



GP-1103 - Customer Connected Equipment Asset Management Plan

Gas Plan

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1. Executive Summary

This asset management plan provides an assessment of condition and risk of the Customer Connected Equipment (CCE) asset family and includes a plan detailing risk mitigations, strategic objectives and asset maintenance, for the life cycle of the assets.

The plan is developed with a 5-year planning horizon to align with the Gas Operations 5-year financial outlook and will be updated annually. It describes the physical assets included in this asset family, an assessment of the current and desired future state of the asset family, the key risks associated with the asset family, and the investments planned or in progress to mitigate and reduce these risks.

1.1 Asset Overview

The Customer Connected Equipment (CCE) asset family is comprised of approximately 4.5 million billing meters and associated regulators, over-protection devices, shut-off valves, piping and fittings that connect to the gas distribution service to the customer. Customer meters are used to measure gas usage to support the billing function.

Table 1 summarizes the primary asset types in the CCE asset family and the quantity of assets.

The Customer Connected Equipment asset management plan looks at the following assets within this asset family:

Table 1 - Primary Customer Connected Equipment Assets

Physical Assets	Quantity
Gas Meters	4,490,000
Service Regulators	2,975,000

1.2 Strategic Objectives

Gas Operations sets annual corporate Line of Sight (LoS) goals that cascade throughout the organization. Asset Family objectives are created using these LoS goals as a framework and developed both from a bottom-up and top-down approach. After analyzing asset risk and condition within the LoS framework, the 2016 Customer Connected Equipment strategic asset objectives are as follows:

Safe

1. Meet the Meter Protection Program regulatory commitments by December 2016
2. Implement a policy that minimizes the number of new inside meter sets installed during reconstruction projects by 2017

Reliable

3. Reach a steady state backlog of 12,000 meter set leaks by 2018
4. Identify and remove problematic regulators by 2018



5. Reduce unplanned meter change-outs by 2020 through the implementation of the Aging Meter Replacement Program
6. Maintain meter accuracy within industry accepted standards

1.3 Asset and Data Condition

The current condition for Customer Connected Equipment assets is assessed in the annual Gas Meter Performance Control (GMPC) report and generally rates the assets as satisfactory. Currently, there is limited data for this asset family in terms of quality, completeness and accessibility to support quantitative analysis of asset risk. Additionally, the performance indicators and metrics for trending and predicting asset performance and health, particularly leading indicators, are relatively immature. There are gaps in the available data which limits its reliability and use for monitoring impact on risk reduction and tracking metrics. This is an area for improvement for the CCE Asset Family to improve decision making going forward.

1.4 Key Risks

This asset management plan takes a risk-based approach to managing the asset to reduce risk. Proposed programs of work are risk scored with a process for prioritization across all asset families in an effort to implement programs that provide the greatest risk reduction

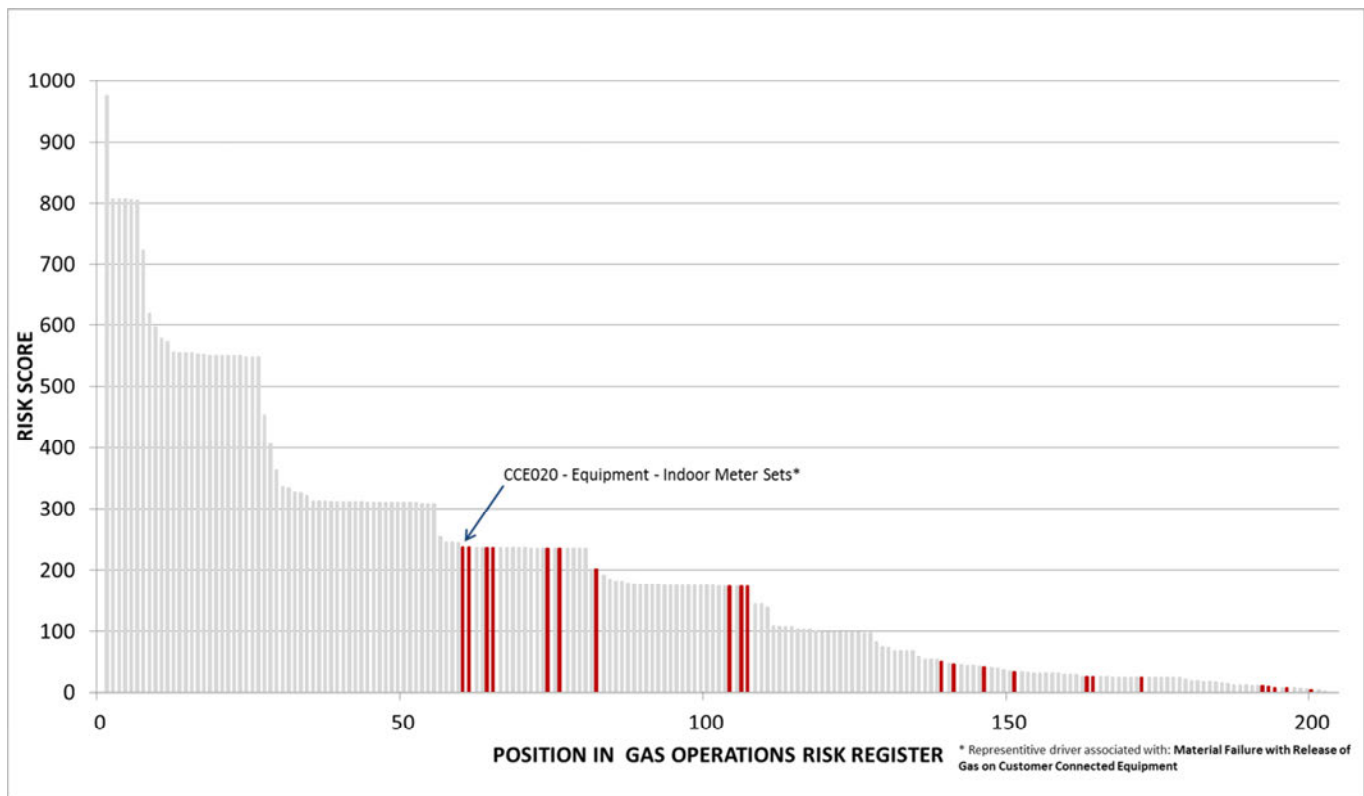
Gas Operations identifies risks for each asset family. For each threat, risk drivers and risks are identified for each asset family based on available data and SME input. The result of this process is a set of Gas Operations risks as shown in Figure 1. For this effort, risk is defined as the potential for an adverse event that can impact company's ability to achieve its objectives. Risk drivers are defined as factor(s) that could cause risk to occur.

