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PACIFIC GAS AND ELECTRIC COMPANY

COMPREHENSIVE GAS ADVANCED METERING INFRASTRUCTURE REPLACEMENT PROGRAM

PREPARED TESTIMONY

PACIFIC GAS AND ELECTRIC COMPANY
COMPREHENSIVE GAS ADVANCED METERING INFRASTRUCTURE
REPLACEMENT PROGRAM
PREPARED TESTIMONY

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CHAPTER 1
INTRODUCTION AND OVERVIEW

A. Introduction

Pacific Gas and Electric Company (PG&E or the Company) respectfully submits, and requests approval to recover, its 2023-2026 forecasted costs to maintain and replace the gas Advanced Metering Infrastructure (AMI) necessary for PG&E to timely collect gas consumption data from customers, present that data to customers to help them reduce their gas consumption and monthly bills, and bill these customers for their utility service. In addition, this Application requests approval to recover the costs of a Gas AMI System Upgrade (including head-end application software and network communication equipment) that will enable enhanced operational and safety benefits in the future (collectively "Comprehensive Gas AMI Replacement Program").

PG&E initially sought approval for these costs in its 2023 General Rate Case (GRC) (Application (A.) 21-06-021), seeking approval of its 2023-2026 forecast to: (1) replace Gas Modules after they fail as part of Corrective Maintenance,[1] and (2) begin replacing Gas Modules on a programmatic, lifecycle basis before they reach the end of their useful lives. However, in Decision (D.) 23-11-069, the California Public Utilities Commission (Commission) found that PG&E had not adequately substantiated these costs, adopted a forecast of $0 for 2023-2026, and authorized PG&E to file a separate application to substantiate the costs necessary to support this required maintenance program.[2] PG&E submits its new Application today and urges the Commission's prompt reconsideration of this critical infrastructure need.

PG&E's original Gas AMI system (Gas AMI 1.0 or Gas SmartMeter™) is a one-way communication system that PG&E installed from 2006 through 2013 and that securely and automatically transmits customer gas energy usage to the Company's billing system, providing timely and accurate billing to over 4 million

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1 As PG&E explains in Chapter 2, PG&E now refers to this type of work—which it referred to as "Corrective Maintenance" in the 2023 GRC—as Required Maintenance, which more accurately describes the work.

2 D.23-11-069, pp. 334, 539-545.

PG&E gas customers. The system comprises head-end application software, network communication equipment, and battery-operated Gas Modules with built-in network interface cards externally-attached to each customer gas meter, which all connect to the Company's billing system. While the Gas AMI system consists of several components, one primary driver for this replacement program is that the battery-operated Gas Modules have failed or are forecasted to reach end-of-life as the Gas Modules' batteries run out of energy. It has been understood since PG&E filed its original Gas AMI 1.0 case that these batteries would eventually fail; at issue in this Application is that some of the batteries did not last as long as originally predicted. As explained in Chapter 4, that some Gas Modules failed before expected occurred for reasons beyond PG&E's control.

Through this Application, PG&E proposes to continue to replace Gas Modules as they fail (Required Maintenance), and replace Gas Modules on a programmatic lifecycle basis as the Gas AMI 1.0 system reaches the end of its useful life, starting in the geographic areas with the oldest Gas Modules or the highest failure rates (Lifecycle Replacement). This Application also proposes to begin to update PG&E's Gas AMI System (referred to as Gas AMI 2.0 throughout this Application) to prevent obsolescence and take advantage of next-generation metering technologies that can provide PG&E and its customers additional safety and operational functions and capabilities in the future.[3]

This chapter provides an overview of PG&E's Application and testimony, summarizes PG&E's 2023-2026 cost forecasts, demonstrates that the program is consistent with prudent and standard utility lifecycle asset management practices, summarizes the improvements and refinements to the program since PG&E's 2023 GRC Application (filed in June 2021), and explains how the program improves the customer experience and is necessary despite the State's trend towards electrification.

PG&E currently expects to complete the Comprehensive Gas AMI Replacement Program by 2030 and present its post-2026 forecast for the program in its 2027 GRC. By the time PG&E completes the program, it will have

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3 See Appendix B, Glossary of Key Terms, for additional explanations of terminology used in this chapter.

replaced all of its original battery-operated legacy Gas Modules with new Gas Modules, and enabled a Gas AMI 2.0 System to provide customers the available safety benefits that newer technologies offer.[4] PG&E provides further details of the Gas AMI 2.0 System in Chapter 3.

B. Summary of Request

PG&E requests that the Commission adopt its 2023-2026 expense forecast of $11.7 million, and its 2023-2026 capital expenditure forecast of $485.1 million for the Comprehensive Gas AMI Replacement Program.[5]

Table 1-1 summarizes PG&E's 2023-2026 expense forecast by Major Work Category (MWC).

TABLE 1-1
SUMMARY OF EXPENSE FORECAST BY MWC
(THOUSANDS OF NOMINAL DOLLARS)

Line No.	MWC	Nature of Work	2023 Recorded	2024 Forecast	2025 Forecast	2026 Forecast	Total
1	EZ	Program Management	$1,081	$1,205	$1,218	$1,232	$4,736
2	IS	Billing and Call Center Operations	705	1,157	1,104	908	3,946
3	JV	Maintain Information Technology (IT) Applications and Infrastructure	–	537	840	1,652	3,029
4	Total		$1,786	$2,899	$3,162	$3,864	$11,711

Table 1-2 summarizes PG&E's 2023-2026 capital expenditure forecast by MWC.

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4 PG&E has separate AMI Systems for providing Gas and Electric services. While its current one-way Gas AMI system will need to be replaced to prevent obsolescence, the Company does not currently expect its Electric AMI system will require any substantial system-wide lifecycle replacement in the foreseeable future. PG&E's Electric AMI is a two-way communicating system. The Electric SmartMeter™ devices are not battery-operated and have built-in network interface cards that facilitate communication capabilities from the meter.

5 For additional expense forecast information, see Chapter 2, Section H.1 and associated Workpapers (WP) 2-3, "Summary of Expense Forecast by Major Work Category" and 2-4, "Detail Expense Forecast by Major Work Category." For additional capital expenditure forecast information, see Chapter 2, Section H.2 and associated WPs 2-5, "Summary of Capital Expenditure Forecast by Major Work Category" and 2-6, "Detail Capital Expenditure Forecast by Major Work Category."

TABLE 1-2
SUMMARY OF CAPITAL EXPENDITURE FORECAST BY MWC
(THOUSANDS OF NOMINAL DOLLARS)

Line No.	MWC	Nature of Work	2023 Recorded	2024 Forecast	2025 Forecast	2026 Forecast	Total
1	74	Install Gas AMI Devices and Infrastructure	$95,873	$112,089	$122,702	$121,939	$452,603
2	2F	Build IT Applications and Infrastructure	1,095	11,048	11,838	8,474	32,455
3	Total		$96,968	$123,137	$134,540	$130,413	$485,058

C. Prudent Lifecycle Replacement of Gas AMI System

PG&E serves over 4 million gas customers. To do so, the Company leverages approximately 4.7 million gas meters, which require externally-attached battery-operated Gas Module communication devices to enable critical functions.[6] These devices automatically and securely transmit customer gas usage to PG&E's billing system. These gas usage data are critical to providing timely and accurate bills to customers without relying on more costly and labor-intensive manual processes and interventions that AMI technology rendered obsolete over a decade ago. Timely and accurate gas usage is also required for third-party gas providers to bill customers and is essential to many of PG&E's energy efficiency programs.

The Commission approved PG&E's proposal for full deployment of Gas AMI in 2006, finding that:

> PG&E's proposal has sufficient probable and quantifiable economic operating and demand response benefits now, including sufficient flexibility to up-grade for enhanced features, over the expected 20-year useful life.[7]

The Commission established a 20-year useful life (i.e., the period when a system is considered "used and useful") for the AMI system, but noted that:

> As with any complex system, individual components may fail early or last longer than the overall useful life. The AMI system's useful life does not depend on when the first component fails or how long the last meter-module can be coaxed to function. Its life depends on the system as a whole

6 See WP 1-1, "Current Gas Modules In-Service by Vintages."

7 D.06-07-027, p. 10.

operating correctly and reliably. We therefore find a 20-year useful life is a reasonable forecast for purposes of this decision.[8]

In addition, the Commission adopted a 20-year depreciable life for the Gas AMI system to "match" the adopted useful life, subject to reexamination in subsequent GRCs.[9] Based on PG&E's recommendation, the Commission recently adopted a 15-year average life for Gas AMI assets in the 2023 GRC.[10]

The Gas AMI 1.0 system that the Commission approved in 2006—which PG&E installed between 2006 and 2013—now requires replacement as the Gas Modules have failed (i.e., the batteries have run out of energy) or are near the end of their useful lives. Over the last several years, PG&E has replaced Gas Modules as they fail as part of Required Maintenance, in order to maintain infrastructure that is critical to customer service.

In light of the volume of Gas Modules at the end of their useful lives, PG&E plans to address the infrastructure replacement programmatically, replacing Gas Modules based on the geographic areas with the oldest Gas Modules or the highest failure rates. A programmatic lifecycle approach that concentrates replacement of the Gas Modules on an area-by-area basis is more efficient and cost-effective than continuing to solely replace Gas Modules after they are no longer useful. This approach also maintains continued service for more customers, enabling continuous, timely, and accurate usage data and billing.

Chapter 2 presents the results of PG&E's economic analysis, which demonstrates that the Net Present Value of incorporating Lifecycle Replacement is more cost-effective than continuing to solely replace Gas Modules on a geographically-dispersed basis after they fail (i.e., Required Maintenance). PG&E's programmatic Lifecycle Replacement approach also provides a better customer experience. Specifically:

- **Cost**: Incorporating Lifecycle Replacement enables PG&E to better design customer communications, annual and multi-year maintenance plans, plan for and utilize available field resource capacity, replace Gas Modules faster,

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8 D.06-07-027, p. 24.

9 D.06-07-027, p. 26.

10 A.21-06-021, Exhibit (PG&E-10), Chapter 12, WP 12-1227 to 12-1228 (Depreciation Study), Chapter 11, WP 11-5, line 238 and WP 11-6, line 282; D.23-11-069, p. 675, fn. 2452.

optimize deployment routes, bundle work, reduce repeat visits, and complete more customer appointments in a given period. PG&E has programmatically replaced Gas Modules in the Kern and Sacramento Divisions at an installed labor replacement unit cost of approximately $91 per unit for Lifecycle Replacement. This is far less expensive than an installed labor unit cost of $169 per unit for Required Maintenance.

- **Customer Experience**: Lifecycle Replacement reduces potential interruptions to timely and accurate customer billing and usage data presentment that supports customers' more actively reducing their gas usage and accompanying gas bills.

PG&E presents in Chapter 2 its 2023-2026 forecast for the work required to maintain functioning Gas Modules and to begin the first phase of programmatically replacing PG&E's approximately 2.9 million remaining first generation (Legacy) Gas Modules.[11]

The Comprehensive Gas AMI Replacement Program also will upgrade PG&E's existing Gas AMI System to enable PG&E to develop, pilot, and leverage next-generation Gas AMI Metering technologies and capabilities that will facilitate new safety, operational, and customer service capabilities in the future. PG&E's Gas AMI Technology Roadmap is presented in Chapter 3, and its 2023-2026 technology-related costs are presented in Chapter 2.

D. Improvements to the Program Based on the Commission's 2023 GRC Input

PG&E took to heart the feedback that the Commission and stakeholders provided in the 2023 GRC, applied recent experiences with Gas Module asset management, and sharpened its pencil to design a refined and less-expensive program. In particular, since filing the 2023 GRC in June 2021, PG&E has:

- Completed a supplier warranty replacement project for certain vintages of Gas Modules (specifically, longer-range Gas Modules), at the supplier's cost;
- Secured a settlement with the supplier regarding legacy product warranty claims, refined product quality assurance (QA) and warranty return

[11] For more detail and PG&E's calculations supporting the 2.9 million remaining legacy Gas Modules to be replaced, see WP 2-2, "Gas Module Replacement Unit Forecast." PG&E currently forecasts replacing approximately 1.7 million Legacy Gas Modules during the 2023-2026 period, with the remaining 1.2 million forecasted from 2027-2030.

processes with the supplier, and performed additional supplier quality verifications;

- Concluded a focused commercial Request for Proposal (RFP), and selected two vendors for the Comprehensive Gas AMI Replacement Program that will enable PG&E to meet current and future customer needs, develop an affordable technology roadmap, leverage next-generation AMI Metering technology in the future, and better balance supplier and market risk;
- Refined the Gas Module end-of-life (failure rate) forecast through more granular, updated data and analysis of trends, resulting in a slower, more methodical proposed pace of Gas Module replacements through 2026; and
- Began programmatic Lifecycle Replacements in key divisions (Kern and Sacramento) where either the oldest vintages of Gas Modules are installed or PG&E is observing the highest Gas Module failure rates, while continuing to replace Gas Modules as they fail in other areas.

E. Customer Affordability and Satisfaction

PG&E made many of the improvements discussed above with customer affordability and satisfaction in mind, including: (1) the proposed slower pace and more geographically targeted proposal for Lifecycle Replacement; (2) supplier quality verifications, product QA and warranty program refinements with its Gas Module supplier; (3) additional warranty benefits from PG&E's Gas Module supplier, which significantly offset replacement costs; (4) the selection of the most competitive suppliers that responded to PG&E's RFP; (5) an updated comprehensive work optimization plan that reduces duplicative and inefficient work by enabling work bundling to increase productivity and lower costs; and (6) a comprehensive customer outreach plan to keep customers informed and reduce access issues that would have resulted in repeat visits to the customer premise. PG&E's more targeted approach and slower ramp up of Lifecycle Replacement has resulted in a 2023-2026 forecast that is approximately 35 percent lower than that presented in the GRC.

PG&E expects Gas Module failures to continue increasing as more devices reach the end of their useful lives. Incorporating a programmatic and comprehensive Lifecycle Replacement program approach will help PG&E and its customers limit interruptions in their gas meter and data communications, and mitigate manual intervention, increased handling, and avoidable costs.

The Lifecycle Replacement work that PG&E completed in Kern Division and began in Sacramento Division validated that a programmatic approach will significantly reduce customer impacts, deliver more positive customer experiences, improve customer satisfaction, and reduce the costs associated with this necessary infrastructure maintenance. PG&E accordingly proposes to apply this approach more broadly now.[12]

F. PG&E's Request Is Necessary Despite Electrification Goals

In its 2023 GRC decision, the Commission wondered whether PG&E's proposed investment in its Gas Metering Infrastructure is necessary in light of California's electrification goals and the expected corresponding declines both in customers' gas demand and PG&E's support for its gas distribution system.[13] However, until the State resolves to end the use of natural gas, PG&E has an obligation to serve its gas customers pursuant to Public Utilities Code Section 451, and must also continue billing customers for their gas consumption. As long as these customers continue to receive gas service, they must have functioning Gas Modules to support timely and accurate transmission of customer gas energy usage for billing and other customer service functions (including various gas-related energy reduction and curtailment programs).

In addition, PG&E relies on data provided by Gas AMI to support a reliable system. For example, the Gas AMI system allows PG&E's Gas Operations team to implement and monitor curtailment procedures to safely preserve the gas system for customers. PG&E depends on curtailments to ensure that system pressure does not decrease to the point that it causes uncontrolled outages. PG&E must be able to monitor compliance in real-time and depends on timely and accurate gas data from Gas Modules to do so. PG&E also uses SmartMeter™ data to generate customer load projections for PG&E gas hydraulic models, develop customer usage profiles and load estimation for gas system clearances and operation support, and conduct feasibility analyses with the usage data for potential large load and renewable natural gas customers. Additionally, gas AMI data can be used to provide key insights into localized gas

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12 See Chapter 2, Section F.3 and WP 2-10 for further details on the Gas Module Lifecycle Replacement work in the Kern and Sacramento Divisions, and WP 2-11 for further details on PG&E's Customer Communications Plan.

13 D.23-11-069, p. 544.

demand leading to more efficient planning, over time, of target electrification activities to avoid large gas capital investments, thereby contributing to reductions in future gas system revenue requirement and operating costs.

Finally, timely and accurate gas usage data that are communicated securely to PG&E systems through Gas Modules are crucial to ensure the provision of energy cost savings and monitoring of gas usage to approximately 2.5 million customers enrolled in 21 energy efficiency gas programs. These gas-related energy efficiency programs rendered savings to customers of approximately 29.6 million therms in 2023.

