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Witness: Brian Walker

PREPARED DIRECT TESTIMONY OF

BRIAN WALKER

ON BEHALF OF

SOUTHERN CALIFORNIA GAS COMPANY

(CHAPTER 4 - ENGINEERING DESIGN)

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

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PREPARED DIRECT TESTIMONY OF

BRIAN WALKER

(ENGINEERING DESIGN)

I. INTRODUCTION

My name is Brian Walker, and I am the Director of Project Management at Southern California Gas Company (SoCalGas or Company). My testimony supports the Application for Authorization to Implement Revenue Requirement for Costs to Enable Commencement of Phase 2 Activities for Angeles Link (Application). The purpose of my testimony is to present the forecasted costs of Angeles Link Phase 2 (Phase 2) activities necessary to support identification of a preferred system route, perform engineering design, environmental assessments, and project management activities associated with progressing the Angeles Link clean renewable hydrogen pipeline system through Front-End Engineering Design (FEED). The Phase 2 engineering design scope of work builds on information developed in the Phase 1 feasibility studies. Phase 2 will result in engineering design being advanced to define the scope and technical requirements of the Angeles Link system as well as the production of a Class 3[1] cost estimate for the Angeles Link system, a detailed project schedule, and certain permitting information.

SoCalGas currently estimates that Angeles Link Phase 2 activities will have a total duration of approximately 30 months following a decision in this proceeding, with an estimated overall cost of approximately $266 million (inclusive of those costs identified in the Testimony of Amy Kitson). The subset of costs presented in this testimony for advancing engineering and performing project management activities for the Angeles Link system through the FEED study total approximately $216 million. These costs are inclusive of a limited set of contracting-related activities that will commence in 2025. These limited activities will allow SoCalGas to retain vendors promptly after a decision is issued in this proceeding to conduct critical-path work to support meeting the timing goals discussed in the Testimony of Neil Navin. All activities and

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1 Estimating classes are described in AACE International (AACEi), *Recommended Practice No. 97R-18 Cost Estimate Classification System - As Applied in Engineering, Procurement, and Construction for the Pipeline Transportation Infrastructure Industries* (AACEi RP 97R-18) (August 7, 2020) at 5, *available at:* https://web.aacei.org/docs/default-source/rps/97R-18.pdf; *also see,* Section V.A. below for more information on SoCalGas's Phase 2 estimating approach.

costs presented in my testimony are based on the current description of Angeles Link, as depicted by Mr. Navin.

II. BACKGROUND INFORMATION

A. Overview

SoCalGas proposes to develop a hydrogen pipeline system to transport clean renewable hydrogen from regional third-party producers to demand in Central and Southern California, including the Los Angeles Basin. In Decision (D.) 22-12-055 (Phase 1 Decision), the Commission authorized SoCalGas to establish the Angeles Link Memorandum Account (ALMA) to track costs related to conducting certain activities, including the Phase 1 feasibility studies. The findings of those feasibility studies are described by Mr. Navin. Feasibility studies, which broadly analyze various aspects of project development, provide a foundation from which a project can be further developed.

The proposed Phase 2 activities described below, which consist of identifying a preferred system route, conducting refined engineering design, and environmental assessments, will build upon the Phase 1 feasibility studies. For example, feasibility-level Phase 1 engineering design-related studies including, but not limited to, the Preliminary Routing Configuration Analysis, Pipeline Sizing and Design Criteria, and Evaluation of Applicable Safety Requirements, provide technical considerations that will be leveraged in Phase 2.[2]

Engineering design activities for Angeles Link Phase 2 activities will identify a preferred system route, advance engineering to the 30% engineering design level and develop project execution plans. The work will utilize the Angeles Link scope and definition described by Mr. Navin, subject to further refinement in Phase 2.[3] Further, environmental, land and right-of-way and stakeholder engagement[4] activities will be completed during Phase 2 to collect pertinent data. This data will inform the engineering design and planning activities. Collectively, the design drawings, documents and reports that will be created are the deliverables for FEED.

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[2] *See* Testimony of Neil Navin for a detailed summary of the Phase 1 studies.

[3] The scope of work is based on the four preliminary preferred routes identified at the conclusion of Phase 1, which ranged between 390 miles to 481 miles and were anticipated to require two or three compressor stations.

[4] *See* Testimony of Amy Kitson for a summary of stakeholder engagement activities.

Phase 2 activities are expected to generate the deliverables and information necessary to advance the Angeles Link concept to a defined proposed project scope and generate system design data in support of a potential future Certificate of Public Convenience and Necessity (CPCN) application and other long-lead permit applications.

The engineering design activities described in my testimony will be completed in collaboration with the project development and programmatic activities described by Ms. Kitson.

B. Engineering Design Project Management Overview

SoCalGas will utilize its project delivery framework for infrastructure project management and execution to conduct the Phase 2 activities described herein. The infrastructure project planning process through which these activities are conducted is known as the Project Delivery Model (also known as the stage-gate process).[5] The Project Delivery Model process encompasses key components required for planning, managing, controlling and executing pipeline and complex facility infrastructure projects. Because it relies on project management principles that are independent of the type of infrastructure project being designed and implemented, the Project Delivery Model process is broadly applicable to a diverse range of pipeline and facilities projects, including a clean renewable hydrogen system such as Angeles Link. The development and execution of natural gas transmission pipeline projects are a reasonable analog to a hydrogen transmission pipeline project such as Angeles Link.[6] The Project Delivery Model process has been developed and refined over the last 10+ years to incorporate lessons learned and best practices to improve project delivery performance for SoCalGas pipeline, valve, and compressor station projects and is well suited to the Phase 2 activities described herein. SoCalGas has the skilled workforce, resources, processes, controls,

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5 The Project Delivery Model was initially pioneered for SoCalGas's Pipeline Safety Enhancement Plan (PSEP). SoCalGas's application of this process, as well as broader oversight and controls, dates to the earliest PSEP projects and has been found reasonable by the Commission in numerous instances. *See* D.16-12-063 at 59 (COL 15), D.19-02-004 at 10-11, 97-99 (FOF 13, 19, and 33), and D.19-03-025 at 44. Although initially developed for PSEP, SoCalGas now employs the stage-gate methodology company-wide for large projects, as well as a scalable stage-gate methodology for smaller, standard design projects.