PG&E also evaluates risks at the enterprise level. The enterprise level assessment ensures that all lines of business have risks defined at a consistent basis for enterprise level decision-making. For the enterprise assessment, the Gas Operations risks are consolidated or rolled-up to provide a higher level of risk definition consistent with all PG&E lines of business. The development of the Gas Operations enterprise risks is performed by treating the Gas Operations risks as "risk drivers" to develop higher level enterprise risks. Therefore, the enterprise risks incorporate many of the "risk drivers" (or risks) from the Gas Operations histogram.

This asset management plan is based on the risks developed for Gas Operations. There are no enterprise risks for this asset family.

The histogram below in Figure 1 displays the position of the Customer Connected Equipment risks (red) within the Gas Operations Risk Register.

Figure 1 - Customer Connected Equipment Risk Profile



1.5 High Level Program Overview

The asset management plan focuses on managing and reducing risk in the most efficient and effective manner possible. As the plan matures, focus on optimizing risks, performance and costs will continue to be strengthened. Proposed programs involve both capital and expense funding and in some cases address more than one area of risk. Detailed description of the scope of each program is found in Section 4. The work scope, pace, and trajectory for these programs are in alignment with the General Rate Case for the Customer Connected Equipment assets.

The key identified Customer Connected Equipment risks, briefly described in Table 2, are derived based on a risk score that considers the likelihood and consequence of failure. The risk drivers highlighted below are the highest among multiple threats that have been identified across the Customer Connected Equipment asset family. The full extent of risks identified is addressed in detail in Appendix C.



Table 2 - Key CCE Threats and Risks

Threat	Risk ID	Description	Primary Mitigation	Mitigation Metrics
Equipment- Indoor Meter Sets	CCE20	Failure of indoor meter sets may result in loss of containment leading to public safety issue.	Leak Survey and AC Inspections	Leak Repair Completion AC Remediation
Material	CCE29	Purchase and use of unapproved fitting or self-fabricated materials (e.g. drips) used on meter sets assemblies may result in loss of containment leading to ignition and safety impact.	Guidance documents and material codes are in place.	None planned
Material Traceability	CCE30	Lack of traceability on regulators may result in inability to locate and recall material resulting in defective material being left in the field resulting in loss containment or over pressurization event which leads to a safety impact	Not Yet Developed	Not Yet Developed
Other Outside Forces- Building and Meter Interaction	CCE31	Damage due to building meter interaction (e.g. during an earthquake) may lead to loss of containment and public safety impacts	Operations Technology Development (OTD) project: (5.11.s): Breakaway Disconnect Fitting for Meter Set Assemblies has been initiated Pre-determined staffing levels for emergency response (Earthquake Damage Model)	None planned
Equipment or Other Outside Force – end of Life Failure	CCE07	End of life failure of gas regulator or, regulator vent debris may result in over pressurization of the customer house line leading to public safety issue.	Replace the regulator if it is 20 years or older when replacing meter. Regulators are visually inspected during leak survey and atmospheric corrosion inspections.	None planned

Of the 204 Gas Operations Risks, the top CCE risk (CCE20) is ranked 62.



2. Asset Inventory and Condition

2.1 Asset Overview

The physical assets within the Customer Connected Equipment asset family include gas meters, service regulators, over- pressure protection devices, distribution service valves, piping and fittings, smart meter modules and communications equipment.

Table 3 describes the different asset types that comprise the Customer Connected Equipment asset family.

Table 3 - Customer Connected Equipment Overview

Asset Type	Description
Gas Meter	Meters measure the quantity of gas utilized by the customer for billing purposes. Includes: <ul style="list-style-type: none">• All Diaphragm meter types• All Rotary meter types• All Turbine meter types Ultrasonic and Orifice meter types belong to the Measurement and Control asset family.
Service Regulator	Service regulators lower distribution pressure to the intended utilization pressure and provide the flow required for the safe operation of customers' house lines and equipment. They are installed when the service line pressure is higher than the required utilization pressure.
Over-pressure protection device	Over-pressure protection devices, such as monitor regulators and internal relief valves, protect customers' equipment in the event of a regulator failure.
Distribution service shutoff valve (Service Valve)	The service shut off valve's main function is to provide isolate capability to the downstream equipment from the pressurized distribution service.
Associated piping and fittings	Piping, tees, elbows, union joints, O-rings, swivels, plugs, manifolds, pipe supports, regulator vent lines.
Smart Meter Module	Reads meter on a regular basis and transmits the reading to central servers.
Communications Equipment	These assets automate the monitoring of gas demand and include: <ul style="list-style-type: none">• Temperature Compensating Index (TCI) with Meter Transmitting Units (MTUs)• Electronic correctors with automatic meter readings• Customer pulse output devices