PG&E is not the only provider that relies on gas usage data to provide accurate and timely bills to customers. As of February 2022, PG&E worked with 28 third-party Core Transport Agents (CTA) who provide gas to customers through PG&E's gas infrastructure. PG&E provides gas usage data to these third-party providers daily to facilitate their customer billing. Providing delayed or estimated gas usage to CTAs may result in a less satisfactory customer experience for the CTAs' customers.

G. Organization of Remainder of Testimony

The remainder of testimony in support of this Application is organized as follows:

- Chapter 2 – Presents a description of the work and 2023-2026 forecast costs for PG&E's Comprehensive Gas AMI Replacement Program.
- Chapter 3 – Presents PG&E's Technology Roadmap for its Gas AMI 2.0 System.
- Chapter 4 – Demonstrates that PG&E acted prudently in installing and maintaining Gas AMI 1.0 as authorized by D.06-07-027.
- Chapter 5 – Presents the revenue requirements associated with the costs in this Application.
- Chapter 6 – Describes PG&E's cost recovery proposals for the costs presented in Chapter 2 and the revenue requirements presented in Chapter 5.

H. Conclusion

The Comprehensive Gas AMI Replacement Program proposed in this Application is necessary to continue to provide required and affordable gas service to PG&E's over 4 million gas customers. PG&E submits that its forecast costs for 2023-2026 are reasonable and should be adopted by the Commission.

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 2

COMPREHENSIVE GAS AMI REPLACEMENT PROGRAM

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COMPREHENSIVE GAS AMI REPLACEMENT PROGRAM

A. Introduction

This chapter describes Pacific Gas and Electric Company's (PG&E or the Company) multi-year Comprehensive Gas Advanced Metering Infrastructure (AMI) Replacement Program, presents the Company's 2023-2026 forecasts for the program, and demonstrates the financial and customer benefits of beginning to incorporate a programmatic lifecycle replacement strategy. The Comprehensive Gas AMI Replacement Program is necessary to maintain critical customer service functions, and the costs to do so are reasonable. PG&E respectfully asks that the California Public Utilities Commission (Commission) authorize the costs proposed here for 2023-2026. PG&E will forecast the 2027-2030 costs associated with the completion of its Comprehensive Gas AMI Replacement Program and launch of a newer, modernized Gas AMI System in its 2027 General Rate Case (GRC), but provides that context for the Commission's broader understanding of this Program.

B. Program Overview

In 2006, the Commission approved cost recovery for PG&E's full deployment of Gas AMI 1.0 (also known as SmartMeter™).[1] The Company's Gas AMI system relies on battery-operated communication Gas Modules externally attached to gas meters and network communications infrastructure to transmit gas consumption from customers' meters to related computerized systems and software that enable billing and data presentation to individual customers.[2] PG&E's Gas AMI 1.0 project included enabling the automation of

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1 Decision (D.) 06-07-027.

2 As stated in Chapter 1, PG&E's original Gas AMI system (Gas AMI 1.0 or Gas SmartMeter™) is a one-way communication system installed between 2006 to 2013 that securely and automatically transmits customers' gas energy usage to the Company's billing system, providing bills to over 4 million PG&E gas customers. The system includes head-end application software, network communication equipment, and battery-operated Gas Modules with built-in network interface cards externally attached to each customer gas meter, which all connect to the Company's billing system. See Appendix B, Glossary of Key Terms, for additional explanations of terminology used in this chapter.

gas metering via the Gas Modules, deploying new communications networks to communicate with the Gas Modules, and upgrading the customer billing system (at the time consisting of 4.2 million gas meters).[3] The Commission found PG&E's Gas AMI 1.0 proposal had "sufficient probable and quantifiable economic operating and demand response benefits," and adopted a project budget of approximately $1.7 billion.[4] The Commission also adopted a 20-year useful life for the Gas AMI system, but recognized that this was a new technology and acknowledged that, "individual components may fail early or last longer than the overall useful life."

In addition, the Commission adopted a 20-year depreciable life for the AMI system to "match" the adopted useful life, but invited PG&E to re-examine the 20-year depreciable life in subsequent GRCs "when there is credible evidence that the life should be adjusted."[5] Based on its most recent depreciation study, PG&E recommended a 15-year average depreciable life for Gas AMI assets (including Gas Modules and Gas AMI communication equipment) in the Company's 2023 GRC. No party opposed PG&E's proposal to move to a 15-year average service life for Gas Modules and communication equipment, and the Commission approved this proposal.[6]

PG&E's roughly 4 million gas customers currently utilize approximately 4.7 million gas meters, which rely on Gas Modules to automatically transmit these customers' gas usage securely to PG&E's billing system. These devices include both extended range Gas Modules and standard range Gas Modules.[7] The Gas Modules—originally installed throughout PG&E's service territory between 2006 and 2013—support critical functions on which PG&E and other

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3 D.06-07-027, p. 2, fn. 2.

4 D.06-07-027, pp. 10, 65-66, Conclusion of Law 3.

5 D.06-07-027, p. 26.

6 Application (A.) 21-06-021, Exhibit (PG&E-10), Chapter 12, WP 12-1227 to 12-1228 (Depreciation Study), Chapter 11, WP 11-5, line 238 and WP 11-6, line 282; D.23-11-069, p. 675, fn. 2452.

7 The vast majority of PG&E's Gas Modules are standard range (approximately 91 percent of the 4.7 million in-service Gas Modules). However, certain customer premises (such as basements, underground locations, and remote locations) require additional range to ensure network coverage and connection to PG&E's back-end systems, and thus require a device that operates on a higher power frequency to provide that extra communication range.

stakeholders rely, such as billing by PG&E and third-party energy providers and administration of energy efficiency programs.

PG&E has found that its legacy first generation battery-operated Gas Modules require replacement, as the batteries have run out of energy or are expected to run out of energy. As PG&E highlighted in its 2020 GRC, and as the Commission acknowledged in its decision on PG&E's 2023 GRC, some Gas Modules failed before reaching the end of their useful lives, and required immediate replacement to continue to support critical customer service functions.[8] From 2014 through 2022, PG&E replaced approximately 1.86 million first generation Gas Modules.[9]

PG&E and the Commission recognized in 2006 that SmartMeter™ was a new technology that had not been deployed on the scale at which PG&E deployed it, such that "individual components may fail early or last longer than the overall useful life."[10] In response, and as explained further below, PG&E pursued compensation from its original Gas AMI 1.0 supplier pursuant to the warranty in the parties' contract, which significantly offset the costs of those replacements, lessening the burden on PG&E's customers for replacement of the Gas Modules.

PG&E forecasts an increasing number of Gas Modules requiring replacement as the devices reach, or near the end of, their useful lives. PG&E forecasts approximately 2.9 million Gas Modules will require replacement from 2023 through 2030.[11] In this Application, PG&E proposes an efficient, multi-pronged, and comprehensive programmatic approach for replacing Gas Modules from 2023-2026, which includes:

1) Completing PG&E's existing program to replace all extended range Gas Modules at the supplier's cost (Warranty Replacements);

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8 D.23-11-069, p. 544.

9 The 1.86 million Gas Module replacements include replacements due to Gas Module failure (Required Maintenance) and Gas Modules replaced when PG&E exchanges gas meters in compliance with its regular gas meter maintenance programs. See WP 2-1, "Legacy Gas Module Replacements."

10 D.06-07-027, p. 24.

11 PG&E currently forecasts replacing approximately 1.7 million Gas Modules during the 2023-2026 period, and 1.2 million from 2027-2030. See WP 2-2, "Gas Module Replacement Unit Forecast."

2) Continuing replacement of certain Gas Modules as they fail (Required Maintenance);[12]

3) Beginning focused Gas Module replacement in select areas to deliver better customer experiences, realize efficiencies and economies of scale, increase productivity, and lower costs (Lifecycle Replacement); and

4) Beginning a Gas AMI 2.0 System Upgrade that will allow PG&E to start upgrading its system before it becomes obsolete, and leverage newer Gas AMI and Metering technologies via two-way communication.

Replacement of failed or failing Gas Modules is necessary to ensure continued automated gas usage collection, continuous customer billing by PG&E and third parties, and support for PG&E's energy efficiency programs. In addition, PG&E plans to maintain and begin upgrading its Gas AMI functionality, utilizing its existing Gas AMI Supplier (Aclara) and preparing to potentially leverage its existing Electric AMI System (Itron) for Gas AMI. This system upgrade will allow PG&E to further leverage existing and emerging Gas AMI and Metering technologies, offering PG&E and its customers additional safety, operational, and customer service capabilities in the future while reducing sole source Gas AMI supplier and market risks. As PG&E explains in Chapter 3, the two-way communication that a Gas AMI 2.0 System enables can support features that have become available (and that other utilities have deployed) since PG&E installed its original Gas AMI 1.0 System, such as automatic and remote shutoff for improved safety capabilities, on-demand meter reads, and over-the-air firmware updates. PG&E expects to complete the Comprehensive Gas AMI Replacement Program in 2030 and will provide its forecasts for 2027-2030 in its 2027 GRC.

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[12] In the 2023 GRC, PG&E referred to the practice of replacing Gas Modules as they fail as "Corrective Maintenance," and included the forecasts for that work in Electric Distribution Operations, Field Metering. (A.21-06-021, Exhibit (PG&E 4), Chapter 8). PG&E now refers to this work as Required Maintenance because it more accurately describes the nature of the work. PG&E presents the Required Maintenance forecast in this chapter for a holistic presentation of the 2023-2026 forecast for the Comprehensive Gas AMI Replacement Program.

C. Summary of Request

1. Expense

PG&E requests that the Commission adopt its 2023-2026 expense forecast of $11.7 million for the Comprehensive Gas AMI Replacement Program, including the annual forecasts below:

TABLE 2-1
SUMMARY OF EXPENSE FORECAST BY YEAR
(THOUSANDS OF DOLLARS)

Line No.		2023 (Recorded)	2024 (Forecast)	2025 (Forecast)	2026 (Forecast)	Total
1	Expense Forecast	$1,786	$2,899	$3,162	$3,864	$11,711

These expenses provide for a Project Management Office (PMO) with centralized, coordinated, and efficient management of the Comprehensive Gas AMI Replacement Program, as well as incremental funding for PG&E's customer outreach and engagement, contact center support, back-office billing, and Information Technology (IT) operations and maintenance.[13]

2. Capital Expenditures

PG&E requests that the Commission adopt its capital expenditure forecast of $485.1 million for the Comprehensive Gas AMI Replacement Program from 2023-2026, including the annual forecasts below:

[13] See WP 2-3, "Summary of Expense Forecast by Major Work Category" and WP 2-4 "Detail Expense Forecast by Major Work Category."

TABLE 2-2
SUMMARY OF CAPITAL EXPENDITURE FORECAST BY YEAR
(THOUSANDS OF DOLLARS)

Line No.		2023 (Recorded)	2024 (Forecast)	2025 (Forecast)	2026 (Forecast)	Total
1	Capital Expenditures Forecast	$96,968	$123,127	$134,540	$130,413	$485,058

These capital expenditures encompass both Required Maintenance and Lifecycle Replacement materials and labor costs, described more fully in this chapter.[14]

D. Updated End-of-Life Study and Projections for Gas Modules

PG&E previously retained an independent, third-party consultant (Exponent) to analyze and assess the remaining operational life of the in-service legacy standard range Gas Modules (3.4 million as of June 2020).[15] PG&E provided data to Exponent regarding Gas Module installation dates, the dates when Gas Modules were replaced or removed, and the reason for replacement.

Exponent incorporated PG&E's data into a statistical model to estimate the probability of failure by module age, which PG&E presented in the 2023 GRC.[16] In that study, Exponent used data from failures across the Company's service area. The data demonstrated the highest rates of failure in the Kern and Sacramento Divisions; as PG&E installed these units earlier in the 2006-2013 installation period, these divisions contain some of the oldest Gas Modules currently in service. Exponent and PG&E extrapolated from these initial results to predict aggregated failure rates for PG&E's entire service area. That study assumed that newer Gas Modules would fail at the same rate as the older Gas Modules since the data relied so heavily on failure rates in the Kern and Sacramento Divisions.[17]

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14 See WP 2-5, "Summary of Capital Expenditure Forecast by Major Work Category" and WP 2-6 "Detail Capital Expenditure Forecast by Major Work Category."

15 Exponent is a leading engineering consulting firm providing services in a variety of industries, including energy, utilities, and construction.

16 A.21-06-021, Exhibit (PG&E 6-E), Chapter 9, WP 9-14 to 9-15, Gas Module Failure Rate Study.

17 PG&E's service area includes five regions (North Coast, North Valley and Sierra, Bay Area, South Bay and Central Coast, and Central Valley). It is further subdivided by 19 geographic divisions.

PG&E and Exponent have since refreshed the failure rate probabilities, applying current data from each division only to that specific division. Using Exponent's updated Gas Module Failure Rate Study, PG&E performed a trend analysis on the updated probability of failure by Gas Module age and division, and applied the probability curves to vintages of legacy Gas Modules remaining in the field as of December 31, 2022 by division to prepare the updated failure forecast.[18] For example, data from failures in the Kern Division are used to predict failures in the Kern Division, and data from failures in the San Francisco Division are used to predict failures in the San Francisco Division.

This division-specific approach better accounts for module vintages, age of the Gas Modules, and the effects that weather, climate, and temperature can have on failure rates in different geographic areas. For example, the refreshed study showed that divisions in higher-range temperature areas have higher failure rates. Indeed, PG&E observed that extreme temperature ranges can cause the expansion and contraction of the Gas Module's casing, which leads to cracking of the casing that can allow entry of water into the Gas Module. PG&E's updated analysis predicts that 95 percent of the remaining Gas Modules in the Sacramento Division would fail by the age of 16 years, and 89 percent of the remaining Gas Modules in the Kern Division would fail by the age of 15 years. By contrast, areas in which Gas Modules were deployed later are experiencing lower failure rates. For example, PG&E's refreshed analysis predicts that 14 percent of the remaining Gas Modules in the Peninsula Division, and 16 percent of the remaining Gas Modules in the Mission Division would fail by the age of 14 years.[19] As a result of these modeling improvements, PG&E determined that failures where Gas Modules were among the first deployed, which also happen to be among the areas with the biggest temperature swings (i.e., Kern and Sacramento Divisions), are significantly higher than in other divisions.

PG&E's updated model, which analyzes failure rates by area, has improved the accuracy of PG&E's 2023-2026 forecast. Accordingly, PG&E's failure rate

[18] See WP 2-7, "Gas Module Failure Rate Probability Forecast Methodology."

[19] See WP 2-8, "End of Life Study."

forecast has declined.[20] PG&E's refreshed forecast includes: (1) warranty replacements at the supplier's cost; (2) lower expected Required Maintenance volumes; and (3) targeted Lifecycle Replacement in those specific areas: (a) containing the oldest vintages of Gas Modules, and (b) the highest failure rates (specifically, Kern and Sacramento Divisions).[21]

E. Detailed Description of Comprehensive Gas AMI Replacement Program

As of January 2023, there are approximately 2.9 million legacy Gas Modules remaining to be replaced (PG&E plans to replace all legacy Gas Modules by 2030).[22] In this Application, PG&E proposes a strategic replacement strategy that includes: (1) completing its existing program to replace certain extended range Gas Modules at the supplier's cost (Supplier Warranty Replacements); (2) continued replacement of standard range Gas Modules as they fail that need to be replaced to maintain customer billing and other functions (Required Maintenance); (3) focused programmatic Gas Module replacement in select key areas (Kern and Sacramento Divisions) where the Company can deliver better customer experiences, realize efficiencies and economies of scale to increase productivity and lower costs (Lifecycle Replacement); and (4) a Gas AMI System Upgrade that begins to transition PG&E's Gas AMI 1.0 System to a Gas AMI 2.0 System that will allow PG&E and its customers to leverage additional safety, operational and customer service features and technologies, and next-generation metering products in the future. PG&E discusses each of these further below.

Table 2-3 summarizes the Company's replacement plans and associated cost forecasts for 2023-2026 set forth in this Application. PG&E will present its cost forecasts for 2027-2030 in its 2027 GRC.[23]

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20 See WP 2-8, "End of Life Study"; A.21-06-021, Exhibit (PG&E 6-E), Chapter 9, WP 9-14 to 9-15, "Gas Module Failure Rate Study."

21 PG&E currently forecasts replacing approximately 1.7 million Legacy Gas Modules during the 2023-2026 period, with the remaining 1.2 million forecasted from 2027-2030. See WP 2-2, "Gas Module Replacement Unit Forecast."

