Electric Plan

Strategic Asset Management Plan (SAMP)

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1. Executive Summary

This is the Electric Strategic Assessment Management Plan (SAMP) for managing Pacific Gas and Electric Company's (PG&E's/the Company's) electric assets through the asset life cycle to achieve desired future performance. This strategy is aligned with PG&E's organizational objectives and is derived from Electric Operations Policy TD-04, "Electric Asset Management Commitment."

The SAMP is defined in International Organization for Standardization (ISO) 55000:2014, Clause 3.3.2, as "documented information that specifies how organizational objectives are to be converted into asset management objectives, the approach for developing asset management plans (AMPs), and the role of the asset management system in supporting achievement of the asset management objectives."

1.1 Organizational Objectives: Our Purpose, Virtues, and Stands

PG&E's responsibilities as an energy provider go far beyond its core mission of providing safe, reliable, affordable, and clean energy to 16 million customers. PG&E also has a responsibility to build better futures for all lives touched.

This means delivering for hometowns, serving the planet, and leading with love. It means making it right and making it safe. It means driving clean energy technologies, while also ensuring that their benefits are accessible to all. And it means helping communities build resilience against climate change—as well as thwarting it—in ways that leave no one behind. The vision at PG&E is captured in its "triple-bottom line" approach to doing business—serving **People**, the **Planet**, and California's **Prosperity**—underpinned by strong operational **Performance**.

- **People:** Safety Culture/Workforce/Public; Diversity; Engagement; Health/Wellness
- **Planet:** Climate, Natural Resources, Green Fleet, Supply Chain Sustainability, Compliance
- **Prosperity**: Customer Engagement: Energy Efficiency, Demand Response, Distributed Generation and Storage, Clean Transportation; Energy Affordability; Community Investments; Supplier Diversity
- **Performance**: Operation Enhancements, Strengthen Infrastructure, Upgrade Grid, Energy Storage, Risk

Reference: Corporate Objectives (Companywide):

Integrating Sustainability – PG&E Corporate Sustainability Report 2021

1.2 True North Strategy

PG&E's True North Strategy (TNS) represents where PG&E is headed and how its goals will be accomplished (see Figure 1 below). PG&E's 10-year enterprise strategy sets a clear strategic vision toward achieving this purpose:

- Delivering for hometowns
- Serving the planet
- Leading with love

The strategy has three major components: (1) focusing on rebuilding trust and delivering excellent service for PG&E customers; (2) architecting a decarbonized, safe, reliable Energy System; and (3) enabling these outcomes by building strong foundational capabilities.

PG&E's TNS is a living strategy that will be reflected throughout every coworker's day-to-day work and integrated into PG&E's enterprise planning processes over time.

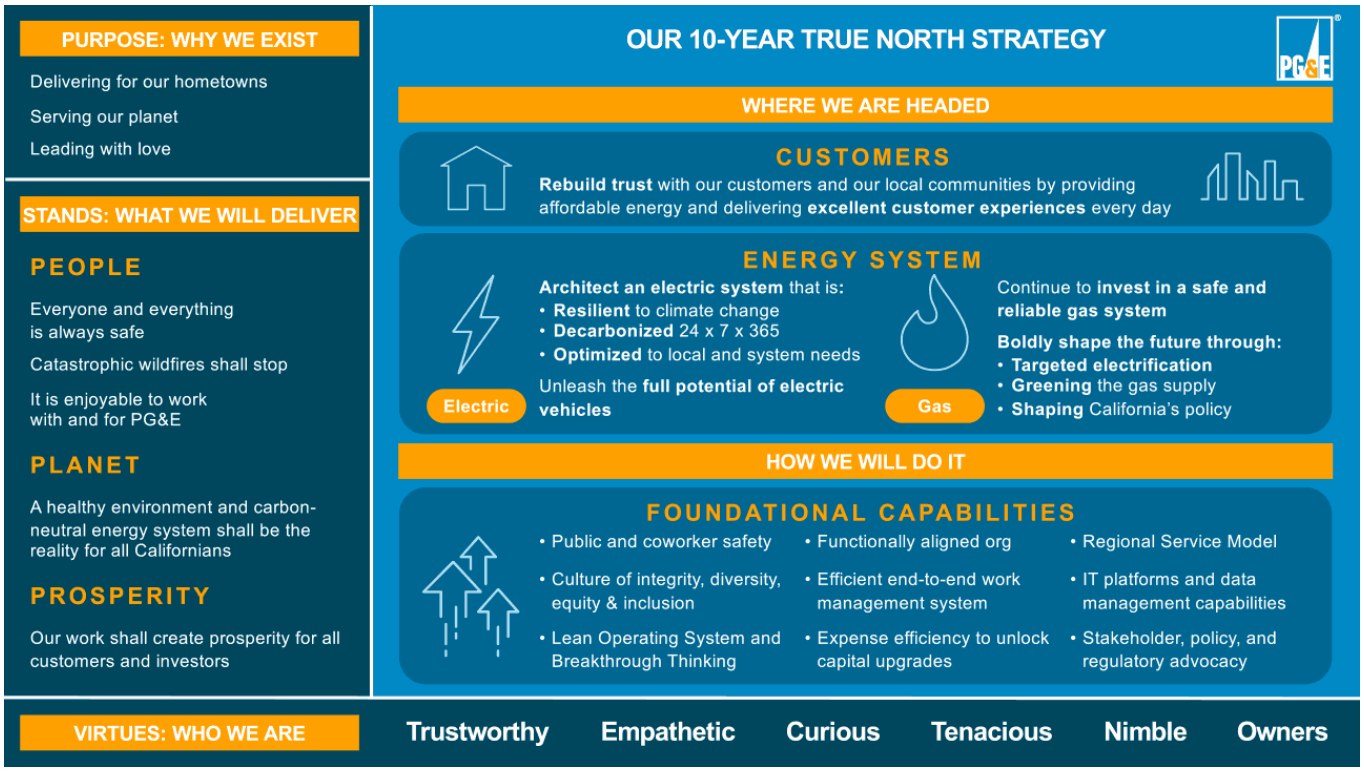

Figure 1. Key Elements of PG&E's TNS

2. Asset Management Objectives

2.1 Certification in PAS 55 and ISO 55001

Electric plans to achieve and maintain Publicly Available Standard (PAS) 55 and ISO 55000 certification of its Electric Asset Management system. The commitment for the journey toward certification was announced in 2018 and included in the 2020 Plan of Reorganization and Wildfire Safety Order Institute Investigation (OII) Settlement. Reasons for obtaining formal certification are to:

- Use recognized international standards for asset management.
- Provide a comprehensive asset management framework. (Plan-Do-Check-Act)
- Set the foundation for continuous improvement going forward.
- Create a feedback loop from the field on asset performance.

The certification process includes ongoing periodic surveillance visits (check-ins) from external auditors where gaps and improvement opportunities are identified and tracked for progress. This strategic plan will be updated where improvement activities impact the asset management strategy.

2.2 Scope of the Strategic Asset Management Plan

PG&E's Electric SAMP is in accordance with PAS 55-1:2008 and ISO 5001:2014. The Electric Asset Management Strategy; establishes the approach PG&E is taking for managing its electric assets and achieving its asset management vision to attain the optimum balance of risk, performance, and cost. In many ways, this document bridges the gap between high-level corporate objectives with the realities of the assets (capabilities, risks, life cycles, etc.). The requirements most relevant to the SAMP are from PAS 55-1 (Clauses 3.5, 3.9, 4.3, 4.4, and 4.7), as well as ISO-55001 (Clauses 4.1, 4.3, 4.4, 5.1, 5.3, 6.2.1, and 6.2.2).