6 The Angeles Link Phase 1 Pipeline Sizing & Design Criteria (Design Study) identified: "A hydrogen gas pipeline system would have a similar architecture to a natural gas pipeline system, whereby similar facilities and pipeline system operation parameters would be employed." Design Study at 7.

and experience to manage the Phase 2 activities for Angeles Link (see additional discussion below).

C. Project Lifecycle

The design and development of a pipeline system project is typically divided into a number of stages. Corresponding to the advancement of project stages, a pipeline system's engineering design is advanced through design cycles, which incrementally refine the technical project details and support the development of cost estimates.[7] The level of engineering detail is expressed in percentage (%) of complete definition, which can range from 0% to 100%. Dividing the project into stages also facilitates management and control of resources at different levels throughout the project lifecycle. The figure (below) depicts a project lifecycle divided into stages, which advance from the identification of a project to placing a project into operation.[8] Phase 2 will consist of the Option Selection / Pre-FEED stage and the FEED stage.

In the first stage, referred to as the identification stage, the project idea is explored and evaluated. In the second stage, referred to as the feasibility stage, feasibility studies are typically conducted to provide an early assessment of a potential project's viability. Typically, at the conclusion of the feasibility stage, the maturity level of project definition is between 0 to 2% and results in a Class 5 cost estimate (-50%/+100% expected accuracy). With respect to Angeles Link, as described by Mr. Navin, over the last two years SoCalGas has conducted preliminary engineering and environmental feasibility studies to evaluate a variety of topics, including production, demand end uses, pipeline configurations and storage solutions, and early project

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[7] SoCalGas follows the industry recommended practices developed by the Association for the Advancement of Cost Engineering International (AACEi) to benchmark the maturity level of project definition deliverables and the class of estimate associated with each stage of a project. The AACEi standards (*AACE RP 97R-18 Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Pipeline Transportation Infrastructure* and *AACE RP 18R-97 Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries*) indicate that as the project's deliverables are increased in quantity and progressively defined, the expected accuracy of the project estimate accuracy improves. However, even though projects of similar nature can be expected to fall within common accuracy ranges there can be outliers where the high range can be two to three times higher. Therefore, SoCalGas utilizes project risk reviews to assess specific project risks when establishing project schedules and estimates.

[8] The project lifecycle depiction does not identify regulatory approvals, permitting, etc.

alternatives (collectively referred to as the Phase 1 studies). SoCalGas now proposes progressing planning in Phase 2, including the selection of a preferred system route and FEED work.

Following the feasibility stage, the next stage is the option selection and Pre-FEED stage during which the proposed project scope will be selected and refined. In this stage, an option selection analysis is completed that will narrow the focus to a proposed project for progressive engineering design activities in Pre-FEED. Certain activities supportive of selecting a preferred system route are described by Ms. Kitson. Pre-FEED will typically produce a design of the proposed project that substantially establishes the project's fundamental design concept and will result in a maturity level of project definition between 1% to 15% and a Class 4 cost estimate (-30%/+50% expected accuracy). Pre-FEED activities typically include the development of technical details (specifications), preliminary calculations (e.g., hydraulics), route refinement, site selection(s), planning, and early designs in preparation for FEED. The deliverables created during Pre-FEED will be refined in the next stage, which is the FEED study stage.

In the FEED study stage activities will be completed to advance the project definition. The proposed project definition will be advanced such that there are sufficient project engineering, project data and completed technical studies to be able to develop applications to seek regulatory approvals and permits, such as a CPCN. The maturity level of project definition for the FEED study stage will typically land between 10% to 40% and result in a Class 3 cost estimate (-20%/+30% expected accuracy). At this design level, the project scope is defined, major equipment is selected, and a detailed list of project materials can be created. The engineering details and planning activities produced in FEED provide a basis for the project execution plan, which outlines how the project will be carried out. This stage also includes development of detailed project cost estimates and schedules for the remaining duration of the project.

After the FEED stage, a project will move into the execution phase, where permit applications are submitted and processed, detailed engineering design is completed, and project materials are procured, with construction subsequently occurring. Commensurate with the advancement of detailed design, project cost estimates can be produced with increased accuracy.

Upon completion of construction, the project is tested to verify that it operates as designed and is placed into service (i.e., commissioning), after which it is operated and maintained.[9]

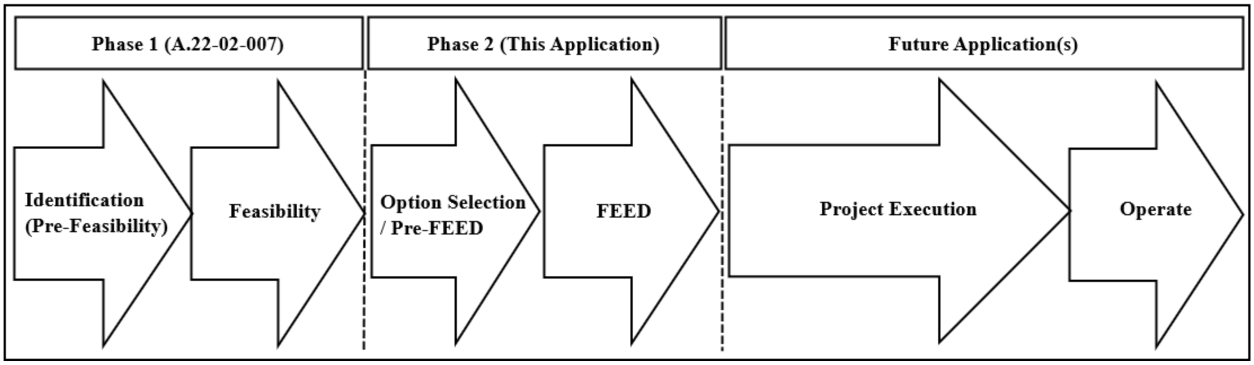

Figure 1. Typical project lifecycle stages

III. DESCRIPTION OF PHASE 2 PRE-FEED AND FEED ACTIVITIES

A. Engineering Design & Project Management Activities

1. Description of Phase 2 Scope and Activities

The costs identified in this testimony are necessary to conduct timely procurement of services, support the identification of a preferred system route, complete Pre-FEED activities, perform environmental studies, perform land and right-of-way (ROW) studies, and complete FEED which will inform the development of a Class 3[10] cost estimate for Angeles Link. Phase 2 activities are incremental to and will build upon the findings from Phase 1 feasibility-level activities.