22 See WP 1-1, "Current Gas Modules In-Service by Vintages" and WP 2-2 "Gas Module Replacement Unit Forecast."

23 See WP 2-3, "Summary of Expense Forecast by Major Work Category," WP 2-4, "Detail Expense Forecast by Major Work Category," WP 2-5, "Summary of Capital Expenditure Forecast by Major Work Category" and WP 2-6, "Detail Capital Expenditure Forecast by Major Work Category" for additional support.

TABLE 2-3
COMPREHENSIVE GAS AMI REPLACEMENT PROGRAM FORECAST (2023-2026)

Line No.	(a) Supplier Warranty Replacements	(b) Required Maintenance	(c) Lifecycle Replacement	(d) Gas AMI System Upgrade	(e) All Replacements
1	Extended range Gas Modules replaced by the supplier pursuant to warranty.	Continued replacement of individual Gas Modules after they fail.	Targeted proactive replacement where PG&E has either the oldest Gas Modules or the highest failure rates.	Gas AMI System Upgrade that begins to transition PG&E's Gas AMI 1.0 System to a modern Gas AMI 2.0 System	Total Gas Module Replacements
2	29,387 Units	1,329,474 Units	230,432 Units	N/A	1,589,293 Units[(a)]
3	Costs covered by the supplier are not included in this Application. See Chapter 4 for information on warranty benefits.	Forecast: Capital $401.5 million Expense $6.1 million	Forecast: Capital $40.8 million Expense $2.6 million	Forecast: Capital $42.8 million Expense $3.0 million	Total Forecast: Capital $485.1 million Expense $11.7 million
4		Current Application	Current Application	Current Application	Current Application

(a) See WP 2-2 "Gas Module Replacement Unit Forecast," lines 15-19.

1. Supplier Warranty Replacements

The warranty for the original Gas AMI 1.0 installation covered both extended range and standard range Gas Modules. Extended range Gas Modules are used in hard-to-reach locations such as remote geographical areas, basements, or indoor locations (such as garages). These extended range Gas Modules operate on a higher power frequency to provide the extra communication strength needed to reach PG&E's Gas AMI and billing system. PG&E and its supplier determined that these extended range Gas Modules have a much shorter lifespan than standard range Gas Modules. In 2018, PG&E and its Gas AMI supplier agreed that PG&E could elect to have its supplier replace all legacy extended range Gas Modules at the supplier's cost.

In June 2020, PG&E exercised that right, informing its Gas AMI supplier that it elected to have the supplier proactively replace all extended range Gas Modules. Following this election, in close coordination with PG&E, the supplier began project planning, field work route design, staging its operations (securing a warehouse and required inventory), and on-boarding and training technicians. The Supplier Warranty Replacements began in June 2021 and were largely completed in 2023. To date, PG&E's legacy extended range Gas Modules have been fully replaced with new Gas Modules (except for a few unique circumstances such as customer premise access issues that PG&E is addressing). PG&E's Gas AMI supplier covered the cost of materials and labor to replace the legacy extended range Gas Modules.

In addition, PG&E's supplier agreed in 2018 that it would provide warranty credits to cover PG&E's replacement of extended range Gas Modules that had failed or that PG&E resources (rather than supplier resources) would replace. In total, the supplier replaced over 74,000 legacy extended range Gas Modules solely at its cost between 2021-2023. The supplier provided PG&E with warranty credits for the approximately 281,000 extended range Gas Modules that PG&E had replaced through 2022, the approximately 7,000 PG&E replaced during 2023 and the approximately 18,000 that remain to be replaced by PG&E as of

December 31, 2023.[24] PG&E's diligence in pursuing supplier warranty claims, securing the supplier's agreement to replace extended range Gas Modules at its cost and provide warranty credits for PG&E-replaced Gas Modules significantly lowered the overall costs of Gas Module Replacement for our customers. The benefits of supplier warranty work are discussed in Chapter 4.

2. Required Maintenance

Required Maintenance refers to the practice of replacing individual Gas Modules after their batteries fail, irrespective of geography. As the individual Gas Modules fail, PG&E is temporarily unable to collect the customer's gas energy usage that a functioning Gas Module would automatically have transmitted to PG&E's billing system. PG&E must replace these failed devices with new devices in order to enable billing, both by PG&E and third-party energy providers. This approach results in a more spread-out or geographically dispersed replacement plan than does a targeted proactive geographic replacement strategy.

This is how PG&E initially addressed Gas Module failures, i.e., replace as needed. Between 2014-2018, PG&E replaced approximately 218,000 Gas Modules, an average of approximately 43,600 Gas Modules per year. However, from 2019-2022, PG&E observed a significant increase in Gas Module failures and replaced approximately 842,000 Gas Modules, an average of 210,500 Gas Modules per year. Required Maintenance replacements occurred on a more geographically dispersed basis. Table 2-4 summarizes annual Gas Module replacements performed by PG&E for 2019-2022.[25]

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[24] See WP 2-9, "Extended Range Warranty Replacements."

[25] As demonstrated in Table 2-4, standard range Gas Module replacements increased year-over-year between 2019 and 2022. PG&E forecasts this trend to continue as the standard range Gas Modules reach end-of-life. By contrast, extended range Gas Module replacements increased between 2019-2021 and decreased in 2022. Nearly all extended range Gas Modules have been replaced by PG&E or its supplier.

TABLE 2-4
REQUIRED MAINTENANCE GAS MODULE REPLACEMENTS
(2019-2022)

Line No.	Year	2019	2020	2021	2022	Total
1	Standard Range	75,301	91,419	188,633	209,231	564,584
2	Extended Range	20,075	78,632	138,768	40,254	277,729
3	Total	95,376	170,051	327,401	249,485	842,313

PG&E forecasts that the standard range Gas Module failures will continue to increase as the devices reach their end-of-life. While it makes economic sense to programmatically replace Gas Modules in some locations, PG&E will need to continue to replace some Gas Modules as they fail during the 2023-2026 period. These costs primarily include the materials and labor costs to perform Required Maintenance (replace Gas Modules as they fail). Table 2-5 below provides a summary of Gas Module Required Maintenance capital expenditures.

TABLE 2-5
SUMMARY OF REQUIRED MAINTENANCE FORECAST
(THOUSANDS OF NOMINAL DOLLARS)

Line No.	Required Maintenance	2023 Recorded	2024 Forecast	2025 Forecast	2026 Forecast	2023-26 Total
1	Capital Expenditures	$87,438	$101,719	$108,049	$104,261	$401,468
2	Expense	$1,151	$1,735	$1,681	$1,557	$6,124
3	Number of Gas Modules (Units)	274,915	370,528	357,255	326,776	1,329,474

3. Focused Lifecycle Replacement of Gas Modules in Targeted Areas

In addition to continued Required Maintenance for Gas Modules that have failed and need to be replaced, PG&E proposes transitioning to a Gas Module Lifecycle Replacement Program where the economics justify proactively replacing Gas Modules on a programmatic basis. Based on its updated analysis and forecasting, PG&E has adjusted its near-term strategy to focus on those divisions where its Gas Modules are oldest and failure rates are highest. Focusing on these areas for Lifecycle Replacement in the short term optimizes field labor plans, achieves economies of scale, lowers costs, and delivers a better customer experience.

PG&E initiated its focused and targeted Lifecycle Gas Module Replacement Program in 2023 in the Kern and Sacramento Divisions, where PG&E had its oldest vintages of Gas Modules and/or its highest end-of-life/failure rates. PG&E completed Lifecycle Replacements in the Kern Division in December 2023 and plans to complete Lifecycle Replacements in the Sacramento Division by the end of 2026.[26] Table 2-6 below provides a summary of Gas Module Lifecycle Replacement capital expenditures and expenses.

TABLE 2-6
SUMMARY OF LIFECYCLE REPLACEMENTS FORECAST
(THOUSANDS OF NOMINAL DOLLARS)

Line No.	Lifecycle Replacements	2023 Recorded	2024 Forecast	2025 Forecast	2026 Forecast	2023-26 Total
1	Capital Expenditures	$8,435	$10,070	$10,789	$11,463	$40,757
2	Expense	$635	$627	$641	$655	$2,558
3	Number of Gas Modules (Units)	50,432	60,000	60,000	60,000	230,432

PG&E will forecast post-2026 Gas Module Lifecycle Replacements in its 2027 GRC.

4. Gas AMI System Upgrade

PG&E also proposes to begin upgrades to its Gas AMI communications network control and management software, which is necessary to replace the system before it becomes obsolete, and allow PG&E and its customers to capture additional safety and operational benefits in the future. PG&E engaged an independent third-party consultant to assist it in conducting an updated global industry Gas AMI technology assessment. The Gas AMI Assessment covered advanced metering for natural gas across the United States, Europe, and Asia Pacific, gathering detailed data concerning existing and evolving technology trends and availability.

The consulting assessment summarized the current market options for Gas AMI communications devices and networks, with a focus on emerging next-generation Gas AMI and Metering technology and industry trends.

[26] See WP 2-10, “Gas Module Lifecycle Replacement Program” for additional details about productivity and cost efficiencies for this work.

PG&E used this information to develop its plan for updating its Gas AMI System to accommodate an efficient programmatic approach to required Gas Module Replacement in the near-term and enable future customer benefits in the long-term.

The assessment described above also informed PG&E's development of an updated set of business and technology requirements for the upgraded Gas AMI System. Those requirements established the basis for a competitive bidding process, utilizing a Request for Proposal (RFP) that PG&E released to five top AMI vendors in North America in the fall of 2021. With a focus on scaled, cost-effective, reliable, and safe solutions, PG&E evaluated the five vendors throughout multiple rounds over an 18-month period. During this process, PG&E assessed and considered the Company's and customers' current and future needs, supplier and market risks, cost constraints, and customer affordability. PG&E evaluated bidders in the following categories: (1) Commercial Terms; (2) Technical; (3) Pricing; (4) Safety; and (5) Responsibility. PG&E also completed product lab tests and limited field trials of the short-listed products as part of the RFP selection process.

In June 2023, PG&E selected the two vendors that scored the highest on PG&E's criteria: (1) Aclara (PG&E's current Gas AMI vendor); and (2) Itron (PG&E's Electric AMI provider). PG&E's decision to select Aclara and Itron balanced current needs and customer affordability, reduced sole source supplier and market risks, and allowed future deployment of newer technology that can provide additional capabilities and benefits for safety, operations, and customer service.

PG&E has developed its technology roadmap and Gas AMI System Upgrade plans. PG&E must begin upgrades to its nearly 20 year old Gas AMI System before it becomes obsolete. In doing so, PG&E will enable enhanced safety, operations, and customer service capabilities that will benefit customers in the future. Table 2-7 provides a summary of PG&E's Gas AMI System Upgrade costs. The Gas AMI System Upgrade currently includes: (1) upgrading to a next-generation two-way Gas AMI software network and hardware platform to support Gas AMI 2.0 technologies; and (2) potentially enabling Gas AMI functionality on PG&E's existing Electric

AMI software platform. Due to continued advancements in vendor technologies, PG&E will continue to monitor industry and technology trends and evaluate the most feasible and cost-effective ways to serve its customers. Further details on PG&E's proposed Gas AMI System Upgrade plans are discussed in Chapter 3.

TABLE 2-7
SUMMARY OF GAS AMI SYSTEM UPGRADE FORECAST
(THOUSANDS OF NOMINAL DOLLARS)

Line No.	Gas AMI System Upgrade	2023 Recorded	2024 Forecast	2025 Forecast	2026 Forecast	2023-26 Total
1	Capital Expenditures	$1,095	$11,348	$15,702	$14,689	$42,834
2	Expense	–	$537	$840	$1,652	$3,029

Note: The $42.8 million of capital expenditures related to the Gas AMI System Upgrade include $32.4 million of IT capital in major work category (MWC) 2F and $10.4 million of network capital in MWC 74. See WP 2-11 "IT Network Project Expenditures."

F. PG&E's Proposed Lifecycle Replacement Provides Added Benefits Over Solely Applying a Required Maintenance Approach

Incorporating Lifecycle Replacement of Gas Modules offers several advantages over a program that relies solely on replacing the Gas Modules as they fail, including: (1) increased productivity; (2) the ability to bundle work; (3) reduced travel time between jobs; and (4) customer communication plans that improve customer-generated appointments, which reduce repeat visits (due to inability to access the customer's premise) and improve customer satisfaction. The benefits of including a Gas Module Lifecycle Replacement approach result in a lower total net present value (NPV) vis-à-vis Required Maintenance, and improved customer experience. These financial and customer experience benefits are discussed in more detail below.

1. Financial Benefits of Gas Module Lifecycle Replacement

Gas Module Lifecycle Replacement work within a specific geography achieves economies of scale and lowers unit costs. Replacing Gas Modules in a single geographic neighborhood all at one time minimizes travel time, improves work productivity, enables work bundling, improves the opportunity to generate customer appointments, which reduces repeat visits, and results in reduced labor costs. PG&E validated these benefits in its targeted Gas Module Lifecycle Replacement work in the Kern and Sacramento Divisions in 2023, which will be discussed in more detail below.[27]

Another benefit of Lifecycle Replacement relates to the potential to take advantage of available field resource capacity in the spring and summer months, which helps the Company avoid: (1) releases and rehires of temporary field technicians that currently perform most of the Gas Module replacements, and (2) associated costs, including recruiting, on-boarding, training, and assigning vehicles and mobile tablets. Over the past several years, PG&E has observed that more Required Maintenance work is necessary during the winter months. PG&E has observed that colder temperatures and water intrusion affect the Gas Modules' internal electronics and accelerate battery end-of-life. PG&E expects this trend to continue. To optimize work and resource plans, PG&E plans to focus on Required Maintenance during the winter months, and focus on programmatic Lifecycle Replacements in targeted geographic areas during the spring and summer months. This will allow PG&E to better plan and normalize work volumes throughout the year with available field resource capacity. By normalizing the monthly Gas Module Replacement work plan throughout the year, PG&E can reduce the time and cost associated with releasing and rehiring the temporary field technicians that perform Gas Module Replacement and related costs. Due to the temporary nature of the Gas Module Replacement Program, PG&E anticipates that it will continue to rely on temporary and regular field technicians for this work, and has planned accordingly.[28]

Since submitting the 2023 GRC, PG&E has refreshed its economic analysis. Table 2-8 below compares the NPV of shifting to a Lifecycle Replacement strategy as proposed in this Application compared to continuing solely with Required Maintenance of individual Gas Modules after

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[27] See WP 2-10 "Gas Module Lifecycle Replacement Program."

[28] PG&E has regular Meter Maintenance Personnel and Gas Service Representatives that are qualified to perform Gas Module maintenance and replacements. However, due to the seasonality of Gas Module failures and relatively short-term nature of the Gas Module Replacement Program, the Company plans to continue to have temporary hiring hall workers perform much of this work.

they fail. This economic analysis forecasts costs over a 15-year period (2023-2037) and on a total program basis, the NPV of the Company's Comprehensive Gas AMI Replacement Program improves as follows:

- Lifecycle Replacement: -$889.6 million
- Required Maintenance Only: -$910.7 million Under both approaches, a certain amount of Required Maintenance is necessary. In addition, there are costs that are common to both approaches (such as IT costs). Therefore, PG&E performed an additional NPV analysis that compares the incremental costs of the two approaches after excluding common Required Maintenance work. The incremental NPVs are:
- Lifecycle Replacement (excluding common costs): -$134.6 million
- Required Maintenance Only (excluding common costs): -$155.7 million.[29]

The results of these economic analyses demonstrate the cost effectiveness of both PG&E's Comprehensive Gas AMI Replacement Program as a whole, and more specifically its current approach which leverages targeted proactive Lifecycle Replacement.

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29 See WP 2-12, "Net Present Value Economic Analysis." PG&E's proprietary economic model used to calculate the NPV economic analysis is available via confidential data request.

TABLE 2-8
ECONOMIC ANALYSIS SUMMARY

Line No.	Replacement Approach	NPV	Description
1	Comprehensive Gas AMI Replacement Program	-$889.6 million	Inclusive of all programmatic costs for the Comprehensive Gas AMI Replacement Program as described in this chapter.
2	Required Maintenance Only	-$910.7 million	Under this approach, PG&E would continue solely to replace Gas AMI Modules individually after failure.
3	Incremental Lifecycle Replacement	-$134.6 million	This approach analyzes the incremental costs of the proposed Lifecycle Replacement included in the Comprehensive Gas AMI Replacement Program above, excluding the Required Maintenance and related costs that are common to the two approaches above.
4	Incremental Required Maintenance Only	-$155.7 million	This approach analyzes the incremental costs in the Required Maintenance Only scenario above, excluding the costs that are common with the Comprehensive Gas AMI Replacement Program above.