PG&E's Electric Asset Management System includes the following key elements[1]:

- Clearly defined organizational context
- Leadership commitment and direction, roles, and responsibilities
- Improvement, including correction and prevention in a quality-process environment

[1] Excerpt from *An Anatomy of Asset Management*, Version 3; published by the Institute of Asset Management (IAM), December 2015.

The Electric SAMP is reviewed every 2 years to ensure it remains fit for purpose and supports continual improvement of the asset management planning process.

This review should:

- Focus on the overall performance of the asset management system[2], not only on how it serves as the basis of asset management planning, but also how it supports PG&E's Purpose, Virtues, and Stands.
- Establish new or updated asset management objectives for continual improvement, appropriate for the coming period.
- Consider the Business Plan Deployment (BPD) and alignment of asset management planning.

The SAMP is developed in accordance with the Electric Asset Management Policy and provides guidance for the development of AMPs. Figure 2 below shows the hierarchy of asset management guidance and depicts the need for consistency and alignment in the individual strategies and objectives at all levels.

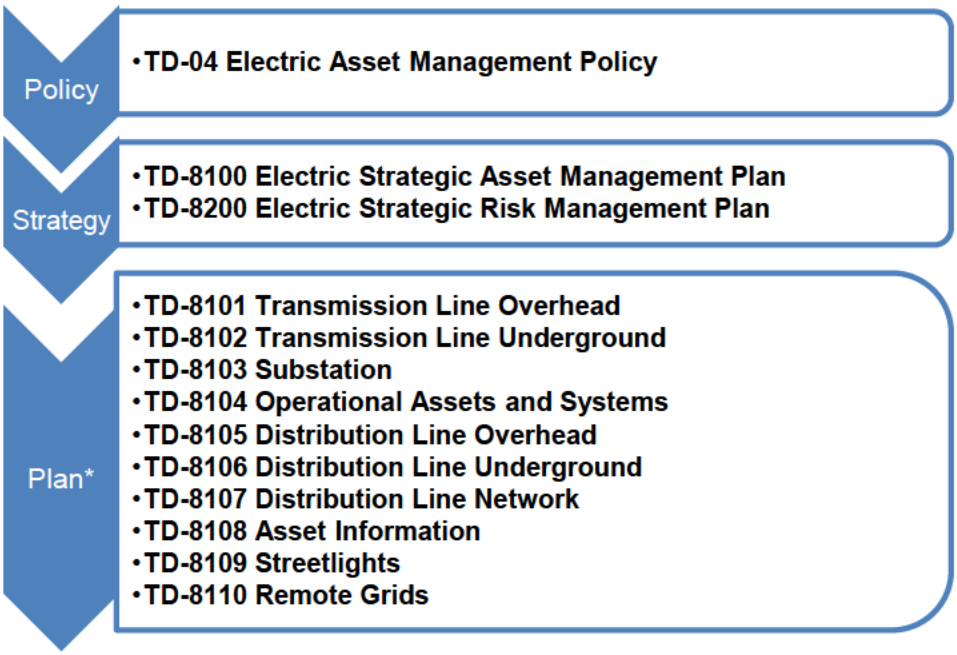

Figure 2. Hierarchy of Asset Management Guidance Documents

*Plans and approach are further described in Section 4 starting on Page 14.

[2] This performance review considers feedback received at the annual Management Review Meeting, as well as performance aligned with asset family strategic objectives.

3. Asset Management Plans

3.1 Approach to Asset Management Plan (AMP) Development

Each asset family creates and maintains an AMP, which specifies the activities, resources, responsibilities, and timescales for each asset family to implement PG&E's asset management strategy and deliverables across the following life cycle activities. It describes the physical assets included in the asset family, the current condition and desired future state of the assets, the key risks associated with the asset family, asset performance metrics, and the investments planned or in progress to mitigate these risks.

For consistency, each AMP is structured in the following manner:

1. Executive Summary – Summary of safety, risks, performance, costs, and processes
2. Safety and Risks
3. Goals and Objectives
4. Strategy – Long and short term
5. Asset Portfolio – Inventory, condition, and performance
6. Work Plan – Programs and risk mitigations
7. Continuous Improvement
8. Appendices – Related information

Further detail of the AMP structure is described in Appendix C starting on Page 30.

3.2 Asset Life Cycle

The AMPs address asset life cycle and optimization in their plans, programs, risk mitigations and controls, and strategic objectives.

Specifically, the phases of asset life cycle management, as adopted by PG&E are as follows:

1. **Acquire** assets – examples include acquisition of third-party owned facilities
2. **Construct** and renew assets – design/construction standards and materials specification
3. **Use** assets – operating parameters, and procedures
4. **Maintain** assets – patrols and inspection, maintenance, and emergency response
5. **Retire** or dispose of assets – removal and disposal of assets from service

Electric has implemented a process management framework to establish ownership throughout the life cycle phases. Appendix D on Page 32, shows the structure of the project delivery systems.

3.3 Asset Family Overview

Electric has organized its systems into asset families so they can be most effectively and efficiently managed. The asset families support the different risks and opportunities to which PG&E's electric assets are exposed. Each asset family has its own set of strategic objectives and is subject to different physical asset risks and consequential business impacts. PG&E's electric business objectives are delivered through the following ten electric asset families (see Figure 3 on Page 11):

A. Transmission Line Overhead
B. Transmission Line Underground
C. Substation
D. Operational Assets and Systems
E. Distribution Line Overhead
F. Distribution Line Underground
G. Distribution Network: S.F./Oakland
H. Asset Information
I. Streetlights
J. Remote Grids

