COST and SCHEDULE WORKPAPERS

Witness: Neil Navin

PSRP Forecast Application

Project: PSRP Alternatives

Workpapers	Corresponding Testimony Tables	Workpaper Page
Capital		
O&M		

FERC ACCT: 367

IN SERVICE DATE:

Proposed Project/ Alternative	Base Estimate	Contingency $	Contingency %	Base Estimate + Contingency	Base Estimate + Contingency + Total Derating Cost*	Anticipated In-Service Date	O&M $	TIMP (Every 7 years) $	TIMP/7 $	Total Annual Ops Costs $
B. No Project										
B. No Project Alternative (Hydrostatic Testing) (Testing 4/1-5/15 & 10/1-12/15)	$ 90,308,094	$ 22,577,024	25.0%	$ 112,885,118	**$ 112,885,118**	**12/15/2021**	$ 300,000	$ 1,400,000	$ 200,000	$ 500,000
C. Alternative Diameter Pipeline, Various Sizes, Proposed Route.										
C1. Alternate Diameter 10"	$ 251,977,246	$ 30,555,897	12.1%	$ 282,533,143	**$ 297,635,596**	**1/1/2021**	$ 240,000	$ 500,000	$ 71,429	$ 311,429
C2. Alternate Diameter 12"	$ 272,218,118	$ 32,775,184	12.0%	$ 304,993,302	**$ 320,095,755**	**1/1/2021**	$ 240,000	$ 500,000	$ 71,429	$ 311,429
C3. Alternate Diameter 16"	$ 287,704,583	$ 34,243,808	11.9%	$ 321,948,391	**$ 337,050,844**	**1/1/2021**	$ 240,000	$ 500,000	$ 71,429	$ 311,429
C4. Alternate Diameter 20"	$ 302,452,879	$ 35,331,820	11.7%	$ 337,784,699	**$ 352,887,152**	**1/1/2021**	$ 240,000	$ 500,000	$ 71,429	$ 311,429
C5. Alternate Diameter 24"	$ 309,909,053	$ 36,233,033	11.7%	$ 346,142,086	**$ 361,244,539**	**1/1/2021**	$ 240,000	$ 500,000	$ 71,429	$ 311,429
C6. Alternate Diameter 30"	$ 337,741,285	$ 39,377,286	11.7%	$ 377,118,571	**$ 392,221,024**	**1/1/2021**	$ 240,000	$ 500,000	$ 71,429	$ 311,429
C7. Alternate Diameter 42"	$ 461,735,039	$ 50,706,817	11.0%	$ 512,441,856	**$ 527,544,309**	**1/1/2021**	$ 240,000	$ 500,000	$ 71,429	$ 311,429
D. Replace Line 1600 in Place with a New 16-inch Transmission Pipeline.	$ 427,746,400	$ 128,323,920	30.0%	$ 556,070,320	**$ 556,070,320**	**1/1/2026**	$ 300,000	$ 500,000	$ 71,429	$ 371,429
E/F. Otay Mesa Alternative.	$ 687,115,205	$ 274,846,082	40.0%	$ 961,961,287	**$ 977,063,740**	**1/1/2024**	$ -	$ -	$ -	$ -
G. LNG Storage (Peak Shaver) Alternative.	$ 2,042,000,000	$ 612,600,000	30.0%	$ 2,654,600,000	**$ 2,669,702,453**	**1/1/2025**	$ 1,200,000	$ -	$ -	$ 1,200,000
H. Alternate Energy Alternatives										
H1. Batteries - Grid Scale	$ 5,600,000,000	$ 2,800,000,000	50.0%	$ 8,400,000,000	**$ 8,415,102,453**	**1/1/2025**	$ 1,200,000	$ -	$ -	$ 1,200,000
H2. Batteries - Small Scale	$ 6,720,000,000	$ 3,360,000,000	50.0%	$ 10,080,000,000	**$ 10,095,102,453**	**1/1/2025**	$ 1,200,000	$ -	$ -	$ 1,200,000
I. Offshore Route Alternative	$ 1,024,879,032	$ 409,951,613	40.0%	$ 1,434,830,645	**$ 1,449,933,098**	**1/1/2030**	$ 450,000	$ 500,000	$ 71,429	$ 521,429
J. Cross-County Pipeline Route Alternatives.										
J1. Blythe to Santee Alternative 1	$ 1,048,025,756	$ 314,407,727	30.0%	$ 1,362,433,483	**$ 1,377,535,936**	**1/1/2025**	$ 1,138,081	$ 1,500,000	$ 214,286	$ 1,352,367
J2. Blythe to Santee Alternative 2	$ 1,000,340,683	$ 300,102,205	30.0%	$ 1,300,442,888	**$ 1,315,545,341**	**1/1/2025**	$ 1,139,104	$ 1,500,000	$ 214,286	$ 1,353,390
J3. Cactus City to San Diego Alternative	$ 867,956,368	$ 260,386,910	30.0%	$ 1,128,343,278	**$ 1,143,445,731**	**1/1/2025**	$ 819,275	$ 1,500,000	$ 214,286	$ 1,033,561
K. Second Pipeline along Line 3010 Alternative	$ 446,191,300	$ 133,857,390	30.0%	$ 580,048,690	**$ 595,151,143**	**1/1/2026**	$ 230,277	$ 500,000	$ 71,429	$ 301,706