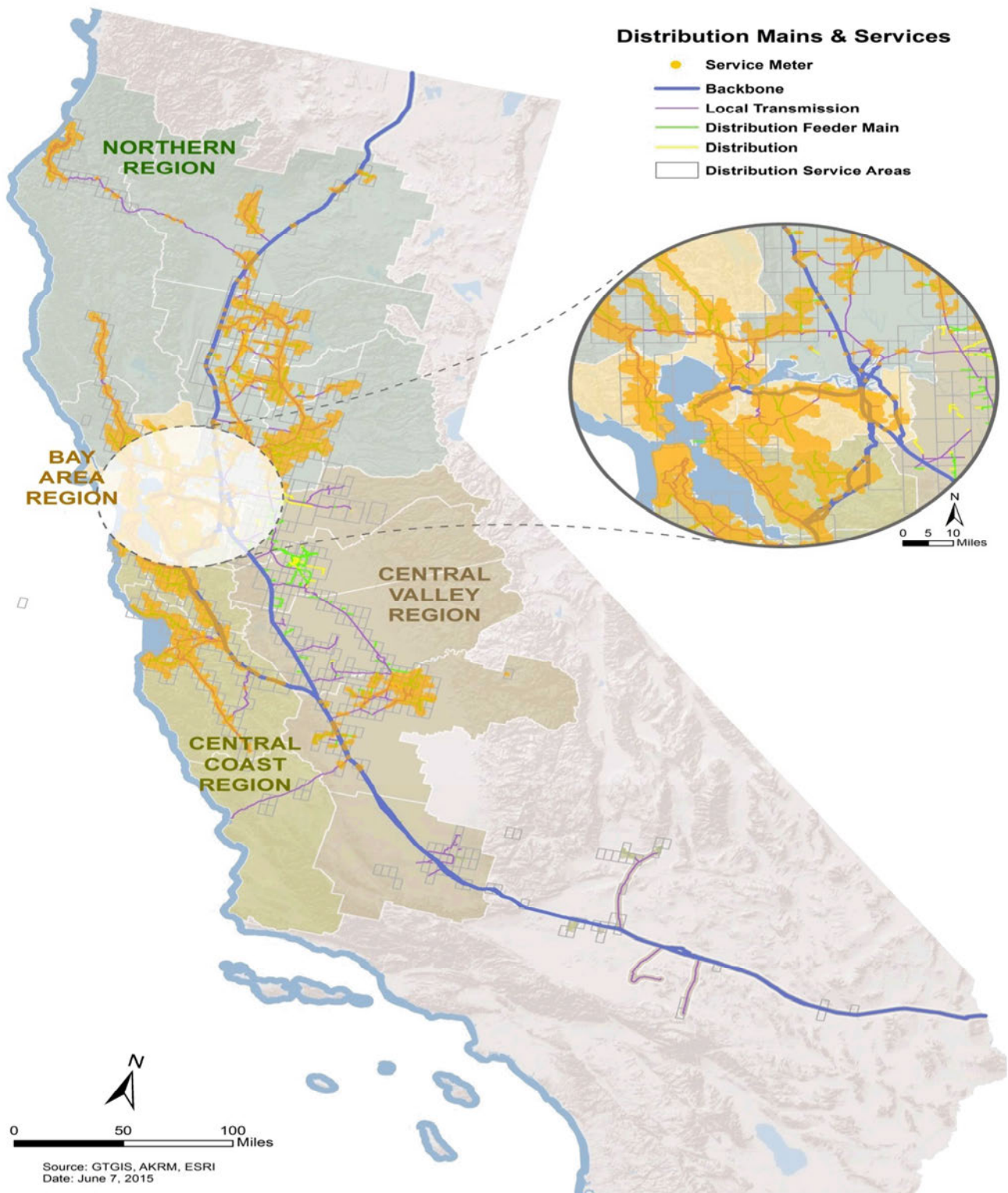
PG&E has approximately 4.5 million gas billing meters in service. Almost all meter locations are located outside and above ground of the facility being served. Small populations of the total gas meter population are below ground installations or are located within the facility being served. In a majority of the Customer Connected Equipment, the distribution gas pressure is too high for direct use in customer appliances. Pressure is reduced by a regulator prior to delivery to the customer. Some gas customers are equipped with a second regulator called a monitor to provide a redundant pressure control device. There are approximately 13,400 monitor regulators.



The gas distribution system canvases PG&E's service territory from Bakersfield to the Oregon border. Figure 2 shows where the meter facilities exist in PG&E's service territory.