2. Gas Module Lifecycle Replacement Improves the Customer Experience

In addition to the financial benefits discussed above, Gas Module Lifecycle Replacement offers several customer experience benefits. Gas Module failures disrupt the communication of gas usage data from meters to the PG&E billing system. Relying solely on a Required Maintenance approach of replacing Gas Modules as they fail on a unit-by-unit basis can lead to billing exceptions. A programmatic approach allows the Company to proactively replace Gas Modules (before they fail) in the areas in which it makes economic sense to do so, reducing customer billing exceptions and improving the customer experience.

Waiting until after Gas Modules fail to replace them can lead to a less satisfying customer experience. In particular, PG&E often must make repeat visits to perform Gas Module maintenance in circumstances where PG&E is unable to access the customer's premise. In those circumstances, PG&E must take further measures to engage with those customers and schedule follow-up service appointments, increasing PG&E's costs and, in some instances, customer frustration. PG&E can mitigate many of the customer satisfaction issues mentioned above as targeted proactive Lifecycle Replacement enables PG&E to plan this work geographically, develop targeted timeframes for the work, and proactively communicate with customers through multiple channels. These practices increase customer generated appointments, reduce customer premise access issues, and reduce unnecessary repeat visits by PG&E to replace Gas Modules.

Replacing Gas Modules after they fail could also have negative impacts on third party energy providers (Core Transport Agents) as well as the energy efficiency programs that PG&E administers, as noted in Chapter 1, Section F. Gas Modules are crucial infrastructure through which timely and accurate gas usage data are communicated securely to PG&E systems ensuring the provision of energy cost savings to customers enrolled in these energy efficiency programs.

3. Gas Module Lifecycle Replacement in the Kern and Sacramento Divisions Realized Benefits

PG&E’s Gas Module Lifecycle Replacements in the Kern and Sacramento Divisions in 2023 confirmed that Gas Module Lifecycle Replacement work within a specific targeted geography can achieve economies of scale and lower labor replacement unit costs. Replacing Gas Modules proactively in the Kern and Sacramento Divisions in a programmatic manner minimized travel time, improved productivity, enabled work bundling opportunities, and reduced repeat visits (due to proactive customer outreach and the ability for customers to schedule appointments), resulting in reduced labor replacement unit costs vis-à-vis a Required Maintenance approach. In the Kern and Sacramento Divisions, PG&E programmatically replaced Gas Modules at an installed labor replacement unit cost of approximately $91 per unit. This is much less expensive than an installed labor unit cost of $169 per unit for Required Maintenance replacement of Gas Modules.[30] PG&E forecasted unit costs for 2024-2026 by applying escalation to 2023 recorded unit costs for Required Maintenance and Lifecycle Replacement, resulting in a lower unit cost

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30 See WP 2-10, “Gas Module Lifecycle Replacement Program” in which PG&E further describes and quantifies the efficiencies achieved from the Lifecycle Replacement Program.

forecast for Lifecycle Replacement than for Required Maintenance. This approach also delivered better customer experiences.

G. Centralized Project Management and Customer Communications

PG&E created the AMI PMO to lead the Comprehensive Gas AMI Replacement Program. The AMI PMO is similar to the project management approach for the original Gas AMI 1.0 installations that the Commission approved in 2006.[31] The overall goal of the AMI PMO is to efficiently plan, coordinate and execute the Comprehensive Gas AMI Replacement Program with a focus on safety, quality, cost, and project delivery. This includes cross-functional planning, coordination, and execution of Supplier Warranty Replacements, Required Maintenance, and Lifecycle Replacement of legacy Gas Modules. The AMI PMO is also responsible to cross-functionally plan, coordinate, and execute Gas AMI System Upgrades and the Company's Gas AMI Technology Roadmap. The responsibilities of the AMI PMO include leading financial management, industry and technology assessments, cross-functional coordination of PG&E's Gas AMI RFP evaluation and suppler selection, technology roadmap planning and implementation, work and resource planning and coordination, customer communications and outreach, business performance, supplier warranty claims and benefits realization, legacy and new product management, and the related portfolio management functions associated with the multi-year Comprehensive Gas AMI Replacement Program.

Customer outreach and engagement is a key focus of the AMI PMO. PG&E has developed a plan to communicate to customers, communities, and other stakeholders regarding Gas Module replacements in their areas. A multi-touchpoint communications plan creates a positive customer experience and keeps customers informed. It can also mitigate customer complaints and minimize costs by improving the scheduling of customer appointments to reduce repeat visits where PG&E is unable to access the customer premise to replace the Gas Module. PG&E plans to coordinate outreach and communications to provide customers with timely and relevant information about the Gas Module

[31] D.06-07-027, pp. 11-12.

replacement activities at their premises through various channels.[32] PG&E will adjust its approach based on real-time customer feedback.

PG&E forecasts approximately $4.7 million in expense in 2023-2026 associated with the AMI PMO and Customer Outreach program in MWC EZ. The forecast comprises $3.0 million of contractor costs, $0.6 million of internal labor costs, and $1.1 million of customer outreach costs. PG&E relies on contractors for certain categories of work, including IT Consulting, Vendor Management, Product Evaluation, and Customer Communications Consulting. PG&E was considering several contractors when the 2023 GRC was pending. The Company has now selected and contracted with several contractors to perform the duties discussed above. As the $3.0 million of contractor cost is not internal labor, no escalation was applied to the annual forecasted amounts.

The AMI PMO is staffed by 8 incremental full-time equivalents that are not currently funded. PG&E dissolved its original PMO (which the Commission approved in 2006) upon completion of the original AMI project in 2014. The proposed AMI PMO is an entirely new organization that will facilitate centralized, coordinated, and efficient management of the Comprehensive Gas AMI Replacement Program over the next several years.[33]

H. Cost Forecasts by Major Work Category

1. Expense Forecasts by MWC and Estimating Method

PG&E's expense forecast for the Comprehensive Gas AMI Replacement Program is summarized in Table 2-9, below.

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[32] See WP 2-13, "Customer Communications Plan" for a detailed overview of the Company's customer communications plan for Gas Module replacement activities.

[33] AMI PMO costs include both expense costs and capital expenditures.

TABLE 2-9
EXPENSE BY MWC
(THOUSANDS OF NOMINAL DOLLARS)

Line No.	MWC	Nature of Work	2023 Recorded	2024 Forecast	2025 Forecast	2026 Forecast	Total
1	EZ	Program Management	$1,081	$1,205	$1,218	$1,232	$4,736
2	IS	Billing and Call Center Operations	705	1,157	1,104	908	3,946
3	JV	Maintain IT Applications and Infrastructure	–	537	840	1,652	3,029
4	Total		$1,786	$2,899	$3,162	$3,864	$11,711

PG&E forecasted expenses by: (1) determining project management and outreach costs needed for the Comprehensive Gas AMI Replacement Program; (2) determining anticipated incremental Contact Center and billing support expenses; and (3) estimating system upgrades based on historical costs and vendor quotes. Descriptions of activities included in each expense MWC are provided below.

a. MWC EZ

PG&E recorded $1.1 million for 2023, and forecasts $1.2 million for 2024, $1.2 million for 2025, and $1.2 million for 2026 to cover incremental expenses associated with the programmatic management, customer communications, and customer outreach activities for the Comprehensive Gas AMI Replacement Program.

b. MWC JV

PG&E recorded $0 for 2023, and forecasts $0.5 million for 2024, $0.8 million for 2025, and $1.7 million for 2026, which includes incremental Operations and Maintenance costs associated with PG&E's Gas AMI System Upgrade discussed in this chapter and more comprehensively in Chapter 3.

c. MWC IS

PG&E recorded $0.7 million for 2023, and forecasts $1.2 million for 2024, $1.1 million for 2025, and $1.0 million for 2026, which includes anticipated incremental billing and Customer Care Operations costs to process customer billing exceptions and handle calls from impacted customers to discuss billing questions and Gas Module replacements.

The estimates of the percentage of customers requiring billing and call center support, as well as the unit costs for providing such support, were based on actual 2023 data, and only reflect incremental forecasted volumes above baseline volumes adopted in the 2023 GRC.

2. Capital Expenditure Forecasts by MWC

PG&E's capital expenditure forecast for the Comprehensive Gas AMI Replacement Program is summarized in Table 2-10, below.

TABLE 2-10
CAPITAL EXPENDITURES BY MWC
(THOUSANDS OF NOMINAL DOLLARS)

Line No.	MWC	Nature of Work	2023 Recorded	2024 Forecast	2025 Forecast	2026 Forecast	Total
1	74	Install Gas AMI Devices and Infrastructure	$95,873	$112,089	$122,702	$121,939	$452,603
2	2F	Build IT Applications and Infrastructure	1,095	11,048	11,838	8,474	32,455
3	Total		$96,968	$123,137	$134,540	$130,413	$485,058

PG&E forecasted capital expenditures using two main methods. The first method includes deriving 2023 labor and materials unit costs for the Comprehensive Gas AMI Replacement Program and multiplying the forecast of units by the expected unit cost, adding escalation where appropriate. The second method includes non-labor assumptions and escalation where appropriate. Descriptions of activities included in each capital MWC are provided below.

a. MWC 74

PG&E recorded $95.9 million for 2023, and forecasts $112.1 million for 2024, $122.7 million for 2025, and $121.9 million for 2026, which includes all activities associated with materials and labor to replace Gas Modules as part of the Required Maintenance and Lifecycle Replacement programs. As previously stated in Table 2-3, the costs for Warranty Replacements were covered by the supplier and are not included in this Application.

b. MWC 2F

PG&E recorded $1.1 million for 2023, and forecasts $11.0 million for 2024, $11.8 million for 2025, and $8.5 million for 2026, which includes activities associated with PG&E's Gas AMI System Upgrade discussed in this chapter and more comprehensively in Chapter 3.

I. Conclusion

PG&E proposes a Comprehensive Gas AMI Replacement Program to perform the necessary work of replacing the Gas AMI System as it reaches the end of its useful life in a cost-effective manner. PG&E's 2023-2026 cost forecasts are reasonable and should be approved by the Commission.

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 3

GAS ADVANCED METERING INFRASTRUCTURE

TECHNOLOGY ROADMAP

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GAS ADVANCED METERING INFRASTRUCTURE TECHNOLOGY ROADMAP

A. Introduction

This chapter presents Pacific Gas and Electric Company's (PG&E or the Company) technology roadmap for its Gas Advanced Metering Infrastructure (Gas AMI) System. Certain costs to implement this roadmap are included in this Application as system communication and control elements of the new Gas AMI System are essential to transition from the legacy Gas AMI System before it becomes obsolete. These costs are reasonable and should be approved by the California Public Utilities Commission (Commission). Gas AMI technology cost forecasts for 2023-2026 are discussed in Chapter 2 (Section E.4).

This chapter describes the near-term and long-term benefits of the technology that PG&E has selected to begin its plan to upgrade key infrastructure components of the original Gas AMI System (Gas AMI 1.0) in conjunction with replacing its legacy Gas Modules.[1] It also demonstrates that PG&E's selection of vendors through its focused Request for Proposal (RFP) and its plans to execute the Gas AMI technology roadmap are in the best interests of customers.

B. Technology Roadmap Planning

1. Framework and Background

In its 2006 decision authorizing PG&E's full-scale deployment of Gas AMI 1.0 throughout its service territory, the Commission recognized the likelihood that "new technology may emerge that offers PG&E and its customers increased reliability and performance enhancements."[2] PG&E has adhered to the Commission's requirement to "monitor market place developments so, whenever feasible, it can upgrade its AMI system and

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1 See Appendix B, Glossary of Key Terms, for additional explanations of terminology used in this chapter.

2 Decision 06-07-027, p. 59.

offer its customers technology upgrades."[3] PG&E continually evaluates new technologies to identify the right combinations that will: (1) provide high functionality to customers now; and (2) allow PG&E to continue to improve its service, deploying new initiatives as needs are identified and as more advanced interfacing technologies become available. For example, PG&E frequently surveys the industry and marketplace to understand vendors' and other gas operators' technology plans, regulatory filings, pilots, and projects. PG&E also conducted a comprehensive RFP to evaluate the offerings and capabilities of next-generation Gas AMI technologies (sometimes called Gas AMI 2.0)[4] by five top vendors in North America. Section B.3 describes the RFP process, evaluation, and outcome in detail.

PG&E's evaluation of the global Gas AMI 2.0 market identified several key trends in the gas industry focused on improving safety and customer benefits. These include (1) an increasing focus on ultrasonic meters (USMs) that offer remote and automatic shut-off capabilities; (2) providing customers with real-time gas usage data; and (3) deploying a two-way communication infrastructure to support these devices and functions. For example, USMs can provide pressure, temperature, flow and seismic alerts, with remote and auto shutoff capabilities that improve safety. Real-time data can provide information to customers and the utility to help identify ways to optimize usage, reduce waste, and lower customers' bills.

Gas AMI systems are beginning to transform and are offering advanced features that can enhance safety, operations, and customer service. PG&E is committed to upgrading its Gas AMI System to an intelligent, integrated, forward-looking next-generation system that: (1) supports energy management and conservation programs; (2) enables customers to participate in demand reduction and customer support programs via near real-time usage data; and (3) enables enhanced safety and operational features.

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3 *Id.*

4 PG&E's original and current Gas AMI System (Gas AMI 1.0 or Gas SmartMeter™) is a one-way communication system that is mainly used for automatically transmitting customer gas usage to the Company's billing system. Next-generation Gas AMI Systems (Gas AMI 2.0) offer two-way communications that can provide additional functionalities and enhanced safety, operational, and customer service capabilities.

2. Global Marketplace and Technology Assessments

Since PG&E's original AMI deployment, the Company has continually monitored and kept current with technology and industry trends. For example, PG&E has participated in vendor technology roadmap updates with established Gas AMI suppliers, regularly attended industry conferences, and frequently evaluated newer technologies.

PG&E formally conducted an updated global industry and Gas AMI technology assessment with an independent third-party consultant. This assessment evaluated current and evolving technology trends and availability in the United States, Europe, and Asia Pacific.

The assessment summarized current options for Gas AMI communications devices and networks with a focus on industry trends. The assessment focused mainly on Gas Modules and excluded large-scale replacements of gas meters themselves. It also included an examination of opportunities to leverage PG&E's investments in its Itron (previously Silver Spring Networks) Electric AMI network to benefit the Gas AMI system where gas and electric service areas overlap. The assessment focused on maintaining the continuity of the Company's automated Meter to Cash (MTC) processes[5] with similar AMI functionality, without requirements to add significant new MTC functionality as part of the project. Finally, the assessment determined that natural gas metering and sensing technology is in the early stages of significant transformation. Accordingly, PG&E's goal was to select a next-generation Gas AMI network and system that will enable the Company to leverage additional products and capabilities as the transformation occurs.

PG&E used the information gathered through the assessment to inform its strategic direction, set business requirements, and develop a path forward for the Company's Gas AMI Replacement plan. The assessment also provided PG&E with valuable input in the development of an RFP for the competitive bidding phase of the project.

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5 "Meter-to-cash" (MTC) refers to the end-to end process from collection of customer usage data at the gas meter through payment of a customer's monthly bill. In between, the data are transmitted to PG&E's systems for verification and validation before sending to the billing system for calculation of the monthly bill.

3. Focused Commercial Request for Proposal

PG&E released a Gas AMI 2.0 RFP to five top AMI vendors in North America in the fall of 2021. PG&E selected these vendors for competitive bidding based on their industry experience, deployment footprint in North America, and their ability to scale to PG&E's potential needs. PG&E also designed the RFP to balance multiple factors, including current and future needs, customer affordability and costs, technology improvements, and market risks.

PG&E developed an extensive RFP with hundreds of detailed functional and technical requirements in addition to questions about commercial terms and pricing. PG&E also asked vendors to provide a solution overview, explain how their services and technology aligned with industry standards, confirm the useful life of solution components, and describe enhanced security features (physical and cyber), safety features and other capabilities. The RFP questions were designed to understand the capabilities of comprehensive next-generation solutions including endpoints, communications networks, and back-office operational systems.

