Application of SAN DIEGO GAS & ELECTRIC COMPANY for authority to update its gas and electric revenue requirement and base rates effective January 1, 2024 (U 902-M)	))))

Application No. 22-05-___

Exhibit No.: (SDG&E-15-CWP)

CAPITAL WORKPAPERS TO
PREPARED DIRECT TESTIMONY
OF FERNANDO VALERO
ON BEHALF OF SAN DIEGO GAS & ELECTRIC COMPANY

BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

May 2022

2024 General Rate Case - APP

INDEX OF WORKPAPERS

Exhibit SDG&E-15-CWP - CLEAN ENERGY INNOVATIONS

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Overall Summary For Exhibit No. SDG&E-15-CWP

Area: CLEAN ENERGY INNOVATIONS

Witness: Fernando Valero

	In 2021 $ (000)		
	Adjusted-Forecast		
	2022	2023	2024
A. Advanced Energy Storage	13,258	16,448	22,582
B. Microgrid and Controls	6,721	102	0
C. Sustainable Communities	969	407	439
D. Mobile Energy Storage	2,076	2,076	2,076
E. Hydrogen	0	5,941	1,236
Total	**23,024**	**24,974**	**26,333**

Note: Totals may include rounding differences.

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Category: A. Advanced Energy Storage
Workpaper: VARIOUS

Summary for Category: A. Advanced Energy Storage

	In 2021$ (000)			
	Adjusted-Recorded	Adjusted-Forecast		
	2021	2022	2023	2024
Labor	0	1,150	1,037	990
Non-Labor	0	12,108	15,411	21,592
NSE	0	0	0	0
Total	**0**	**13,258**	**16,448**	**22,582**
FTE	0.0	9.2	8.3	8.5
20278A Advanced Energy Storage				
Labor	0	525	35	0
Non-Labor	0	11,958	1,279	0
NSE	0	0	0	0
Total	**0**	**12,483**	**1,314**	**0**
FTE	0.0	4.2	0.3	0.0
212690 Advanced Energy Storage 2.0				
Labor	0	0	252	440
Non-Labor	0	0	13,032	19,590
NSE	0	0	0	0
Total	**0**	**0**	**13,284**	**20,030**
FTE	0.0	0.0	2.0	3.5
212710 Non-Lithium-Ion Energy Storage Technology				
Labor	0	625	750	550
Non-Labor	0	150	1,100	2,002
NSE	0	0	0	0
Total	**0**	**775**	**1,850**	**2,552**
FTE	0.0	5.0	6.0	5.0

Note: Totals may include rounding differences.

Beginning of Workpaper Group
20278A - Advanced Energy Storage

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 20278.0
Category: A. Advanced Energy Storage
Category-Sub: 1. Advanced Energy Storage
Workpaper Group: 20278A - Advanced Energy Storage

Summary of Results (Constant 2021 $ in 000s):

Forecast Method		Adjusted Recorded					Adjusted Forecast		
Years		2017	2018	2019	2020	2021	2022	2023	2024
Labor	Zero-Based	0	0	0	0	0	525	35	0
Non-Labor	Zero-Based	0	0	0	0	0	11,958	1,279	0
NSE	Zero-Based	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**0**	**0**	**12,483**	**1,314**	**0**
FTE	Zero-Based	0.0	0.0	0.0	0.0	0.0	4.2	0.3	0.0

Business Purpose:

This project supports the completion of the last deployment of the Advanced Energy Storage (AES) project approved in SDG&E's 2019 GRC, pursuant to D.19-09-051.

Physical Description:

The AES system at the Borrego Springs Microgrid is currently under-construction and forecasted to reach operational status in the second half of 2022. For the current phase of AES, SDG&E is in the process of installing and integrating a 7.3 MW/14.6 megawatt-hour (MWh) Battery Energy Storage System (BESS) and a 0.25 MW/4 MWh Hydrogen Energy Storage System (HESS) to leverage excess PV at the Borrego Spring Microgrid.

Project Justification:

This project supports the Company's goal of decarbonization, resiliency, and operational flexibility. The Advanced Energy Storage project continues the Company's strategic deployment of energy storage devices established in SDG &E's TY 2019 GRC, D.19-09-051, on distribution circuits with an abundance of solar photovoltaic (PV) penetration to effectively manage the reliability of the grid. Benefits include leveraging excess renewable energy to charge the battery component of the microgrid during the day when the circuit is experiencing lighter load levels, discharging the battery component of the microgrid during times of higher loading, and mitigating electric service intermittency.

Note: Totals may include rounding differences.

Area:	CLEAN ENERGY INNOVATIONS
Witness:	Fernando Valero
Budget Code:	20278.0
Category:	A. Advanced Energy Storage
Category-Sub:	1. Advanced Energy Storage
Workpaper Group:	20278A - Advanced Energy Storage

Forecast Methodology:

Labor - Zero-Based

The forecast method used is zero-based. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. SDG&E develops detailed cost estimates based on current construction labor rates, material costs, overhead rates, contract pricing/quotes, and other project specific details. When projects are completed, actual costs are compared to the estimate to verify the estimates are accurate. Any significant variances between the estimated cost for a project and the actual costs are scrutinized to determine if cost estimate inputs need to be adjusted for future projects. Please see supplemental workpaper.

Non-Labor - Zero-Based

The forecast method used is zero-based. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. SDG&E develops detailed cost estimates based on current construction labor rates, material costs, overhead rates, contract pricing/quotes, and other project specific details. When projects are completed, actual costs are compared to the estimate to verify the estimates are accurate. Any significant variances between the estimated cost for a project and the actual costs are scrutinized to determine if cost estimate inputs need to be adjusted for future projects. Please see supplemental workpaper.

NSE - Zero-Based

N/A

Beginning of Workpaper Sub Details for
Workpaper Group 20278A

Area:	CLEAN ENERGY INNOVATIONS
Witness:	Fernando Valero
Budget Code:	20278.0
Category:	A. Advanced Energy Storage
Category-Sub:	1. Advanced Energy Storage
Workpaper Group:	20278A - Advanced Energy Storage
Workpaper Detail:	20278A.001 - Advanced Energy Storage Project
In-Service Date:	06/30/2023

Description:

As part of the program, SDG&E is installing and integrating a 7.3 MW/14.6 megawatt-hour (MWh) Battery Energy Storage System (BESS) and a 0.25 MW/4 MWh Hydrogen Energy Storage System (HESS) to leverage excess PV at the Borrego Spring Microgrid

Forecast In 2021 $(000)			
Years	**2022**	**2023**	**2024**
Labor	405	35	0
Non-Labor	11,958	1,279	0
NSE	0	0	0
Total	**12,363**	**1,314**	**0**
FTE	3.2	0.3	0.0

Note: Totals may include rounding differences.

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 20278.0
Category: A. Advanced Energy Storage
Category-Sub: 1. Advanced Energy Storage
Workpaper Group: 20278A - Advanced Energy Storage
Workpaper Detail: 20278A.002 - AES - Billable Labor

In-Service Date: 12/31/2022

Description:

As part of the program, SDG&E is installing and integrating a 7.3 MW/14.6 megawatt-hour (MWh) Battery Energy Storage System (BESS) and a 0.25 MW/4 MWh Hydrogen Energy Storage System (HESS) to leverage excess PV at the Borrego Spring Microgrid

Forecast In 2021 $(000)			
Years	**2022**	**2023**	**2024**
Labor	120	0	0
Non-Labor	0	0	0
NSE	0	0	0
Total	**120**	**0**	**0**
FTE	1.0	0.0	0.0

Note: Totals may include rounding differences.