SoCalGas intends to conduct certain contracting activities for vendor services, such as primary engineering design and environmental services, necessary to conduct Phase 2 activities discussed in my testimony and by Ms. Kitson. To maintain the proposed 30-month Phase 2 schedule, the selection of these primary contractor services needs to occur prior to starting the option selection and Pre-FEED activities. The selection of these vendors requires a series of activities to occur which will include the advancement of contracting strategy, assessment of

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9 Project Execution and Operate stage activities are not included in Phase 2 but are described herein to provide information and context about the entire project development lifecycle.

10 "Class 3 estimates are typically prepared to support full project funding requests and become the first of the project phase control estimates against which all actual costs and resources will be monitored for variations to the budget." AACEi RP 97R-18 at 10.

potential service providers, development of contract technical exhibits and the execution of a Request for Proposal (RFP) process which will culminate with the selection of vendors.[11] These activities support the selection of skilled service providers at competitive rates and support the proposed 30-month Phase 2 schedule shown in Figure 3 below.

a. Option Selection and Pre-FEED Activities

At the beginning of Phase 2, a system route options analysis will be performed that will further consider the potential Angeles Link routes and route variation identified in Phase 1 and ultimately select a preferred system route for further development. The activities that will be conducted in support of the system route options analysis are described by Ms. Kitson. This system route options analysis will be closely coordinated with, and receive inputs from, activities described in this testimony. These alternatives will be shared with stakeholders to obtain input for SoCalGas to consider as part of its preferred route selection (*see* Section IV.A., Public Outreach, below). Once a preferred system route is identified, SoCalGas will advance development of the preferred system route, including engineering design and planning, to develop the information needed to complete Pre-FEED for the preferred system route.

SoCalGas will also commence the Pre-FEED stage of engineering design at the beginning of Phase 2. Preliminary engineering design development for both the potential pipeline and compressor stations will occur during this stage, which will result in a conceptual design of the Angeles Link system. During this stage, documentation such as specifications, technical documents and initial designs will be developed, which are foundational to the development of a proposed project. Project planning deliverables will also be created to document project execution, control and communication plans. These documents will guide activities and set expectations for deliverables in future stages of the project. This documentation will mature the project definition and support completion of a FEED study.

Activities expected to occur during the Pre-FEED stage of Phase 2 are:

- Ramp-up of project team resources;
- Mobilize engineering services vendor(s);
- Advance design development requirements (Basis of Design);

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[11] Further information on the procurement of services can be found in Section IV.B, Procurement, of this testimony.

- Select a preferred system route;
- Develop preliminary proposed pipeline routing and engineering design;
- Develop preliminary proposed compressor station siting and engineering design;
- Collect project data and information (execute surveys and studies);
- Refine identification of permitting requirements for the preferred system route;
- Prepare preliminary proposed project schedule (Level 2);
- Prepare Class 4 cost estimate;
- Develop project quality plan;
- Refine estimate of project resources and schedule for FEED study stage;
- Develop and execute project communication plan (e.g., project coordination meetings);
- Perform preliminary project risk review;
- Refine preliminary environmental and safety assessment of the preferred system route;
- Perform necessary design reviews; and
- Prepare Pre-FEED report(s) for the Angeles Link system.

b. FEED

The FEED stage of Phase 2 will take the preliminary designs and technical specifications identified during Pre-FEED and further advance and refine these details into plans and design drawings that describe the proposed infrastructure. The objective of FEED will be to develop an engineering design that is at approximately 30% definition, execute studies to select major equipment, execute studies to identify and mitigate technical and operational issues, increase the accuracy of the proposed project cost estimate, develop the project execution plan, and perform value engineering on the proposed project.[12]

Activities expected to occur during the FEED stage of Phase 2 are:

- Ramp up project team resources;

[12] A value engineering study is a systematic approach used to improve the value of the project by performing analysis, reviews and evaluations of the proposed project FEED design. Value engineering will seek to optimize the balance between performance, quality, safety and cost of the proposed project. As appropriate, the FEED study is refined to reflect improvements identified in the value engineering process.

- Mobilize additional engineering services vendor(s) resources;
- Refine design development requirements (Basis of Design);
- Perform FEED deliverable assessment;
- Collect project data and information, including on topics such as:
    - Documenting existing site conditions;
    - Performing engineering surveys;
    - Regulatory;
    - Engineering and operational codes and standards;
    - Safety;
    - Environmental;
    - Land & ROW;
- Generate technical deliverables/studies, including but not limited to:
    - Major equipment;
    - Process diagrams;
    - Piping configurations;
    - Compressor plant configuration;
    - Hazard Identification (HAZID);
    - Material Data Sheets (MDS);
    - Long lead items (procurement);
- Prepare FEED drawings and schematics, including:
    - Refine and advance proposed pipeline routing and engineering design;
    - Refine and advance compressor station siting and engineering design;
- Quality management of the FEED study;
- Prepare contracting strategy (for execution stage);
- Prepare Land & ROW acquisition strategy;
- Prepare project schedule (Level 3);
- Estimate project cost (Class 3 cost estimate);
- Prepare Project Execution Plan;
- Prepare Operating Philosophy document;
- Perform communication coordination activities (e.g., project coordination meetings);

- Prepare Project Risk Register;
- Perform Hazard and Operability Study (HAZOP) to identify potential hazards and operability problems;
- Develop project specifications (detailed design, construction, etc.);
- Perform Value Engineering; and
- Prepare FEED study report for the Angeles Link system.

As noted above, preparing a more refined, i.e., Class 3, cost estimate is one objective of the FEED stage. The project definition maturity level, which is dependent on the status of technical and planning deliverables, drives the project's estimate class. The maturity level of the project definition typically correlates with the percent of engineering design that has been completed. As project definition is progressed in maturity level, the associated cost estimate accuracy typically improves.[13] AACEi has defined estimate accuracy ranges for typical pipeline and process industry projects. At the conclusion of Phase 1, the Angeles Link system is at approximately 1-2% project definition maturity level, which can produce Class 5 cost estimates that can range in accuracy from -50% to +100%.[14] Progressing to a Class 3 estimate in Phase 2 will facilitate the production of estimates with an expected accuracy of -20% to +30%.