* Derating cost not added to Option B - No Project Alternative (Hydrostatic Testing)

DERATING COST ESTIMATE:

A1 Derating L1600	$ 12,663,537	$ 2,438,916	19.3%	$ 15,102,453	N/A

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option B - L1600 Hydrotest (Shoulder Months)	TBD
WITNESS	**IN SERVICE DATE**
Neil Navin	12/15/2021

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Materials	$ 2.3
Construction	$ 43.7
Engineering & Design	$ 3.6
Environmental	$ 5.2
Company Labor	$ 2.4
Major Bypasses	$ 8.9
Gas Transportation to Otay Mesa	$ 16.2
Other Project Execution Activities	$ 8.1
Contingency	$ 22.6
Total	$ 112.9

Project Description

This pipeline falls under the SDG&E and SCG Pipeline Safety Enhancement Plan (PSEP). Documentation of strength-testing by hydrotest must be established to validate the Maximum Allowable Operating Pressure (MAOP) of 640 psi. A minimum test pressure of 960 psi must be held continuously for at least 8 hours to verify the 640 psi MAOP. A spike test will also be included with each test raising the pressure approximately 5% for one-half hour. The maximum test pressure may be higher in some cases to accommodate elevation differences but should not exceed 90% SMYS or 1,462 psi. Per National Transportation Safety Board (NTSB) recommendations and as adopted by the California Public Utilities Commission (CPUC), pipeline pressure test performed in conjunction with integrity validation work utilize the pressure spike test format.

Forecast Methodology

SPEC Services, Inc. (SPEC) performed a preliminary engineering study and provided cost estimates to hydrotest Line 1600, from Rainbow Metering Station to Kearny Villa Pressure Limiting Station, as part of the SDG&E and SCG Pipeline Safety Enhancement Plan (PSEP). SPEC subcontracted a pipeline contractor, ARB, to assist with the estimate. The environmental preliminary study and estimate were performed by Insignia Environmental.

A standard template has been developed for hydrotest cost estimating through involvement with SPEC Services the Pipeline Safety Enhancement Plan (PSEP). The estimates include consistent assumptions and costs relative to mobilization, crew sizes, materials, inspection, support personnel, etc. Additional cost input specific to this project were obtained from ARB, ROW consultants, environmental consultant Insignia, engineering and design staff to have the cost estimate be reflective of the specific conditions associated with the Line 1600 project.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option B - L1600 Hydrotest (Shoulder Months)	TBD
WITNESS	**IN SERVICE DATE**
Neil Navin	12/15/2021

Schedule

Since there must always be a flow path from either the north or the south, only one test can be conducted at a time. Each test segment will take approximately four to six weeks to conduct. Avoidance of peak gas usage during the winter and summer months will limit hydrotesting activities from April 1st through June 15th and October 1st through December 15th. Testing all 19 segments, avoidance of peak usage, installing bypasses and arranging for alternative distribution requirements, the total duration will be approximately 3 years.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option C1 - Alternate Diameter 10"	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2021