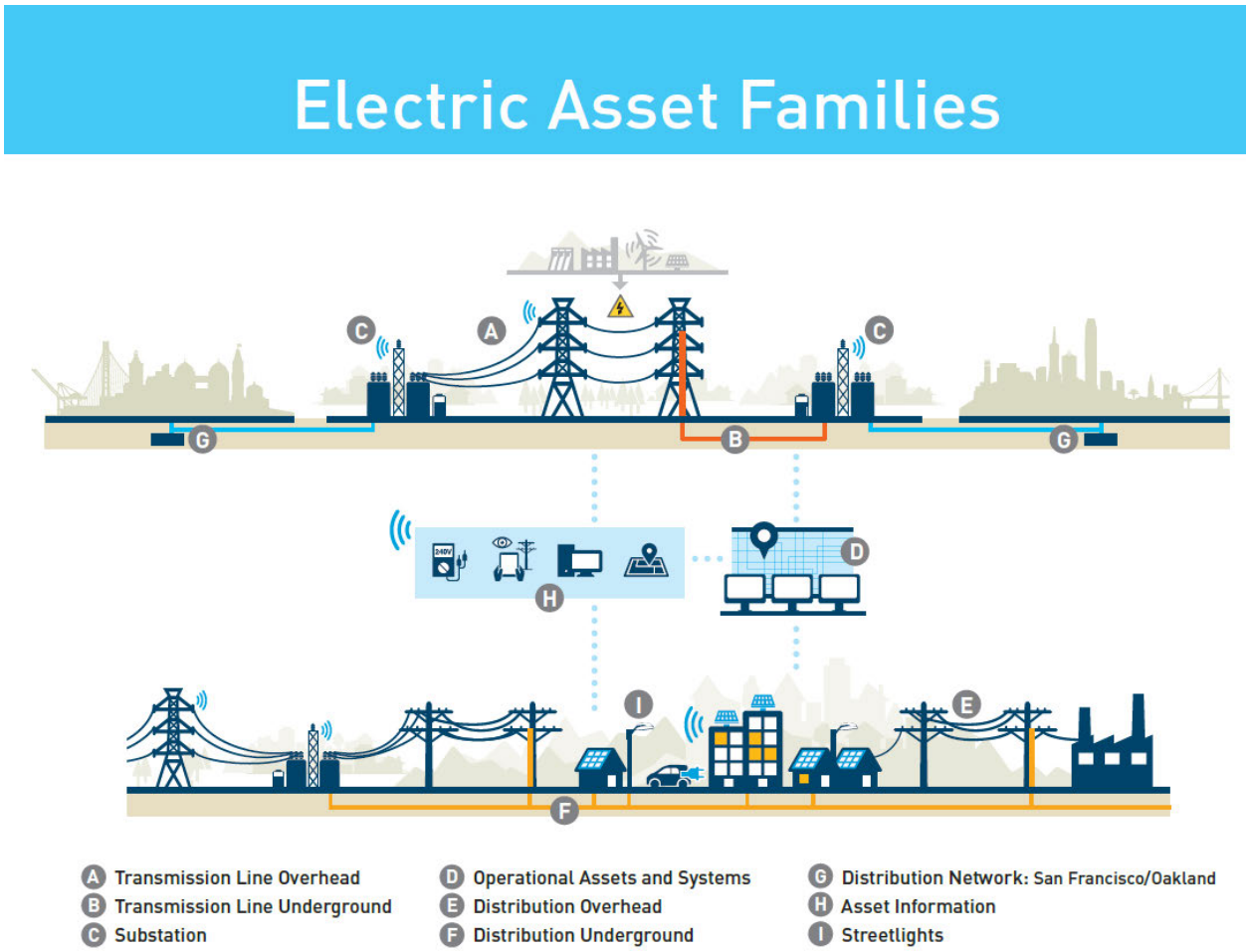

Figure 3. Electric Asset Families

Table 1. Asset Family Description

Asset Family	Description
Transmission Line Overhead	The Transmission Line Overhead Asset Family consists of overhead steel structures (including lattice steel towers and poles, tubular steel poles, and light duty steel poles), wood structures, conductors, insulators, switches (including manual, motor operated, and Supervisor Control and Data Acquisition [SCADA]-operated), and idle transmission lines.
Transmission Line Underground	The Transmission Line Underground Asset Family consists of underground lines (including conductors, pipes, conduits, enclosures, and associated equipment) of which 95% can be found in the Bay Area. There are primarily two technologies present in the system.
Substation	The Substation Asset Family includes both transmission and distribution substations and consists of power transformers (some with load tap changers), voltage regulators, circuit breakers, circuit switchers and switchgear, switches, voltage, and flow control equipment (including shunt capacitors and reactors, condensers, static, and dynamic volt amperes reactive [VAR] compensators), grounding systems, and bus structures. Also included is battery electric storage equipment.
Operational Assets and Systems	The Operational Assets and Systems Family includes both transmission and distribution line and substation facilities and consists of substation protective relays, instrument transformers, station batteries, line and substation SCADA equipment, station current transformers (CT), PC control system, remote telemetry units (RTUs) and associated metering and peripherals, phasor measurement units (PMUs), and Information Technology (IT) hardware and software (including energy management systems [EMSs], remedial action schemes [RASs], fault location, isolation, and service restoration [FLISR]) operated and managed by Electric Operations.
Distribution Line Overhead	The Distribution Line Overhead Asset Family consists of overhead conductor (primary and secondary), support structures (primarily wood poles), line equipment (voltage regulators, boosters, and capacitors), transformers, switches, and protective equipment (reclosers, sectionalizers, and fuses).
Distribution Line Underground	The Distribution Line Underground Asset Family consists of underground cable (primary and secondary), subsurface and pad-mounted transformers, underground line equipment (including potential transformers (PTs), pad-mounted and subsurface switches, capacitors, circuit interrupters, regulators, conduit, and enclosures).
Distribution Network	The Distribution Network Asset Family is comprised of network transformers and protectors, vaults, enclosures, and conduit systems serving customers in the San Francisco Financial District and downtown Oakland. The network circuits consist of 34 kilovolt (kV) feeders (mostly polyethylene concentric) and 12 kV feeders (mostly paper insulated lead sheathed cable [PILC]).
Asset Information	The Asset Information Asset Family consists of all asset data sets characterizing the electric transmission, substation, operational, and distribution assets and land base data, including static data (e.g., physical attributes, dynamic data [e.g., condition, operating status]).
Streetlights	The Streetlights Asset Family includes the streetlight fixtures, photocells, support structures, conductors, splice boxes, badge numbers, shields, and foundations.
Remote Grids	The Remote Grid consists of several interworking components that comprise the unit, including solar photovoltaic cells, batteries, propane fuel, backup generators, inverters, and other related equipment.

3.4 Asset Registry Standard (TD-9212S)

Utility Standard TD-9212S, "Electric Operations Asset Registry Governance" describes the requirements and methodologies used by Electric to govern the Asset Registry. The Asset Registry Standard (ARS) identifies Electric Asset Excellence (EAE) as the owner of the process to create new asset families and asset classes within existing asset families, thereby establishing a responsibility that EAE procedures be followed during covered activities. It is vital that EAE processes are followed to ensure that all aspects of asset family and asset class creation have been fully considered and properly executed upon by all relevant stakeholders in conformance with the ARS.

Electric uses the Asset Registry as the authoritative digital information source for asset as-built attributes, electrical connectivity, and the spatial information required to manage, operate, and maintain PG&E's electric transmission, substation, and distribution assets safely and effectively.

The Asset Registry is PG&E's authoritative information source for as-built, electrical connectivity, and spatial data required to manage electric assets throughout their lifecycle.

The Asset Registry supports Electric Operations Policy TD-04, "Electric Asset Management Commitment," and conforms with Utility Standard TD-8012S, "Electric Operations Asset Management System (AMS) Documentation."

4. Roles of the Asset Management System

4.1 Asset Management System

PG&E's Asset Management System is defined as the interrelated processes, organizational structure, roles and responsibilities, standards and procedures, information systems, and resources needed to develop, implement, and improve the asset management policy, asset management strategy, asset management objectives, and AMPs. PAS 55-1:2008 is organized in a Plan-Do-Check-Act management structure (see Figure 4 on Page 16).

4.2 Asset Management Clauses (Requirements)

PAS 55 separates asset management into several asset management system components, referred to as clauses or elements. Each PAS 55 element is assigned an owner who is accountable for ensuring continued compliance. Table 2 below summarizes the PAS 55 and corresponding ISO 55001 clauses.