After the FEED technical deliverables are completed, a refined view of the next stage of work will be developed and, as a result, a more detailed project execution stage schedule and cost estimate will be created. At the conclusion of the FEED stage, the completeness of FEED documentation will be reviewed. The deliverables developed during the FEED stage are intended to provide adequate information for regulatory and environmental project permitting.

B. Environmental Activities and Land & Right-of-Way

Environmental support from internal resources and third-party contractors will be utilized to aid Angeles Link system routing, siting, and planning activities. Data gathered during the Phase 1 desktop analysis will be leveraged to conduct further review of the preliminary preferred

13 In addition to the degree of maturity of the project definition, the range of accuracy for any particular estimate is also driven by other systemic risks such as level of familiarity with technology, unique/remote nature of project locations and conditions, complexity of the project and its execution, and other factors. AACEi RP 18R-97 at 4.

14 Class 5 estimates for various scenarios of Angeles Link reflecting a range of pipeline miles, pipe sizes, and numbers of compressor stations are presented within the Design Study at 63-64.

routes and refine potential environmental constraints identified in the Phase 1 studies. The team will develop a portfolio of detailed assessments, including biological, cultural resources and site assessment field work, which will inform the project's schedule, estimating activities, and permitting activities. Other Phase 2 environmental activities will also be conducted to support FEED. The scope of these studies and activities will be guided by the Commission's Proponent's Environmental Assessment[15] checklist as well as other agency guidance (e.g., United States Fish & Wildlife Service, California Department of Fish & Wildlife, Native American Heritage Commission). These studies will help to inform the development of the engineering deliverables and overall proposed schedule and costs to complete the project and incorporate into the Class 3 estimate.

Land and Right-of-Way activities during the Pre-FEED and FEED component of Phase 2 include non-labor costs associated with pre-acquisition due diligence activities related to identification of the preferred route. The specific deliverables associated with Land and ROW incorporate the development of a preliminary land acquisition plan, refining ownership and existing ROW analyses conducted in Phase 1, a detailed title review of private parcels with temporary and permanent easement acquisition needs identified through engineering and design, preliminary land value market analysis, development of a land acquisition cost estimate, and acquiring private owner consents to facilitate necessary survey activities.

C. Description of Pipeline System Components to Be Evaluated During Phase 2

A pipeline system like Angeles Link consists of many interconnected components that are designed to safely work together. During Pre-FEED and FEED, these various components will be evaluated holistically to define a system route and develop the engineering design of the route and associated facilities. To forecast the cost of Phase 2 activities, a detailed list of pipeline and compressor station-related deliverables was created, inclusive of pipeline system components that are reasonably expected to be included in the Angeles Link system design. This list leveraged information from the Phase 1 feasibility-level Pipeline Sizing & Design Criteria

[15] A Proponent's Environmental Assessment must be included with any application for authority to undertake a project that is not statutorily or categorically exempt from the requirements of the California Environmental Quality Act (CEQA). CPUC Rules of Practice and Procedure, available at: https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/administrative-law-judge-division/documents/rules-of-practice-and-procedure-may-2021.pdf.

(Design Study). The following is a list of the components that may be part of the Angeles Link system and will be addressed during the Pre-FEED and FEED study engineering design; additional features may be necessary on a case-by-case basis:

- **Pipelines:** Tubular sections made from materials compatible with hydrogen to transport the gas from one point to another. They must be designed to resist hydrogen embrittlement and withstand the specific pressures and temperatures of hydrogen gas.

    1. **Compressors:** Mechanical equipment, typically found in transmission stations, used to increase the pressure of hydrogen gas to adequate levels for transmission through the pipeline. They are essential for maintaining flow and overcoming frictional losses along the pipeline length.
    2. **Air Cooled Heat Exchangers:** Heat transfer equipment, typically found in transmission stations, used to cool the hot discharge gas from compressors to acceptable temperatures conducive to pipeline transportation.
    3. **Valves:** Including isolation valves, control valves, and safety valves; these components regulate, direct, or control the flow of hydrogen by opening, closing, or partially obstructing various passageways.
    4. **Pressure Relief Valves (PRVs):** Safety devices designed to open at a predetermined pressure to prevent an excess pressure build-up that could jeopardize the pipeline's structural integrity.
    5. **Emergency Shutdown Systems (ESDs):** Systems designed to rapidly shut down compressor station equipment and/or facilities under certain conditions in the event of a detected leak or other hazardous situations that will isolate sections of the pipeline to minimize risks.
    6. **Pressure Limiting Station (PLS):** Devices that regulate or limit the flow of gas at a specific set point to achieve or maintain a certain pressure to keep pipeline operations within the determined pressure limits.
    7. **Pig Launchers & Receivers:** Facilities used for the insertion and retrieval of in-line inspection tools used to clean and inspect the pipeline.
    8. **Metering Stations:** Stations that measure the flow rate of hydrogen through the pipeline and are utilized for operational control and billing purposes.
    9. **Corrosion Protection Systems:** Includes cathodic protection and protective coatings that are designed to prevent internal and external corrosion.
    10. **Leak Detection Systems:** Technologies deployed along the pipeline to detect and locate leaks based on pressure, acoustic signals, or chemical

sensors. These components are essential for the early detection of failures or breaches in pipeline integrity.

11. **Control & Monitoring Systems:** Centralized systems that use field technology, sensors and communication methods to monitor and control the physical parameters of the pipeline.

Additionally, as indicated in the Design Study, the final design of a system and the selection of the above components will take into account federal, state, and industry codes and standards. The system will be designed to meet operational requirements, account for Angeles Link system facility locations, and support construction, operations, and integrity management objectives.

IV. SOCALGAS SYSTEM DESIGN

SoCalGas will design the Angeles Link system in accordance with best practices common to the industry, including the safety and design codes and standards applicable to the engineering, construction, and operation of a hydrogen gas transportation pipeline system.[16] SoCalGas will incorporate appropriate safety features into the Angeles Link system design, such as automated and remote-control valves. These enhanced valves detect operating abnormalities and either automatically close or alert the gas control center to take action. SoCalGas will evaluate the design of similar valve functionality safety features into the Angeles Link system design. SoCalGas will also seek to evaluate and design an optical pipeline monitoring system feature for Angeles Link, as appropriate. This type of system allows for advanced right-of-way intrusion detection and monitoring to provide early warning of digging, drilling, boring, cutting, or compacting, or if unplanned vehicle operations by third parties pose a threat to pipeline integrity. The system also allows for continuous monitoring of ground movement and temperature gradients associated with an unplanned release of gas from the pipeline.