4. Comprehensive Evaluation and Selection Process

PG&E assembled a cross-organizational team of technical and functional experts to help assess vendor responses to the RFP. PG&E evaluated the five vendors through multiple rounds over an 18-month period. During this process, PG&E considered the Company's current and future needs and market risks, including the extent to which products are currently commercially available or planned for future release. The Company also addressed cost constraints and focused on customer affordability to make a final decision. PG&E scored bidders in the following categories: Commercial Terms, Technical, Pricing, Safety, and Supply Chain Responsibility. PG&E then conducted lab and limited field tests on a subset of these vendors' then-available products to assess their compliance with PG&E requirements. Ultimately, PG&E selected two vendors: its legacy Gas AMI provider (Aclara), and its Electric AMI provider (Itron).

PG&E's vendor selection will enable the Company to accomplish several key objectives, including:

- Maintain its automated gas energy usage collection, customer data presentment, and customer billing processes;
- Enable a two-way communication gas network that provides the foundation for the next-generation functionalities (e.g., deployment of future metering products and pull real-time usage data to answer customer billing questions);
- Implement end-to-end security framework with proper security policies and governance which allows for adequate risk management;
- Enable deployment of newer grid sensor technologies that can provide enhanced customer, safety, environmental, and operational benefits;
- Continue testing, piloting, certifying, and deploying future Gas AMI and Metering products as they become available;
- Leverage and employ the existing Electric AMI communications network in areas where gas and electric service overlap to cost-effectively connect hard-to-reach customer gas service locations;
- Balance and reduce market risk and sole-source supplier risk;
- Drive more innovation and competition within the industry; and
- Negotiate favorable contracts and pricing.

C. Near-Term AMI Roadmap (2023-2026)

This section presents PG&E's near-term plan for Gas AMI technology.

1. Maintain Gas AMI and Enable Electric AMI to Support Gas

The rigorous evaluation conducted during the Gas AMI RFP identified Aclara as a cost-effective vendor for PG&E. PG&E plans to continue with Aclara as a vendor, and upgrade to Aclara's next-generation two-way Gas AMI software platform and field communications network before the original one-way solution becomes obsolete. The upgraded system will support Gas AMI 2.0 technologies like solid-state gas ultrasonic meters (USM) with automatic and remote shutoff capabilities.[6] The USMs will incorporate Aclara's integrated network interface card, allowing for two-way communications over the Aclara network. Two-way communications will

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6 The American Gas Association (AGA) approved the USM standard titled "ANSI B109.6 Single Path Ultrasonic Gas Meters (Under 1400 Cubic Feet Per Hour Capacity)" and published the standard in January 2024.

enable customer benefits by allowing PG&E to: (1) obtain real-time usage data (*i.e.*, on-demand reads) to answer customer billing questions; (2) obtain near real-time alarm and event information from Gas Modules; (3) push firmware updates to Gas Modules to maintain and enhance security and features; and (4) initiate remote shutoff of USMs to leverage safety and operational benefits.

PG&E plans to deploy new Gas AMI head-end application software and next-generation network equipment in the near term that will allow PG&E to deploy new two-way communication Gas Modules on existing diaphragm meters and introduce new USMs in the future. These costs are included in Chapter 2 (Section E.4).

The Aclara next-generation software and hardware system will support current Aclara Gas Modules, ensuring continuity in customer service as PG&E migrates to Gas AMI 2.0. This will minimize potential customer impacts—such as customer billing and service interruptions. PG&E plans to implement the next-generation gas solution while the current population of battery-operated Gas Modules progressively reach the end of their useful lives.

The Gas AMI RFP evaluation process also identified opportunities to leverage PG&E's existing Electric AMI system to support gas metering with minimal investment in the existing Electric AMI communications network. PG&E's near-term plan is to leverage its existing Itron Electric AMI system by enabling gas functionality on the current Itron AMI software platform. This plan will allow PG&E to deploy Itron's Gas Modules on existing diaphragm meters in hard-to-reach customer gas service locations and to selectively deploy Itron's USMs in PG&E's gas and electric dual commodity service territory where it makes economic sense. PG&E expects the benefits associated with connecting gas meters in hard-to-reach locations to offset the incremental cost associated with enabling gas on the Electric AMI system, thus lowering the overall cost to customers.

Utilizing two vendors further serves to mitigate single-vendor risks and creates optionality. For example, PG&E will be able to deploy USMs and, potentially, other Gas AMI 2.0 technologies like methane detectors sooner because the Electric AMI system already supports the two-way communication required for these Gas AMI 2.0 technologies.[7] Due to advancements in vendor technologies, PG&E will continue to monitor industry and technology trends and evaluate the most feasible and cost-effective ways to serve its customers and adjust accordingly.

2. Customer Benefits of Near-Term Strategy

Since its original Gas AMI system deployment in 2006, PG&E has prudently maintained the AMI system, but it remains a one-way communication system. PG&E plans to begin upgrading towards a Gas AMI 2.0 system. This future Gas AMI 2.0 will enable secure two-way communication between PG&E and customers' meters as it consists of integrated meter systems and controls, network communications equipment, data processing and management systems.

Gas AMI 2.0 capabilities will enable on-demand reads of customer energy consumption, provide additional safety alarms and alerts (e.g., USMs can provide pressure, temperature, flow and seismic alerts, with auto shutoff capabilities), and facilitate over-the-air firmware updates to ensure that endpoint devices remain current for the duration of their useful lives.

Finally, PG&E's selection of two vendors for its Gas AMI Replacement provides several customer benefits. Continuing with Aclara as PG&E's Gas AMI supplier is the lowest cost option for customers. In addition, proceeding with two vendors allows PG&E to mitigate single vendor, market, and supply chain risks. PG&E has separate AMI systems for electric and gas. Its Electric AMI system already provides two-way communication and has proven over-the-air software upgrade capabilities and benefits. Moreover, Electric AMI has no battery-enabled field devices. Therefore, PG&E does not expect any major system-wide lifecycle replacement of field assets in its Electric AMI network in the foreseeable future.

7 The cost to purchase and fully deploy Gas AMI 2.0 technologies like USMs and methane detectors is not included in this Application. PG&E's near-term plan includes piloting these newer technologies.

D. Long-Term AMI Roadmap (2027 and Beyond)

This section presents PG&E's current long-term plan for Gas AMI technology which continues to build-on PG&E's near-term strategy discussed above.

1. Gas AMI 2.0 Two-Way Communication Benefits

The Gas AMI industry is increasingly focused on Gas AMI 2.0 technologies as a major evolution. The most promising future benefits require two-way communication, which is a central feature of PG&E's proposed Gas AMI Technology Roadmap. A two-way communication lays the foundation for many Gas AMI 2.0 capabilities, and includes the following benefits:

- Customer Benefits: On-demand reads provide customers and the Company with access to more real-time energy usage data to help inform and manage energy supply plans and customer usage.
- Safety and Environmental Benefits: Secure, automatic or remote shutoff capabilities that may be used in certain instances such as a seismic event (earthquake) or when the Company needs to shut-off gas at customer premises (such as when a customer no longer resides at the premise). The next-generation Gas AMI system also can enable methane detection devices. These capabilities improve safety and reduce greenhouse gas emissions.
- Operational Benefits: Secure over-the-air firmware updates can address programming and maintenance needs without having to send a gas meter technician to perform this function at every individual Gas Module device and customer location. This capability significantly improves operations, reduces unnecessary truck-rolls, and lowers costs.

2. Ultrasonic Meter Pilot Project

Through an advanced gas metering assessment across the United States, Europe, and the Asia Pacific, PG&E gathered detailed data concerning existing and evolving Gas AMI 2.0 technology trends and next-generation product availability. PG&E regularly attends industry conferences, conducts gas utility roadmap meetings and engages with gas vendors on current and future technology roadmaps. Through these engagements, PG&E has observed that ultrasonic meters (USMs) continue to capture the attention of the global gas smart metering markets. One major U.S. manufacturer ceased manufacturing diaphragm meters for the U.S. market in 2021 to focus on manufacturing USMs. Since then, PG&E has seen the cost of diaphragm meters purchased by PG&E increase by 29 percent as only two major manufacturers of diaphragm meters remain in the U.S. market.

In North America, many large utilities are either planning to deploy or currently deploying USMs. As of May 2023, one major meter manufacturer has shipped more than one million USMs in North America.[8] Utilities initially have been focused on USM safety benefits, including autonomous shutoff (*e.g.*, when the meter automatically turns off gas flow when temperature, pressure, flow or other factors exceed pre-defined thresholds), as well as potential operational cost savings like reduced truck rolls. The industry also is focused on other USM features such as enabling remote gas shutoff (in response to safety or customer services issues) and methane detection in conjunction with installing separate methane detector devices. At least three utilities with more than one million gas meters in the U.S. and Canada have committed to replacing their diaphragm gas meters with USMs.[9]

PG&E currently is piloting USM technology to verify use cases for features such as autonomous shutoff, remote shutoff, and self-diagnostics. The pilots will validate key benefits including increased measurement accuracy of gas usage, monitoring capabilities (*e.g.*, monitoring temperature, pressure and flow and providing alerts if values exceed defined thresholds), remote and autonomous shut-off capabilities for temperature, pressure and flow, and seismic events that can provide significant safety benefits for customers. Additional potential benefits of USMs include streamlining operations and billing, improving customer engagement, and reducing PG&E’s environmental footprint.

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8 See WP 3-1, “Utility Benchmarking References,” Part A1.

9 See WP 3-1, ”Utility Benchmarking References,” Part A2.

3. Methane Detector Pilot Project

Methane detectors also have garnered much attention throughout the industry. These are separate devices connected to gas meters with the capability to send alarms via a two-way Gas AMI communications network in the case of methane leak events. With these alerts, utilities can take proactive safety actions such as remote gas shut-off, immediately dispatching a gas service representative to the customer's premise or scheduling an appointment with the customer for a service call. These devices typically are installed in enclosed spaces like garages, basements, and meter rooms. As of the end of 2022, at least one large U.S. utility has installed more than 162,000 of these devices with a main driver to identify and remediate potentially serious safety conditions.[10] PG&E currently is conducting a limited pilot of this technology.[11]

4. New Metering Certifications

The Gas AMI industry also is focused on new Gas AMI 2.0 technologies like USMs and methane detectors as the next devices to certify. PG&E has already conducted rigorous lab tests and evaluations of these technologies.

Additionally, vendors continue to release new Gas Modules, including Gas Modules for large industrial customers that require certification. PG&E will continue to work with its vendors as new products are released.

5. Future Customer Benefits

PG&E continues to lead meetings and benchmarking sessions with industry leaders to identify and evaluate additional customer benefits of Gas AMI 2.0 technologies. PG&E is confident that the Gas AMI technologies and related metering devices selected are prudent choices that will provide benefits to PG&E's customers and the Company now and will serve as a robust Gas AMI System for future initiatives. PG&E will evaluate these initiatives focused on additional safety features, reducing the environmental footprint related to greenhouse gas emissions, improving the Company's operational capabilities, and increasing customer affordability.

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[10] See WP 3-1,"Utility Benchmarking References," Part B1.

[11] The costs of the Methane Detector Pilot are not included in this Application.

E. Conclusion

This chapter demonstrates that PG&E's Gas AMI 2.0 Technology Roadmap will benefit customers now and into the future by improving safety capabilities, business operations, operational efficiencies, customer engagement, and customer satisfaction, while further reducing sole source supplier and market risks. To capture these benefits, Gas AMI 2.0 communications network and network control and management software must be in place. These costs (summarized in Chapter 2, Section E.4) are reasonable and should be approved.

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 4

PRUDENCY OF MANAGEMENT OF AMI 1.0

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 4
PRUDENCY OF MANAGEMENT OF AMI 1.0

A. Introduction

This chapter demonstrates that Pacific Gas and Electric Company (PG&E or the Company) acted prudently in installing and maintaining its first-generation Gas Advanced Metering Infrastructure (Gas AMI 1.0 or SmartMeter™), consistent with the authorization provided by the California Public Utilities Commission (CPUC or Commission). PG&E, now and throughout the deployment of its AMI Program, has worked to protect its customers from undue risk, and balanced customer experience and cost when replacing end-of-life Gas Modules.

B. Early Large-Scale Adoption of SmartMeter™ in California

The Commission first evaluated and approved PG&E's SmartMeter™ deployment in 2006, finding the program just and reasonable in Decision (D.) 06-07-027. Specifically, the Commission found that:

> PG&E's proposal has sufficient probable and quantifiable economic operating and demand response benefits now, including sufficient flexibility to up-grade for enhanced features, over the expected 20-year useful life.[1]

At the time that PG&E filed its SmartMeter™ deployment application (2005), SmartMeter™ technology was a new and innovative approach to serving utility customers. No other utility had attempted to deploy an advanced metering program on such a large scale, rendering it impossible to project the useful life of each part of the new system with certainty.

The CPUC recognized this when it first approved PG&E's widespread deployment of Gas AMI, noting that:

> Although PG&E expects the system to remain in service for 20 years, **only time will tell whether there will be significant unforeseen developments—good or bad—that may lead to an earlier or later replacement of the AMI system.**[2]

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1 D.06-07-027, p. 10.

2 D.06-07-027, pp. 27-28 (emphasis added).

Accordingly, PG&E took extensive action to prudently address and mitigate uncertainty and risk, from the initial Gas AMI 1.0 Request for Proposal (RFP) process, through the deployment and installation of the Gas AMI 1.0 System, to securing an extended warranty from its Gas AMI supplier, and through the post-installation management of the system and warranties. These steps are addressed in this chapter.[3]

1. PG&E's RFP and Vendor Selection

PG&E selected its Gas AMI 1.0 vendors and products after performing a detailed, extensive RFP and evaluation process that included 77 proposals, with at least five specifically related to Gas Modules. In connection with the RFP, PG&E required these vendors to demonstrate that their proposed technologies had been tested, could be deployed at the scale required by PG&E, and had a proven track record of reliability (even if on a smaller scale). PG&E developed a detailed evaluation and selection process to consider various risk considerations, including product maturity, vendors' experience in AMI deployments, and the products vendors had used for other utilities' AMI installations.

PG&E performed detailed product assessments with each of the vendors involved in the RFP, reviewing extensive details about the products, including designs, raw materials, and manufacturing processes. In addition, PG&E visited manufacturing sites to evaluate these vendors' quality assurance procedures. PG&E also evaluated studies of the estimated meter module battery life and overall expected useful product life.[4]

At the time of PG&E's Gas AMI 1.0 Application, several utilities in the United States had begun to deploy AMI technology, though on a much smaller scale. PG&E's Gas AMI technology evaluation and vendor selection process involved consultation with other utilities and consultants who had direct experience with AMI implementations.

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3 See Appendix B, Glossary of Key Terms, for additional explanations of terminology used in this chapter.

4 See WP 4-1, "Product Adoption Protocol," which includes an example of a recent Gas Module standard asset management and product evaluation process implemented by PG&E.

2. PG&E Conducted a Field Pilot Before Deployment of the Gas AMI 1.0 System

Before starting its full deployment of the Gas AMI 1.0 System, PG&E conducted a months-long field pilot in Vacaville, California. The pilot included the installation of more than 2,650 gas and 2,350 electric AMI devices at customer homes and businesses. PG&E engaged International Business Machines (IBM)—a highly experienced system integrator—to design many of the tests and perform multiple testing protocols. IBM had experience working with AMI systems and operated a state-of-the-art, scalable lab through which they performed and evaluated high volumes of tests. PG&E also performed multiple tests: unit testing, factory acceptance testing, system acceptance testing, and quality assurance testing upon each shipment that it received from its AMI vendors. In addition to confirming the viability of the field devices, PG&E evaluated and confirmed many aspects of the installation process, materials handling, software, and systems operations during the pilot period. PG&E also studied meter module installation methodologies. Further, PG&E evaluated any inadvertent billing exceptions or billing inquiries that resulted from meter exchange transactions.

Through the field pilot, PG&E demonstrated that the products and related software met the Company's criteria for proceeding to contract with the vendors that PG&E had selected through the RFP.

3. PG&E Secured an Extended Supplier Warranty for Customers

PG&E secured a warranty from its Gas Module supplier to support any product claims that might arise over the expected product life. At the time that PG&E entered the contract, it was (to PG&E's knowledge) the longest warranty ever secured in the industry, far exceeding the typical one to three-year warranties that PG&E had found other utilities had negotiated.