Table 2. PAS 55 and ISO 55001 Clauses

PAS 55 Element Number	PAS 55 Element Name	ISO 55001 Clause Number	ISO 55001 Clause Name
4.2	Asset Management Policy	5.2	Policy
4.3.1	Asset Management Strategy	4.3	Determining the Scope of the Asset Management System
4.3.2	Asset Management Objectives	6.2.1	Asset Management Objectives
4.3.3	Asset Management Plans	4.4	Asset Management System
4.3.4	Contingency Planning	6.2.2	Planning to Achieve Asset Management Objectives
4.4.1	Structure, Authority & Responsibilities	4.1	Understanding the Organization and its Context
		5.1	Leadership and Commitment
		5.3	Organizational Roles, Responsibilities, and Authorities
4.4.2	Outsourcing of Asset Management Activities	8.3	Outsourcing
4.4.3	Training, Awareness & Competence	7.2	Competence
		7.3	Awareness
4.4.4	Communication, Participation & Consultation	4.2	Understanding the Needs and Expectations of Stakeholders
		7.4	Communication
4.4.5	Asset Management System Documentation	7.6	Documented Information
4.4.6	Information Management	7.5	Information Requirements

PAS 55 Element Number	PAS 55 Element Name	ISO 55001 Clause Number	ISO 55001 Clause Name
4.4.7	Risk Management	6.1	Actions to Address Risk and Opportunities
4.4.8	Legal & Other Requirements	7.6	Documented Information
4.4.9	Management of Change	8.2	Management of Change
4.5.1	Life Cycle Activities	8.1	Operational Planning and Control
4.5.2	Tools, Facilities & Equipment	7.1	Resources
4.6.1	Performance & Condition Monitoring	9.1	Monitoring, Measurement, Analysis, and Evaluation
4.6.2	Investigation of Asset-Related Failures, Incidents & Nonconformities	10.1	Nonconformity and Corrective Action
4.6.3	Evaluation of Compliance	7.6	Documented Information
4.6.4	Audit	9.2	Internal Audit
4.6.5	Improvement Actions	10.2	Preventative Actions
4.6.6	Records	7.6	Documented Information
4.7	Management Review	9.3	Management Review

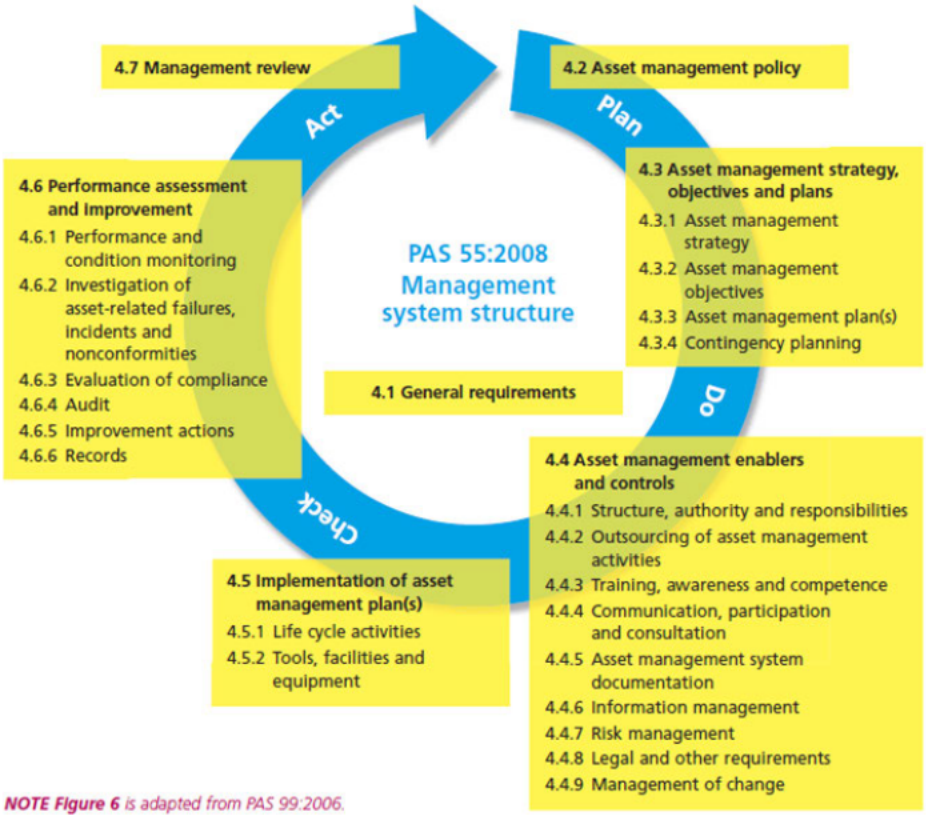

Figure 4. PAS 55:2008 Management System Structure (Plan-Do-Check-Act)

4.3 Key Asset Management Stakeholders and Documentation

PG&E's Electric Asset Management System involves all Electric Operations and Electric Engineering personnel in attaining the optimum balance between electric asset risk, performance, and cost.

Some positions in the Company hold specific responsibilities, as described in Table 3 on Page 17. Table 3 shows the Responsible, Accountable, Consulted, and Informed (RACI) matrix with the roles and responsibilities associated with key asset management deliverables. Table 4 on Page 17 summarizes the roles, responsibilities, and competencies of specific personnel involved in asset management.

Table 3. Key Asset Management Documentation RACI Matrix

Role / Asset Management Documentation	Senior VP of Electric Operations and Engineering	VP of Electric Asset Management	Asset Family Owner (AFO)	Asset Family Specialist	PAS 55/ISO 55000 Clause Owner
Electric Asset Management Commitment Policy (TD-04)	I	A	I	I	I
Electric Strategic Asset Management Plan (TD-8100)	I	A	R, I	R	I
Asset Management Plans ((TD-8101 through TD-8110)	I	A	R	R	I
Electric Operations Asset Management System Documentation (TD-8012S)	I	I	I	R	A
Electric Strategic Risk Management Plan (TD-8200)	I	I	I	I	A, R
Electric Operations Asset Registry Governance Standard (TD-9212S)	I	I	I	I	A, R
Electric Asset Management Review Standard (TD-8010S)	I	A	I	I	I

4.4 Key Asset Management Stakeholder Roles and Responsibilities

Table 4. Asset Management System Roles and Responsibilities

Role[3]	Asset Management System Responsibilities	Asset Management Competencies
Senior Vice President, Electric Operations Electric Engineering	• Support Electric Asset Management System • Review and approve asset management policy • Help shape asset management culture	Understand: • The organization's strategic plan • The organization's risk management framework • Stakeholder expectations on the long-term management of assets
Vice President, Electric Asset Management	• Support Electric Asset Management System • Review and approve asset management policy, strategic asset management plan, and asset management plans • Help shape asset management culture	Understand: • The organization's strategic plan • The organization's risk management framework • Legislative and regulatory • Stakeholder expectations on the long-term management of assets
AFOs: Senior Director, Electric Asset Maintenance Delivery Director, Transmission & Substation AM Senior Director, Distribution AM Senior Director, Asset Planning Director, Protection, Test, Automation Director, Electric Grid Operations Director, Asset Knowledge Management	• Accountable for establishing the strategy that balances the risk, performance, and cost of the asset family • Establish asset family objectives and programs to meet objectives • Oversee and direct the development of asset management plan(s) • Identify and reduce risks associated with assets in asset family • Support rationalization and optimization of assets within the asset family • Review progress and performance against asset family asset objectives • Provide direction in asset management information system	Understand: • The organization's strategic plan • The organization's risk management framework • Legislative and regulatory • How Electric Operations AM strategies support business goals • AM decision-making: capital investment, operations and maintenance, lifecycle cost and value optimization, resourcing strategy and optimization, shutdowns and outage strategy and optimization, aging assets strategy • The importance of identifying how future planning can be improved

[3] Responsibilities may be delegated as appropriate within the organizational structure.