Supplemental Workpapers for Workpaper Group 20278A

TY2024 GRC FORECAST - DETAILS

Budget Code:	20278A
Sub-Budget Code:	
Estimated In Service Date:	6/30/2023

20278A - Advanced Energy Storage Program				2022			2023			2024			
Line Item	Unit Description	Labor/Non-Labor	Unit Metric	# of units	Cost per unit	Total cost	# of units	Cost per unit	Total cost	# of units	Cost per unit	Total cost	Total Cost
1	EPC Payments	Non-Labor	each	1	$ 9,487,472	$ 9,487,472	1	$ 1,114,330	$ 1,114,330	$ -	$ -	$ -	*$ 10,601,802*
2	FTE's Non-Union	Labor	each	1.2	$ 125,000	$ 155,000	0.3	$ 125,000	$ 35,000	$ -	$ -	$ -	*$ 190,000*
3	FTEs Union	Labor	each	1.0	$ 125,000	$ 125,000	-	$ -	$ -	$ -	$ -	$ -	*$ 125,000*
4	Vehicle Utilization	Non-Labor	vehicle	1	$ 41,920	$ 41,920	-	$ -	$ -	$ -	$ -	$ -	*$ 41,920*
5	switchgear	Non-Labor	each	2	$ 250,000	$ 500,000	-	$ -	$ -	$ -	$ -	$ -	*$ 500,000*
6	Owner Engineers	Non-Labor	hours	1,256	$ 180	$ 226,080	94	$ 180	$ 16,920	$ -	$ -	$ -	*$ 243,000*
7	Communication Equipment	Non-Labor	each	1	$ 225,000	$ 225,000	-	$ -	$ -	$ -	$ -	$ -	*$ 225,000*
8	QA/QC Services	Non-Labor	month	7	$ 30,000	$ 195,000	1	$ 15,000	$ 15,000	$ -	$ -	$ -	*$ 210,000*
9	Environmental Services	Non-Labor	month	9	$ 20,000	$ 180,000	-	$ -	$ -	$ -	$ -	$ -	*$ 180,000*
10	Project Support (SP, Schedule, specialists)	Non-Labor	month	12	$ 3,000	$ 36,000	4	$ 3,000	$ 12,000	$ -	$ -	$ -	*$ 48,000*
11	Security services	Non-Labor	month	12	$ 45,294	$ 543,528	1	$ 107,000	$ 107,000	$ -	$ -	$ -	*$ 650,528*
12	IT services	Non-Labor	month	12	$ 12,500	$ 150,000	1	$ 3,750	$ 3,750	$ -	$ -	$ -	*$ 153,750*
13	Community Education Services	Non-Labor	each	1	$ 100,000	$ 100,000	-	$ -	$ -	$ -	$ -	$ -	*$ 100,000*
14	Third Party Study services (CAISO)	Non-Labor	each	2	$ 20,000	$ 40,000	-	$ -	$ -	$ -	$ -	$ -	*$ 40,000*
15	ICON (construction trailer services)	Non-Labor	month	9	$ 5,000	$ 45,000	2	$ 5,000	$ 10,000	$ -	$ -	$ -	*$ 55,000*
16	SCG Labor (Billed capital)	Labor	FTE	1	$ 125,000	$ 125,000	-	$ -	$ -	$ -	$ -	$ -	*$ 125,000*
17	Other Engineering Design	Non-Labor	hours	3	$ 60,000	$ 180,000	-	$ -	$ -	$ -	$ -	$ -	*$ 180,000*
18	SCG PE Services	Non-Labor	hours	40	$ 200	$ 8,000	-	$ -	$ -	$ -	$ -	$ -	*$ 8,000*

Summary								
	Labor		$ 405,000		$ 35,000		$ -	$ 440,000
	Non-Labor		$ 11,958,000		$ 1,279,000		$ -	$ 13,237,000
	NSE		$ -		$ -		$ -	$ -
Total Project Forecast			**$ 12,363,000**		**$ 1,314,000**		**$ -**	**$ 13,677,000**

Beginning of Workpaper Group
212690 - Advanced Energy Storage 2.0

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21269.0
Category: A. Advanced Energy Storage
Category-Sub: 1. Advanced Energy Storage
Workpaper Group: 212690 - Advanced Energy Storage 2.0

Summary of Results (Constant 2021 $ in 000s):

Forecast Method		Adjusted Recorded					Adjusted Forecast		
Years		2017	2018	2019	2020	2021	2022	2023	2024
Labor	Zero-Based	0	0	0	0	0	0	252	440
Non-Labor	Zero-Based	0	0	0	0	0	0	13,032	19,590
NSE	Zero-Based	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**0**	**0**	**0**	**13,284**	**20,030**
FTE	Zero-Based	0.0	0.0	0.0	0.0	0.0	0.0	2.0	3.5

Business Purpose:

This project is a continuation of the prior Advanced Energy System (AES) project and will consist of three energy storage systems each approximately 7MW/14 MWh in size. Strategic deployments of energy storage devices on distribution circuits with an abundance of solar photovoltaic (PV) penetration to effectively manage the operational flexibility of the grid. SDG&E plans to build and place the Advanced Energy Storage 2.0 program in service by 2024.

Physical Description:

Three energy storage systems (e.g. Li-Ion, Li-iron phosphate, hydrogen energy storage) installed on SDG&E distribution circuits with a high penetration of renewable energy and DER PV. Impacts of current market demands and supply chain constraints are reflected in the forecast. As these projects have not yet begun construction, SDG&E intends to conduct a competitive solicitation process requesting proposals (RFP) to identify the optimal product and vendor for the specific locations.

Project Justification:

This project continues to advance the company's strategic deployments of energy storage devices on distribution circuits with an abundance of PV penetration, which has grown significantly since SDG&E's first phase of this project, to effectively manage the reliability of the grid. Benefits include leveraging excess renewable energy to charge during the day when the circuit is experiencing lighter load levels, discharging during times of higher loading, and mitigating intermittency.

Note: Totals may include rounding differences.

Area:	CLEAN ENERGY INNOVATIONS
Witness:	Fernando Valero
Budget Code:	21269.0
Category:	A. Advanced Energy Storage
Category-Sub:	1. Advanced Energy Storage
Workpaper Group:	212690 - Advanced Energy Storage 2.0

Forecast Methodology:

Labor - Zero-Based

Zero based forecast. Please see supplemental workpaper

Non-Labor - Zero-Based

Zero based, Please see supplemental workpaper

NSE - Zero-Based

Not applicable

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21269.0
Category: A. Advanced Energy Storage
Category-Sub: 1. Advanced Energy Storage
Workpaper Group: 212690 - Advanced Energy Storage 2.0

Summary of Adjustments to Forecast

In 2021 $ (000)										
Forecast Method		**Base Forecast**			**Forecast Adjustments**			**Adjusted-Forecast**		
Years		**2022**	**2023**	**2024**	**2022**	**2023**	**2024**	**2022**	**2023**	**2024**
Labor	Zero-Based	0	0	0	0	252	440	0	252	440
Non-Labor	Zero-Based	0	0	0	0	13,032	19,590	0	13,032	19,590
NSE	Zero-Based	0	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**0**	**13,284**	**20,030**	**0**	**13,284**	**20,030**
FTE	Zero-Based	0.0	0.0	0.0	0.0	2.0	3.5	0.0	2.0	3.5

Forecast Adjustment Details

Year	Labor	NLbr	NSE	Total	FTE
2022 Total	0	0	0	0	0.0
2023 Total	0	0	0	0	0.0
2024 Total	0	0	0	0	0.0

Note: Totals may include rounding differences.

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21269.0
Category: A. Advanced Energy Storage
Category-Sub: 1. Advanced Energy Storage
Workpaper Group: 212690 - Advanced Energy Storage 2.0

Determination of Adjusted-Recorded:

	2017 ($000)	2018 ($000)	2019 ($000)	2020 ($000)	2021 ($000)
Recorded (Nominal $)*					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Adjustments (Nominal $) **					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Recorded-Adjusted (Nominal $)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Vacation & Sick (Nominal $)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Escalation to 2021$					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Recorded-Adjusted (Constant 2021$)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0

* After company-wide exclusions of Non-GRC costs
** Refer to "Detail of Adjustments to Recorded" page for line item adjustments
Note: Totals may include rounding differences.

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21269.0
Category: A. Advanced Energy Storage
Category-Sub: 1. Advanced Energy Storage
Workpaper Group: 212690 - Advanced Energy Storage 2.0

Summary of Adjustments to Recorded:

In Nominal $(000)					
Years	**2017**	**2018**	**2019**	**2020**	**2021**
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0

Year	Labor	NLbr	NSE	Total	FTE

Note: Totals may include rounding differences.

Beginning of Workpaper Sub Details for
Workpaper Group 212690

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21269.0
Category: A. Advanced Energy Storage
Category-Sub: 1. Advanced Energy Storage
Workpaper Group: 212690 - Advanced Energy Storage 2.0
Workpaper Detail: 212690.001 - Advanced Energy Storage Program

In-Service Date: Not Applicable

Description:

Continuation of the Advanced Energy Storage Project. Three individual systems approximately 7MW/14 MWh in size.

Forecast In 2021 $(000)			
Years	**2022**	**2023**	**2024**
Labor	0	252	440
Non-Labor	0	13,032	19,590
NSE	0	0	0
Total	**0**	**13,284**	**20,030**
FTE	0.0	2.0	3.5

Note: Totals may include rounding differences.

Supplemental Workpapers for Workpaper Group 212690

TY2024 GRC FORECAST - DETAILS

Budget Code:	212690
Sub-Budget Code:	
Estimated In Service Date:	10/31/2024

212690 - Advanced Energy Storage Program 2.0				2022			2023			2024			
Line Item	Unit Description	Labor/Non-Labor	Unit Metric	# of units	Cost per unit	Total cost	# of units	Cost per unit	Total cost	# of units	Cost per unit	Total cost	Total Cost
1	EPC	Non-Labor	Contract	-	$ -	$ -	1	$ 11,495,500	$ 11,495,500	2	$ 8,625,000	$ 17,250,000	*$ 28,745,500*
2	FTEs	Labor	FTE	-	$ -	$ -	2.0	$ 125,000	$ 252,000	3.5	$ 125,000	$ 440,000	*$ 692,000*
3	Owner's Engineer	Non-Labor	hours	-	$ -	$ -	600	$ 180	$ 108,000	800	$ 180	$ 144,000	*$ 252,000*
4	switchgear	Non-Labor	switchgear	-	$ -	$ -	2	$ 250,000	$ 500,000	3	$ 250,000	$ 750,000	*$ 1,250,000*
5	Communications Equipment	Non-Labor	network comm. equip.	-	$ -	$ -	2	$ 60,000	$ 120,000	3	$ 60,000	$ 180,000	*$ 300,000*
6	QA/QC Services	Non-Labor	month	-	$ -	$ -	7	$ 30,000	$ 210,000	10	$ 30,000	$ 300,000	*$ 510,000*
7	Environmental Services	Non-Labor	month	-	$ -	$ -	7	$ 20,000	$ 140,000	10	$ 20,000	$ 190,000	*$ 330,000*
8	Project Support (SP, Schedule, specialists)	Non-Labor	month	-	$ -	$ -	12	$ 3,000	$ 36,000	12	$ 3,000	$ 36,000	*$ 72,000*
9	Security services	Non-Labor	month	-	$ -	$ -	7	$ 45,000	$ 315,000	10	$ 50,000	$ 500,000	*$ 815,000*
11	IT services	Non-Labor	month	-	$ -	$ -	7	$ 12,500	$ 87,500	8	$ 25,000	$ 200,000	*$ 287,500*
12	Interconnection study fees	Non-Labor	Study fees	-	$ -	$ -	1	$ 20,000	$ 20,000	2	$ 20,000	$ 40,000	*$ 60,000*