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Materials	$ 27.0
Construction	$ 159.2
Engineering & Design	$ 7.3
Environmental	$ 19.4
Other Project Execution Activities	$ 22.3
Company Labor	$ 16.8
Contingency	$ 30.6
Total	$ 282.5

Project Description

This Alternative requires Applicants to evaluate the construction of different sized pipelines of alternate diameters. This analysis assumed the same proposed route as the 47-mile Proposed Project from Rainbow Metering Station to MCAS Miramar. C1 Alt. Dia. 10" Pipe, 10", X-52, 0.365" WT, FBE. Line 1600 would be de-rated and would operate as a distribution asset.

Forecast Methodology

High-level cost estimates have been developed for the alternative diameters. This project involves similar components as the Proposed Project though in different quantities. The pipeline material specifications for each alternative would be similar to the Proposed Project. Other costs for activities such as engineering, survey, and right-of-way acquisition , should be comparable, on a unit cost basis, to the estimates developed for the Proposed Project. Costs for construction activities and materials were factored from the Proposed Project relative to pipe diameter size.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option C1 - Alternate Diameter 10"	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2021

Schedule

The schedule for the alternate diameter is assumed to be similar to the Proposed Project.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option C2 - Alternate Diameter 12"	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2021

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Materials	$ 36.8
Construction	$ 168.1
Engineering & Design	$ 7.6
Environmental	$ 20.4
Other Project Execution Activities	$ 22.6
Company Labor	$ 16.8
Contingency	$ 32.8
Total	$ 305.0

Project Description

This Alternative requires Applicants to evaluate the construction of different sized pipelines of alternate diameters. This analysis assumed the same proposed route as the 47-mile Proposed Project from Rainbow Metering Station to MCAS Miramar. C2 Alt. Dia. 12" Pipe, 12", X-52, 0.375" WT, FBE. Line 1600 would be de-rated and would operate as a distribution asset.

Forecast Methodology

High-level cost estimates have been developed for the alternative diameters. This project involves similar components as the Proposed Project though in different quantities. The pipeline material specifications for each alternative would be similar to the Proposed Project. Other costs for activities such as engineering, survey, and right-of-way acquisition , should be comparable, on a unit cost basis, to the estimates developed for the Proposed Project. Costs for construction activities and materials were factored from the Proposed Project relative to pipe diameter size.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option C2 - Alternate Diameter 12"	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2021

Schedule

The schedule for the alternate diameter is assumed to be similar to the Proposed Project.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option C3 - Alternate Diameter 16"	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2021

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Materials	$ 44.7
Construction	$ 175.3
Engineering & Design	$ 7.9
Environmental	$ 20.4
Other Project Execution Activities	$ 22.6
Company Labor	$ 16.8
Contingency	$ 34.2
Total	$ 321.9

Project Description

This Alternative requires Applicants to evaluate the construction of different sized pipelines of alternate diameters. This analysis assumed the same proposed route as the 47-mile Proposed Project from Rainbow Metering Station to MCAS Miramar. C3 Alt. Dia. 16" Pipe, 16", X-52, 0.375" WT, FBE. Line 1600 would be de-rated and would operate as a distribution asset.

Forecast Methodology

High-level cost estimates have been developed for the alternative diameters. This project involves similar components as the Proposed Project though in different quantities. The pipeline material specifications for each alternative would be similar to the Proposed Project. Other costs for activities such as engineering, survey, and right-of-way acquisition , should be comparable, on a unit cost basis, to the estimates developed for the Proposed Project. Costs for construction activities and materials were factored from the Proposed Project relative to pipe diameter size.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option C3 - Alternate Diameter 16"	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2021

Schedule

The schedule for the alternate diameter is assumed to be similar to the Proposed Project.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option C4 - Alternate Diameter 20"	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2021

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Materials	$ 56.7
Construction	$ 177.8
Engineering & Design	$ 8.2
Environmental	$ 20.4
Other Project Execution Activities	$ 22.6
Company Labor	$ 16.8
Contingency	$ 35.3
Total	$ 337.8

Project Description

This Alternative requires Applicants to evaluate the construction of different sized pipelines of alternate diameters. This analysis assumed the same proposed route as the 47-mile Proposed Project from Rainbow Metering Station to MCAS Miramar. C4 Alt. Dia. 20" Pipe, 20", X-65, 0.375" WT, FBE. Line 1600 would be de-rated and would operate as a distribution asset.