Figure 2 - Map of PG&E's Gas Distribution System

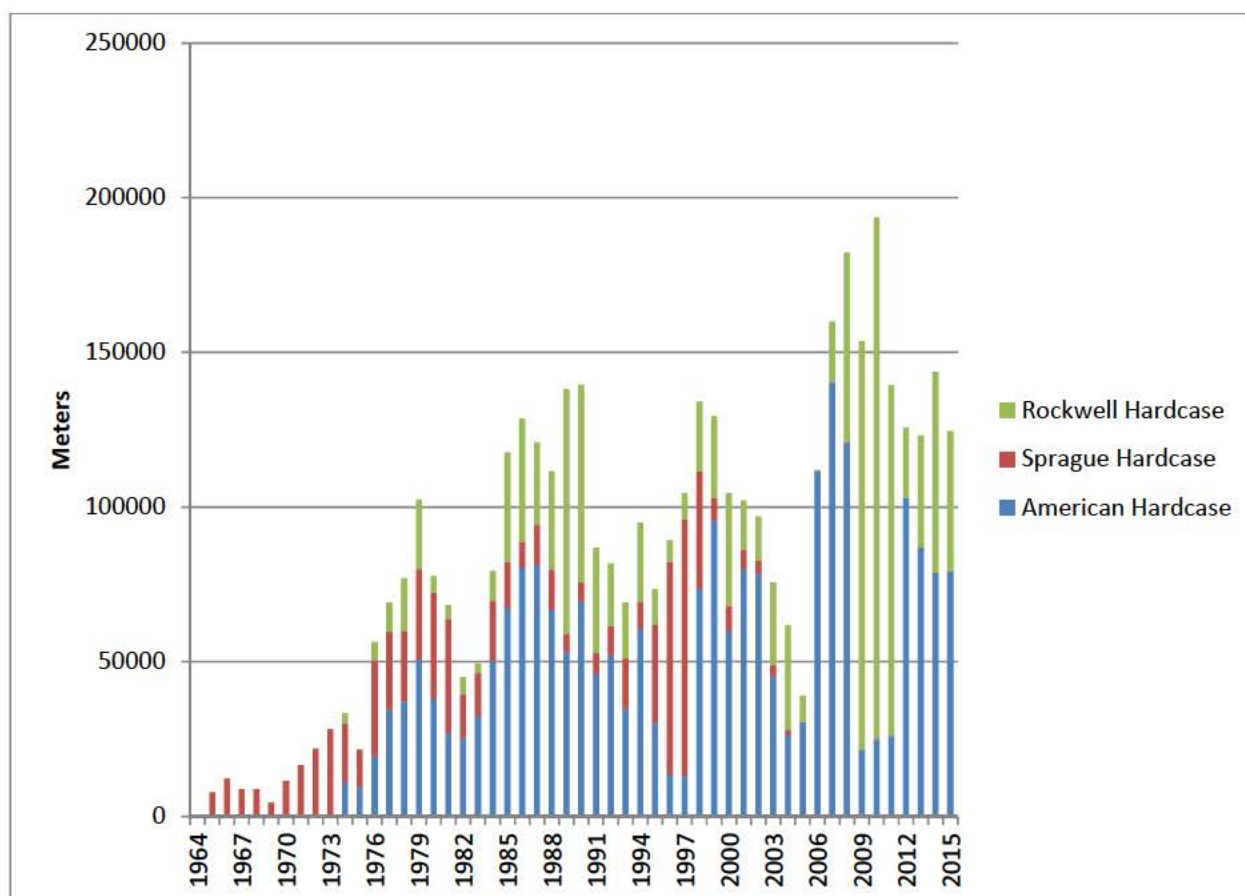


2.2 Asset Inventory and Condition

The majority of data describing the age and condition of assets in the CCE family are for the meters. Information on the regulators is not generally available or complete. There are approximately 4.5 million meters in the CCE asset family with an average age of 29 years. The majority of meters are expected to have a life of approximately 35 years on average, although some can perform reliably for much longer.

Meters can be generally categorized into large meters and small meters. Figure 3 illustrates the distribution of meters by Set Year since the mid-1960s.

Figure 3 - Distribution of Meters by Type and Set Year



Source: Gas Meter Performance Control Program (GMPCP) 2015 Annual Report

The primary information on the condition of the CCE assets comes from meter maintenance and inspection programs.

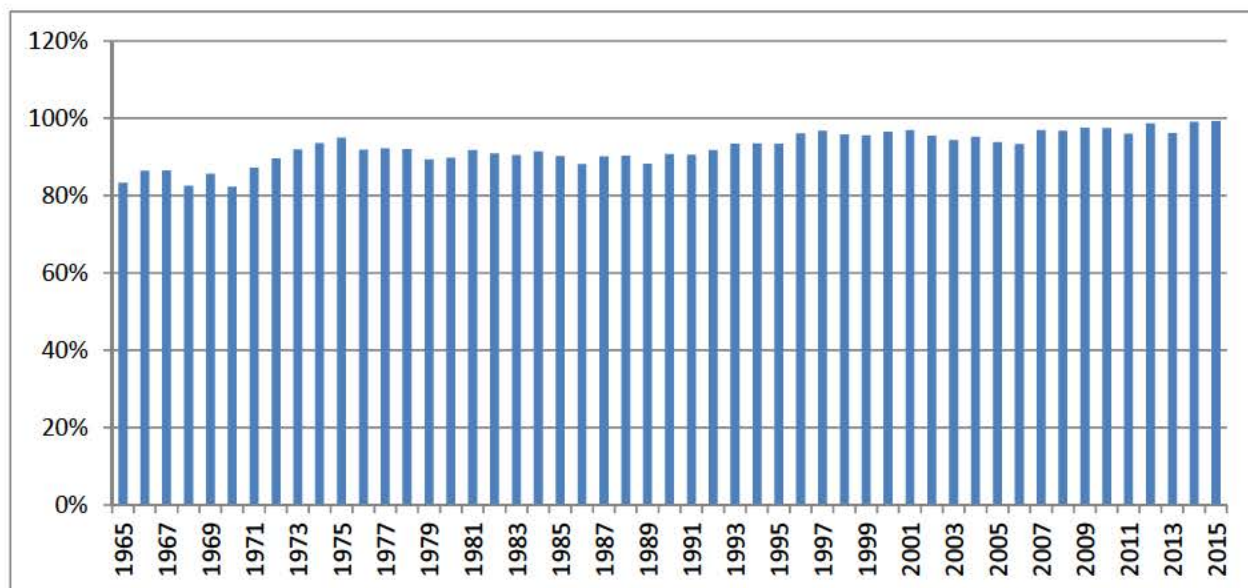
The Gas Meter Performance Control Program (GMPCP) monitors and maintains the accuracy of PG&E's diaphragm gas meters and small rotary meters (capacity less than or equal to 1,000 cubic feet per hour). The GMPCP consists of the Statistical Meter Performance Control Program (SMC) and the Periodic Meter Change (PMC) Program. The Statistical Meter Performance Control Program detects and