Summary					
Labor		$ -	$ 252,000	$ 440,000	$ 692,000
Non-Labor		$ -	$ 13,032,000	$ 19,590,000	$ 32,622,000
NSE		$ -	$ -	$ -	$ -
Total Project Forecast		**$ -**	**$ 13,284,000**	**$ 20,030,000**	**$ 33,314,000**

Beginning of Workpaper Group
212710 - Non-Lithium-Ion Energy Storage Technology

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21271.0
Category: A. Advanced Energy Storage
Category-Sub: 1. Advanced Energy Storage
Workpaper Group: 212710 - Non-Lithium-Ion Energy Storage Technology

Summary of Results (Constant 2021 $ in 000s):

Forecast Method		Adjusted Recorded					Adjusted Forecast		
Years		2017	2018	2019	2020	2021	2022	2023	2024
Labor	Zero-Based	0	0	0	0	0	625	750	550
Non-Labor	Zero-Based	0	0	0	0	0	150	1,100	2,002
NSE	Zero-Based	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**0**	**0**	**775**	**1,850**	**2,552**
FTE	Zero-Based	0.0	0.0	0.0	0.0	0.0	5.0	6.0	5.0

Business Purpose:

Seek commercially available solutions for energy storage technologies that avoid risks associated with over-dependence on lithium-ion and other existing battery technologies. Deploy alternative technologies on a small scale to become familiar with them and the application situations in which they would have merit in larger scale deployment. Examples of technologies that may be deployed are new battery chemistries, as they emerge, and non-battery alternatives such as flywheels and gravity-based storage. This program would perform pilot projects on commercially available technology similar to SDG&E's 2021 Smart Grid Energy Storage program approved in which SDG&E still has the battery energy storage systems in place and operational today.

Physical Description:

Identifying the host sites and getting clearance to use them, and procuring the energy system. Engineering support will be used for arranging the design, installation, and interconnection for the new energy storage systems. Use cases will be defined and monitoring requirements set, as well as running the use cases and monitoring the operational performance. The requested funding includes initial feasibility and planning work, followed by actual deployment and commissioning.

Project Justification:

State policies are driving the future of electricity supply in California in the direction of major reliance on energy storage systems. Only a few types of storage technologies are currently being deployed so there is a risk of over-dependence on these technologies. Furthermore, longer-duration storage, defined as 8 hours or more, and other energy storage alternatives are needed. This project seeks to expand the energy storage options available for field deployment.

Note: Totals may include rounding differences.

Area:	CLEAN ENERGY INNOVATIONS
Witness:	Fernando Valero
Budget Code:	21271.0
Category:	A. Advanced Energy Storage
Category-Sub:	1. Advanced Energy Storage
Workpaper Group:	212710 - Non-Lithium-Ion Energy Storage Technology

Forecast Methodology:

Labor - Zero-Based

Zero based forecast. Please see supplemental workpaper.

Non-Labor - Zero-Based

Zero based forecast. Please see supplemental workpaper.

NSE - Zero-Based

Not applicable

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21271.0
Category: A. Advanced Energy Storage
Category-Sub: 1. Advanced Energy Storage
Workpaper Group: 212710 - Non-Lithium-Ion Energy Storage Technology

Summary of Adjustments to Forecast

In 2021 $ (000)										
Forecast Method		**Base Forecast**			**Forecast Adjustments**			**Adjusted-Forecast**		
Years		**2022**	**2023**	**2024**	**2022**	**2023**	**2024**	**2022**	**2023**	**2024**
Labor	Zero-Based	0	0	0	625	750	550	625	750	550
Non-Labor	Zero-Based	0	0	0	150	1,100	2,002	150	1,100	2,002
NSE	Zero-Based	0	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**775**	**1,850**	**2,552**	**775**	**1,850**	**2,552**
FTE	Zero-Based	0.0	0.0	0.0	5.0	6.0	5.0	5.0	6.0	5.0

Forecast Adjustment Details

Year	Labor	NLbr	NSE	Total	FTE
2022 Total	0	0	0	0	0.0
2023 Total	0	0	0	0	0.0
2024 Total	0	0	0	0	0.0

Note: Totals may include rounding differences.

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21271.0
Category: A. Advanced Energy Storage
Category-Sub: 1. Advanced Energy Storage
Workpaper Group: 212710 - Non-Lithium-Ion Energy Storage Technology

Determination of Adjusted-Recorded:

	2017 ($000)	2018 ($000)	2019 ($000)	2020 ($000)	2021 ($000)
Recorded (Nominal $)*					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Adjustments (Nominal $) **					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Recorded-Adjusted (Nominal $)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Vacation & Sick (Nominal $)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Escalation to 2021$					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Recorded-Adjusted (Constant 2021$)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0

* After company-wide exclusions of Non-GRC costs
** Refer to "Detail of Adjustments to Recorded" page for line item adjustments
Note: Totals may include rounding differences.

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21271.0
Category: A. Advanced Energy Storage
Category-Sub: 1. Advanced Energy Storage
Workpaper Group: 212710 - Non-Lithium-Ion Energy Storage Technology

Summary of Adjustments to Recorded:

In Nominal $(000)					
Years	**2017**	**2018**	**2019**	**2020**	**2021**
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0

Year	Labor	NLbr	NSE	Total	FTE

Note: Totals may include rounding differences.

Beginning of Workpaper Sub Details for
Workpaper Group 212710

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21271.0
Category: A. Advanced Energy Storage
Category-Sub: 1. Advanced Energy Storage
Workpaper Group: 212710 - Non-Lithium-Ion Energy Storage Technology
Workpaper Detail: 212710.001 - Non-Lithium Energy Storage Technology

In-Service Date: 11/30/2024

Description:

Three deployments of non-lithium ion energy storage technology.

Forecast In 2021 $(000)			
Years	**2022**	**2023**	**2024**
Labor	625	750	0
Non-Labor	150	1,100	0
NSE	0	0	0
Total	**775**	**1,850**	**0**
FTE	5.0	6.0	0.0

Note: Totals may include rounding differences.

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21271.0
Category: A. Advanced Energy Storage
Category-Sub: 1. Advanced Energy Storage
Workpaper Group: 212710 - Non-Lithium-Ion Energy Storage Technology
Workpaper Detail: 212710.002 - Non-Lithium Energy Storage Technology

In-Service Date: 11/30/2024

Description:

Three deployments of non-lithium ion energy storage technology.

Forecast In 2021 $(000)			
Years	**2022**	**2023**	**2024**
Labor	0	0	550
Non-Labor	0	0	2,002
NSE	0	0	0
Total	**0**	**0**	**2,552**
FTE	0.0	0.0	5.0

Note: Totals may include rounding differences.

Supplemental Workpapers for Workpaper Group 212710

TY2024 GRC FORECAST - DETAILS

Budget Code:	212710
Sub-Budget Code:	
Estimated In Service Date:	11/30/2024

212710 - Non-Lithium-Ion Energy Storage Technology				2022			2023			2024			Total Project
Line Item	Unit Description	Labor/Non-Labor	Unit Metric	# of units	Cost per unit	Total cost	# of units	Cost per unit	Total cost	# of units	Cost per unit	Total cost	Total Cost
1	New storage technology 1	Non-Labor	Number of demos	1	$ 50,000	$ 50,000	1	$ 1,000,000	$ 1,000,000	-	$ -	$ -	*$ 1,050,000*
2	New storage technology 1	Labor	FTE	1	$ 125,000	$ 125,000	2	$ 125,000	$ 250,000	1	$ 50,000	$ 50,000	*$ 425,000*
3	New storage technology 2	Non-Labor	Number of demos	1	$ 50,000	$ 50,000	1	$ 50,000	$ 50,000	1	$ 1,000,000	$ 1,000,000	*$ 1,100,000*
4	New storage technology 2	Labor	FTE	2	$ 125,000	$ 250,000	2	$ 125,000	$ 250,000	2	$ 125,000	$ 250,000	*$ 750,000*
5	New storage technology 3	Non-Labor	Number of demos	1	$ 50,000	$ 50,000	1	$ 50,000	$ 50,000	1	$ 1,002,000	$ 1,002,000	*$ 1,102,000*
6	New storage technology 3	Labor	FTE	2	$ 125,000	$ 250,000	2	$ 125,000	$ 250,000	2	$ 125,000	$ 250,000	*$ 750,000*

