALIFORNIA GAS COMPANY

AUTHORITY TO ESTABLISH A MEMORANDUM ACCOUNT FOR THE ANGELES LINK PROJECT

(A.22-02-007)

(DATA REQUEST FROM PUBLIC ADVOCATES – PAO-1)
Date Received: April 7, 2022; Date Responded: April 21, 2022

QUESTION 17:

SoCalGas repeatedly claims in its Application that hydrogen will be used to decarbonize activities that are difficult to electrify, such as long-haul trucking.

a. Provide any evidence that hydrogen-fueled technologies will be readily available in the LA Basin within the next 5-10 years. Specifically for the following end- uses:
i. Electric generation.
ii. Heavy duty transportation sector.
iii. Other "hard-to-electrify" industries.

b. Provide any evidence that hydrogen will be cost-competitive with fuel alternatives within the next 5-10 years. Specifically for the following end-uses:
i. Electric generation.
ii. Heavy duty transportation sector.
iii. Other "hard-to-electrify" industries.

RESPONSE 17:

a. See Response 15 regarding estimates of demand for green hydrogen in the Los Angeles Basin and hydrogen-fueled generation opportunities. See also the California Air Resources Board's ("CARB") recent Scoping Plan scenario workshop presentation, at slides 17, 18, 25, and 26 (available here: https://ww2.arb.ca.gov/sites/default/files/2022-03/SP22-Model-Results-E3-ppt.pdf), which show significant use of hydrogen for electricity generation. Further, as described in its August 2021 Request for Information, LADWP is transitioning its Scattergood Generating Station to run on green hydrogen by 2030, and may also convert its Harbor, Haynes, and Valley Generating Stations to hydrogen fuel. The LADWP Request for Information is available here: https://www.ammoniaenergy.org/wp-content/uploads/2021/09/Green_Hydrogen_RFI_-_8.5.21-Power-SAL.pdf.

   Regulatory requirements will drive the availability of hydrogen-fueled technologies in the LA Basin for heavy-duty transportation, including long-haul trucking. The finalized Advanced Clean Trucks ("ACT") regulation, promulgated and implemented by CARB, requires manufacturers to sell an increasing percentage of zero emission heavy duty trucks into the market starting in Model Year ("MY") 2024. By 2035, zero-emission truck/chassis sales would need to be 55% of Class 2b – 3 truck sales, 75% of Class 4

– 8 straight truck sales, and 40% of truck tractor sales. See https://ww2.arb.ca.gov/resources/fact-sheets/advanced-clean-trucks-fact-sheet.

CARB currently is promulgating the Advanced Clean Fleets ("ACF") regulation that would accelerate the market for zero-emission trucks and buses by requiring fleets that are well suited for zero-emission technologies to transition where feasible. The ACF regulation also would contribute to the goal of achieving the Governor's Executive Order N-79-20 (available here: https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf) to reach: 100 percent zero-emission drayage trucks by 2035; 100 percent off-road ZEVs and equipment by 2035, where feasible; and 100 percent medium and heavy-duty ZEVs by 2045, where feasible.

In support of the ACF regulation, CARB conducted a Preliminary Inventory Analysis of Public Fleet zero-emission population in a business-as-usual case and where the ACT and ACF regulations are implemented. The Analysis shows a statewide inventory of over 20,000 zero-emission trucks in 2030 and over 80,000 zero-emission trucks in 2040. See https://ww2.arb.ca.gov/sites/default/files/2021-03/210302emissions_ADA.pdf at slide 4. The ACT and ACF regulations recognize hydrogen fuel cell electric vehicles ("FCEV") as zero-emission and FCEVs contribute to this Preliminary Inventory.

CARB's recent 2022 Scoping Plan Update scenario workshop held March 15, 2022 (available here: https://ww2.arb.ca.gov/sites/default/files/2022-03/SP22-Model-Results-E3-ppt.pdf) shows significant utilization of hydrogen in various decarbonization scenarios, including for hard-to-electrify sectors such as cement and chemical processing.

b. As explained in the Memorandum Account Application (see page 18), the HyDeal Los Angeles initiative, in which SoCalGas participates, aims to achieve at-scale green hydrogen procurement at $1.50 per kilogram in the Basin by 2030. Offtakers may include power plants, refineries, and heavy industry such as cement plants. Additional details on HyDeal Los Angeles are provided in a presentation available here: https://static1.squarespace.com/static/5e8961cdcbb9c05d73b3f9c4/t/61395af7e252d140fd159522/1631148798127/2021-09-08+HyDeal+Presentation+Slides%2C+DOE+Hydrogen+Shot+Summit.pdf.

As further explained in the Memorandum Account Application (see page 18), the U.S. Department of Energy's Hydrogen Shot initiative seeks to reduce the price of clean hydrogen to $1 per kilogram by 2031 to transition industry and chemicals, transportation, and power and energy storage to hydrogen. Additionally, the

Infrastructure Investment and Jobs Act allocates $9.5 billion for clean hydrogen programs, further reducing costs of hydrogen technologies.

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(DATA REQUEST FROM PUBLIC ADVOCATES – PAO-1)
Date Received: April 7, 2022; Date Responded: April 21, 2022

QUESTION 18:

To what extent can existing SoCalGas resources be repurposed to serve the needs of storing and transporting hydrogen?

RESPONSE 18:

SoCalGas understands the term “resources” means physical assets and that the phrase “storing and transporting hydrogen” means storing and transporting green hydrogen as contemplated in the Memorandum Account Application.

SoCalGas will evaluate the extent to which existing resources can be repurposed to serve the needs of storing and transporting green hydrogen for Angeles Link during Phases 1 through 3. At this stage, SoCalGas does not expect existing physical assets (such as pipelines and storage facilities) to be repurposed to serve the needs of storing and transporting green hydrogen for Angeles Link. However, SoCalGas does expect certain non-physical assets, such as rights-of-way, human capital, and energy business leadership, could be leveraged during the development and operation of Angeles Link.

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(DATA REQUEST FROM PUBLIC ADVOCATES – PAO-1)
Date Received: April 7, 2022; Date Responded: April 21, 2022

QUESTION 19:

Will the new materials needed to support the Angeles Link infrastructure be sourced in-state? If so, provide any supporting analysis or evidence. If not, explain.

RESPONSE 19:

SoCalGas will evaluate where materials will be sourced during Phases 1 through 3.

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Date Received: April 7, 2022; Date Responded: April 21, 2022

QUESTION 20:

In the "Final Angeles Link Briefing Deck_March.pdf", p. 5, provided to Cal Advocates at a March 16, 2022, briefing, SoCalGas claims the Angeles Link Project will displace 3 million gallons of diesel gas per day; reduce NOx by 24,721 tons per year; and remove 14.3 million metric tons of CO2, equivalent to eliminating 57% of LA County's large stationary source CO2 emissions.

a. Provide the supporting workpapers for these calculations including any supporting documentation.

b. Provide the definition used for large stationary source CO2 emissions.

RESPONSE 20:

a. Please see the attached file for the workpapers supporting these calculations.
b. As shown in the attachment, "large stationary source" refers to all the facilities included in the Facility Level Information on GreenHouse gases Tool (FLIGHT) of the Environmental Protection Agency available at: https://ghgdata.epa.gov/ghgp/main.do