removes any group of smaller gas diaphragm meters whose performance does not meet the prescribed standards of performance. The PMC Program manages the accuracy of larger diaphragm gas meters and meters that cannot be effectively managed using statistical techniques. PMC Program meters are tested for accuracy prior to installation and allowed to remain in service up to 10 years. CCE is also inspected every 3-years as part of the Atmospheric Corrosion Inspection Program and every 1-5 years as part of the Leak Survey Program. Data compiled from these maintenance and inspection programs provides the majority of information available on asset condition.

In Figure 4 the percentage of meters that are accurate relative to the meters tested in 2015 are shown below.

Figure 4 - Percentage of Small Meters Accurate Relative to Test Meters



Source: Gas Meter Performance Control Program (GMPCP) 2015 Annual Report



3. Threats and Risks

Risks are tracked in an enterprise-wide risk register, a central repository where risk names, descriptions and scores (as determined by utilization of Enterprise Operational Risk Management's (EORM) risk criteria) along with other pertinent information are documented. The risk register is updated and refined as additional information is obtained and evaluated.

The risk management framework is fully integrated into PG&E's Integrated Planning Process (IPP). Additional information about the integrated planning process can be found in the Strategic Asset Management Plan, GP-1100.

3.1 Threat and Risk Identification

To identify the Gas Distribution Customer Connected Equipment risks, the Asset Family Owner (AFO) works with their team and other Subject Matter Experts (SMEs) to identify asset threats. The AFOs rely on the 49 Code of Federal Regulations (CFR) Part 192, subpart P threat categories shown in Table 4.



Table 4 - Customer Connected Equipment Threat Categories

Threat Category	Description	Specific Threats
Time-Dependant	Potentially increase over time	<ul style="list-style-type: none">• External Corrosion•
Stable or "Resident"	Present, or potentially inherent in the pipeline, but do not grow over time or pose a threat unless influenced by another condition or failure mechanism	<ul style="list-style-type: none">• Material or Weld• Equipment Related
Time-Independent	Not influenced by time	<ul style="list-style-type: none">• Excavation Damage• Incorrect Operation• Natural Forces• Other Outside Forces

Having identified the various threats applicable to the Asset Family, each AFO works with their team and other Subject Matter Experts (SMEs) to determine the relative risk associated with each threat. The impact and frequency levels are selected using available data and subject matter judgment. The enterprise Risk Evaluation Tool (RET) is used to calculate the risk score based on a set criteria. The AFOs meet with the Gas Operations Risk Management team to calibrate and validate the ranking of each risk. The Gas Operations Risk Management team then calibrates and validates the risk rankings with other Lines of Business across the enterprise.

3.1.1 Primary Threats and Mitigations

The threat matrix in Appendix B lists the primary threats that have been identified for the Customer Connected Equipment asset family. These threats guide the identification of the risks contained in the Customer Connected Equipment Risk Register.

3.1.2 Primary Customer Connected Equipment Risks

The Customer Connected Equipment asset family identified 22 risks in 2016. The top risk (CCE20) ranked 62 among the 204 risk in Gas Operations.



Table 5 - Key Customer Connected Equipment Risks

Risk ID	Threat	Risk Description
CCE20	Equipment Failure	Failure of indoor meter sets may result in loss of containment, leading to public safety issue.
CCE29	Material	Purchase and use of unapproved fittings or self-fabricated materials (e.g. drips) used on indoor meter set assemblies may result in loss containment leading to ignition and safety impact
CCE30	Material Traceability	Lack of traceability on regulators may result in inability to locate and recall material resulting in defective material being left in the field resulting in loss of containment or an over pressurization event which leads to a safety impact
CCE31	Other Outside Force	Damage due to building-meter interaction (e.g. during an earthquake) may lead to loss of containment and public safety impacts
CCE07	Equipment or Other Outside Force – End of Life Failure	End of life failure of gas regulator or, regulator vent debris may result in over pressurization of the customer house line leading to public safety issue.

**For all Customer Connected Equipment risks see Appendix C

3.2 Integrity Management Programs

Distribution Integrity Management Program

PG&E's Distribution Integrity Management Program (DIMP), based on the federal regulation (49 Code of Federal Regulations (CFR) 192, subpart P), evaluates and ranks the risks to the gas distribution system and proposes mitigations to address those risks. The risk process for this program gathers, reviews and integrates data to calculate risk, identifies mitigative measures and monitors for effectiveness. Additional information about the DIMP can be found in Procedure RMP-15 (Risk Management Procedure - Gas Distribution Integrity Management Program).