Summary				
Labor		$ 625,000	$ 750,000	$ 550,000	$ 1,925,000
Non-Labor		$ 150,000	$ 1,100,000	$ 2,002,000	$ 3,252,000
NSE		$ -	$ -	$ -	$ -
Total Project Forecast		**$ 775,000**	**$ 1,850,000**	**$ 2,552,000**	**$ 5,177,000**

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Category: B. Microgrid and Controls
Workpaper: VARIOUS

Summary for Category: B. Microgrid and Controls

	In 2021$ (000)			
	Adjusted-Recorded	Adjusted-Forecast		
	2021	2022	2023	2024
Labor	0	938	60	0
Non-Labor	0	5,783	42	0
NSE	0	0	0	0
Total	**0**	**6,721**	**102**	**0**
FTE	0.0	7.5	0.5	0.0
17246A Borrego 3.0 Microgrid				
Labor	0	938	60	0
Non-Labor	0	4,358	42	0
NSE	0	0	0	0
Total	**0**	**5,296**	**102**	**0**
FTE	0.0	7.5	0.5	0.0
212660 Integrated Test Facility Expansion				
Labor	0	0	0	0
Non-Labor	0	1,425	0	0
NSE	0	0	0	0
Total	**0**	**1,425**	**0**	**0**
FTE	0.0	0.0	0.0	0.0

Note: Totals may include rounding differences.

Beginning of Workpaper Group
17246A - Borrego 3.0 Microgrid

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 17246.0
Category: B. Microgrid and Controls
Category-Sub: 1. Microgrid and Controls
Workpaper Group: 17246A - Borrego 3.0 Microgrid

Summary of Results (Constant 2021 $ in 000s):

Forecast Method		Adjusted Recorded					Adjusted Forecast		
Years		2017	2018	2019	2020	2021	2022	2023	2024
Labor	Zero-Based	0	0	0	0	0	938	60	0
Non-Labor	Zero-Based	0	0	0	0	0	4,358	42	0
NSE	Zero-Based	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**0**	**0**	**5,296**	**102**	**0**
FTE	Zero-Based	0.0	0.0	0.0	0.0	0.0	7.5	0.5	0.0

Business Purpose:

Borrego 3.0 builds on existing infrastructure, assets, and control systems already existing and operational at the Borrego Springs Microgrid. The project provides power continuity to customers during planned and unplanned outages. The scope of Borrego 3.0 is to install a new distribution circuit to allow for additional capacity to support the installation of additional energy storage assets to increase the size of the microgrid supporting the community of Borrego Springs. The additional energy storage assets will not only support SDG&E's goal of transitioning this microgrid to being 100% renewable solution by reducing reliance on diesel generators, but will also help increase the amount of load the microgrid can carry for extended durations. A portion of this project is reimbursable by a grant from the Department of Energy studying various microgrid capabilities.

Physical Description:

Installation of new distribution circuits to increase capacity to support the additional energy storage resources being added to the Borrego Springs microgrid. The costs for the additional energy storage assets are captured under workpaper 20278 A Advanced Energy Storage.

Project Justification:

This project supports the transition of Borrego Springs microgrid to be 100% renewable and increases the resiliency support offered to the community of Borrego Springs. This project is also support by a Department of Energy grant related to microgrid capabilities.

Note: Totals may include rounding differences.

Area:	CLEAN ENERGY INNOVATIONS
Witness:	Fernando Valero
Budget Code:	17246.0
Category:	B. Microgrid and Controls
Category-Sub:	1. Microgrid and Controls
Workpaper Group:	17246A - Borrego 3.0 Microgrid

Forecast Methodology:

Labor - Zero-Based

The forecast method used is zero-based. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. SDG&E develops detailed cost estimates based on current construction labor rates, material costs, overhead rates, contract pricing/quotes, and other project specific details. When projects are completed, actual costs are compared to the estimate to verify the estimates are accurate. Any significant variances between the estimated cost for a project and the actual costs are scrutinized to determine if cost estimate inputs need to be adjusted for future projects. Please see supplemental workpaper.

Non-Labor - Zero-Based

The forecast method used is zero-based. The forecast is based on cost estimates that were developed based on the specific scope of work for the project. SDG&E develops detailed cost estimates based on current construction labor rates, material costs, overhead rates, contract pricing/quotes, and other project specific details. When projects are completed, actual costs are compared to the estimate to verify the estimates are accurate. Any significant variances between the estimated cost for a project and the actual costs are scrutinized to determine if cost estimate inputs need to be adjusted for future projects. Please see supplemental workpaper.

NSE - Zero-Based

Not applicable

Beginning of Workpaper Sub Details for
Workpaper Group 17246A

Area:	CLEAN ENERGY INNOVATIONS
Witness:	Fernando Valero
Budget Code:	17246.0
Category:	B. Microgrid and Controls
Category-Sub:	1. Microgrid and Controls
Workpaper Group:	17246A - Borrego 3.0 Microgrid
Workpaper Detail:	17246A.001 - Borrego 3.0 Microgrid Project
In-Service Date:	07/31/2023

Description:

Borrego 3.0 Microgrid

Forecast In 2021 $(000)			
Years	**2022**	**2023**	**2024**
Labor	938	60	0
Non-Labor	1,854	-248	0
NSE	0	0	0
Total	**2,792**	**-188**	**0**
FTE	7.5	0.5	0.0

Note: Totals may include rounding differences.

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 17246.0
Category: B. Microgrid and Controls
Category-Sub: 1. Microgrid and Controls
Workpaper Group: 17246A - Borrego 3.0 Microgrid
Workpaper Detail: 17246A.002 - Borrego 3.0 - DOE Reimbursable Portion

In-Service Date: 07/31/2023

Description:

DOE Reimbursable Portion of Borrego 3.0

Forecast In 2021 $(000)			
Years	**2022**	**2023**	**2024**
Labor	0	0	0
Non-Labor	2,504	290	0
NSE	0	0	0
Total	**2,504**	**290**	**0**
FTE	0.0	0.0	0.0

Note: Totals may include rounding differences.

Supplemental Workpapers for Workpaper Group 17246A

TY2024 GRC FORECAST - DETAILS

Budget Code:	17246A
Sub-Budget Code:	
Estimated In Service Date:	Jul-23

				2022			2023			2024			
Line Item	**Unit Description**	**Labor/Non-Labor/ NSE**	**Unit Metric**	**# of units**	**Cost per unit***	**Total cost**	**# of units**	**Cost per unit***	**Total cost**	**# of units**	**Cost per unit***	**Total cost**	**Total Cost**
1	Management Labor	Labor	FTE	7.2	$125,000	$ 900,000	0.5	$125,000	$ 60,000	$ -	$ -	$ -	*$ 960,000*
2	Union Labor	Labor	FTE	0.3	$125,000	$ 37,500	-	$ -	$ -	$ -	$ -	$ -	*$ 37,500*
3	Substation equipment	Non-Labor	each	1.0	$ 244,000	$ 244,000	-	$ -	$ -	$ -	$ -	$ -	*$ 244,000*
4	Vehicle Utilization	Non-Labor	each	1.0	$ 8,000	$ 8,000	-	$ -	$ -	$ -	$ -	$ -	*$ 8,000*
5	Microgrid Controller - Services and PCS sc	Non-Labor	each	1.0	$ 454,500	$ 454,500	-	$ -	$ -	$ -	$ -	$ -	*$ 454,500*
6	Services (tech advisor)	Non-Labor	month	12.0	$ 6,500	$ 78,000	6.5	$ 6,500	$ 42,250	$ -	$ -	$ -	*$ 120,250*
7	domestic travel (employee expenses)	Non-Labor	month	8.0	$ 4,000	$ 32,000	-	$ -	$ -	$ -	$ -	$ -	*$ 32,000*
8	Simulation/modeling support services	Non-Labor	month	6.0	$ 5,000	$ 30,000	-	$ -	$ -	$ -	$ -	$ -	*$ 30,000*
9	Test and infrastructure management serv	Non-Labor	month	9.0	$ 14,000	$ 126,000	-	$ -	$ -	$ -	$ -	$ -	*$ 126,000*
10	Grading services	Non-Labor	month	2.0	$ 475,000	$ 950,000	-	$ -	$ -	$ -	$ -	$ -	*$ 950,000*
11	new circuit construction services	Non-Labor	month	4.0	$ 331,400	$ 1,325,600	-	$ -	$ -	$ -	$ -	$ -	*$ 1,325,600*
12	staff aug (scheduling)	Non-Labor	month	11.0	$ 2,500	$ 27,500	-	$ -	$ -	$ -	$ -	$ -	*$ 27,500*
13	community education services	Non-Labor	each	1.0	$ 75,000	$ 75,000	-	$ -	$ -	$ -	$ -	$ -	*$ 75,000*
14	other project support services	Non-Labor	each	6.0	$ 168,000	$ 1,008,000	-	$ -	$ -	$ -	$ -	$ -	*$ 1,008,000*

Summary

Labor	$ 937,500	$ 60,000	$ -	$ 997,500
Non-Labor	$ 4,358,600	$ 42,250	$ -	$ 4,400,850
NSE	$ -	$ -	$ -	$ -
Total Project Forecast	$ 5,296,100	$ 102,250	$ -	$ 5,398,350