Forecast Methodology

High-level cost estimates have been developed for the alternative diameters. This project involves similar components as the Proposed Project though in different quantities. The pipeline material specifications for each alternative would be similar to the Proposed Project. Other costs for activities such as engineering, survey, and right-of-way acquisition , should be comparable, on a unit cost basis, to the estimates developed for the Proposed Project. Costs for construction activities and materials were factored from the Proposed Project relative to pipe diameter size.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option C4 - Alternate Diameter 20"	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2021

Schedule

The schedule for the alternate diameter is assumed to be similar to the Proposed Project.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option C5 - Alternate Diameter 24"	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2021

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Materials	$ 54.9
Construction	$ 186.8
Engineering & Design	$ 8.3
Environmental	$ 20.4
Other Project Execution Activities	$ 22.7
Company Labor	$ 16.8
Contingency	$ 36.2
Total	$ 346.1

Project Description

This Alternative requires Applicants to evaluate the construction of different sized pipelines of alternate diameters. This analysis assumed the same proposed route as the 47-mile Proposed Project from Rainbow Metering Station to MCAS Miramar. C5 Alt. Dia. 24" Pipe, 24", X-65, 0.375" WT, FBE. Line 1600 would be de-rated and would operate as a distribution asset.

Forecast Methodology

High-level cost estimates have been developed for the alternative diameters. This project involves similar components as the Proposed Project though in different quantities. The pipeline material specifications for each alternative would be similar to the Proposed Project. Other costs for activities such as engineering, survey, and right-of-way acquisition , should be comparable, on a unit cost basis, to the estimates developed for the Proposed Project. Costs for construction activities and materials were factored from the Proposed Project relative to pipe diameter size.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option C5 - Alternate Diameter 24"	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2021

Schedule

The schedule for the alternate diameter is assumed to be similar to the Proposed Project.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option C6 - Alternate Diameter 30"	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2021

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Materials	$ 59.7
Construction	$ 209.3
Engineering & Design	$ 8.9
Environmental	$ 20.4
Other Project Execution Activities	$ 22.8
Company Labor	$ 16.8
Contingency	$ 39.4
Total	$ 377.1

Project Description

This Alternative requires Applicants to evaluate the construction of different sized pipelines of alternate diameters. This analysis assumed the same proposed route as the 47-mile Proposed Project from Rainbow Metering Station to MCAS Miramar. C6 Alt. Dia. 30" Pipe, 30", X-65, 0.50" WT, FBE. Line 1600 would be de-rated and would operate as a distribution asset.

Forecast Methodology

High-level cost estimates have been developed for the alternative diameters. This project involves similar components as the Proposed Project though in different quantities. The pipeline material specifications for each alternative would be similar to the Proposed Project. Other costs for activities such as engineering, survey, and right-of-way acquisition , should be comparable, on a unit cost basis, to the estimates developed for the Proposed Project. Costs for construction activities and materials were factored from the Proposed Project relative to pipe diameter size.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option C6 - Alternate Diameter 30"	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2021

Schedule

The schedule for the alternate diameter is assumed to be similar to the Proposed Project.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option C7 - Alternate Diameter 42"	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2021

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Materials	$ 123.9
Construction	$ 266.5
Engineering & Design	$ 10.5
Environmental	$ 20.4
Other Project Execution Activities	$ 23.1
Company Labor	$ 17.4
Contingency	$ 50.7
Total	$ 512.4

Project Description

This Alternative requires Applicants to evaluate the construction of different sized pipelines of alternate diameters. This analysis assumed the same proposed route as the 47-mile Proposed Project from Rainbow Metering Station to MCAS Miramar. C7 Alt. Dia. 42" Pipe, 42", X-60, 0.750" WT, FBE. Line 1600 would be de-rated and would operate as a distribution asset.