PG&E identifies relative risk through subject matter expertise of its staff and industry experience, historical performance of the system as indicated by leak history and the application of various threats to pipeline assets using its risk algorithm. Mitigating actions such as inspection, repair, and replacement are considered to address each high priority asset risk. The DIMP is still evaluating ways to include CCE into its integrity management programs.



4. Desired State, Strategic Objectives, Programs and Risk Mitigations

The CCE asset family's strategic objectives are developed to maintain and improve asset condition and mitigate risks and threats. These strategic objectives also support PG&E's Line of Sight (LoS) goals.

Using these inputs, a long-term plan has been defined to meet CCE Asset Management and corporate objectives.

The long term plan is to minimize the number of new indoor meter sets created during reconstruction activities and to have appropriate safeguards on indoor meter sets when no alternative location is possible. Eliminating new indoor meter sets will reduce CCEs top risk and provide better access to equipment with reduced impact to customers. As stated in Table 6, a policy to minimize the installation in new inside meter sets will be implemented by the end of 2017.

The CCE strategic asset objectives and associated metrics as they correspond to Gas Operations' LoS goals are detailed in Table 6 below:

Table 6 - Strategic Objectives Mapped to Gas Operations Line of Sight (LoS) Goals

Corporate Objectives	CCE Strategic Objectives	Metric
Safe	Meet meter protection regulatory commitments by 2016	100% of meters within the program are protected
Safe	Implement a policy that minimizes the number of new inside meter sets installed during new reconstruction projects by 2017	Policy fully (100%) implemented by November 17, 2017
Reliable	Reach a steady state backlog of 12,000 meter set leaks by 2018	Number of backlog for meter set leaks
Reliable	Identify and remove problematic regulators by 2018	Number of Regulator Replacement
Reliable	Reduce unplanned meter change-outs by 2020 through the implementation of the Aging Meter Replacement Program	Maintain a favorable trend in the number of corrective meter change-outs
Reliable	Maintain meter accuracy within regulatory required standards	Customer bills adjusted after mailing



4.1 Strategic Objectives, Programs & Mitigations Alignment

PG&E has developed the following programs to meet these strategic objectives:

Table 7 - Programs, Mitigations, and Strategic Objectives

Programs & Mitigations	Asset Family Strategic Objectives				
	Meet meter protection regulatory commitment by December 2016	Reach a steady state backlog of 12,000 meter set leaks by 2018	Identify and remove problematic customer regulators by 2018	Reduce unplanned meter change-outs by 2020	Maintain meter accuracy within regulatory required standards
Leak Repair		X			
Non-IRV Identification and Replacement			X		
Meter Performance Control Program				X	X
Meter Protection Program	X				



4.2 Programs and Mitigations Overview

Program: Meter Set Leak Repair
Scope: Perform meter set leak repair and other repair work including atmospheric corrosion remediation and meter and regulator replacement.
Desired State: Prevent and reduce leaks on meter sets
Risk Addressed: CCE-20, CCE-7, CCE-26, CCE-16,
Timeframe: On-going
Mitigation: Leak Surveys, Atmospheric Corrosion Inspections
Metric: Meter Set Leak Backlog
Responsible Organization: Leak Management
Program: Gas Meter Performance Control Program (GMPCP)
Scope: The GMPCP is a program that monitors meter accuracy. The GMPCP meets the requirements of California Public Utility Commission General Order 58-A, Standards for Gas Service in the State of California. Included in the GMPCP are the following maintenance programs: <ul style="list-style-type: none">i. Statistical Meter Change Program- Identifies meter groups that are performing outside of accuracy limits allowed by regulatory requirements and remove them from service.ii. Periodic Meter Change Program- Schedules certain gas meters to be replaced based on a pre-determined basis.
Desired State: Maintain meter accuracy within regulatory required standards
Risk Addressed: CCE-20, CCE-7, CCE-26, CCE-6,
Timeframe: On-going
Mitigation: Scheduled Meter Change (SMC), Periodic Meter Change
Metric: Actual Units vs. Planned Units
Responsible Organization: Field Services and Gas Pipeline Operations and Maintenance



Program: Gas Regulator Replacement
Scope: This program focuses on the replacement of regulators without internal relief valves (non-IRV regulators). The goal of this program is to ensure regulator equipment has appropriate over-pressure relief capabilities to prevent houseline pressure build-up under low or no-flow conditions and to provide over-pressure protection to the equipment downstream of the regulator.
Desired State: Inspections to identify non-IRV regulators are complete and all identified regulators have been replaced by the end of 2018.
Risk Addressed: CCE-20, CCE-7, CCE-5, CCE-26, CCE-6
Timeframe: On-going
Mitigation: Residential Gas Regulator Replacement
Metric: Actual Units vs Planned Units
Responsible Organization: Field Services
Program: Meter Protection Program
Scope: Ensure that gas meter locations not in conformance with current PG&E standards and or federal pipeline safety regulations are addressed. The program focuses on two types of non-conforming meter locations: 1. Those with inadequate protection from damage by vehicles; and 2. Those with inaccessible service or shutoff valves
Desired State: Installation of barrier posts to protect above ground gas facilities (meters and risers) from damage by vehicles. The installation of a new service valve or the relocation of an existing service valve to an accessible location.
Risk Addressed: CCE-2, CCE-16
Timeframe: On-going
Mitigation: Corrective Maintenance
Metrics: Number of locations that require protection or service valves to be installed.
Responsible Organization: Gas General Construction

Program Investment Plan

For the latest program investment plan information contact the Gas Operations Investment Planning organization.