15	DOE Collectible Portion	Non-Labor	each	1	$ (2,504,000)	$ (2,504,000)	1	$ (290,000)	$ (290,000)	$ -	$ -	$ -	*$ (2,794,000)*
Total Project excluding DOE Collectible Portion						$ 2,792,100			$ (187,750)			$ -	$ 2,604,350

Beginning of Workpaper Group
212660 - Integrated Test Facility Expansion

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21266.0
Category: B. Microgrid and Controls
Category-Sub: 1. Microgrid and Controls
Workpaper Group: 212660 - Integrated Test Facility Expansion

Summary of Results (Constant 2021 $ in 000s):

Forecast Method		Adjusted Recorded					Adjusted Forecast		
Years		2017	2018	2019	2020	2021	2022	2023	2024
Labor	Zero-Based	0	0	0	0	0	0	0	0
Non-Labor	Zero-Based	0	0	0	0	0	1,425	0	0
NSE	Zero-Based	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**0**	**0**	**1,425**	**0**	**0**
FTE	Zero-Based	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Business Purpose:

Increasing complexity of projects like microgrids and advanced systemp protection require modern RTDS (Real Time Digital Simulator) systems to effectively model grid events and the technology response. Lab testing and commissioning requires Doble test sets to validate control system configuration files for simulation events. The NovaCor racks and card racks being purchased are able to handle the additional complexity required and will increase the number of simulations able to be performed along wtih reducing the duration that each simulation takes to complete.

Physical Description:

Five of the RTDS NovaCor Racks to be purchased in 2022. Two of the RTDS IO Card Racks to be purchased in 2022. Four of the Doble testsets to be purchased in 2022.

Project Justification:

High end modeling and testing equipment to necessary to verify relay and control settings. The upgrade to the NovaCor Racks allows enhanced testing efficiency and also enables flexible testing locations given the mobility of newer equipment .

Note: Totals may include rounding differences.

Area:	CLEAN ENERGY INNOVATIONS
Witness:	Fernando Valero
Budget Code:	21266.0
Category:	B. Microgrid and Controls
Category-Sub:	1. Microgrid and Controls
Workpaper Group:	212660 - Integrated Test Facility Expansion

Forecast Methodology:

Labor - Zero-Based

Zero based forecast, please see supplemental workpaper

Non-Labor - Zero-Based

Zero based forecast, please see supplemental workpaper

NSE - Zero-Based

Not applicable

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21266.0
Category: B. Microgrid and Controls
Category-Sub: 1. Microgrid and Controls
Workpaper Group: 212660 - Integrated Test Facility Expansion

Summary of Adjustments to Forecast

In 2021 $ (000)										
Forecast Method		**Base Forecast**			**Forecast Adjustments**			**Adjusted-Forecast**		
Years		**2022**	**2023**	**2024**	**2022**	**2023**	**2024**	**2022**	**2023**	**2024**
Labor	Zero-Based	0	0	0	0	0	0	0	0	0
Non-Labor	Zero-Based	0	0	0	1,425	0	0	1,425	0	0
NSE	Zero-Based	0	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**1,425**	**0**	**0**	**1,425**	**0**	**0**
FTE	Zero-Based	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Forecast Adjustment Details

Year	Labor	NLbr	NSE	Total	FTE
2022 Total	0	0	0	0	0.0
2023 Total	0	0	0	0	0.0
2024 Total	0	0	0	0	0.0

Note: Totals may include rounding differences.

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21266.0
Category: B. Microgrid and Controls
Category-Sub: 1. Microgrid and Controls
Workpaper Group: 212660 - Integrated Test Facility Expansion

Determination of Adjusted-Recorded:

	2017 ($000)	2018 ($000)	2019 ($000)	2020 ($000)	2021 ($000)
Recorded (Nominal $)*					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Adjustments (Nominal $) **					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Recorded-Adjusted (Nominal $)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Vacation & Sick (Nominal $)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Escalation to 2021$					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Recorded-Adjusted (Constant 2021$)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0

* After company-wide exclusions of Non-GRC costs
** Refer to "Detail of Adjustments to Recorded" page for line item adjustments
Note: Totals may include rounding differences.

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21266.0
Category: B. Microgrid and Controls
Category-Sub: 1. Microgrid and Controls
Workpaper Group: 212660 - Integrated Test Facility Expansion

Summary of Adjustments to Recorded:

In Nominal $(000)					
Years	**2017**	**2018**	**2019**	**2020**	**2021**
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0

Year	Labor	NLbr	NSE	Total	FTE

Note: Totals may include rounding differences.

Beginning of Workpaper Sub Details for
Workpaper Group 212660

Area:	CLEAN ENERGY INNOVATIONS
Witness:	Fernando Valero
Budget Code:	21266.0
Category:	B. Microgrid and Controls
Category-Sub:	1. Microgrid and Controls
Workpaper Group:	212660 - Integrated Test Facility Expansion
Workpaper Detail:	212660.001 - Integrated Test Facilitiy Expansion
In-Service Date:	12/31/2022

Description:

High end modeling and testing equipment to necessary to verify relay and control settings. More details to follow explaining why this matters to people who may not be skilled in the art of protection etc.

Forecast In 2021 $(000)			
Years	**2022**	**2023**	**2024**
Labor	0	0	0
Non-Labor	1,425	0	0
NSE	0	0	0
Total	**1,425**	**0**	**0**
FTE	0.0	0.0	0.0

Note: Totals may include rounding differences.

Supplemental Workpapers for Workpaper Group 212660

TY2024 GRC FORECAST - DETAILS

Budget Code:	21266
Sub-Budget Code:	
Estimated In Service Date:	12/31/2022

ITF Expansion				**2022**			**2023**			**2024**			
Line Item	**Unit Description**	**Labor/Non-Labor/ NSE**	**Unit Metric**	**# of units**	**Cost per unit**	**Total cost**	**# of units**	**Cost per unit**	**Total cost**	**# of units**	**Cost per unit**	**Total cost**	**Total Cost**
1	Simulator Hardware	Non-Labor	Racks	5	$ 200,000	$ 1,000,000	-	$ -	$ -	-	$ -	$ -	*$ 1,000,000*
2	Simulator Hardware IO Cards	Non-Labor	IO Cards	2	$ 150,000	$ 300,000	-	$ -	$ -	-	$ -	$ -	*$ 300,000*
3	Advanced Electric Testsets	Non-Labor	testsets	4	$ 30,000	$ 120,000	-	$ -	$ -	-	$ -	$ -	*$ 120,000*
4	Installation	Non-Labor	hours	83	$ 60	$ 5,000	-	$ -	$ -	-	$ -	$ -	*$ 5,000*

Summary				
Labor	$ -	$ -	$ -	$ -
Non-Labor	$ 1,425,000	$ -	$ -	$ 1,425,000
NSE	$ -	$ -	$ -	$ -
Total Project Forecast	**$ 1,425,000**	**$ -**	**$ -**	**$ 1,425,000**

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Category: C. Sustainable Communities
Workpaper: 20281A

Summary for Category: C. Sustainable Communities

	In 2021$ (000)			
	Adjusted-Recorded	Adjusted-Forecast		
	2021	2022	2023	2024
Labor	0	0	0	0
Non-Labor	0	969	407	439
NSE	0	0	0	0
Total	**0**	**969**	**407**	**439**
FTE	0.0	0.0	0.0	0.0

20281A Sustainable Communities Removal

Labor	0	0	0	0
Non-Labor	0	969	407	439
NSE	0	0	0	0
Total	**0**	**969**	**407**	**439**
FTE	0.0	0.0	0.0	0.0

Note: Totals may include rounding differences.

Beginning of Workpaper Group
20281A - Sustainable Communities Removal

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 20281.0
Category: C. Sustainable Communities
Category-Sub: 1. Sustainable Communities
Workpaper Group: 20281A - Sustainable Communities Removal

Summary of Results (Constant 2021 $ in 000s):

Forecast Method		Adjusted Recorded					Adjusted Forecast		
Years		2017	2018	2019	2020	2021	2022	2023	2024
Labor	Zero-Based	0	0	0	0	0	0	0	0
Non-Labor	Zero-Based	0	0	0	0	0	969	407	439
NSE	Zero-Based	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**0**	**0**	**969**	**407**	**439**
FTE	Zero-Based	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Business Purpose:

The Sustainable Community Program (SCP) has been open since 2004 as authorized by D.04-12-015. While the program now is closed to enrollment, lease payments and operations and maintenance expenses associated with maintaining the assets are required as part of SDG&E's obligations under the leasing contractual agreements with the community members.

Physical Description:

Removal of distributed energy resources installed as part of the SCP. Upon lease expirations, communities have the choice of renewing the lease or requesting to have the resources removed.

Project Justification:

Pursuant to D.04-12-015, SDG&E opened the Sustainable Community Program to engineer, design, procure, install and maintain community-based energy strategies, state-of-the-art generation and storage technologies, and advanced control devices. As part of the program, SDG&E would own the assets and lease the land from the community. Upon the expiration of a land lease, community members could either extend the lease with SDG&E or choose to have SDG&E remove the assets. The costs requested herein are to support anticipated removal costs associated with a certain percentage of lease expirations based on the Decommissioning Study presented in the Depreciation testimony of Witness Watson (Ex. SDG&E-36).