It was—and remains PG&E's view—that such an extended warranty represented a significant, reasonable, and practical way to manage and mitigate the risks of product failure, particularly in light of what PG&E could know about SmartMeter™ technology in that timeframe. The negotiated warranty provided PG&E with a credit for the remaining value of an installed Gas Module after taking into account the number of years that the Gas

Module provided effective service. For example, if a Gas Module experienced a product-related failure after 17 years in service (i.e., after a customer benefited from its use for 17 years), then PG&E maintained a residual warranty covering the value for the remainder of the 20-year warranty term, i.e., the last three years of the Gas Module's projected 20-year life.[5]

4. PG&E's Regular Reporting to the Commission and Parties Throughout Its Gas AMI Deployment

PG&E responsibly managed the deployment of its Gas AMI system, consistent with practices that PG&E, intervenors, and the Commission developed through PG&E's original Gas AMI case and that the Commission ordered in D.06-07-027. Specifically, from 2006-2013, PG&E: (a) monitored advances in AMI technology, (b) conducted assessments of AMI system operating performance based on performance criteria established in consultation with the Commission's Energy Division and the Division of Rate Payer Advocates (DRA) (now known as the Public Advocates Office at the California Public Utilities Commission, or Cal Advocates), and (c) assessed the system's ability to provide near real-time usage data, and customer interest in receiving such data.[6] In addition, PG&E filed semi-annual reports to keep the Commission's Energy Division, Cal Advocates, and other parties to Application (A.) 05-06-028 informed of AMI deployment and AMI product performance.[7] PG&E's semi-annual assessments:

> …include[d] general information on advances in metering technology and infrastructure with specific information, when available, on (1) meter/meter module reliability, (as well as) (2) meter/meter module costs and performance....[8]

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5 For example, see confidential WP 4-2, "Gas Module Warranty Discount Schedule."

6 PG&E, intervenors, and the CPUC developed this forward-looking management regimen in PG&E's original Gas AMI case.

7 See, for example, A.05-06-028, Fourteenth Semi-Annual Assessment Report on the Deployment of its AMI Program and Fourteenth Quarterly Report on the implementation progress of its SmartMeter™ Program Upgrade (Dec. 19, 2014), p. 19.

8 D.06-07-027, p. 58.

PG&E also semi-annually conferred with representatives of the Energy Division and Cal Advocates to discuss the scope of topics to be addressed and the metrics by which the Gas AMI system was to be assessed.

C. Oversight and Management Following AMI 1.0 Deployment

Since the completion of PG&E's AMI deployment in 2013, PG&E has instituted significant, effective asset management practices to mitigate Supplier Quality Assurance (SQA) risks. PG&E has sought to reduce costs to customers associated with these risks, including continuously monitoring Gas Module performance and regularly coordinating with suppliers to review performance trends, conduct root cause failure analyses, and implement effective solutions to identified challenges.

1. Quality Assurance Practices

PG&E's SQA Department performs critical AMI product quality oversight to identify, prevent, and reduce risks associated with defective materials originating from the supply chain. PG&E's SQA utilizes rigorous, industry-accepted quality assurance standards to ensure that suppliers have the necessary internal processes and controls in place to manufacture and deliver materials that meet PG&E's high quality and minimal defect requirements. PG&E's quality assurance processes include testing to identify defects prior to releasing new inventory into the field. Testing includes out-of-box visual inspections and comprehensive product quality, performance, and reliability tests. PG&E also conducts periodic SQA reviews at the supplier's Gas Module manufacturing facilities to validate supplier adherence to industry standards. Enforcing these rigorous standards ensures that PG&E's equipment is safe and reliable. By identifying defects early, the Company eliminates potential maintenance and repair activities, reducing costs for customers.[9]

2. Gas Module Replacement Strategies

As discussed in Chapter 2, in addition to PG&E's continued replacement of Gas Modules after failure (Required Maintenance), the Company implemented a focused programmatic Gas Module replacement program in

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[9] See WP 4-3, "Gas AMI Supplier Quality Program" for additional information regarding PG&E's Supplier Quality Assurance Program.

select geographic areas to realize efficiencies and economies of scale that increased productivity and lowered costs (Lifecycle Replacement). Additionally, PG&E implemented a program to efficiently identify failed Gas Modules that qualify for warranty coverage and to process the resulting warranty claims with the supplier (Warranty Returns Program). This process includes root-cause failure analysis in appropriate cases. The Company also completed a program under the warranty in which the supplier replaced extended range Gas Modules that had experienced particularly high early failure rates (Supplier Warranty Replacements). In 2023, PG&E completed a comprehensive Gas AMI technology RFP and developed a Gas AMI technology roadmap to address the Company's and its customers' current and future needs. PG&E's actions regarding its Gas AMI Remaining Life Statistical Model, Gas Module Warranty Returns Program, including the Supplier Extended Range Warranty Module Replacement Project, and vendor selection for next-generation AMI technology are further detailed below.

a. Remaining Life Statistical Model Projections for Gas Modules

In 2015, PG&E's supplier advised that some of its Gas Modules might fail earlier than their projected 20-year life. PG&E promptly took action to protect its customers, including engaging with the supplier on the problem, monitoring and assessing early Gas Module failure rates, performing failure rate studies, expanding quality assurance product testing, conducting field-based root cause analyses, replacing failed Gas Modules, activating the Supplier Warranty Program, and monitoring the AMI technology marketplace.[10]

PG&E monitored failure rates to make a data-informed decision on whether it would be more cost-effective to proactively replace Gas Modules on a lifecycle basis based on their expected end-of-life, rather than after they fail. PG&E retained a third-party consultant, Exponent, a leading engineering consulting firm, to perform failure rate analyses and to assess the remaining life of installed legacy standard range Gas

10 PG&E also notified the Commission and parties to the risk of earlier-than-expected Gas Module failure in 2018 when it filed its 2020 GRC. A.18-12-009, HE-91: Exhibit (PG&E-6), p. 6-16, line 9 to p. 6-17, line 23.

Modules (3.4 million as of June 2020). Using data from field-removed Gas Modules and applying a statistical model, the consultant forecasted how long PG&E's installed legacy standard range Gas Modules likely would remain in service. Exponent updated its failure rate statistical model study to analyze failure rates on a geographic basis (i.e., by division) within PG&E's service area.[11]

3. Gas Module Warranty Returns Program

PG&E worked with the supplier to establish and implement two distinct warranty programs for products that reached their end-of-life prior to the 20-year supplier warranty: one for extended range Gas Modules and one for standard range Gas Modules. These programs as described below have enabled the Company to realize warranty claims on behalf of its customers, which significantly reduced the cost of replacing failed Gas Modules.

a. Extended Range Module Replacements

In 2018, PG&E and its Gas AMI supplier agreed that PG&E could elect to have its supplier replace all the remaining legacy extended range Gas Modules at the supplier's cost. In addition, PG&E's supplier agreed that it would provide warranty credits to cover PG&E's replacement of any extended range Gas Modules that failed before they could be replaced by the supplier. PG&E largely completed replacing the legacy extended range Gas Modules in 2023 at the supplier's cost, significantly lowering the overall costs of Gas Module Replacement for customers. PG&E plans to replace the remaining approximately 18,000 extended range Gas Modules at the supplier's cost as part of this program.[12] The second-generation extended range Gas Modules will follow the enhanced electronic return process described above.

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[11] See Chapter 2, Section D, "Updated End-of-Life Study and Projections for Gas Modules," for more information on the failure forecast modeling.

[12] As of December 31, 2023, approximately 18,000 extended range Gas Modules remain. See WP 2-9, "Extended Range Warranty Replacements."

b. Standard Gas Module Returns

PG&E actively pursued and resolved claims with its Gas Module supplier on customers' behalf. In 2022, PG&E and its supplier settled warranty claims for legacy standard range Gas Modules. Additionally, PG&E and its supplier agreed to an enhanced electronic warranty return process for the second-generation Gas Modules to streamline the return and evaluation process and reduce operational costs.[13] PG&E's current forecast incorporates the amount of the supplier warranty compensation for both legacy and second-generation standard range Gas Modules.[14]

c. Warranty Credits Offset in This Application

PG&E has received a substantial benefit from the Gas Module supplier for legacy Gas Modules, significantly reducing PG&E's forecast in this Application.[15]

4. AMI Vendors Reselected for Next-Generation Products

As discussed in Chapter 3, PG&E selected its Gas AMI 1.0 vendor to continue supplying Gas AMI products and services. In addition, PG&E selected its current Electric AMI vendor to mitigate risk by providing a secondary supplier that has demonstrated to be equally capable of delivering Gas AMI products and services on a cost-effective basis.[16]

PG&E plans to upgrade to a next-generation Gas AMI System (Gas AMI 2.0) that will leverage currently available and emerging AMI metering technologies with additional safety, operational, and customer

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13 PG&E and its supplier have improved the original supplier warranty return process, reducing manual processes and leveraging data analytics.

14 See confidential WP 4-4, "Supplier Warranty Valuation in Application."

15 Total warranty benefits are detailed in confidential WP 4-5, "Supplier Warranty and Settlement Valuation." A summary description of the settlement can be referenced in confidential WP 4-6, "Supplier Settlement Summary."

16 PG&E has separate AMI Systems for providing Gas and Electric services. While its current one-way Gas AMI system will need to be replaced to prevent obsolescence, the Company does not currently expect its Electric AMI system will require any substantial systemwide lifecycle replacement in the foreseeable future. PG&E's Electric AMI is a two-way communicating system. The Electric SmartMeter™ devices are not battery-operated and have built-in network interface cards that facilitate communication capabilities from the meter.

service capabilities. For instance, the Gas AMI 2.0 system has the potential to provide alerts associated with pressure, temperature, flow and seismic events with automatic shutoff capabilities. This next-generation Gas AMI system also can enable methane detection devices. Furthermore, the Gas AMI system can provide on-demand reads of customer energy consumption as well as over-the-air firmware updates.[17]

D. Conclusion

PG&E has acted prudently in deploying and managing its Gas AMI 1.0 System. Smart metering was a new technology that has laid the foundation for significant utility advances and PG&E successfully managed its comprehensive deployment. Since discovering that some Gas Modules fail earlier than expected, PG&E has proactively analyzed the issue, managed its response to protect customers, and has held its supplier accountable, significantly reducing customers' costs.

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17 See Chapter 3 for further discussion of the capabilities and benefits of the Gas AMI 2.0 two-way communication system.

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 5

RESULTS OF OPERATIONS

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CHAPTER 5
RESULTS OF OPERATIONS

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PACIFIC GAS AND ELECTRIC COMPANY
CHAPTER 5
RESULTS OF OPERATIONS

A. Introduction

This chapter describes Pacific Gas and Electric Company's (PG&E) 2023-2026 revenue requirements for its Comprehensive Gas Advanced Metering Infrastructure (AMI) Replacement Program. The revenue requirements for the Comprehensive Gas AMI Replacement Program are calculated using methods approved by the California Public Utilities Commission (CPUC or Commission) and should be adopted.

B. Summary of Request

PG&E calculated the revenue requirements for 2023 through 2026 using the mini-Results of Operations (RO) model. The mini-RO model compiles all capital costs and expenses as presented in Chapter 2 to calculate the revenue requirements that PG&E needs to recover for work presented in the Application, the elements of which are further described in Section C of this testimony.

The total revenue requirement for the Gas AMI Replacement Program in the period 2023-2026 is $143.3 million, including Revenue Fees & Uncollectible (RF&U). It was calculated based on a total of $485.1 million in capital expenditures and $11.7 million in operating expenses in PG&E's cost forecast presented in Chapter 2.

Table 5-1 presents the revenue requirements for 2023-2026 associated with the Gas AMI Replacement Program using the methodology and assumptions described in this section.

TABLE 5-1
REVENUE REQUIREMENTS (RRQ) INCLUDING RF&U
(WHOLE DOLLARS)

Line No.	Description	2023	2024	2025	2026	2023-2026 Total
1	Capital Revenue Requirement	$7,417,061	$23,463,311	$41,200,287	$59,320,609	$131,401,268
2	Expense Revenue Requirement	1,824,395	2,939,922	3,142,676	3,953,689	11,860,682
3	Total RRQ (including RF&U)	$9,241,456	$26,403,233	$44,342,963	$63,274,298	$143,261,950

Table 5-3 at the end of this chapter presents the revenue requirement by functional area.

C. Elements of the RO Calculation

1. Expenses

In this Application, PG&E seeks to recover a total expense revenue requirement of $11.9 million including RF&U, for the Gas AMI Replacement Program costs presented in Chapter 2. This amount is associated with project management and outreach, Contact Center and billing support, and system upgrades as described in Chapter 2.

2. Capital-Related Inputs

a. Capital Expenditures

Capital expenditures are incurred when PG&E spends funds on capital projects that are necessary to install new utility plant or replace its existing utility plant. This Application includes $485.1 million of capital expenditures from 2023-2026 for the Gas AMI Replacement Program.

b. Capital Additions

As capital work is performed, the capital expenditures, net of removal costs, are accumulated and recorded to Construction Work in Progress (CWIP) until the project is operational and providing utility service. While in CWIP, projects that last over 30 days accrue an Allowance for Funds Used During Construction (AFUDC). Projects that last less than 30 days do not accrue AFUDC and are treated as "operative as installed." When a specific capital project becomes operational, the CWIP balance is transferred to plant-in-service, and the capital expenditures and associated AFUDC become part of capital additions. Once a project is transferred to plant-in-service, it is included in rate base and a revenue requirement is calculated.

The capital projects associated with the installation of Gas Meters, Gas Modules, and Gas Communication Equipment (also referred to in this chapter as Gas Data Collection Units (DCU)) are forecasted to be less than 30 days and treated as "operative as installed." The Gas AMI System Upgrade described further in Chapter 3 is forecasted to be operative in the first quarter of 2025 (Itron-related costs) and 2027 (Aclara-related costs). The 2023-2026 forecast capital additions associated with the 2023-2026 capital expenditures for the installation of Gas Meters, Gas Modules, and Gas Communication Equipment, and the Gas AMI System Upgrade are $452.6 million and $12.0 million, respectively.

D. Cost of Removal and Gross Salvage

The portion of capital expenditures associated with the retirement of existing assets known as removal cost is recorded in accumulated depreciation (AD), which decreases the amount of AD in rate base. Gross salvage generally refers to any value received for retired plant and increases the amount of AD in rate base. In this application, there is no forecast cost of removal or gross salvage associated with the forecast capital expenditures or retired plant.

1. Capital Revenue Requirement Components

CPUC Resolution E-3238 provides that "in addition to direct expenses, utilities could also book capital-related costs such as depreciation and return on capitalized additions." Consistent with this resolution, PG&E's capital-related revenue requirement includes depreciation expense, a return on rate base, related federal and state income taxes, and property taxes. The various capital-related components of the RO calculation are discussed below.

In this Application, PG&E seeks recovery of a total capital-related revenue requirement of $131.4 million including RF&U. The total capital revenue amount is associated with the forecast capital expenditures of $464.6[1] million.

a. Depreciation

Depreciation is included in the revenue requirement calculation, as both depreciation expense and through AD, a component of rate base. Depreciation expense forecast is calculated using the straight-line, remaining-life method (in accordance with the Commission's Standard

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1 Excludes $20.5 million associated with the Aclara Information Technology (IT) project that will be operative in Q1 2027, which is outside the cost recovery period of this Application.

Practice U-4, Determination of Straight-Line Remaining Life Depreciation Accruals) using Commission-approved rates from depreciation accrual rate schedules effective during the period for which the revenue requirement calculations are made. Depreciation expense forecast is calculated by multiplying the forecasted end of month plant in service balance by the corresponding book depreciation rates.

In this Application, PG&E used the depreciation rates adopted in PG&E's General Rate Case (GRC) for each asset type. See below table for each type of asset associated with its corresponding 2023 GRC Decision (D.) 23-11-069 adopted depreciation rate.

TABLE 5-2
DEPRECIATION RATE BY ASSET TYPE

Line No.	Asset	Asset Class	Depreciation Rate
1	Gas Meters	GDP38100	4.99%
2	Gas Modules/DCUs	GGP39708	8.28%
3	IT Equipment – Hardware	CMP39102	2.06%
4	IT Equipment – Software	CMP30302	17.19%

b. Rate of Return on Rate Base

The forecasted rate base is calculated using utility plant less adjustments for deferred taxes, depreciation reserve, and other rate base components. Utility plant consists of the forecast cost of investment in plant and equipment for rendering utility services. In developing the forecasted rate base associated with utility plant for purposes of this filing, certain deductions are made. A reduction is made for the accumulated deferred income taxes associated with these assets. These deferred income taxes primarily result from the Modified Accelerated Cost Recovery System (MACRS) tax depreciation method. Rate base is also reduced by the amount of depreciation reserve (i.e., the AD already taken in prior years).