Forecast Methodology

High-level cost estimates have been developed for the alternative diameters. This project involves similar components as the Proposed Project though in different quantities. The pipeline material specifications for each alternative would be similar to the Proposed Project. Other costs for activities such as engineering, survey, and right-of-way acquisition , should be comparable, on a unit cost basis, to the estimates developed for the Proposed Project. Costs for construction activities and materials were factored from the Proposed Project relative to pipe diameter size.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option C7 - Alternate Diameter 42"	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2021

Schedule

The schedule for the alternate diameter is assumed to be similar to the Proposed Project.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option D - Replace L1600 in Place with a 16" Pipeline	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2026

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Materials	$ 41.1
Construction	$ 156.2
Engineering & Design	$ 17.1
Environmental	$ 29.2
Company Labor	$ 17.3
Major Bypasses	$ 8.9
Gas Transportation to Otay Mesa	$ 29.2
Other Project Execution Activities	$ 128.9
Contingency	$ 128.3
Total	$ 556.1

Project Description

This Alternative requires the removal of the existing Line 1600 and its replacement with a new 16-inch diameter pipeline within existing easements.

Nineteen pipeline segments covering approximately 45 miles would be removed and replaced over a period over 3 years. Removal and replacement would be conducted in phases to minimize customer impact.

Forecast Methodology

A high-level cost estimate has been developed for the applicable quantities and unit costs based on Alternate B and Alternate C3 estimates. Costs for environmental and other project execution activities were consistent with the assumptions and costs relative to the Proposed Project.

A standard template has been developed for replacement cost estimating through involvement with SPEC Services the Pipeline Safety Enhancement Plan (PSEP). The estimates include consistent assumptions and costs relative to mobilization, crew sizes, materials, inspection, support personnel, etc. Additional cost input specific to this project were obtained from ROW consultants, engineering and design staff to have the cost estimate be reflective of the specific conditions associated with the Line 1600 replacement project.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option D - Replace L1600 in Place with a 16" Pipeline	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2026

Schedule

Since there must always be a flow path from either the north or the south, only one replacement can be conducted at a time. Each replacement segment will take approximately seven to eighteen weeks to conduct. Replacing all 19 segments will take over 3 years for construction. An additional year would be required for preliminary engineering/design and an additional 2 years would be required for permanent ROW acquisition through

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option E/F - Otay Mesa Alternative	367
WITNESS	**IN SERVICE DATE**
Gwen Marelli	1/1/2024

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Subtotal	$ 687.1
Contingency	$ 274.8
Total	$ 962.0

Project Description

The high cost alternative assumes the North Baja Pipeline System (86 miles of 30") and Gasoducto Rosarito System (140 miles of 30") are looped from Ehrenberg to TGN. No corresponding expansion of TGN is assumed to be required because TGN's existing delivery capacity to Otay Mesa is already 800 MMcfd.

Forecast Methodology

The cost per mile, to loop North Baja Pipeline with 30" pipeline, construction costs was calculated using TransCanada's North-South alternative proposal filed in 2012 without compression. The cost per mile, to loop Gasoducto Rosarito, was calculated based on a successful bid for the Gasoducto Sonora Project. The total cost was escalated from 2012 to 2015 dollars.

Schedule

The time required to develop an application and negotiate a preliminary contract with the interstate pipeline company would be approximately 1 year. The regulatory proceeding takes an additional 2 years. The construction of the expansion capacity and operation availability would likely be an additional 3 to 4 years. The Otay Mesa alternative to have (Contractual/ North Baja) in place and flowing supplies is 2024.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option G - LNG Storage (Peak Shaving)	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2025

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Subtotal	$ 2,042.0
Contingency	$ 612.6
Total	$ 2,654.6

Project Description

To provide an alternative solution by means of LNG storage facilities at the four major power plants in San Diego. The estimated approach was to take existing power plant capacity (Mega Watts) for each power plant and convert it to natural gas consumption in order to properly size an LNG storage facility for each power plant to provide a 5 day reserve.

Forecast Methodology

Costs were based on a similar project, Energía Costa Azul (ECA). Each plant was compared to the ECA project and factored based on the 6/10th rule. Liquefaction costs were excluded and not used. Plant costs were factored based on Inside Battery Limits (ISBL), which included regasification and storage only, and did not include Outside Battery Limits (OSBL).