Role[3]	Asset Management System Responsibilities	Asset Management Competencies
Asset Family Specialist	• Support development of strategic vision for asset family • Revise and maintain asset management plan(s) • Support appraisal of investment options for the asset family • Support rationalization and optimization of assets within the asset family • Monitor and review progress and performance against asset family asset objectives	Understand: • The organization's strategic plan • The organization's risk management framework • Legislative and regulatory • AM strategies support goals • AM decision-making • Changing economic/stakeholder expectations on day-to-day management and long-term • The importance of identifying how future planning can be improved
PAS 55/ISO 55000 Clause Owner	• Support Electric Operations in understanding asset management principles of proactively managing assets throughout the asset life cycle • Ensure conformance with relevant PAS 55 and ISO 55000 clause(s) • Seek out, leverage, and promote continuous improvement opportunities with relevant PAS 55 and ISO 55000 clause(s)	Understand: • The organization's strategic plan • Legislative and regulatory • AM strategies and AM objectives support business goals • AM decision-making • Changing economic/stakeholder expectations on day-to-day management and long-term • The importance of identifying how future planning can be improved
Inspection Process Owners	• The inspection process owner is responsible for managing the inspection process	Reference GOV-1038S
Maintenance Process Owner	• The maintenance process owner is responsible for managing the corrective maintenance or replacement work identified	Reference GOV-1038S
All other Electric Operations and Electric Engineering employees, including front line field employees	• Competent to conduct roles • Follow appropriate procedures to comply with compliance obligations and effectively manage risk • Use appropriate tools and equipment to perform work • Identify opportunities to improve performance and share with their leadership • Report any safety issues or concerns	Understand: • The Electric Asset Excellence (EAE) organization and its role in managing assets throughout the asset life cycle • How EAE work aligns with asset management plans • How to provide feedback on the Asset Management System and plans

4.5 Relevant Stakeholder Communication

Communications to all relevant stakeholders are conducted to the level of detail appropriate to their participation or business interests. These are in the form of documentation, training, and notification via email, website, or business meetings.

5. Achieving Asset Management Objectives

5.1 Achieving Asset Management Objectives

An understanding of PG&E's asset portfolio, risks, and performance measures are required to prioritize the work necessary to achieve asset management objectives. It involves the entire Asset Management System previously described as "clauses." As part of continuous improvement, the asset families and clause owners perform ongoing reviews of their areas of responsibility against the PAS 55 and ISO 55000 clauses. The process for changes to the Asset Management System is further described in TD-8013S, "Electric Change Control (Management of Change) Standard."

5.2 Business Plan Deployment

Integrated Planning is now called Business Plan Deployment (BPD). The BPD process will deliver a 10-year investment plan that is business-outcome driven, TNS-aligned, and risk-informed that delivers on the 2023 General Rate Case (GRC) period. It will contain 2 years of detail (2024 and 2025 plans) with full visibility to achieving targets and is appropriately balanced within available funding and resources.

Planning Parameters – BPD planning parameters now include:

- TNS Key Performance Indicators (KPIs)
- Workforce Management Standard
- Investment Planning Standard
- Waste Elimination Planning Approach
- 10-year Financial Targets
- Further Refinement of Risk-Based Portfolio Prioritization Framework (RBPPF)
- Catchball Procedure

5.3 Risk Management Process

PG&E uses an Enterprise and Operational Risk Management (EORM) framework to manage risks at both an enterprise and operational level. The objective of PG&E's EORM process is to facilitate risk-based, data-driven decision-making that results in measurable risk reduction. The EORM framework provides a repeatable and consistent method to identify, assess, mitigate, and monitor risks across its asset families.

For additional information on the risk management process, refer to the Electric Strategic Risk Management Plan (TD-8200). Each AMP (TD-8101 thru throughTD-8110) describes the identified primary threats specific to their assets and the strategic objectives developed to mitigate risks and threats.

Risk References:

- RISK-5001S. "Enterprise and Operational Risk Management Standard"
  - RISK-5001P-01, "Enterprise and Operational Risk Management Procedure"
  - RISK-5001P-02, "Maintaining the Corporate Risk Register"
- RISK-5004S, "Risk-Based Portfolio Prioritization Framework"
- RISK-5005S, "LOB Horizon Scanning Standard"
- RISK-5006S, "Corporate Horizon Scanning Standard"
- RISK-5007S, "Risk Owner Standard"
- RISK-5008S, "Enterprise Risk Board Communication Standard"

5.4 Investment Planning Standard (GOV-4003S)

GOV-4003S, "Functional Area Investment Planning Standard," is a comprehensive plan that integrates safety, risk, compliance, customer commitments, and financials. The desired outcome is a robust investment plan tied to clear priorities that translates into a stable work and resource plan for the function area (FA). The process also provides visibility on prioritizing work decisions and allows for transparent communication.

As part of PG&E's BPD, investment plans are aligned with enterprise planning parameters and guidance documents. This includes executive guidance on the 10-year TNS, KPIs, financial parameters, prioritization using the RBPPF, and other guidance issued in the BPD process.

FA investment plans form the basis for forecasts shared externally in regulatory filings, such as the GRC, Transmission Owner (TO) filings, Wildfire Mitigation Plan (WMP), Catastrophic Event Memorandum Account (CEMA), and other plans submitted to regulators.

GOV-4003S provides the roles, responsibilities, and requirements for PG&E to deliver FA investment plans for expenditures in projects, programs, and operations. This includes capital and expense work in all cost categories and funding types.

5.5 Integrated Grid Planning

Integrated Grid Planning promotes three objectives: 1) Planned Bundling, 2) Stable Work Plan, and 3) Aligned with TNS Objectives.

PG&E's collective electric system faces accelerating, multi-dimensional needs that must be addressed to deliver for communities (see Figure 5 below).

Figure 5. Electric System's Multi-Dimensional Needs

Integrated Grid Planning is a data-driven approach for optimizing PG&E's plan around strategic objectives and developing stable multi-year capital plans that drive savings by planning work at the circuit, substation, and transmission line level:

1. **Determine System Need:** Assess asset health and risk by consolidating relevant data into a single database.
2. **Identify Potential Solutions:** Develop solutions set with clear eligibility, benefits, and costs.
3. **Assign Solutions to Resolve Need:** Calculate "unconstrained investment need" to resolve all system needs.
4. **Prioritize to Develop Multi-Year Plans:** Optimize investments within capital and resource constraints to deliver on strategic goals.
5. **Execute Circuit-Level Plans:** Execute on investment plans by bundling work at the circuit and substation level.

Integrated Grid Planning considers all circuit needs to efficiently bundle work (see Figure 6 below).

Figure 6. Circuit Needs to Consider When Bundling Work

5.6 Wildfire Mitigation Plan (WMP) – Executive Summary

The 2023 WMP builds on the work PG&E has done to reduce wildfire risk by incorporating more mitigation work that targets the highest risk-informed areas of PG&E's system using existing mitigations measures and innovative technologies. The following outlines PG&E's integrated strategy to manage and reduce ignition risk:

1. Deployed a suite of comprehensive monitoring and data collection programs, such as wildfire cameras and asset inspections designed to provide insight into changing environmental hazards around assets. These programs provide a continuous monitoring capability that PG&E uses to decide what mitigations to deploy and where and when to deploy them.
2. Operational Mitigations like Enhanced Powerline Safety Settings (EPSS) and Downed Conductor Detection – provide on-going risk reduction and influence how PG&E manages the environment around the electric grid. Operational mitigations also include initiatives PG&E undertakes to support customers before, during, and after wildfire events.
3. Deploying System Hardening mitigations, such as PG&E's 10,000-mile distribution undergrounding program and transmission line reconductoring, splice shunting work to reduce ignition risk by changing how the grid is constructed, maintained, and operated.
4. Engaging with customers and communities to address issues related to wildfire preparation, ongoing safety work, and other public safety and preparedness issues.

5.7 Transmission Planning Process (TPP)

The California Independent System Operator (ISO) annually prepares the Transmission Plan as part of its core responsibility to identify and plan the development of solutions to comprehensively meet the future needs of the ISO-controlled transmission grid. The plan was prepared through the annual transmission planning process (TPP) that culminates in an ISO Board of Governors approved, comprehensive transmission plan.