Note: Totals may include rounding differences.

Area:	CLEAN ENERGY INNOVATIONS
Witness:	Fernando Valero
Budget Code:	20281.0
Category:	C. Sustainable Communities
Category-Sub:	1. Sustainable Communities
Workpaper Group:	20281A - Sustainable Communities Removal

Forecast Methodology:

Labor - Zero-Based

Not Applicable.

Non-Labor - Zero-Based

“Decommissioning Study” prepared for SDG&E was used to give the results below (rounded to nearest hundredth). Referencing page ten, the table ES-1 Cost Estimate Summary for PV Sites. The identified customer sites below are scheduled for lease renewal in the corresponding years indicated, however it is highly unlikely they will renew and will exercise their right to removal of their PV panels. The amounts given for each site was taken from the column total cost estimated to remove their system. Please see supplemental workpaper.

NSE - Zero-Based

Not Applicable.

Beginning of Workpaper Sub Details for
Workpaper Group 20281A

Area:	CLEAN ENERGY INNOVATIONS
Witness:	Fernando Valero
Budget Code:	20281.0
Category:	C. Sustainable Communities
Category-Sub:	1. Sustainable Communities
Workpaper Group:	20281A - Sustainable Communities Removal
Workpaper Detail:	20281A.002 - Sustainable Communities Removal
In-Service Date:	Not Applicable

Description:

The identified customer sites below are scheduled for lease renewal in the corresponding years indicated, however it is highly unlikely they will renew and will exercise their right to removal of their PV panels. The amounts given for each site was taken from the column total cost estimated to remove their system.

Forecast In 2021 $(000)			
Years	**2022**	**2023**	**2024**
Labor	0	0	0
Non-Labor	969	407	439
NSE	0	0	0
Total	**969**	**407**	**439**
FTE	0.0	0.0	0.0

Note: Totals may include rounding differences.

Supplemental Workpapers for Workpaper Group 20281A

Supplemental Workpaper for Workpaper 20281A - Sustainable Communities

The Capital forecast is at follows:
The "Decommissioning Study" prepared for SDG&E (See the Depreciation testimony of Dane Watson (Ex. SDG&E-36) was used to give the results below (rounded to nearest hundredth). Referencing page ten, the table ES-1 Cost Estimate Summary for PV Sites. The identified customer sites below are scheduled for lease renewal in the corresponding years indicated, however it is highly unlikely they will renew and will exercise their right to removal of their PV panels. The amounts given for each site was taken from the column total cost estimated to remove their system.

2022
Rueben H Fleet (Science Center) - $405K
Thomas Jefferson School of Law - $171K
Hanna Gabriel Wells - $87K
Pacific Station - $306K

2023
Del Sur Elementary - $168
SDG&E EIC (Parking) - $75K
SDG&E EIC (Roof) - $164

2024
Del Lago Academy - $439K

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Category: D. Mobile Energy Storage
Workpaper: 212610

Summary for Category: D. Mobile Energy Storage

	In 2021$ (000)			
	Adjusted-Recorded	Adjusted-Forecast		
	2021	2022	2023	2024
Labor	0	0	0	0
Non-Labor	0	2,076	2,076	2,076
NSE	0	0	0	0
Total	**0**	**2,076**	**2,076**	**2,076**
FTE	0.0	0.0	0.0	0.0

212610 Mobile Battery Energy Storage Program

Labor	0	0	0	0
Non-Labor	0	2,076	2,076	2,076
NSE	0	0	0	0
Total	**0**	**2,076**	**2,076**	**2,076**
FTE	0.0	0.0	0.0	0.0

Note: Totals may include rounding differences.

Beginning of Workpaper Group
212610 - Mobile Battery Energy Storage Program

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21261.0
Category: D. Mobile Energy Storage
Category-Sub: 1. Mobile Energy Storage
Workpaper Group: 212610 - Mobile Battery Energy Storage Program

Summary of Results (Constant 2021 $ in 000s):

Forecast Method		Adjusted Recorded					Adjusted Forecast		
Years		2017	2018	2019	2020	2021	2022	2023	2024
Labor	Zero-Based	0	0	0	0	0	0	0	0
Non-Labor	Zero-Based	0	0	0	0	0	2,076	2,076	2,076
NSE	Zero-Based	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**0**	**0**	**2,076**	**2,076**	**2,076**
FTE	Zero-Based	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Business Purpose:

Strategic deployment of mobile energy storage systems to support the Company's goal of increasing resiliency and operational flexibility. These mobile energy storage systems will be designed, built and deployed to provide back-up and microgriding capabilities without being limited by its physical location. The technology, along with its use case and benefits, were demonstrated in EPIC 3, Project 7.

Physical Description:

This program will consist of purchasing three mobile battery systems for each of the years 2022, 2023, and 2024 for a total of nine mobile battery systems. The intent is to have the mobile battery systems staged throughout SDG& E's service territory at either district operations & control centers or substations with available space for storage of the units to allow for quick and efficient deployment when needed.

Project Justification:

This cost supports the Company's goals of decarbonization by decreasing the reliance on back-up diesel generation through the alternative use of clean energy batteries which are not limited by physical location. SDG&E can leverage these mobile battery energy storage systems (MBESS) to increase grid resiliency and operational flexibility for the Company's customers during public safety power shut-off (PSPS) events by deploying these systems to at-risk substations experiencing things like system maintenance outages and adverse weather conditions. The MBESS can also be used during outages related to planned maintenance work or construction activities reducing the use of back-up diesel generators to provide power continuity to customers and support construction activities, respectively.
SDG&E has successfully demonstrated multiple pre-commercial MBESS demonstration use cases within its EPIC-3 projects (EPIC-3, Project 7, Modules 1 and 2). Through multiple demonstration sites, SDG&E was able to test the MBESS for use in functions such as demand shaving, emergency energy supply, voltage regulation, and frequency regulation. SDG&E will be able to leverage those EPIC pre-commercial demonstrations and their resulting accomplishments to deploy the requested MBESS in this GRC to lower SDG&E's GHG emission footprint while offering power continuity to customers and supporting construction activities.

Note: Totals may include rounding differences.

Area:	CLEAN ENERGY INNOVATIONS
Witness:	Fernando Valero
Budget Code:	21261.0
Category:	D. Mobile Energy Storage
Category-Sub:	1. Mobile Energy Storage
Workpaper Group:	212610 - Mobile Battery Energy Storage Program

Forecast Methodology:

Labor - Zero-Based

Zero based forecast method, Please see supplemental workpaper.

Non-Labor - Zero-Based

Zero based forecast method. Please see supplemental workpaper.

NSE - Zero-Based

Not Applicable

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21261.0
Category: D. Mobile Energy Storage
Category-Sub: 1. Mobile Energy Storage
Workpaper Group: 212610 - Mobile Battery Energy Storage Program

Summary of Adjustments to Forecast

In 2021 $ (000)										
Forecast Method		**Base Forecast**			**Forecast Adjustments**			**Adjusted-Forecast**		
Years		**2022**	**2023**	**2024**	**2022**	**2023**	**2024**	**2022**	**2023**	**2024**
Labor	Zero-Based	0	0	0	0	0	0	0	0	0
Non-Labor	Zero-Based	0	0	0	2,076	2,076	2,076	2,076	2,076	2,076
NSE	Zero-Based	0	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**2,076**	**2,076**	**2,076**	**2,076**	**2,076**	**2,076**
FTE	Zero-Based	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Forecast Adjustment Details

Year	Labor	NLbr	NSE	Total	FTE
2022 Total	0	0	0	0	0.0
2023 Total	0	0	0	0	0.0
2024 Total	0	0	0	0	0.0

Note: Totals may include rounding differences.

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21261.0
Category: D. Mobile Energy Storage
Category-Sub: 1. Mobile Energy Storage
Workpaper Group: 212610 - Mobile Battery Energy Storage Program

Determination of Adjusted-Recorded:

	2017 ($000)	2018 ($000)	2019 ($000)	2020 ($000)	2021 ($000)
Recorded (Nominal $)*					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Adjustments (Nominal $) **					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Recorded-Adjusted (Nominal $)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Vacation & Sick (Nominal $)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Escalation to 2021$					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Recorded-Adjusted (Constant 2021$)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0

* After company-wide exclusions of Non-GRC costs
** Refer to "Detail of Adjustments to Recorded" page for line item adjustments
Note: Totals may include rounding differences.

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21261.0
Category: D. Mobile Energy Storage
Category-Sub: 1. Mobile Energy Storage
Workpaper Group: 212610 - Mobile Battery Energy Storage Program

Summary of Adjustments to Recorded:

In Nominal $(000)					
Years	**2017**	**2018**	**2019**	**2020**	**2021**
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0

Year	Labor	NLbr	NSE	Total	FTE

Note: Totals may include rounding differences.

Beginning of Workpaper Sub Details for
Workpaper Group 212610

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21261.0
Category: D. Mobile Energy Storage
Category-Sub: 1. Mobile Energy Storage
Workpaper Group: 212610 - Mobile Battery Energy Storage Program
Workpaper Detail: 212610.001 - Mobile Battery Energy Storage Program

In-Service Date: Not Applicable

Description:

Purchase of two 725 kWh mobile energy storage units and one 525 kWh mobile battery energy storage units, for a total three units, per year.