PG&E multiplied the currently adopted composite Rate of Return (ROR) of 7.28 percent by the weighted average rate base forecast for each year to calculate the Net for Return. This calculation uses the ROR and capital structure adopted in PG&E's 2023 authorized Cost of

Capital (COC) decision[2] for years 2023, 2025, and 2026. For the year 2024, PG&E uses the increased ROR of 7.80 percent which was authorized following the adoption of Advice Letter (AL) 4813-G/7046-E[3] (COC Formula Adjustment Mechanism) approving the increased ROR in 2024 pursuant to D.08-05-035.[4] PG&E will update the return on rate base if the Commission authorizes a new COC in a future COC proceeding or if a new AL is issued pursuant to D.08-05-035.

c. Income Tax

This section describes the calculation of the forecasted Federal Income Tax (FIT) and the associated deferred FIT and California Corporation Franchise Taxes (CCFT or state income tax) expenses.

PG&E estimates current FIT and CCFT on net operating income before income taxes. PG&E follows MACRS and Asset Depreciation Range[5] guidelines for classifying capital additions and calculating federal and state tax depreciation. Current FIT expense forecast is the product of the currently effective corporate income tax rate (21 percent) and forecasted federal taxable income. Likewise, current state income tax expense is the product of the statutory rate (8.84 percent) and the forecasted state taxable income. The following tax adjustments are made to pre-tax book income and are common to the development of the federal and CCFT taxable income.

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[2] D.23-01-002.

[3] PG&E AL 4813-G/7046-E (Dec. 22, 2023), p. 4.

[4] D.08-05-035, pp. 21-22, Ordering Paragraph 2.

[5] Uses Sum of Years Digits method.

1) FIT Depreciation and CCFT Adjustment

Federal MACRS deductions are computed on a normalized basis. This allows PG&E to recognize the timing differences between book and federal tax deductions. This difference multiplied by the federal tax rate is called deferred FITs and is included as an adjustment to current federal tax expense and the deferred FITs is credited to rate base. State income taxes are calculated using flowthrough treatment. With a flowthrough treatment, customers receive an immediate benefit from the use of accelerated state tax deductions; there are no deferred state taxes and therefore no associated deduction to rate base.

2) FIT and CCFT Repair Deduction

Certain capital expenditures may qualify for the tax repair deductions. Both Federal and California tax repair deductions are treated on a flowthrough basis. In this proceeding, the Gas AMI Replacement Program is ineligible for tax repair deductions due to major component of replacement per the Internal Revenue Code (IRC) guidelines.

3) FIT and CCFT Capitalized Software Adjustment

IRC Section 174 and Revenue Procedure 2000-50 provide that a certain portion of the costs of qualifying self-developed software may be deducted currently. IRC Section 167(f) generally requires taxpayers to capitalize and depreciate purchased software. For financial reporting purposes, software development costs are generally capitalized and depreciated over the software's book life, resulting in a tax and book timing difference. Under the federal 2017 Tax Cuts and Jobs Act (TCJA), Section 174 software development costs paid or incurred in tax years beginning after December 31, 2021 are required to be capitalized and amortized over five years for FIT purposes. However, this post-2021 TCJA adjustment to require capitalization does not apply for state tax purposes. PG&E has followed this rule in calculating the FIT and CCFT associated with the IT capital expenditure in this application.

d. Property Taxes

Property tax calculations are determined by multiplying the forecasted taxable Plant Less Depreciation (Net Plant) by the composite property tax factor. The composite property tax factor is based on PG&E's 2023 GRC levelized average property factor for 2023 through 2026. The property tax factor is composed of the adjusted base year (recorded 2020) market to cost ratio multiplied by the composite tax rate. The adjusted market to cost ratio is the relationship between the most current assessment (adjusted) and the taxable Net Plant.

E. Common Cost Allocation

D.23-11-069 adopted a methodology of allocating certain common, general, and intangible (CGI) costs among other functional areas within PG&E. In this Application, the Gas Modules and Gas AMI System Upgrade capital costs are considered CGI costs and subject to common cost allocation. Similar to PG&E's practice adopted in its 2023 GRC, these costs are allocated to different functional areas (Electric Distribution, Gas Distribution, Electric Generation, Gas Transmission & Storage and Electric Transmission) using the authorized Operations & Maintenance (O&M) labor allocation factors adopted in D.23-11-069. The revenue requirement presented in this chapter for years 2023-2026 incorporates the allocation of the CGI portion of the revenue requirement into the separate functional areas under CPUC jurisdiction (all functional areas, excluding FERC-jurisdictional Electric Transmission) based on 2023 GRC adopted O&M labor allocation factors. Gas meters capital costs are not considered CGI plant. The revenue requirement related to gas meters capital costs and the O&M expense are included in the Gas Distribution functional area only.

F. Cost Recovery

PG&E proposes to recover a total revenue requirement of $143.3 million (including RF&U) for the Gas AMI Replacement Program costs presented in Chapter 2. In this proceeding, the capital revenue requirement covers 2023 through 2026. PG&E proposes to roll the forecast capital additions and plant associated with the Gas AMI Replacement Program capital expenditures into its 2027 GRC Application.

The revenue requirement calculation in this filing includes RF&U and excludes Interest. Upon the CPUC approval of the cost recovery in this application, the revenue requirement associated with the approved costs in this filing will be posted monthly into the specific revenue adjustment mechanisms as described in Chapter 6, and will include interest.

PG&E's final cost recovery will include the interest expense based on the applicable interest rates, timing of the decision and the approved cost recovery. PG&E will accrue interest associated with the authorized revenue requirement based on the latest available interest rates, consistent with the Commission approved preliminary statement, which states:

> [I]nterest rate on three-month Commercial Paper for the previous month, as reported in the Federal Reserve Statistical Release, G.13, or its successor.

Additional details on cost recovery are provided in Chapter 6, Cost Recovery.

G. Conclusion

PG&E respectfully requests that the Commission adopt a total revenue requirement of $143.3 million (including RF&U) for the Gas AMI Replacement Program costs presented in Chapter 2. The revenue requirement set forth in this Application was calculated using the RO model for separately funded rate applications and was based on the forecast costs presented in Chapter 2. The detailed revenue requirement calculation is provided in the workpapers supporting this chapter.[6]

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6 See WP 5-1, "CGI RRQ Allocation", WP 5-2, "Gas Module and IT RO Model" and WP 5-3, "Gas Meter and O&M RO Model."

TABLE 5-3
REVENUE REQUIREMENT – SUMMATION OF ALL YEARS (2023-2026)
(THOUSANDS OF DOLLARS)

Line No.	Account	Electric Distribution (2023-2026) Total	Electric Generation (2023-2026) Total	Gas Distribution (2023-2026) Total	Gas Transmissio n & Gas Storage (2023-2026) Total	Total Functional Areas (2023-2026) Total
1	Gas AMI Module Capital & IT Capital	$46,419	$14,988	$24,525	$11,689	$97,620
2	Gas Meter Capital	–	–	33,781	–	33,781
3	Operating Expenses	–	–	11,861	–	11,861
4	Total RRQ (including RFU)	$46,419	$14,988	$70,167	$11,689	$143,262

PACIFIC GAS AND ELECTRIC COMPANY

CHAPTER 6

COST RECOVERY

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CHAPTER 6
COST RECOVERY

A. Introduction

This chapter presents Pacific Gas and Electric Company's (PG&E) proposal for tracking, recording, and recovering the costs of PG&E's Comprehensive Gas Advanced Metering Infrastructure (AMI) Replacement Program.

PG&E's expense and capital expenditures forecasts for the Gas AMI Replacement Program are set forth in Chapter 2. Adoption of PG&E's cost recovery proposal presented in this chapter will assure timely recovery of the reasonable costs of the Gas AMI Replacement Program.

In summary, PG&E requests that the California Public Utilities Commission (CPUC or the Commission):

- Approve PG&E's contemporaneously-filed motion to establish the Advanced Metering Infrastructure Memorandum Accounts (AMIMA) and authorize PG&E to track and record its actual revenue requirements for its costs from January 1, 2023 through the effective date of the final decision on this Application.
- Authorize PG&E to recover all amounts recorded to the AMIMAs through the next available rate change or the next Annual Electric True-Up (AET) and Annual Gas True-Up (AGT) following the Commission's decision on this Application.
- Authorize PG&E to recover through rates on a forecast basis the adopted revenue requirements from 2024 through 2026.

B. Cost Recovery

1. Summary of Costs

PG&E requests authorization to recover $143.3 million in total 2023-2026 revenue requirements, of which $11.9 million is expense revenue requirement and $131.4 million is capital revenue requirement as described in Chapter 5. Chapter 2 shows the total actual 2023 expenses and capital expenditures, and 2024-2026 forecasted expenses and capital expenditures by year. These costs are incremental and not included in costs recorded in any other balancing accounts, or in revenue requirements adopted by the 2023 General Rate Case (GRC) Decision, Decision (D.) 23-11-069.

2. Memorandum Account

In its 2023 GRC Application (A.) 21-06-021, PG&E requested rate recovery for its Gas AMI Replacement Program. On November 17, 2023, the Commission issued D.23-11-069, which adopted a forecast of $0 for the Gas AMI Replacement Program, but allowed PG&E to file a separate application seeking cost recovery for this program. In 2023, PG&E incurred $1.8 million in expenses, and $97 million in capital expenditures for the Gas AMI Replacement Program. PG&E will shortly file a *Motion to Establish Advanced Metering Infrastructure Memorandum Accounts,* to request that the Commission authorize PG&E to track and record its actual revenue requirements for its Gas AMI Replacement Program costs beginning on January 1, 2023 through the effective date of the final decision on this Application. Upon approval of the motion, PG&E will file a Tier 1 Advice Letter to establish the AMIMAs, effective as of January 1, 2023, and track Gas AMI Replacement Program costs in these accounts through the effective date of a final decision on this Application.

PG&E proposes, upon a final decision on this Application, to transfer the balance of the AMIMAs to the applicable revenue adjustment mechanisms for recovery from customers in rates[1] through the next available rate change or the next AET and AGT. The Commission has the opportunity to review and assess the reasonableness of the 2023 actual costs in this Application. Actual costs recorded beyond 2023 to the AMIMAs up to the adopted forecast amounts in this Application shall be deemed reasonable since the Commission has approved the adopted amounts.[2] Therefore, PG&E seeks cost recovery of the balances recorded in the AMIMAs through this Application. All costs recorded to the AMIMAs and recovered through rates would be subject to the Commission's final decision on this Application

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[1] The related revenue adjustment mechanisms and rate components are identified and discussed in Section 3 below.

[2] Actual costs beyond 2023 recorded to the AMIMAs, up to the adopted forecast amounts, through the date of the final decision in this Application will be recovered from customers, rather than the adopted amounts.

authorizing revenue requirements to be recovered in rates. PG&E proposes that the total of the actual costs recorded to the AMIMAs and the amounts recovered on a forecast basis for 2024 through 2026 may not exceed the total adopted amounts.

3. Recovery of Functional Revenue Requirements

a. Existing Revenue Adjustment Mechanisms to Be Used to Recover Gas AMI Replacement Program Adopted Revenue Requirements

PG&E proposes to recover through rates its adopted Gas AMI Replacement Program revenue requirements for 2023 based on actual expenses and capital expenditures and on a forecast basis for 2024-2026. As described in Chapter 5, the Gas AMI Replacement Program costs are: (1) common, general, and intangible costs (the recovery of which is allocated to all functional areas),[3] and (2) gas meters (the recovery of which is included in the Gas Distribution functional area only). Chapter 5 also describes PG&E's proposal to allocate these common costs across PG&E's base GRC revenue requirements as approved in its 2023 GRC decision. Specifically, PG&E proposes to use its existing revenue adjustment mechanisms to recover the Gas AMI Replacement Program adopted revenue requirements through the related rate components/revenue adjustment mechanisms over which common costs are allocated. The purpose of the revenue adjustment mechanisms described below is to ensure the recovery of the adopted revenue requirements in PG&E's electric and gas rates, as actual energy sales deviate from forecasted energy sales. PG&E will utilize the existing accounting procedures used to record and recover the adopted GRC revenue requirements to similarly record and recover the adopted Gas AMI Replacement Program revenue requirements.

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3 As described in Chapter 5, the Federal Energy Regulatory Commission jurisdictional portion of the allocated revenue requirements is not included in this Application.

Electric:

TABLE 6-1
ELECTRIC REVENUE ADJUSTMENT MECHANISMS FOR RECOVERY BY COMPONENT

Line No.	Component	Revenue Adjustment Mechanisms for Recovery
1	Electric Distribution	Distribution Revenue Adjustment Mechanism (DRAM)
2	Electric Generation	Energy Resource Recovery Account (ERRA)
3		New System Generation Balancing Account (NSGBA)
4		Portfolio Allocation Balancing Account (PABA)

The allocation between electric distribution and electric generation components of the actual costs will be based on the adopted revenue requirements.

- DRAM:[4] DRAM is a two-way revenue balancing account that recovers adopted electric distribution revenue requirements.
- ERRA:[5] ERRA is a two-way revenue balancing account that recovers power costs associated with PG&E's authorized procurement plan and California Public Utilities Code § 454.5(d)(3). Power costs recorded in ERRA are applicable solely to PG&E's bundled customers.
- NSGBA:[6] NSGBA is a two-way balancing account that records the benefits and the costs of Power Purchase Agreements associated with generation resources for which the Commission has determined that the costs and benefits will be allocated to all benefitting customers, including bundled service, Direct Access, and Community Choice Aggregation customers.

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4 Electric Preliminary Statement Part CZ, available at: <https://www.pge.com/tariffs/assets/pdf/tariffbook/ELEC_PRELIM_CZ.pdf> (accessed Feb. 20, 2024).

5 Electric Preliminary Statement Part CP, available at: <https://www.pge.com/tariffs/assets/pdf/tariffbook/ELEC_PRELIM_CP.pdf> (accessed Feb. 20, 2024).

6 Electric Preliminary Statement Part FS, available at: <https://www.pge.com/tariffs/assets/pdf/tariffbook/ELEC_PRELIM_FS.pdf> (accessed Feb. 20, 2024).

- PABA:[7] PABA is a two-way balancing account that records the "above-market" costs of all generation resources that are eligible for recovery through Power Charge Indifference Adjustment rates. PABA is composed of subaccounts for each year's vintage portfolio resources, that records the costs, market revenues, and imputed revenues of all generation resources executed or approved by the Commission for cost recovery that year. Amounts include costs related contracts executed with third-parties and Utility-Owned Generation.

Gas:

TABLE 6-2
GAS REVENUE ADJUSTMENT MECHANISMS FOR RECOVERY BY COMPONENT AND CUSTOMER CLASS

Line No.	Component	Revenue Adjustment Mechanisms for Recovery
1	Gas Distribution	Core Fixed Cost Account (CFCA), Distribution Subaccount
2		Noncore Customer Class Charge Account (NCA), Distribution Subaccount
3	Gas Transmission and Storage (GT&S)	Adjustment Mechanism for Costs Determined in Other Proceedings (AMCDOP),[a] Other Costs Impacting GT&S Revenue Subaccount
4	Gas Local Transmission	AMCDOP, Local Transmission Subaccount

(a) Adjustments to PG&E's GRC adopted GT&S revenue requirements are approved to be recorded to the AMCDOP. Note that the GT&S adjustments recorded to the AMCDOP are transferred to the CFCA and NCA for recovery from core and noncore customers, respectively.

The allocation between Gas Distribution, GT&S, and Local Transmission components of the actual costs will be based on the adopted revenue requirements.

7 Electric Preliminary Statement Part HS, available at: <https://www.pge.com/tariffs/assets/pdf/tariffbook/ELEC_PRELIM_HS.pdf> (accessed Feb. 20, 2024).

- AMCDOP:[8] AMCDOP records the difference in the revenue requirement associated with the costs determined in other proceedings and the revenue requirements based on placeholder costs included in the currently effective GRC decision and consists of several subaccounts including:
  - The "Other Costs Impacting GT&S Revenue Subaccount" tracks the amount of other costs, (including those resulting from policy changes), determined to be allocated and applied to GT&S in any other proceeding against the allocation of costs allocated and applied to GT&S services in the currently effective GRC decision.
  - The "Local Transmission Subaccount" records local transmission costs applicable to any of the other subaccounts of the AMCDOP.
- CFCA:[9] CFCA is a two-way balancing account that records the authorized GRC distribution base revenue amounts (with credits and adjustments), certain other core transportation costs, and transportation revenue from core customers and consists of several subaccounts including:
  - The "Distribution Cost Subaccount" recovers the distribution base revenue requirement adopted in PG&E's GRC that are allocated to core transportation customers based on the distribution base revenue allocation adopted in the Cost Allocation Proceeding.