A. Project Team Activities

To execute the Phase 2 Pre-FEED and FEED activities described in this testimony, SoCalGas will assemble a project team that is comprised of personnel from Project Management, Engineering, Cost and Schedule Controls, Cost Estimating, Construction Management,

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16 These codes and standards are discussed in the Evaluation of Applicable Safety Requirements completed in Phase 1.

Operations, Permitting and Environmental Support, and Public Outreach. The project team will be responsible for the management of the engineering design and project planning scope. Complex infrastructure project development, such as the siting and design of a clean renewable hydrogen pipeline system like Angeles Link, requires appropriate governance and management. Accordingly, the activities described in my testimony will be overseen and evaluated consistently by personnel from various SoCalGas organizations.

The project team will manage the engineering design and project planning scope of work in collaboration with the programmatic scope of work described by Ms. Kitson. The project team will receive inputs from the programmatic scope of work, such as the pipeline and equipment material evaluation, which will support the development of requirements for engineering design of the Angeles Link system. The project team will also provide information such as scope, cost and schedule updates to facilitate programmatic cost monitoring and controls. The following section discusses key project team functions, including both company labor and non-labor resources.

SoCalGas intends to contract with a third-party engineering firm(s) to assist with Pre-FEED and FEED activities. Throughout engineering development activities, the third-party engineering firm and SoCalGas's project team (described below) will collaborate to execute Phase 2 activities. Computer Aided Design (CAD) drawings, three-dimensional models, narratives, studies, and reports will be generated by third-party engineering firms and reviewed by the SoCalGas project team to address issues that might impact safety, construction, operations, maintenance, environmental, and permitting requirements, taking into account constructability and safety considerations.

1. Project Management

To enable the ramp up of project activities during Phase 2, SoCalGas will utilize internal and external resources to perform project management functions. Internal and external project managers will work closely with the engineering team and other stakeholders to develop the necessary deliverables to support the completion of Pre-FEED and FEED. Project managers will serve as the key points of contact for communicating work direction to other project stakeholders, contract management, managing project scope, managing progress, and keeping leadership apprised of progress during Phase 2.

Project management services such as document control, change control, and project administration will be needed to support the management of documents created during Pre-FEED and FEED. Documents will be administered through a computer document management system for accurate project documentation and change management implementation.

2. Engineering

For Phase 2, SoCalGas and the selected engineering consultant firm(s) will coordinate to complete engineering design of the Angeles Link system. SoCalGas will use both internal and external resources to support the Pre-FEED and FEED engineering activities. SoCalGas's Gas Engineering organization, in coordination with third-party engineers as needed, will provide technical support for Pre-FEED and FEED activities such as developing design requirements and performing QA/QC of the engineering design. This includes both project engineering coordination and various engineering disciplines.

In addition to the FEED engineering consultant, additional third-party specialty engineering firms may be retained, as needed, to support engineering activities, such as preparing permit packages for any Phase 2 field activities (e.g., surveys or ground studies) and carrying out geotechnical and environmental evaluations.

3. Engineering Design Project Controls

The project team will utilize project management resources to implement project governance related to the execution of Pre-FEED and FEED activities. These resources will support activities such as Project Delivery Model process assurance, regulatory program management, cost controls, schedule management, and estimating. The implementation of proper controls and management across the functional areas will help verify that each component of Phase 2 activities is performed consistent with SoCalGas's processes.

4. Cost and Schedule Controls

The project cost and scheduling team will track and report on performance indicators (e.g., variance reporting) and facilitate communication among the project team and key SoCalGas stakeholders regarding cost and schedule. These cost and schedule controls will assist the project team in identifying critical project activities along with changes compared to project baseline plans. Both internal and external resources will be utilized for project cost and schedule controls.

5. Cost Estimating

SoCalGas, in conjunction with input from third-party contractors, will develop cost estimates during Phase 2. The estimate deliverables are typically comprised of an estimate basis, estimate details, and a contingency recommendation that takes into account project risks. Developing a cost estimate on a project of this scale is an iterative process. Proposed project cost estimates will be produced at the end of Pre-FEED before FEED activities commence (Class 4 cost estimate) and at the end of the FEED study (Class 3 cost estimate). Additionally, at the end of Pre-FEED activities, an updated estimate to complete FEED-stage activities will be produced based upon the design development that has occurred. These updates will take into account the more detailed information and scope refinement from the completed and forecasted activities.

6. Construction Management

During Phase 2, internal and external construction management resources will work collaboratively to perform preliminary scoping, constructability reviews, and support the development of the project execution plan, schedule, and cost estimate. They will be integrated into project development early in Phase 2 to provide input on constructability considerations, identify potential risks to the construction schedule and costs, and assist with the identification of construction impacts and factoring them into the cost estimate and future permitting efforts.

7. Operations

The operations teams that manage and operate SoCalGas's existing pipeline system will support Angeles Link system development by providing input on system operability. Operations will be consulted for their input on aspects of engineering design such as pipeline routing, facility siting, equipment selection, maintainability, and operability.

8. Ministerial Permitting and Environmental Support

Permitting and environmental support will be an important element of the Pre-FEED and FEED process as considerable upfront planning is necessary. These activities will be supported by two separate but coordinated teams: the Permitting team and the Environmental team.[17]

The Permitting team will support ministerial permitting necessary to conduct Phase 2 field work. These actions/permits may include street use permits, traffic control permits, or related items for exploratory investigations (e.g., surveys and soil testing) and permits associated with contractor-owned equipment. The Permitting team will help oversee and/or complete permit application packages, coordinate with the engineering team, permitting authority, landowners and contractors as applicable, facilitate site inspections by the permitting authority, and other related activities.

The Environmental team will be utilized to manage any environmental activities associated with the Phase 2 Angeles Link system design. The environmental team will coordinate with third parties to conduct necessary surveys and environmental analyses, review data, and perform QA/QC on third-party environmental work described above.