Forecast In 2021 $(000)			
Years	**2022**	**2023**	**2024**
Labor	0	0	0
Non-Labor	2,076	2,076	2,076
NSE	0	0	0
Total	**2,076**	**2,076**	**2,076**
FTE	0.0	0.0	0.0

Note: Totals may include rounding differences.

Supplemental Workpapers for Workpaper Group 212610

TY2024 GRC FORECAST - DETAILS

Budget Code:	212610
Sub-Budget Code:	
Estimated In Service Date:	June 2022, June 2023, June 2024

212610 - Mobile Battery Energy Storage Program				2022			2023			2024			
Line Item	Unit Description	Labor/Non-Labor	Unit Metric	# of units	Cost per unit	Total cost	# of units	Cost per unit	Total cost	# of units	Cost per unit	Total cost	Total Cost
1	Pull along mobile battery energy storage system (725 kWh)	Non-Labor	mobile energy battery system	2	$ 788,000	$ 1,576,000	2	$ 788,000	$ 1,576,000	2	$ 788,000	$ 1,576,000	*$ 4,728,000*
2	Self-propelled mobile battery energy storage system (525 kWh)	Non-Labor	mobile energybattery system	1	$ 500,000	$ 500,000	1	$ 500,000	$ 500,000	1	$ 500,000	$ 500,000	*$ 1,500,000*

Summary					
	Labor		$ -	$ -	$ -	$ -
	Non-Labor		$ 2,076,000	$ 2,076,000	$ 2,076,000	$ 6,228,000
	NSE		$ -	$ -	$ -	$ -
Total Project Forecast			**$ 2,076,000**	**$ 2,076,000**	**$ 2,076,000**	**$ 6,228,000**

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Category: E. Hydrogen
Workpaper: VARIOUS

Summary for Category: E. Hydrogen

	In 2021$ (000)			
	Adjusted-Recorded	Adjusted-Forecast		
	2021	2022	2023	2024
Labor	0	0	500	406
Non-Labor	0	0	5,441	830
NSE	0	0	0	0
Total	**0**	**0**	**5,941**	**1,236**
FTE	0.0	0.0	4.0	3.2
212680 Hydrogen Build Ready Infrastructure				
Labor	0	0	250	375
Non-Labor	0	0	520	780
NSE	0	0	0	0
Total	**0**	**0**	**770**	**1,155**
FTE	0.0	0.0	2.0	3.0
212720 Hydrogen Energy Storage System Expansion				
Labor	0	0	250	31
Non-Labor	0	0	4,921	50
NSE	0	0	0	0
Total	**0**	**0**	**5,171**	**81**
FTE	0.0	0.0	2.0	0.2

Note: Totals may include rounding differences.

Beginning of Workpaper Group
212680 - Hydrogen Build Ready Infrastructure

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21268.0
Category: E. Hydrogen
Category-Sub: 1. Hydrogen
Workpaper Group: 212680 - Hydrogen Build Ready Infrastructure

Summary of Results (Constant 2021 $ in 000s):

Forecast Method		Adjusted Recorded					Adjusted Forecast		
Years		2017	2018	2019	2020	2021	2022	2023	2024
Labor	Zero-Based	0	0	0	0	0	0	250	375
Non-Labor	Zero-Based	0	0	0	0	0	0	520	780
NSE	Zero-Based	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**0**	**0**	**0**	**770**	**1,155**
FTE	Zero-Based	0.0	0.0	0.0	0.0	0.0	0.0	2.0	3.0

Business Purpose:

To meet California's environmental goals and SDG&E's sustainability strategy, this project provides for the upgrades necessary to the distribution electric system service infrastructure to support the localized creation of hydrogen via electrolysis. By facilitating the development of this service infrastructure, SDG&E's program will allow customers to adopt hydrogen to reduce their greenhouse gases and other emissions. SDG&E will target installations that serve the public interest in the development of projects. Money will only be spent when/if qualifying projects arise in SDGE territory.

Physical Description:

This effort targets the installation of up to five electrolyzers of up to 2MW each in nameplate capacity size and required ancillary system loads as required. Equipment includes all of the necessary infrastructure elements needed to create new and/or upgraded electrical distribution service for an electrolyzer. It is envisioned that all services will be underground and thereby require these facilities as well as part of this request.

Project Justification:

Reduces regional GHG emissions by enabling the use of hydrogen to substitute for the use of carbon-based fuels in transportation and industrial applications.

Note: Totals may include rounding differences.

Area:	CLEAN ENERGY INNOVATIONS
Witness:	Fernando Valero
Budget Code:	21268.0
Category:	E. Hydrogen
Category-Sub:	1. Hydrogen
Workpaper Group:	212680 - Hydrogen Build Ready Infrastructure

Forecast Methodology:

Labor - Zero-Based

Zero-based. Based on an average of historical projects providing new MW class electrical service to customers.
Please see supplemental workpapers.

Non-Labor - Zero-Based

Zero-based. Based on an average of historical projects providing new MW class electrical service to customers.
Please see supplemental workpapers.

NSE - Zero-Based

Not applicable

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21268.0
Category: E. Hydrogen
Category-Sub: 1. Hydrogen
Workpaper Group: 212680 - Hydrogen Build Ready Infrastructure

Summary of Adjustments to Forecast

In 2021 $ (000)										
Forecast Method		**Base Forecast**			**Forecast Adjustments**			**Adjusted-Forecast**		
Years		**2022**	**2023**	**2024**	**2022**	**2023**	**2024**	**2022**	**2023**	**2024**
Labor	Zero-Based	0	0	0	0	250	375	0	250	375
Non-Labor	Zero-Based	0	0	0	0	520	780	0	520	780
NSE	Zero-Based	0	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**0**	**770**	**1,155**	**0**	**770**	**1,155**
FTE	Zero-Based	0.0	0.0	0.0	0.0	2.0	3.0	0.0	2.0	3.0

Forecast Adjustment Details

Year	Labor	NLbr	NSE	Total	FTE
2022 Total	0	0	0	0	0.0
2023 Total	0	0	0	0	0.0
2024 Total	0	0	0	0	0.0

Note: Totals may include rounding differences.

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21268.0
Category: E. Hydrogen
Category-Sub: 1. Hydrogen
Workpaper Group: 212680 - Hydrogen Build Ready Infrastructure

Determination of Adjusted-Recorded:

	2017 ($000)	2018 ($000)	2019 ($000)	2020 ($000)	2021 ($000)
Recorded (Nominal $)*					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Adjustments (Nominal $) **					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Recorded-Adjusted (Nominal $)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Vacation & Sick (Nominal $)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Escalation to 2021$					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Recorded-Adjusted (Constant 2021$)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0

* After company-wide exclusions of Non-GRC costs
** Refer to "Detail of Adjustments to Recorded" page for line item adjustments
Note: Totals may include rounding differences.

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21268.0
Category: E. Hydrogen
Category-Sub: 1. Hydrogen
Workpaper Group: 212680 - Hydrogen Build Ready Infrastructure

Summary of Adjustments to Recorded:

In Nominal $(000)					
Years	**2017**	**2018**	**2019**	**2020**	**2021**
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0

Year	Labor	NLbr	NSE	Total	FTE

Note: Totals may include rounding differences.

Beginning of Workpaper Sub Details for
Workpaper Group 212680

Area:	CLEAN ENERGY INNOVATIONS
Witness:	Fernando Valero
Budget Code:	21268.0
Category:	E. Hydrogen
Category-Sub:	1. Hydrogen
Workpaper Group:	212680 - Hydrogen Build Ready Infrastructure
Workpaper Detail:	212680.001 - Hydrogen Build-Ready Infrastructure
In-Service Date:	Not Applicable

Description:

Equipment includes all of the necessary infrastructure elements needed to create new and/or upgraded electrical service for an electrolyzer. It is envisioned that all services will be underground and thereby require these facilities as well as part of this request.

Forecast In 2021 $(000)			
Years	**2022**	**2023**	**2024**
Labor	0	250	375
Non-Labor	0	520	780
NSE	0	0	0
Total	**0**	**770**	**1,155**
FTE	0.0	2.0	3.0

Note: Totals may include rounding differences.