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8 Gas Preliminary Statement Part CO, available at: <https://www.pge.com/tariffs/assets/pdf/tariffbook/GAS_PRELIM_CO.pdf> (accessed Feb. 20, 2024).

9 Gas Preliminary Statement Part F, available at: <https://www.pge.com/tariffs/assets/pdf/tariffbook/GAS_PRELIM_F.pdf> (accessed Feb. 20, 2024).

- NCA:[10] NCA is a two-way balancing account that records certain noncore costs and revenues from noncore customers and consists of several subaccounts, including:
  - The “Distribution Subaccount” recovers the noncore distribution portion of the authorized GRC base revenue requirement and other costs and balances approved by the Commission from noncore customer classes in proportion to their allocation of distribution base revenue as adopted in Cost Allocation Proceedings.

C. Conclusion

PG&E requests that the Commission approve the cost recovery described in this chapter for the reasons described above. Specifically, PG&E requests that the Commission:

- Approve PG&E’s contemporaneously-filed motion to establish the AMIMAs and authorize PG&E to track and record its actual revenue requirements for its costs from January 1, 2023 through the effective date of the final decision on this Application.
- Authorize PG&E to recover all costs recorded to the AMIMAs through the next available rate change or the next AET and AGT following the Commission’s decision on this Application.
- Authorize PG&E to recover through rates on a forecast basis the adopted revenue requirements for 2024-2026.

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10 Gas Preliminary Statement Part J, available at: <https://www.pge.com/tariffs/assets/pdf/tariffbook/GAS_PRELIM_J.pdf> (accessed Feb. 20, 2024).

PACIFIC GAS AND ELECTRIC COMPANY

APPENDIX A

STATEMENTS OF QUALIFICATIONS

PACIFIC GAS AND ELECTRIC COMPANY
STATEMENT OF QUALIFICATIONS OF GUSTAVO CASTILLO

Q 1 Please state your name and business address.

A 1 My name is Gustavo Castillo, and my business address is Pacific Gas and Electric Company (PG&E), 111 Almaden Blvd. San Jose, California.

Q 2 Briefly describe your responsibilities at PG&E.

A 2 I am the Director of Field Metering at PG&E, currently responsible for the field operations associated with metering, meter reading and revenue assurance.

Q 3 Please summarize your educational and professional background.

A 3 I earned my Associates of Science degree in Computer Electronic Technology from Mission College, Bachelor of Science degree in Business Management from University of Phoenix and my Master’s degree in Business Management from Golden Gate University in San Francisco. For over 20 years, I have had the opportunity and privilege to serve our customers across the service territory in almost every aspect of utility metering and field services.

Q 4 What is the purpose of your testimony?

A 4 I am sponsoring the following testimony and workpapers in PG&E’s Comprehensive Gas Advanced Metering Infrastructure Replacement Program Application:

- Chapter 2, “Comprehensive Gas AMI Replacement Program”;
- Workpapers supporting Chapter 2, including the following:
  - WP 2-2, “Gas Module Replacement Unit Forecast”;
  - WP 2-5, “Summary of Capital Expenditure by MWC”;
  - WP 2-6, “Detail Capital Expenditure by MWC”;
  - WP 2-10, “Gas Module Lifecycle Replacement Program”; and
  - WP 2-13, “Customer Communications Plan.”

Q 5 Does this conclude your statement of qualifications?

A 5 Yes, it does.

PACIFIC GAS AND ELECTRIC COMPANY
STATEMENT OF QUALIFICATIONS OF TONY CHIMIENTI

Q 1 Please state your name and business address.

A 1 My name is Tony Chimienti, and my business address is Pacific Gas and Electric Company (PG&E), 300 Lakeside Drive, Oakland, California.

Q 2 Briefly describe your responsibilities at PG&E.

A 2 I have held several Information Technology Operational roles that included Vendor Management and roadmap responsibilities of the Electric Advanced Meter Infrastructure (AMI) system. I am currently the Technical Program Manager in the AMI Project Management Office group responsible for analyzing and gathering key business requirements for both Gas & Electric AMI systems.

Q 3 Please summarize your educational and professional background.

A 3 Prior to my work at PG&E, I held several high-tech Product Management roles for both software and hardware product lines in the Silicon Valley. I currently hold a Bachelor of Science degree in Business Information Systems from the University of Phoenix.

Q 4 What is the purpose of your testimony?

A 4 I am sponsoring the following testimony and workpapers in PG&E's Comprehensive Gas Advanced Metering Infrastructure Replacement Program Application:

- Chapter 3, "Gas Advanced Metering Infrastructure Technology Roadmap"; and
- Workpapers supporting Chapter 3, including the following:
  - WP 3-1, Utility Benchmarking References.

Q 5 Does this conclude your statement of qualifications?

A 5 Yes, it does.

PACIFIC GAS AND ELECTRIC COMPANY
STATEMENT OF QUALIFICATIONS OF DAVID CONSOLE

Q 1 Please state your name and business address.

A 1 My name is David Console, and my business address is Pacific Gas and Electric Company (PG&E or the Company), 300 Lakeside Drive, Oakland, California.

Q 2 Briefly describe your responsibilities at PG&E.

A 2 I am a Director, in the Advanced Meter Infrastructure (AMI), Project Management Office responsible for the comprehensive and programmatic management of the Company's Gas AMI Program.

Q 3 Please summarize your educational and professional background.

A 3 I earned my Bachelor of Arts degree in Business Management Economics from the University of California, Santa Cruz and my Master's Degree in Finance from Golden Gate University in San Francisco. For over 16 years, I have had the opportunity and privilege to serve our customers in a financial and program management capacity at PG&E managing advanced metering infrastructure assets, operations, and leading program management activities. Lastly, I testified before the California Public Utilities Commission in the 2023 General Rate Case regarding the Gas AMI Module Replacement Application (A.05-06-028).

Q 4 What is the purpose of your testimony?

A 4 I am sponsoring the following testimony and workpapers in PG&E's Comprehensive Gas Advanced Metering Infrastructure Replacement Program Application:

- Chapter 1, "Introduction and Overview";
- Chapter 2, "Comprehensive Gas AMI Replacement Program";
- Workpapers supporting Chapter 1 and 2, including the following:
  - WP 1-1, "Current Modules In-Service by Vintages";
  - WP 2-1, "Legacy Gas Module Replacements";
  - WP 2-2, "Gas Module Replacement Unit Forecast";
  - WP 2-3, "Summary of Expense Forecast by MWC";
  - WP 2-4, "Detail Expense Forecast by MWC";
  - WP 2-5, "Summary of Capital Expenditure by MWC";

- WP 2-6, “Detail Capital Expenditure by MWC”;
- WP 2-7, “Gas Module Failure Rate Probability Forecast Methodology”;
- WP 2-8, “End of Life Study”;
- WP 2-9, “Extended Range Warranty Replacements”;
- WP 2-10, “Gas Module Lifecycle Replacement Program”;
- WP 2-11, “IT – Network Project Expenditures”;
- WP 2-12, “Net Present Value Economic Analysis”; and
- WP 2-13, “Customer Communications Plan.”

Q 5 Does this conclude your statement of qualifications?

A 5 Yes, it does.

PACIFIC GAS AND ELECTRIC COMPANY
STATEMENT OF QUALIFICATIONS OF REBECCA MADSEN

Q 1 Please state your name and business address.

A 1 My name is Rebecca Madsen, and my business address is Pacific Gas and Electric Company (PG&E), 300 Lakeside Drive, Oakland, California.

Q 2 Briefly describe your responsibilities at PG&E.

A 2 I am an Expert Regulatory Analysis and Forecasting Analyst in PG&E's Energy Accounting Department, within the Controller's organization. I am responsible for advising on emerging regulatory issues and implementing cost recovery requirements in California Public Utilities Commission decisions.

Q 3 Please summarize your educational and professional background.

A 3 I earned a Bachelor of Arts degree in Archaeology from the George Washington University and an Associate in Science degree in Accounting from Skyline College. I have been a registered Certified Public Accountant in California (License 118069) since 2013.

I have had the opportunity and privilege to serve our customers across the service territory since 2015 in Energy Accounting.

Q 4 What is the purpose of your testimony?

A 4 I am sponsoring the following testimony in PG&E's Comprehensive Gas Advanced Metering Infrastructure Replacement Program Application:

- Chapter 6, "Cost Recovery."

Q 5 Does this conclude your statement of qualifications?

A 5 Yes, it does.

PACIFIC GAS AND ELECTRIC COMPANY
STATEMENT OF QUALIFICATIONS OF JAMES MEADOWS

Q 1 Please state your name and business address.

A 1 My name is James Meadows, and my business address is 2 Embarcadero Center, 8th Floor, San Francisco, California.

Q 2 Briefly describe your responsibilities at Pacific Gas and Electric Company (PG&E).

A 2 I advise the Gas Advanced Meter Infrastructure (AMI) Project Team on various aspects and considerations regarding PG&E's current Gas AMI system. I have previously been involved with both the Gas and Electric AMI systems installed at PG&E since the original selection and implementation of each system.

Q 3 Please summarize your educational and professional background.

A 3 I received a Bachelor of Business Administration degree from the University of Texas in 1986, and a Masters of Business Administration degree from the JL Kellogg Graduate School of Management at Northwestern University in 1992. I have held management consulting positions with Deloitte and PwC, as well as being a partner in my current consulting firm, Veregy Consulting. I have held various roles on the original PG&E SmartMeter Program from 2002 through 2013. These roles included project risk analysis, project controls, financial management and held the role of project director. I testified before the California Public Utilities Commission regarding the original AMI Application (Application (A.) 05-06-028), the PG&E Proposed Upgrade Application (A.07-12-009) and the SmartMeter Opt-Out Program (A.11-03-014).

Q 4 What is the purpose of your testimony?

A 4 I am sponsoring the following testimony and workpapers in PG&E's Comprehensive Gas Advanced Metering Infrastructure Replacement Program Application:

- Chapter 4, "Prudency of Management of AMI 1.0";
- Workpapers supporting Chapter 4, including the following:
  - WP 4-1, "Product Adoption Protocol";
  - WP 4-2, "Module Warranty Discount Schedule";

- WP 4-3, “Gas AMI Supplier Quality Program”;
- WP 4-4, “Supplier Warranty Valuation in Dollars (Confidential)”;
- WP 4-5, “Supplier Warranty and Settlement Valuation in Dollars (Confidential)”; and
- WP 4-6, “Supplier Settlement Summary (Confidential).”

Q 5 Does this conclude your statement of qualifications?

A 5 Yes, it does.

PACIFIC GAS AND ELECTRIC COMPANY
STATEMENT OF QUALIFICATIONS OF SEAN SU

Q 1 Please state your name and business address.

A 1 My name is Sean Su, and my business address is Pacific Gas and Electric Company (PG&E), 300 Lakeside Drive, Oakland, California.

Q 2 Briefly describe your responsibilities at PG&E.

A 2 I am a Senior Results of Operations (RO) Analyst in the Revenue Requirements and RO organization, responsible for developing revenue requirement calculations for rate cases across PG&E's regulatory jurisdictions.

Q 3 Please summarize your educational and professional background.

A 3 I earned my Bachelor of Science degree in Finance from Santa Clara University. I began the first seven years of my career in various credit finance roles. In the past three years, I began working in the investor-owned utility space, first as a Rates Analyst in the water sector, and most recently in my current role at PG&E.

Q 4 What is the purpose of your testimony?

A 4 I am sponsoring the following testimony and workpapers in PG&E's Comprehensive Gas Advanced Metering Infrastructure Replacement Program Application:

- Chapter 5, "Results of Operations";
- Workpapers supporting Chapter 5, including the following:
  - WP 5-1, "CGI RRQ Allocation";
  - WP 5-2, "Gas Module and IT RO Model"; and
  - WP 5-3, "Gas Meter and O&M RO Model."

Q 5 Does this conclude your statement of qualifications?

A 5 Yes, it does.

PACIFIC GAS AND ELECTRIC COMPANY

APPENDIX B

GLOSSARY OF KEY TERMS

Appendix B: Glossary of Key Terms

Aclara Technologies (a subsidiary of Hubbell, Inc.): PG&E's current Gas AMI supplier and one of two Gas AMI suppliers that the Company is planning to use in the future.

Distributed Operational Capabilities: The next-generation Gas AMI 2.0 software and hardware system will provide enhanced command and control over key system components, like network equipment and gas endpoints, allowing for improved operational capabilities and efficiencies of the gas network.

Extended Range Gas Modules: Gas Modules typically used in customer locations where radio communications are impaired, such as remote geographical areas, basements, or indoor locations (e.g., garages). These Gas Modules operate on a higher power frequency to provide the extra strength needed to communicate to PG&E's Gas AMI and its billing system.

Gas Advanced Metering Infrastructure 1.0 (aka Gas AMI System or SmartMeter™): PG&E's original and current one-way communication system installed between 2006 to 2013 that securely and automatically transmits customer gas energy usage to the Company's billing system. The Gas AMI System included head-end application software, network communication equipment (also known as gas data collection units or DCUs) and battery-operated Gas Modules with built-in network interface cards (NICs) externally attached to each customer gas meter, which all connect to the Company's billing system.

Gas Advanced Metering Infrastructure 2.0: The Gas AMI 2.0 System includes new head-end application software, new network communications equipment, and new Gas Modules.

Gas Data Collection Unit: Network hardware device that collects gas usage from Gas Modules via the Gas AMI network and transmits gas usage to the head-end application for transmission to PG&E's billing system.

Gas Head-End Application: Software application with a user interface that provides administrative tools which allows for command and control of Gas AMI devices.

Gas Meter: A specialized flow meter, used to measure the volume of gas energy usage from customers. The current generation of gas meters are called diaphragm meters, and the next generation of gas meters are called ultrasonic meters (USMs).

Gas Module: Battery-operated hardware devices with built-in NICs externally attached to each customer gas meter that enables Gas AMI capabilities and delivers customer gas usage via the Gas AMI network to the gas head-end application for transmission to PG&E's billing system.

Gas Module End-of-Life: Gas Modules reach end-of-life when their batteries run out of energy and require replacement with a new Gas Module.

Gas Module Failure Rate: Measures the rate at which Gas Modules have failed or are forecasted to reach end-of-lifespan.

Gas Module Types – Legacy Original 506 Series and Second-Generation Series 3000: The vast majority of the Gas Modules that currently need to be replaced by PG&E are its legacy Gas Modules (aka Aclara Series 506). The Company has been and plans to continue replacing its legacy Gas Modules with Aclara's second generation Gas Modules (aka Aclara Series 3000).

Gas Ultrasonic Meter (USM): USM flow meters use sound waves to determine the velocity of gas flowing through a pipe versus the mechanical diaphragm meters widely used today. USMs do not have mechanical components and are equipped with monitoring sensors for gas flow, pressure, temperature, and seismic events, and allow for autonomous and remote shutoff capabilities.

Itron (formerly Silver Spring Networks): PG&E's current electric AMI supplier and one of two Gas AMI suppliers that the Company is planning to use in the future.

Lifecycle Replacement (aka Programmatic or Proactive Replacement): The practice of proactively replacing Gas Modules forecasted to reach end-of-life. This approach is more focused and concentrated in select geographic areas.

Meter to Cash (MTC): Refers to the end-to end process from collection of customer usage data at the gas meter/Gas Module through payment of a customer's monthly bill. The usage data is transmitted to PG&E's systems for verification and validation before sending billing quality data to the Customer Information System (CIS) billing system for final processing of the customer's bill.

Network Interface Card (NIC): A hardware component integrated into the Gas Module unit that allows the Gas Module to communicate customer gas energy usage to PG&E's network data collection units and then back its head-end application.

Next Generation Gas AMI Technology: New and emerging technologies including head-end systems, network infrastructure, Gas Modules, ultrasonic gas meters, and residential methane detectors. These technologies require two-way communications between the gas meter and PG&E's back-office systems.

Required Maintenance (formerly termed Corrective Maintenance): The practice of replacing Gas Modules as they fail on a more geographically dispersed basis.

Residential Methane Detector (RMD): A battery operated hardware device that provides alerts of leaking natural gas inside a home, basement, or meter room. The RMD measures the concentration of methane in the air and sounds an alarm before flammable levels are reached.