Schedule

No detailed schedule analysis was done. The permit approval timeline is unknown.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option H1 - Alternate Energy (Grid-Scale Battery)	367
WITNESS	**IN SERVICE DATE**
Sohrab Ali Yari	1/1/2025

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Subtotal	$ 5,600.0
Contingency	$ 2,800.0
Total	$ 8,400.0

Project Description

Grid Scale Battery/Energy Storage envisions the installation of a system of grid-scale batteries and associated equipment that would be sufficient to supply customers with energy equivalent to the Proposed Project. The gas supply is lost to all local electric generation during a peak load period; gas supply is unavailable for a four-hour period; and that no customer outages would occur. A system of grid-scale batteries might provide four hours of electric supply under the circumstances that electric generation was unavailable due to the loss of the natural gas supply; however, grid-scale batteries would not provide any energy replacement for the residential and business needs that are currently supplied by natural gas. The same can be assumed that a smaller-scale, alternative energy battery storage involves the installation of smaller-scale batteries and associated equipment to supplement the gas supply system at times when additional capacity is needed (e.g. unplanned outages, maintenance, peak demand). Similar to the grid-scale battery storage project, the Applicants assume that smaller-scale battery storage would supply four hours of electric supply, including approximately 11,200 MWh of energy storage capacity.

Forecast Methodology

The Applicants are unaware of a battery storage project of this magnitude being undertaken and, as a result, battery production on this scale would be very difficult, very expensive, very large (requiring approximately 100 acres of land) and would take a very long time to produce. $500 per kWh was the Bloomberg New Energy Finance observed value. 11,200 MWH would cost approximately $5.6B.

Schedule

No detailed schedule analysis was done. The permit approval timeline is unknown.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option H2 - Alternate Energy (Small-Scale Battery)	367
WITNESS	**IN SERVICE DATE**
Sohrab Ali Yari	1/1/2025

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Subtotal	$6,720.0
Contingency	$3,360.0
Total	$10,080.0

Project Description

Applicants assume that a smaller-scale alternative energy battery storage involves the installation of smaller-scale batteries and associated equipment to supplement the gas supply system at times when additional capacity is needed (e.g. unplanned outages, maintenance, peak demand). Similar to the grid-scale battery alternate, the following scope of smaller-scale battery storage in order to supply four hours of electric supply would include approximately 11,200 MWh of energy storage capacity.

The same issues exist for smaller-scale battery storage as described above related to grid-scale battery storage, specifically which electric services batteries could replace and which natural gas services batteries could not replace. Likewise, the same issues exist as described above regarding the status of the system of smaller-scale batteries depending on their charging and discharging schedules and whether the CAISO schedules that electric supply for grid reliability purposes.

Forecast Methodology

The projected installation cost of $600/kWh in 2020 (a 20% premium over a centralized project to account for the number of sites required, additional complexity, etc.).

Schedule

No detailed schedule analysis was done. The permit approval timeline is unknown.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option I - Offshore Pipeline	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2030

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Subtotal	$ 1,024.9
Contingency	$ 410.0
Total	$ 1,434.8

Project Description

The Offshore Route Alternative assumes construction of a 56.6-mile long, 36-inch diameter underwater pipeline 1-mile off-shore of Southern California, transitioning from offshore to onshore at Line 3010/3011 intersection (receiving point for supply gas to other pipelines in San Diego region).

Forecast Methodology

A high level cost estimate for this Alternative was prepared based on considering broad project assumptions. There is a lack of scope definition. The estimate is based on a productivity efficiency factor for marine project conditions. Permitting and environmental unknowns were assumed to be equal to construction costs.

Schedule

The timeline for permitting will require at least 8 years.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option J1 - Blythe to Santee Alternative 1	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2025

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Subtotal	$ 1,048.0
Contingency	$ 314.4
Total	$ 1,362.4

Project Description

This 222 mile cross-county pipeline initiates in the City of Blythe and traverses directly west, veering south near the northwestern corner of the Salton Sea in Riverside County. The route would then shift southwardly through Imperial County until just north of Ocotillo, at which point the route would run in a general westerly direction until its terminus within the community of Spring Valley. Approximately 202 miles of pipeline would be sited cross-county on undeveloped land, including land that is managed by eight different state and federal agencies.