9. Public Outreach

SoCalGas's public outreach organization conducts project-specific efforts to inform impacted stakeholders including customers, community groups, and local permitting offices about SoCalGas project-related activities taking place in their communities. These efforts have been, and continue to be, an integral part of SoCalGas's Project Delivery Model. SoCalGas proposes that, during Phase 2 of Angeles Link, the public outreach team will work closely with the project team to engage with local communities, including nearby residents, businesses, and stakeholders, to communicate Phase 2 project-specific impacts. Costs included in the Pre-FEED/FEED forecast presented below are limited to project public outreach efforts that would be needed to support field activities for engineering development (e.g., survey, environmental surveys). Stakeholder engagement costs are different and are discussed and included in the forecast presented by Ms. Kitson.

[17] The Permitting and Environmental teams will also engage outside consultants to support permitting and environmental activities, including but not limited to focused biological surveys, cultural resource surveys, and other related materials.

B. Procurement

In selecting contractors for both Pre-FEED and FEED (and the programmatic activities discussed by Ms. Kitson), SoCalGas will endeavor to evaluate, select, and retain qualified suppliers and contractors at reasonable rates. SoCalGas plans to utilize market competition (e.g., competitive bidding) to obtain services at market-based rates to the extent feasible.[18] The process for competitively bidding contracts involves soliciting bids from potential contractors based on the scope, specifications, and terms and conditions of the proposed contract. While pricing is a major consideration in the selection process, other factors such as safety, supplier performance, supplier experience, key personnel, lifecycle cost analyses, diverse business enterprise (DBE) participation, and history, among others, are also typically considered for award recommendation and contractor selection.[19,20]

In addition to individual bidding events, as appropriate, SoCalGas may execute agreements by leveraging terms and conditions and rates from existing agreements. This avoids administrative costs, uses previously negotiated rates, and allows SoCalGas to commence work on an expedited basis. This work typically commences through releases issued pursuant to a Master Service Agreement (MSA). Releases from an MSA are used to authorize services and memorialize any commercial and technical terms for a specific scope of work, compensation schedule, and delivery/performance schedule in accordance with the terms and conditions of the MSA. For tracking purposes, these MSAs and releases are considered single-sourced because a separate individual bidding does not occur. Although tracked as single-source, releases from MSAs that were implemented using market-based rates further promote cost reduction by avoiding logistical costs associated with separate bidding events. In these instances, SoCalGas capitalizes on previous efforts to competitively bid, vet, and negotiate contracts, thus promoting

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[18] Utilizing non-labor services with unique skills and experience associated with hydrogen pipelines may require sole-sourcing. Sole-sourcing best practices will be utilized as needed.

[19] Procuring services from diverse businesses is a CPUC goal (General Order (GO) 156 at 16, *available at:* https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/news-and-outreach/documents/bco/go-156-d22-04-035.pdf) that SoCalGas has consistently exceeded annually for the past 31 years. In 2023, SoCalGas reported purchasing 44% of all goods and services from minority, women, service-disabled veteran, and LGBT-owned businesses, amounting to over $1 billion to 618 diverse businesses, of which almost 87% are based in California.

[20] Development of a procurement plan in Phase 2 will consider domestic sourcing of equipment, materials, and labor.

market-based rates, leveraging earlier efforts to competitively source vendors and contractors, and achieving cost-effective and expeditious project commencement.

C. Schedule

As described by Mr. Navin, SoCalGas's efforts to meet ARCHES' timeline for operation of the California Hydrogen Hub are dependent on swift commencement of Phase 2 when Commission approval is granted.[21] Therefore, as stated above, SoCalGas intends to begin certain contracting activities in 2025 in support of the Phase 2 schedule. These activities, which are anticipated to take approximately one year, will enable SoCalGas to then transition to Phase 2 beginning in 2026. SoCalGas estimates that, in total, Phase 2 activities will span approximately 30 months following a decision in this proceeding, estimated to start in January 2026 (*see* Figure 3 below). The schedule is based on a number of preliminary assumptions, such as assumed production rates (how quickly work can be performed), number of engineering teams supporting the project, schedule predecessors (i.e., items required to be performed before another item can start), and internal reviews.

Angeles Link	**2025**				**2026**				**2027**				**2028**			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Contracting Activities																
Contracting Activities																
Phase 2 - Pre-FEED/FEED Schedule																
Pre-FEED																
Route & Facilities Planning and Optimization																
Compressor Station Study																
FEED																
Route & Facilities Design																
Compressor Station Design																

Figure 3 – Angeles Link Phase 2 Schedule

The schedule is anticipated to be iterative in nature and will be adjusted during the course of Pre-FEED and FEED as new information is obtained, such as when the preferred system route is selected and Pre-FEED activities are completed.

[21] Testimony of Neil Navin at Section IV.

V. COST FORECAST

As shown in Table BW-1 below, the Phase 2 costs I am sponsoring total approximately $216 million.[22] These costs primarily comprise labor and non-labor costs necessary to support identification of a preferred system route, perform engineering design, environmental assessments, and project management activities associated with progressing the Angeles Link clean renewable hydrogen pipeline system through FEED. However, the costs are also inclusive of the aforementioned contracting activities, to be commenced in 2025, that are critical to enabling SoCalGas to quickly transition to Phase 2 with its selected vendors ready when the Commission issues its final decision. These contracting activities are necessary for SoCalGas to meet its schedule objectives, and furthermore provide cost savings benefits for ratepayers. By initiating contracting activities in 2025, SoCalGas can mitigate the additive impacts of escalation costs that would otherwise be incurred if these activities were deferred to later years. SoCalGas estimates that the associated benefit to ratepayers as a result of initiating activities in 2025 is approximately $5 million.

Table 1

Phase 2 Engineering Design Cost Forecast (in millions)

	2025	2026	2027	2028	Total
Total Direct O&M Costs	4.0	56.0	86.1	48.4	194.4
Direct Labor	2.2	5.3	6.8	3.3	17.6
Direct Non-Labor	1.7	50.7	79.2	45.2	176.8
Total Fully Loaded O&M Costs	**5.7**	**61.5**	**94.9**	**53.4**	**215.5**

A. Phase 2 Cost Forecasting Methodology

SoCalGas developed a cost forecast to complete Phase 2 engineering design for the Angeles Link system using AACEi principles and common practices associated with projects in development. The following describes the process that was used to develop the cost forecast; additional detail is provided in the supplemental workpaper supporting my testimony.