The need for additional generation of electricity over the next 10 years has escalated rapidly in California as it continues transitioning to the carbon-free electrical grid required by the state's clean-energy policies. This has been driving a dramatically accelerated pace for new transmission development in current and future planning cycles. To help ensure PG&E has the transmission in place to achieve this transition reliably and cost-effectively, the ISO 2022-2023 Transmission Plan reflects a much more strategic and proactive approach to better synchronize power and transmission planning, interconnection queuing, and resource procurement and is put forward in close coordination with the state's primary energy planning and regulatory entities, the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC).

This year's transmission plan is based on state projections provided to the ISO in 2022 that California needs to add more than 40 gigawatts (GW) of new resources over the next 10 years and a sensitivity study projection calling for 70 GW by 2032, reflecting the potential for increased electrification occurring in other sectors of the economy, most notably in transportation and the building industry. The CPUC has recently established that next year's transmission plan will be based on this projection of 70 GW by 2033.

Types of Transmission Projects Recommended for Approval

- **Reliability-Driven Projects**: Reliability projects driven by load growth and evolving grid conditions as the generation fleet transitions to increased renewable generation. These projects are required to reliably supply the increase in forecasted load related to electrification and electric vehicle transportation loads.
- **Policy-Driven Projects**: The ISO determined projects needed to meet the renewable generation requirements established in the CPUC-developed renewable generation portfolios.

5.8 Uncertainties

PG&E is a regulated utility and, as such, must be aware of proposed regulations and evaluate their potential impact on the business. The electricity market impacts many aspects of PG&E's business. Changes in the regulatory or market conditions have the potential to impact achieving asset family asset objectives, as well as the Asset Management System improvement activities outlined in Subsection 4.2 beginning on Page 14. These same regulatory or market changes have the potential to shift the focus of electric, resulting in new strategic objectives. Following are some regulatory and market changes that may influence the implementation of PG&E's Electric Asset Management System:

- Legal, regulatory, and financial impacts of the October 2017 Northern California Wildfires
- California Senate Bill 32, "California Global Warming Solutions Act"
- California Senate Bill 100, "The 100 Percent Clean Energy Act of 2018"
- Ongoing development of Community Choice Aggregation (CCA) formation
- Increased rate of change of electric industry restructuring and lagging policy and rate structure changes
- California Public Utilities Commission (CPUC) rule making
- Climate change hazards, including drought, subsidence, flooding, sea level rise, and temperature extremes
- Increased distributed energy resources, including rooftop solar, transportation electrification, and energy storage
- Customer willingness to pay higher rates versus reliability expectations
- Technological advancements
- Covid-19 pandemic: health and safety orders, workforce and workplan changes. PG&E monitors these and any new potential regulatory or market changes that may create challenges, as well as business opportunities.

5.9 Continuous Improvement Opportunities

PG&E continues to build a culture of continuous improvement. Development of some areas in the asset management strategy and plans is incomplete and still in progress. These are considered areas of continual improvement. The following is a list of examples of key areas for improvement applicable to the asset families:

- Strengthen engagement with Asset Management System stakeholders
- Develop more refined data driven risk models (probability and consequence of failure) for life cycle decision making and investment prioritization
- Enhance the sophistication and breadth of whole-life cost modelling
- Improve asset information, including asset condition and performance
- Continue benchmarking and/or knowledge sharing

These areas, as well as others, continue to evolve and improve as data sets and the understanding of asset conditions develop over time.

Benchmarking is another important component of PG&E's continuous improvement effort and is used to identify industry best practices. PG&E currently relies on various outlets for benchmarking best practices, such as participation in industry associations and otherwise, comparing assets and operations with other operating companies, and reviewing publications and standards written by subject matter experts (SMEs) and public agencies. The benchmarking effort can result in specific statistics or metrics, or an understanding of industry best practices.

PG&E's benchmarking efforts rely on both formal and informal practices. The formal benchmarking process involves engaging trade associations to learn more about the practices, processes, and standards used by their members. The information has helped PG&E understand what other companies are doing, but often the information is not attributed to a specific source. On occasion, an individual company has been willing to share its best practices directly with PG&E, but in exchange for this information the company has asked for anonymity in regulatory proceedings.

APPENDICES

Appendix	Title
A	Change Log
B	Related Documents
C	Asset Management Plan (AMP) Structure
D	Capital Work Delivery System
E	Definitions and Acronyms
F	Other Related Company Strategies

Appendix A – Change Log

Table 5 summarizes the revisions made to this plan since the previous publication of TD-8100, "Electric Strategic Asset Management Plan (SAMP)," Revision 1, dated 8/11/2020.

Table 5. SAMP Change Log

Section	Change	Reason for Change
Entire	Revised entire document.	Revision every 2 years.
1	Combined Sections 1 and 2 into one Executive Summary. Previous Mission, Vision statements replaced with Purpose, Virtues, and Stands. Added Triple Bottom Line and TNS. Removed previous statements: Meet commitments, know assets, relentless execution, and execute on budget.	Reduce redundancy. Update to current business practices.
2	Minor changes.	
3	Minor changes to Asset Management Plan Development (shorten). Added Remote Grid asset family. Added Asset Registry Standard.	Update to current business practices.
4	Minor updates to Roles table. Shorten responsibilities list.	Shorten list.
5	Replaced Integrated Planning Process with Business Plan Deployment. Added Investment Planning Standard. Added Integrated Grid Planning. Added Wildfire Mitigation Plan. Added 10k Undergrounding Program. Added Transmission Planning Process. Need to add New Business.	Update to current business practices.
Appendix F	Added Appendix to reference other company strategies. e.g., Lean, Corporate Sustainability, Climate, R&D Strategy.	Additional references.

Appendix B – Related Documents

The following Table 6 lists documents associated with this SAMP.

Table 6. Related Documents

Related Document	Document Number	Location
Electric Asset Management Commitment Policy	TD-04	Technical Information Library (TIL)
Transmission Line Overhead Asset Management Plan	TD-8101	
Transmission Line Underground Asset Management Plan	TD-8102	
Substation Asset Management Plan	TD-8103	
Operational Assets and Systems Asset Management Plan	TD-8104	
Distribution Line Overhead Asset Management Plan	TD-8105	
Distribution Line Underground Asset Management Plan	TD-8106	
Distribution Network Asset Management Plan	TD-8107	
Asset Management Plan	TD-8108	
Streetlight Asset Management Plan	TD-8109	
Remote Grid Standalone Power System Asset Management Plan	TD-8110	
Electric Strategic Risk Management Plan	TD-8200	
Electric Asset Management Review	TD-8010S	
Electric Operations Asset Management System (AMS) Documentation Standard	TD-8012S	
Electric Change Control (Management of Change) Standard	TD-8013S	
Electric Operations Asset Registry Governance Standard	TD-9212S	

Appendix C – Asset Management Plan Structure

This appendix provides guidance for the development of the Asset Management Plans (AMPs).

Table 7 below provides the structure for all AMPs. This structure is a general guide to help provide consistency between asset families. Slight deviations may exist due to the specific needs of the asset family.

Appendices are included in each AMP, as appropriate, to capture pertinent data that further describes the plans, activities, and status for the asset family.

Table 7. Structure of AMPs

Section	Section Title	Description
1	Executive Summary	Overview of the AMP with summaries of asset risks, performance, and costs.
2	Safety and Risks Enterprise Risks Risk Analysis, Drivers, Controls CPUC RAMP filings	Information relative to risk and threat identification. Electric asset risks with impacts that are elevated to receive Companywide attention. Methods or tools such as bowtie, probability risk assessments. List of risk drivers by asset risk type. List of controls such as inspection and maintenance used to reduce or eliminate the frequency and/or impact of risk consequences. Summary of how RAMP filings affect the risk assessment of the asset family.
3	Goals and Objectives	Specific objectives related to the asset family.
4	Strategy	Methods or analysis performed to determine future needs.
5	Asset Portfolio Asset Overview Asset Types Asset Inventory and Condition Key Performance Metrics Data Sources	Description of assets, components, or facilities. List of the asset types and description of the function. Description of the quantity, age, condition, configurations, failure data, and condition monitoring characteristics. Performance measures related to the assets. Data sources where the asset information is maintained.