Forecast Methodology

A high level cost estimate for this Alternative was prepared based on the cost per mile of undeveloped/cross-country crossed and urban areas crossed of the Proposed Project. Materials were assumed to be consistent regardless of type of land crossed. ROW costs were assumed to be half per unit to the Proposed Project. Environmental was based on the USFWS critical habitat crossed compared to the Proposed Project.

Schedule

The in-service year will be 2025.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option J2 - Blythe to Santee Alternative 2	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2025

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Subtotal	$ 1,000.3
Contingency	$ 300.1
Total	$ 1,300.4

Project Description

This 223 mile cross-county pipeline initiates in the City of Blythe and travels south until nearly reaching the City of Yuma, Arizona. At the City of Yuma, the route would veer west, following I-8 until its terminus within the community of Spring Valley. This Alternative would run through Riverside, Imperial, and San Diego counties. Approximately 199 miles of pipeline would be sited cross-county on undeveloped land, including land that is managed by eight different state and federal agencies.

Forecast Methodology

A high level cost estimate for this Alternative was prepared based on the cost per mile of undeveloped/cross-country crossed and urban areas crossed of the Proposed Project. Materials were assumed to be consistent regardless of type of land crossed. ROW costs were assumed to be half per unit to the Proposed Project. Environmental was based on the USFWS critical habitat crossed compared to the Proposed Project.

Schedule

The in-service year will be 2025.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option J3 - Cacuts City to San Diego	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2025

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Subtotal	$ 868.0
Contingency	$ 260.4
Total	$ 1,128.3

Project Description

This 160 mile cross-county pipeline initiates in Cactus City and travel south until just north of Ocotillo, at which point the route would shift west and travel generally in a western direction until its terminus within the community of Spring Valley. Approximately 120 miles of pipeline would be sited cross-county on undeveloped land that is managed by eight different state and federal agencies.

Forecast Methodology

A high level cost estimate for this Alternative was prepared based on the cost per mile of undeveloped/cross-country crossed and urban areas crossed of the Proposed Project. Materials were assumed to be consistent regardless of type of land crossed. ROW costs were assumed to be half per unit to the Proposed Project. Environmental was based on the USFWS critical habitat crossed compared to the Proposed Project.

Schedule

The in-service year will be 2025.

CAPITAL WORKPAPER

WORKPAPER TITLE	FERC ACCT.
Option K - Second Pipeline along 3010, 36" Pipeline	367
WITNESS	**IN SERVICE DATE**
Neil Navin	1/1/2026

ESTIMATED PROJECT DIRECT COST ($000,000 IN 2015$)	
Materials	$ 77.7
Construction	$ 231.9
Engineering & Design	$ 25.6
Environmental	$ 30.4
Company Labor	$ 26.5
Other Project Execution Activities	$ 54.0
Contingency	$ 133.9
Total	$ 580.0

Project Description

This Alternative requires the installation of a new 36" pipeline parallel to Line 3010 within the existing right of way. Extensive right-of-way (ROW) acquisition would be required to fit the new line. Station and cross-tie work assumed to be the same as the Proposed Project. The environmental requirements are assumed to be more extensive than the Proposed Project's environmental scope due to wetlands. Assumed to have the same project outreach and other project execution activities as the Proposed Project.

Forecast Methodology

A high-level cost estimate has been developed for the applicable quantities and unit costs based on the Proposed Project's estimate. Costs for other project execution activities were consistent with the assumptions and costs relative to the Proposed Project. Environmental requirements are assumed to be higher than the Proposed Project.

A standard estimate template was modified with involvement with SPEC Services. The estimate is consistent assumptions and costs relative to mobilization, crew sizes, materials, inspection, support personnel, etc. Additional cost input specific to this project were obtained from ROW consultants, engineering and design staff to have the cost estimate be reflective of the specific conditions associated with the Line 3010 installation project.

Schedule

The high-level schedule duration is assumed to be similar to the Proposed Project. An additional year would be required for preliminary engineering/design and an additional 2 years would be required for permanent ROW acquisition through condemnation prior to construction activities beginning. The anticipated in-service year is by 2026.