The SoCalGas estimating team developed the cost forecast based on the project's assumed scope from the Phase 1 feasibility studies, including routing information from the

22 The costs reflected herein are all Operating and Maintenance (O&M) costs, which include direct costs, adjusted for applicable overhead loaders, escalation, and other necessary costs. Additional discussion of SoCalGas's proposed cost treatment is provided in the Testimony of Nasim Ahmed and Michael W. Foster.

Preliminary Routing and Configuration Analysis. The forecast assumes a route length of 481 miles, which correlates to a potential directional route option (Route D) identified in the Phase 1 Preliminary Routing and Configuration Analysis. This was the longest route considered in the analysis; it was selected to account for alignment variations that will be evaluated during FEED. The forecast also assumes that two 50,000 horsepower compressor stations will be required. These assumptions anchored the estimating scope so the Phase 2 cost forecast could be developed.

In developing the Phase 2 cost forecast in Table BW-1, SoCalGas utilized AACEi principles to develop an activity-based, bottom-up approach to identify direct costs for the completion of Pre-FEED and FEED activities. This approach derives the total cost "from the summation of detailed estimates for all the individual constituent components of the project. This method aims at constructing the estimate of a system from the knowledge accumulated about the small components and their interactions."[23] This method results in a structured estimate that can be tracked and managed.

Specifically, project engineering and design, project management, environmental, and other cost categories were estimated through various methodologies and experience from previous projects. A deliverable list for pipeline and compressor station components was compiled and labor hours were estimated to complete each deliverable. Project packages, deliverables, levels of effort, and staff hours were based on historical experience and expert judgment. Critical assumptions such as engineering design drawing sheet-count per mile, number of valve stations, alternative installations, and level of effort per drawing sheet for all pipeline segments were also derived in this manner.

Project cost estimates will evolve with the advancement of project definition. As with all project estimates, the forecast for Phase 2 Pre-FEED and FEED work includes assumptions, constraints, uncertainty, and perceptions of risk.[24] The Angeles Link system is early in the project development lifecycle as identified above, with project definition maturity level estimated at 1-2%. At this early time in the project development lifecycle, there is typically a

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[23] PMI, *Practice Standard for Project Estimating – Second Edition* (January 2020) at 50.

[24] *Id.* at 21.

reduced estimate confidence and accuracy, which necessitates a larger confidence range. As the project definition advances, a smaller confidence range is typically utilized.

SoCalGas also conducted a risk assessment for Phase 2 engineering design and project management activities in order to perform a Monte Carlo simulation analysis to generate a contingency amount to be applied to the base forecast. The risk assessment took into consideration the current maturity of project definition. According to AACEi, contingency is "an amount added to an estimate to allow for items, conditions, or events for which the state, occurrence, or effect is uncertain and that experience shows will likely result, in aggregate, in additional costs."[25] Contingency is "typically estimated using statistical analysis or judgment based on past asset or project experience."[26] Using the AACEi contingency methodology, SoCalGas identified an average contingency percentage of 24% that was included in the Phase 2 Engineering Design Cost Forecast presented herein. This percentage is within the range of expected contingency for projects that are in a preliminary stage of development and reflects SoCalGas's careful consideration of risks through the aforementioned AACEi methodology that is widely accepted.[27] Contingency is expected to be expended during the execution of Phase 2; however, it is not a provision to cover major changes in scope or execution.

B. Cost Controls

SoCalGas will implement project controls to execute Phase 2 of Angeles Link on schedule and at reasonable cost, while producing quality deliverables and meeting applicable engineering standards and regulatory requirements. The Pre-FEED and FEED methodologies and the stage-gate approach SoCalGas will employ during Phase 2 are industry standard processes for large infrastructure projects. Further, cost controls are an important part of SoCalGas's Project Delivery Model and have been exercised effectively on other recent programs.[28] A dedicated Project Controls team will be responsible for performing cost controls

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[25] AACEi, *Recommended Practice 10S-90: Cost Engineering Terminology* (July 24, 2024) at 31, *available at:* https://web.aacei.org/docs/default-source/rps/10s-90.pdf.

[26] *Id.*

[27] The Commission has ruled in SoCalGas's favor regarding the estimation of contingency in this manner in both D.19-03-025 and D.19-09-051.

[28] *See* PSEP Decisions D.16-12-063, D.19-02-004, D.19-03-025, and D.20-08-034; approval for recovery of Storage Integrity Management Program Balancing Account (SIMPBA) costs in

for Angeles Link. The Project Controls team, in coordination with SoCalGas's Project Management team discussed above, will implement a cost management plan for Phase 2 to: estimate the planned resources; convert the estimates to a time-phased budget; monitor expenditures and cash flow as the work proceeds; identify incorrect or unapproved charges; manage changes to the baseline as they occur; take corrective actions; continuously forecast the final cost of the project; and report the status of project costs to key stakeholders and leadership.

Effective cost management is a necessary endeavor that promotes confidence in completing the defined scope of work within the approved budget, mitigating possible risks, and proactively controlling cost variances. To accomplish these objectives in Phase 2, SoCalGas will utilize cost control concepts that are widely practiced by infrastructure project practitioners such as Earned Value Management and the development of an Estimate at Completion (EAC) forecasted budget. Consistent with best practices for project management, actual and forecasted costs will be updated and tracked. Costs will be tracked through the creation of internal order numbers which will then be used to record expenditures. Cost tracking reports will be utilized to monitor incurred expenditures against forecast. Forecast changes will be reported and reviewed with the Project Team periodically to determine the required action(s).

VI. CONCLUSION

This concludes my prepared direct testimony.

Resolution G-3544 at 4-5; approval for recovery of Transmission Integrity Management Program Balancing Account costs in Resolution G-3600 at 5-9.