Section	Section Title	Description
6	Work Plan Programs, Controls, and Mitigations Overview Resources Strategy and Constraints Wildfire Mitigation Plan Rate Case Filings	Programs to meet strategic objectives, including investments to address both enterprise and asset level risks, meet compliance requirements, and maintain asset condition. Detail description of key programs related to the asset family. Review of resource availability related to the asset family. Where applicable, the WMP includes measures to further reduce risks to the asset family. Summary of rate case filings related to the asset family and description of testimonies or work papers.
7	Continuous Improvement	List of areas of improvement for the assets or improvement in documenting AMP.
8	Appendix	

Appendix D – Electric Operations (EO) Capital Work Delivery System

The EO Capital Delivery System is structured to support PG&E's EO initiative of implementing the Project Management Institute's Organizational Project Management Maturity Model 3 (OPM3). This model is a tool for improving organizational alignment around project management and PG&E's ability to integrate portfolio, program, and project work in support of enterprise objectives. All mega processes have senior leadership mega process owners. All processes have a process owner and a process manager. Roles and responsibilities for these positions are outlined in the Process Owner Playbook, along with other information related to process management.

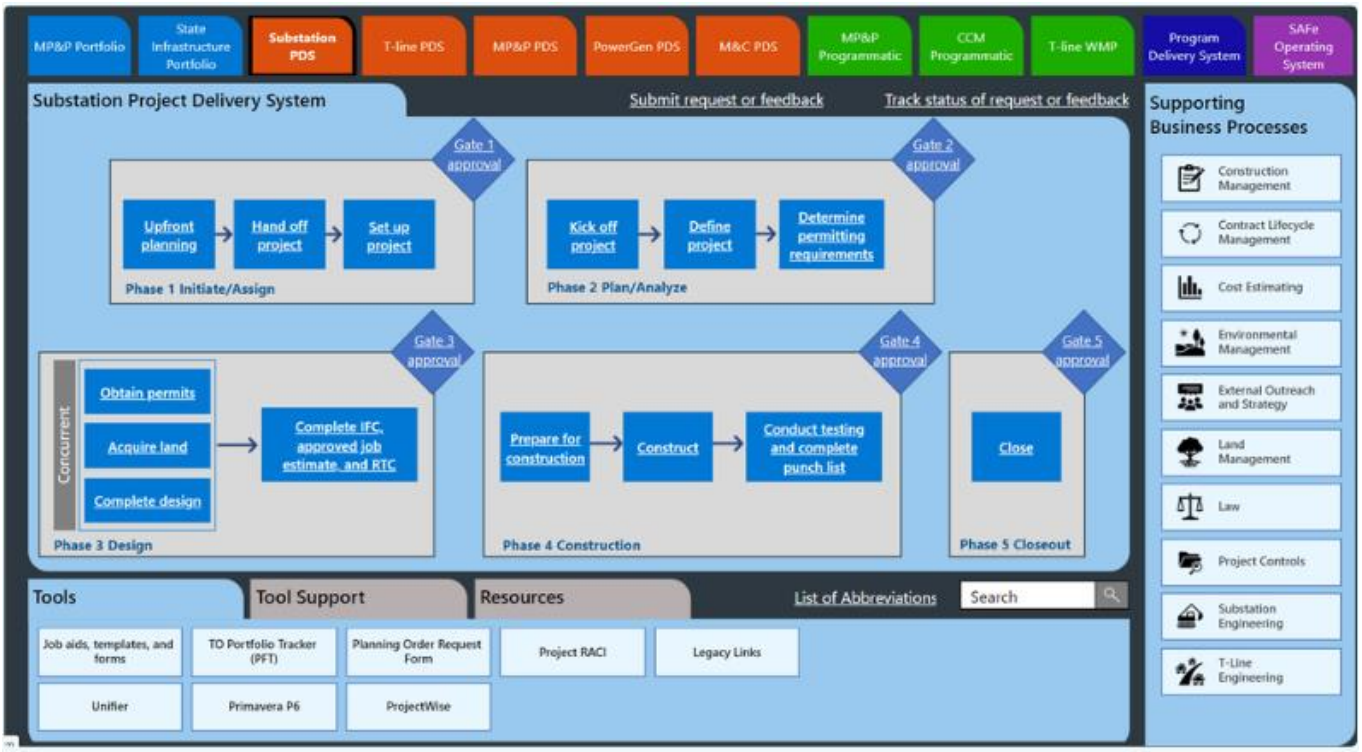

Figure 7. EO Capital Delivery System (CDS)

Appendix E – Definitions and Acronyms

This appendix provides definitions for frequently used words, phrases, and acronyms found in the SAMP.

Table 8. Definitions

Word or Phrase	Definition	Source
Asset	Plant, machinery, property, buildings, vehicles, and other items that have a distinct value to Electric Operations.	TD-8010S
Asset Family	Set of physical assets that interact or are interrelated to deliver a required business function or service, i.e., overhead transmission lines, underground transmission lines, substations, and distribution lines.	
Asset Life Cycle	Electric Asset Lifecycle Stages are: Acquire, Construct/Renew, Use, Maintain, and Retire.	TD-8012S TD-3350S
Asset Management	Systematic, coordinated activities, and practices through which Electric Operations optimally and sustainably manages its assets and asset families, their associated safety, reliability, and affordability over their life cycle in alignment with PG&E's vision, mission, culture, stakeholder requirements, and objectives.	TD-8010S
Asset Management System	The interrelated activities/processes, organizational structure, roles/responsibilities, planning activities, standards/procedures, information systems, and resources needed to develop, implement, and improve the asset management policy, asset management strategy, asset management objectives, and AMPs.	TD-8010S
Control	Currently established measures that modify risk.	RISK-5001S
ISO 55000	International Organization for Standardization (ISO) 55000. The generic reference to the ISO 55000 series of documents: • ISO 55000:2014, "Asset management – Overview, principles, and terminology" • ISO 55001:2014, "Asset management – Management systems – Requirements" • ISO 55002:2014, "Asset management – Management systems – Guidelines for the Application of ISO 55001"	TD-8010S
Mitigation	Measure or activity proposed or in process designed to reduce the impact/consequences and/or likelihood of an event.	RISK-5001S

Word or Phrase	Definition	Source
PAS 55	Publicly Available Standard (PAS) 55. The generic reference to the PAS 55 series of documents: • PAS 55-1:2008, "Asset Management Part 1: Specification for the optimized management of physical assets." • PAS 55-2:2008, "Asset Management Part 2: Guidelines for the application of PAS55-1."	TD-8010S
Record	Information created, received, and maintained for a business purpose or to comply with regulatory or legal requirements. Includes the documentation of a specific action, transaction, decision, regulatory compliance requirement, or legal commitment made by PG&E Corporation or the utility during business activities.	GOV-7101S
Risk	The potential for the occurrence of an event that would be desirable to avoid, often expressed in terms of a combination of various outcomes of an adverse event and their associated probabilities. Different stakeholders may have varied perspectives on risk.	RISK-5001S
Risk Driver	Element which alone or in combination with other drivers has the intrinsic potential to give rise to risk (can be a single risk or multiple risks).	RISK-5001S
Asset Objective	Specific and measurable outcomes or achievements of asset system(s) to implement the asset management policy and asset management strategy.	AMPs TD-8101 through TD-8110