Supplemental Workpapers for Workpaper Group 212680

TY2024 GRC FORECAST - DETAILS

Budget Code:	212680
Sub-Budget Code:	
Estimated In Service Date:	Not Applicable

H2 Build Ready Infrastructure				**2022**			**2023**			**2024**			
Line Item	**Unit Description**	**Labor/Non-Labor**	**Unit Metric**	**# of units**	**Cost per unit**	**Total cost**	**# of units**	**Cost per unit**	**Total cost**	**# of units**	**Cost per unit**	**Total cost**	**Total Cost**
1	Trench & Conduit	Non-Labor	feet		$ 30	$ -	600	$ 30	$ 18,000	900	$ 30	$ 27,000	$ 45,000
2	Cable	Non-Labor	feet		$ 20	$ -	600	$ 20	$ 12,000	900	$ 20	$ 18,000	$ 30,000
3	Contractor Services	Non-Labor	Contract		$ 100,000	$ -	2	$ 100,000	$ 200,000	3	$ 100,000	$ 300,000	$ 500,000
4	Project Management	Labor	FTE		$ 125,000	$ -	2	$ 125,000	$ 250,000	3	$ 125,000	$ 375,000	$ 625,000
5	Switches	Non-Labor	Disconnect Switch		$ 120,000	$ -	2	$ 120,000	$ 240,000	3	$ 120,000	$ 360,000	$ 600,000
6	Capacitors	Non-Labor	Capacitor		$ 25,000	$ -	2	$ 25,000	$ 50,000	3	$ 25,000	$ 75,000	$ 125,000

Summary						
Labor		$ -		$ 250,000		$ 375,000	$ 625,000
Non-Labor		$ -		$ 520,000		$ 780,000	$ 1,300,000
NSE		$ -		$ -		$ -	$ -
Total Project Forecast		**$ -**		**$ 770,000**		**$ 1,155,000**	**$ 1,925,000**

Beginning of Workpaper Group
212720 - Hydrogen Energy Storage System Expansion

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21272.0
Category: E. Hydrogen
Category-Sub: 1. Hydrogen
Workpaper Group: 212720 - Hydrogen Energy Storage System Expansion

Summary of Results (Constant 2021 $ in 000s):

Forecast Method		Adjusted Recorded					Adjusted Forecast		
Years		2017	2018	2019	2020	2021	2022	2023	2024
Labor	Zero-Based	0	0	0	0	0	0	250	31
Non-Labor	Zero-Based	0	0	0	0	0	0	4,921	50
NSE	Zero-Based	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**0**	**0**	**0**	**5,171**	**81**
FTE	Zero-Based	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.2

Business Purpose:

To support the Borrego Springs community's electric resiliency and environmental goals , SDG&E plans to expand the Hydrogen Energy Storage System at the Borrego Microgrid. The expansion includes increasing fuel cell capacity from 250 kW to 1,000 kW, doubling onsite hydrogen storage and allowing for 8 hours of long duration energy storage at an output of 1,000 kW, and purchasing an atmospheric water generation system to relieve the water demand from the local water utility. An atmospheric water generator generates converts ambient water vapor in the air into liquid, usable water using solar energy and desiccants.

Physical Description:

Atmospheric water equipment includes solar panels integrated with a desiccant technology that can pull water vapor from the air and condense it into pure water (demineralized). A water connection from the new water system to an existing hydrogen system will be built. Hydrogen storage equipment is primarily large metal cylinders, with piping and instrumentation (pressure, etc). Additional fuel cell storage capacity (750 KW) will also be added.

Project Justification:

In line with SDG&E's sustainability strategy, SDG&E is developing hydrogen systems to support multiple clean-energy use cases to comply with California environmental energy laws and regulations. Electrolytic hydrogen requires water, which can create constraints and trade-offs in California during droughts and general water shortages . This system will pull water from the air to relieve the strain on aquafers and traditional water supplies. The hydrogen storage cylinders will provide additional capacity of 8-hour duration energy storage.

Note: Totals may include rounding differences.

Area:	CLEAN ENERGY INNOVATIONS
Witness:	Fernando Valero
Budget Code:	21272.0
Category:	E. Hydrogen
Category-Sub:	1. Hydrogen
Workpaper Group:	212720 - Hydrogen Energy Storage System Expansion

Forecast Methodology:

Labor - Zero-Based

Zero based forecast, please see supplemental workpaper

Non-Labor - Zero-Based

Zero based forecast, please see supplemental workpaper

NSE - Zero-Based

Not applicable

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21272.0
Category: E. Hydrogen
Category-Sub: 1. Hydrogen
Workpaper Group: 212720 - Hydrogen Energy Storage System Expansion

Summary of Adjustments to Forecast

In 2021 $ (000)										
Forecast Method		**Base Forecast**			**Forecast Adjustments**			**Adjusted-Forecast**		
Years		**2022**	**2023**	**2024**	**2022**	**2023**	**2024**	**2022**	**2023**	**2024**
Labor	Zero-Based	0	0	0	0	250	31	0	250	31
Non-Labor	Zero-Based	0	0	0	0	4,921	50	0	4,921	50
NSE	Zero-Based	0	0	0	0	0	0	0	0	0
Total		**0**	**0**	**0**	**0**	**5,171**	**81**	**0**	**5,171**	**81**
FTE	Zero-Based	0.0	0.0	0.0	0.0	2.0	0.2	0.0	2.0	0.2

Forecast Adjustment Details

Year	Labor	NLbr	NSE	Total	FTE
2022 Total	0	0	0	0	0.0
2023 Total	0	0	0	0	0.0
2024 Total	0	0	0	0	0.0

Note: Totals may include rounding differences.

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21272.0
Category: E. Hydrogen
Category-Sub: 1. Hydrogen
Workpaper Group: 212720 - Hydrogen Energy Storage System Expansion

Determination of Adjusted-Recorded:

	2017 ($000)	2018 ($000)	2019 ($000)	2020 ($000)	2021 ($000)
Recorded (Nominal $)*					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Adjustments (Nominal $) **					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Recorded-Adjusted (Nominal $)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Vacation & Sick (Nominal $)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Escalation to 2021$					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0
Recorded-Adjusted (Constant 2021$)					
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0

* After company-wide exclusions of Non-GRC costs
** Refer to "Detail of Adjustments to Recorded" page for line item adjustments
Note: Totals may include rounding differences.

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21272.0
Category: E. Hydrogen
Category-Sub: 1. Hydrogen
Workpaper Group: 212720 - Hydrogen Energy Storage System Expansion

Summary of Adjustments to Recorded:

In Nominal $(000)					
Years	**2017**	**2018**	**2019**	**2020**	**2021**
Labor	0	0	0	0	0
Non-Labor	0	0	0	0	0
NSE	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**
FTE	0.0	0.0	0.0	0.0	0.0

Year	Labor	NLbr	NSE	Total	FTE

Note: Totals may include rounding differences.

Beginning of Workpaper Sub Details for
Workpaper Group 212720

Area: CLEAN ENERGY INNOVATIONS
Witness: Fernando Valero
Budget Code: 21272.0
Category: E. Hydrogen
Category-Sub: 1. Hydrogen
Workpaper Group: 212720 - Hydrogen Energy Storage System Expansion
Workpaper Detail: 212720.001 - Hydrogen Energy Storage System Expansion

In-Service Date: 12/31/2024

Description:

Water equipment includes a solar panels integrated with a desiccant technology that can pull water vapor from the air and condense it into pure water (demineralized). New land will be required. A water connection from the new water system to an existing hydrogen system will be built.
Hydrogen storage equipment is primarily large metal cylinders, with piping and instrumentation (pressure, etc).

Forecast In 2021 $(000)			
Years	**2022**	**2023**	**2024**
Labor	0	250	31
Non-Labor	0	4,921	50
NSE	0	0	0
Total	**0**	**5,171**	**81**
FTE	0.0	2.0	0.2

Note: Totals may include rounding differences.

Supplemental Workpapers for Workpaper Group 212720

TY2024 GRC FORECAST - DETAILS

Budget Code:	21272
Sub-Budget Code:	
Estimated In Service Date:	12/31/2024

Hydrogen Energy Storage System Expansion				2022			2023			2024			
Line Item	Unit Description	Labor/Non-Labor	Unit Metric	# of units	Cost per unit*	Total cost	# of units	Cost per unit*	Total cost	# of units	Cost per unit*	Total cost	Total Cost
1	Solar-powered atmospheric water system	Non-Labor	Solar Water System	-	$ -	$ -	50	$ 3,500	$ 175,000	-	$ -	$ -	*$ 175,000*
2	250 kW Fuel Cells	Non-Labor	Fuel Cell	-	$ -	$ -	3	$ 850,000	$ 2,550,000	-	$ -	$ -	*$ 2,550,000*
3	Hydrogen Storage Tanks (141 kg)	Non-Labor	Storage Tank - 141 kg	-	$ -	$ -	2	$ 273,000	$ 546,000	-	$ -	$ -	*$ 546,000*
4	Engineering System Design	Non-Labor	Contract	-	$ -	$ -	1	$ 450,000	$ 450,000	-	$ -	$ -	*$ 450,000*
5	Construction Contract Costs	Non-Labor	Contract	-	$ -	$ -	1	$ 1,000,000	$ 1,000,000	1	$ 50,000	$ 50,000	*$ 1,050,000*
9	Operational Controls Enhancement	Non-Labor	Software	-	$ -	$ -	1	$ 200,000	$ 200,000	-	$ -	$ -	*$ 200,000*
10	Project Management	Labor	FTE	-	$ -	$ -	2.00	$ 125,000	$ 250,000	0.25	$ 125,000	$ 31,000	*$ 281,000*

Summary									
	Labor		$ -		$ 250,000		$ 31,000	$ 281,000
	Non-Labor		$ -		$ 4,921,000		$ 50,000	$ 4,971,000
	NSE		$ -		$ -		$ -	$ -
Subtotal Non-RAMP			$ -		$ 5,171,000		$ 81,000	$ 5,252,000
Total Project Forecast			**$ -**		**$ 5,171,000**		**$ 81,000**	**$ 5,252,000**