VII. CHAPTER 4 GLOSSARY[29]

- Association for the Advancement of Cost Engineering International (AACEi) – An industry leading organization in the field of cost estimating. AACEi guidelines and standards are used by SoCalGas to develop cost estimates for all major capital projects, inclusive of pipelines and complex facilities such as compressor stations.
- Baseline – The approved version of a work product, used as a basis for comparison to actual results.
- Budget – The approved estimate for the project or any work breakdown structure (WBS) component or any schedule activity.
- Change – A modification to any formally controlled deliverable, project management plan component or project document.
- Change Control – A process whereby modifications to documents, deliverables, or baselines associated with the project are identified, documented, approved or rejected.
- Class 3 Estimate – Generally produced at the conclusion of FEED when a 30% design package is available. Typically, engineering is 10 to 40% complete; therefore, a higher level of accuracy is anticipated and may fall within the range of -20% to +30%. According to AACE, Class 3 estimates are "generally prepared to form the basis for budget authorization, appropriation, and/or funding. As such, they typically form the initial control estimate against which all actual costs and resources will be monitored."[30]
- Class 4 Estimate – Generally produced at the conclusion of Pre-FEED. Typically, engineering is 1 to 15% complete; therefore, accuracy is limited and may fall within the range of -30% to +50%. These estimates are often used for project screening, concept evaluation, and preliminary budget approval.
- Complexity – A characteristic of a program or project or its environment that is difficult to manage due to human behavior, system behavior, and ambiguity.

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[29] This section references the *PMBOK Guide: A Guide to the Project Management Body of Knowledge.*

[30] AACEi RP 97R-18 at 10.

- Contingency – An event or occurrence that could affect the execution of the project, which may be accounted for with a reserve.
- Control – The process of comparing actual performance with planned performance, analyzing variances, assessing trends to effect process improvements, evaluating possible alternatives, and recommending appropriate corrective action as needed.
- Deliverable – Any unique and verifiable product, result, or capability to perform a service that is required to be produced to complete a process, phase, or project.
- Earned Value – The measure of work performed expressed in terms of the budget authorized for that work.
- Estimate – A quantitative assessment of the likely amount or outcome of a variable, such as project costs, resources, effort or durations.
- Forecast – An estimate or prediction of conditions and events in the project's future based on information and knowledge available at the time of the forecast.
- Governance – The framework for directing and enabling an organization through its established policies, practices and other relevant documentation.
- Estimate at Completion (EAC) – The expected total cost of completing all work expressed as the sum of the actual cost to date and the estimate to complete.
- FEED (Front-End Engineering Design) - The process through which the engineering design of the system route identified during Pre-FEED is advanced to 30% design level, which would support a Class 3 estimate.
- Incremental Approach – An adaptive development approach in which the deliverable is produced successively, adding functionality until the deliverable contains the necessary and sufficient capability to be considered complete.
- Issue – A current condition or situation that may have an impact on the project objectives.
- Iterative Approach – A development approach that focuses on an initial, simplified implementation then progressively elaborates adding to the feature set until the final deliverable is complete.

- Lessons Learned – The knowledge gained during a project, which shows how project events were addressed or should be addressed in the future, for the purpose of improving future performance.
- Monitor – Collect project performance data, produce performance measures, and report and disseminate performance information.
- Monte Carlo Simulation – A method of identifying the potential impacts of risk and uncertainty using multiple iterations of a computer model to develop a probability distribution of a range of outcomes that could result from a decision or course of action.
- Plan – A proposed means of accomplishing something.
- Pre-FEED (Pre-Front-End Engineering Design) - References to Pre-FEED activities in Phase 2 refer to those Phase 2 activities to advance the work done during Phase 1 and to select a preferred system route and further refine pipeline system design and requirements to develop the information needed to complete a FEED study for the preferred system route.
- Project – A temporary endeavor undertaken to create a unique product, service or result.
- Project Governance – The framework, functions, and processes that guide project management activities in order to create a unique product, service or result to meet organizational, strategic, and operational goals.
- Project Lifecycle – The series of phases that a project passes through from its start to its completion.
- Project Execution Plan – The document that describes how the project will be executed, monitored and controlled, and closed.
- Project Management Team – The members of the project team who are directly involved in project management activities.
- Project Manager – The person assigned by the performing organization to lead the team that is responsible for achieving the project objectives.
- Project Schedule – An output of a schedule model that presents linked activities with planned dates, durations, milestones and resources.

- Project Scope – The work performed to deliver a product, service, or result with the specified features and functions.
- Project Team – A set of individuals performing the work of the project to achieve its objectives.
- Proponent's Environmental Assessment (PEA) – is an environmental assessment that must be included with any CPUC Public Convenience and Necessity (CPCN) or Permit to Construct (PTC) application for authority to undertake a project that is not statutorily or categorically exempt from the requirements of the California Environmental Quality Act (CEQA). CPUC Rules of Practice and Procedure, available at: https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/administrative-law-judge-division/documents/rules-of-practice-and-procedure-may-2021.pdf.
- Quality Management Plan – A component of the project or program management plan that describes how applicable policies, procedures, and guidelines will be implemented to achieve the quality objectives.
- Report – A formal record or summary of information.
- Requirement – A condition of capability that is necessary to be present in a product, service, or result to satisfy a business need.
- Risk Register – A repository in which outputs of risk management processes are recorded.
- Risk Review – The process of analyzing the status of existing risks and identifying new risks.
- Specification – A precise statement of the needs to be satisfied and the essential characteristics that are required.
- Stakeholder Engagement Plan – A component of the project execution plan that identifies the strategies and actions required to promote productive involvement of stakeholders in project or program decision making and execution.
- Verification – The evaluation of whether or not a product, service, or result complies with a regulation, requirement, specification, or imposed condition.

- Work Breakdown Structure (WBS) – A hierarchical decomposition of the total scope of work to be carried out by the project team to accomplish the project objectives and create the required deliverables.
- Work Package – The work defined at the lowest level of the work breakdown structure for which cost and duration are estimated and managed.

VIII. QUALIFICATIONS

My name is Brian J. Walker. I presently hold the position of Director of Project Management for SoCalGas. I hold a Bachelor of Science degree in Mechanical Engineering and a Master's degree in Business Administration from California Polytechnic State University, Pomona.

I have a broad background in engineering and natural gas pipeline operations with over 17 years of experience with SoCalGas. I have held a number of technical and managerial positions with increasing responsibility in the Gas Engineering, Gas Transmission, Gas Control & System Planning, and Construction Departments. In these positions, I have been responsible for engineering, field operations, gas system control operations, project management, and construction. I have held my current position as the Director of Project Management since September 2022.

I have not previously testified before the Commission.