Table 9. List of Acronyms

Acronym	Description
AFO	Asset Family Owner
AM	Asset Management
AMP	Asset Management Plan
BPD	Business Plan Deployment
CAP	Corrective Action Program
CARB	California Air Resources Board
CPUC	California Public Utilities Commission
EBRR	Event-Based Risk Register
EORM	Enterprise and Operational Risk Management
FA	Functional Area
IAM	Institute of Asset Management
IGP	Integrated Grid Planning
IPP	Integrated Planning Process
ISO	International Organization for Standardization
LOB	Line of Business
PAS	Publicly Available Standard
PG&E	Pacific Gas, and Electric
RACI	Responsible, Accountable, Consulted, and Informed
RAMP	Risk Assessment Mitigation Phase
RC	Responsible Care
RET	Risk Evaluation Tool
S-MAP	Safety Modeling Assessment Phase
SAMP	Strategic Asset Management Plan
SCADA	Supervisory Control and Data Acquisition
TD	Technical Document

Appendix F – Other Related Company Strategies

F.1 Lean at PG&E: Customers at the Core

PG&E is transitioning to a new way of working by adopting a Lean Operating System designed to drive more effective and responsive decision-making, reduce the human struggle many face in day-to-day work, and deliver better outcomes for PG&E customers. See Figure 8, “Customers at the Core,” on Page 37.

The Lean Team is creating a robust set of resources to support this implementation – starting with a playbook to serve as a practical guide to using Lean in day-to-day work. It is called the "Clear Sky Playbook" to underscore the idea that Lean is PG&E's fundamental, everyday operating system. It outlines the following Four Basic Plays:

- **Visual Management:** Being able to see at a glance how PG&E is performing against the most important metrics across safety, customer, delivery, and quality.
- **Operating Reviews:** Brief, focused reviews to identify and address issues and barriers to getting the right work done, meant to involve the people closest to the work in decision-making. These are reviews are performed daily, weekly, and monthly.
- **Problem Solving:** Resolving issues and negative trends that impede performance as soon as people closest to the work flag them.
- **Standard Work**: Standardizing effective work processes and best practices so PG&E can continue to improve.

Figure 8. Customers at the Core

F.2 Corporate Sustainability

The Corporate Sustainability Report highlights the strategies and partnerships PG&E is pursuing to meet its commitment to deliver for hometowns, serve the planet, and lead with love. Using statistics and stories, this comprehensive report outlines how PG&E is working every day to provide safe, reliable, affordable, and clean energy for customers, while also helping to build a more sustainable energy future for California.

Strategy: Embedding the Triple Bottom Line

PG&E approaches work through the triple bottom line framework of serving people, the planet, and California's prosperity underpinned by a relentless pursuit of performance.

As an energy provider,PG&E's purpose is to deliver for hometowns, serve the planet, and lead with love. This means making it right, making it safe, and helping drive clean energy technologies, while also ensuring that their benefits are accessible to all. It also means helping communities build resilience against climate change today, as well as helping to heal the planet in ways that leave no one behind.

Reflecting this focus on the triple bottom line, PG&E's TNS represents a 10-year enterprise strategy that sets a clear strategic vision toward achieving its purpose and climate commitments.

F.3 Climate Strategy

PG&E Corporation developed the Climate Strategy Report as part of its longstanding commitment to lead the way on addressing climate change. This report provides information on PG&E's strategy and the steps PG&E is taking to meet the challenge of climate change on behalf of the more than 16 million Californians who rely on PG&E to deliver their energy. The report describes the risks and opportunities PG&E faces from a changing energy landscape along with the potential physical impacts of a changing climate and associated weather patterns. It also describes how PG&E governs climate-related issues and manages climate-related risks.

Urgent Need for Action

From extreme weather to rising tides, like the rest of the planet, California is experiencing significant and increasing effects of a changing climate. The latest report from the Intergovernmental Panel on climate change has been called a "code red for humanity." With the growing threat of climate change comes the urgent need for action to stabilize the climate.

To rise to the challenge, PG&E must build on this progress in other sectors – while also achieving deeper penetration of renewable energy combined with investments in the grid and energy storage, dramatic improvements in energy efficiency, and evolving the natural gas system to integrate cleaner fuels and accommodate a massive shift to electrifying vehicles and buildings.

Committing to Help Heal the Planet

As the state's largest energy provider, PG&E embraces its foundational role in transitioning California to a decarbonized and more climate-resilient economy. There are many ways that PG&E can be a force for change, and its size and scale enable it to be a vital part of the solution.

PG&E has a proven performance record on clean energy, delivering 93% greenhouse gas emissions-free electricity to customers in 2021. Today, one-in-every-five solar rooftops in the country is in PG&E's service area, and one-in-six electric vehicles in the nation plugs into PG&E's grid.

PG&E is committed to helping to heal the planet by achieving a:

- Climate- and nature-positive energy system by 2050.
- Net zero energy system in 2040 – 5 years ahead of California's current carbon neutrality goal.

- Series of 2030 climate goals to reduce PG&E's operational carbon footprint and enable both customers and communities to reduce their carbon footprints:
  - Reduce Scope 1 and 2 emissions by 50% from 2015 levels.
  - Reduce Scope 3 emissions by 25% from 2015 levels.
  - Achieve "Scope 4" goals to enable customer emission reductions.

F.4 Research and Development Strategy:

Our True North Strategy (TNS)

PG&E's TNS represents a 10-year enterprise strategy that sets a clear strategic vision towards achieving purpose and climate commitments. The strategy has three major components:

- Focusing on rebuilding trust and delivering excellent service for customers
- Architecting a decarbonized, safe, and reliable energy system
- Enabling these outcomes by building strong foundational capabilities

Building the Future: Bringing True North to Life

In 2022, PG&E articulated its TNS – a bold, breakthrough vision that charts a course over the next 10 years towards achieving its purpose and climate commitments.

TNS reflects a deep conviction that PG&E has a vital role to play in building a better future and in supporting California's transition to an emissions-neutral and more climate-resilient future. As California's largest energy provider, PG&E's size and scale uniquely position it to be a positive force for change on behalf of the planet, PG&E's 16 million customers, and California's continued prosperity.

Bridging the Gap: How R&D Helps PG&E Get There

The nation's electric grid and natural gas systems were designed for a world powered centrally by fossil fuels where supply and demand dynamics evolved more predictably over time. Today, the operating environment for utilities globally is changing rapidly, placing increasing strain on systems designed for a fundamentally different world.

The accelerating forces of electrification, decarbonization, and climate change are driving the need for sweeping changes to transform core operations. Given that California sits at the forefront of these trends, PG&E's need for breakthrough technologies may be more acute and more urgent than its peers in many cases. In addition to this accelerated pace of change experienced by California's utilities, PG&E

and other dual-commodity utilities also face a unique challenge in the scope and scale of change required and must navigate evolving dynamics, while dramatically transforming operations concurrently across PG&E gas and electric systems.

This report outlines nearly 70 high-priority problem statements PG&E is seeking to address through innovative technologies and breakthrough foundational research. These problem statements span the gas and electric sides of the business and align to several key themes described in subsequent sections.

PG&E's ultimate goal is to identify, test, refine, and deploy novel solutions and technologies that help us address these problem statements and deliver on a strategic vision for the future. While foundational research is needed to better understand evolving dynamics and potential paths forward in some areas, part of PG&E's direct involvement is looking for technologies that have successfully progressed out of the foundational research phase, are ready to pilot or deploy near-term, and have a clear path to commercialization at scale.