5. Areas for Continuous Improvement

There are some areas in the asset management plans that have not been fully built out at this stage; these are highlighted in Table 8 below. These are areas that will continue to evolve and improve as more complete data sets and understanding of asset condition are developed over time.

Table 8 - Areas for Continuous Improvement

Areas for Continuous Improvement	
Risk Process	<ul style="list-style-type: none"> Continue developing list of subject matter experts who can be relied upon in the Risk Register process
Performance Metrics	<ul style="list-style-type: none"> Development of performance indicators in order to measure, monitor and report on asset performance and condition
Data	<ul style="list-style-type: none"> Continue to develop programs or processes to address data gaps
Asset Management Plan	<ul style="list-style-type: none"> Continue to work with other asset families to develop consistency in plan content Ensure asset management plans are the primary source of asset family information and incorporates information from the Threat Matrices, Risk & Compliance Committee meetings, Session D, S1, and S2 Improve criteria for identifying mitigation program status, including benchmarking criteria, program effectiveness metrics, and funding fulfillment
Personnel Implications	<ul style="list-style-type: none"> Identify development plans for subject matter experts to ensure their knowledge and skills remain current Continue developing skills of Asset Management Principals



APPENDICES



A. Related Documents

The following table lists documents associated with this asset management plan.

Table 9 - Related Documents

Related document	Document Number / Description	Link
Customer Connected Equipment Risk Register	The risk register captures all risks outlined in this plan at the data of publish	http://gasrisk/
Asset family investment planning forecast	Retained by investment planning for S1 and S2 planning purposes.	
Enterprise and Operational Risk Management Standard and Procedures	RISK-5001S, RISK-5001P-01, RISK-5001P-02, RISK-5001P-03	http://pgeatwork/Guidance/RiskCompliance/Pages/default.aspx
Gas Asset Management Policy	TD-01	TD-01
Gas Operations Asset Management System Risk Management Standard and Procedure	TD-4011S, TD-4011P-01	TD-4011S and TD-4011P-01
Gas Operations Risk and Compliance Committee Charter	GOV-1021S	http://pgeatwork/Guidance/Governance/Pages/default.aspx
Strategic Asset Management Plan	GP-1100	Gas Safety Plans / Asset Management
Transmission Pipe Asset Management Plan	GP-1101	
Distribution Mains and Services Asset Management Plan	GP-1102	
Measurement and Control Asset Management Plan	GP-1104	
Compression and Processing Asset Management Plan	GP-1105	
LNG/CNG Portable Supplies Asset Management Plan	GP-1106	
CNG Station Asset Management Plan	GP-1107	
Gas Storage Asset Management Plan	GP-1108	

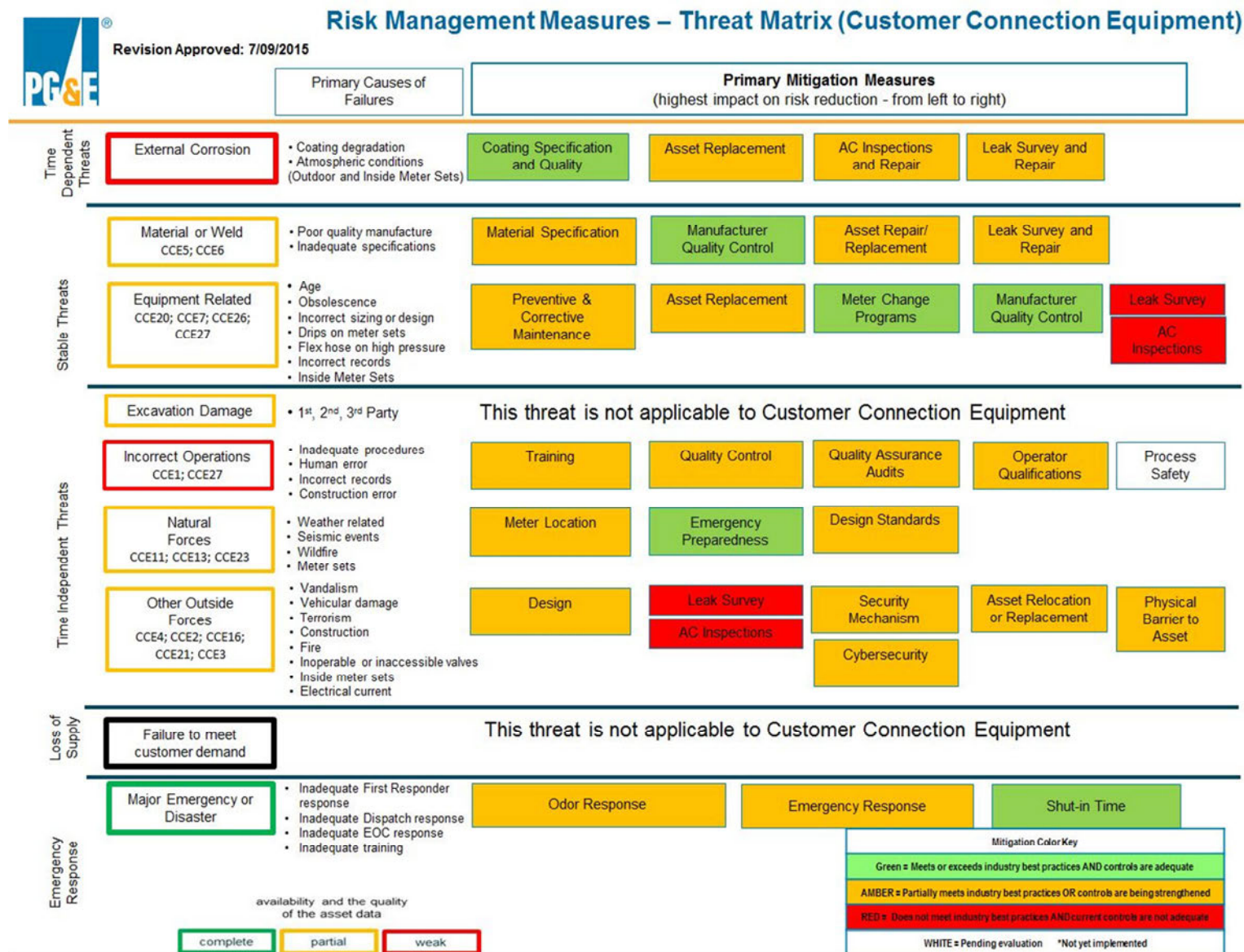


B. Threat Matrix & Key Threats

The threat matrix below displays threats, drivers, and mitigations associated with this asset family. The threats are outlined with a red, amber, or green status denoting the current availability and quality of asset data. The mitigations are color coded with white, red, amber, or green status to display how it currently compares to industry best practices as well as the strength of the controls.



Figure 5 - Customer Connection Equipment Asset Threat Matrices





Key Threats

In order to identify key threats to the Customer Connected Equipment asset family, national and PG&E data was evaluated. Following are summaries of incidents in US gas meter / regulator sets as well as PG&E's gas meter / regulator sets from the past five years, organized by primary cause.

Table 10 - Industry and PG&E Reported Gas Meter/ Regulator Sets Significant Incidents by Cause in the U.S. (2010-2016)

Significant Incident Cause, Inside/Outside Meter Sets	All Significant Industry Incidents	Percent of Total	Significant PG&E Incidents	Percent of Total
Equipment Failure	1	2%	0	0%
Corrosion Failure	0	0%	0	0%
Material Failure of Pipe and Weld	0	0%	0	0%
Incorrect Operation	4	7%	0	0%
Natural Force Damage	6	10%	0	0%
Other Outside Force Damage	39	67%	5	100%
Other Incident Cause	8	14%	0	0%
Excavation Damage	0	0%	0	0%
Total	58	100%	5	100%

Source: PHMSA Natural Gas Distribution Significant Incident Data through May 31, 2016

C. Asset Family Risks

The Customer Connection Equipment asset family risks below are sorted below by risk score.

Table 11 - Customer Connected Equipment Risks

Threat	Risk ID	Risk Description
Equipment Failure	CCE20	Failure of indoor meter sets may result in loss of containment, leading to public safety issue.
Material	CCE29	Purchase and use of unapproved fittings or self-fabricated materials (e.g. drips) used on indoor meter set assemblies may result in loss containment leading to ignition and safety impact
Material Traceability	CCE30	Lack of traceability on regulators may result in inability to locate and recall material resulting in defective material being left in the field resulting in loss of containment or an over pressurization event which leads to a safety impact
Other Outside Forces	CCE31	Damage due to building meter interaction (e.g. during an earthquake) may lead to loss of containment and public safety impacts
Equipment Failure	CCE7	End of life failure of gas regulator or, regulator vent debris may result in over pressurization of the customer house line leading to public safety issue.
Natural Forces (Flood)	CCE11	Flood event may result in submergence of multiple house regulators and over pressurization of house lines, the release of gas into homes and ignition leading to public safety issues.
Other Outside Force	CCE33	Installation of roof-top customer connected equipment may result in inaccessibility issues leading to inadequate maintenance resulting in loss of containment resulting in migration into the building resulting in a public safety impact
Material or Weld	CCE5	Inadequate customer regulator design left in service may result in in over pressurization of the customer house line, leading to public safety issue.
Natural Forces	CCE35	Lightning strike or electric fault may result in damage to the meter set (indoor or outside) with release of gas and ignition leading to safety impact and property damage
Natural Forces (Seismic)	CCE13	Seismic event may result in failure of large diaphragm meters and loss of containment and ignition leading to public safety issue.
Other Outside Force	CCE32	Inadequate clearance is a result of others action
Other Outside Force	CCE4	Third party damage due to construction & redevelopment may result in loss of containment and ignition leading to public safety issue.
Equipment Failure	CCE26	Meter and/or regulator fails to deliver gas to customer may result in loss of service to a large or critical customer shutting down their operations which could lead to a chemical process failure leading to facility damage and injury.



Threat	Risk ID	Risk Description
Other Outside Force	CCE2	Third party damage due to vehicles on a meter which should have meter protection may result in loss of containment and ignition leading to public safety issue
Material or Weld	CCE6	Poor quality control of regulator and meter set manufacturing may result in faulty equipment with loss of containment and ignition leading to public safety issue.
Other Outside Force	CCE28	Unsafe grounding configuration on the houseline at the meter location may result in a potential ignition of gas during maintenance activities resulting in a safety impact employees
Natural Forces	CCE23	Settlement of soil causing riser to break meter or regulator piping to multi-residential buildings may result in loss of containment ignition and public safety issue.
Other Outside Force	CCE16	Inoperable or inaccessible service valve on multi-residential building may result in delayed emergency response leading to extended gas release, ignition and public safety issue.
Incorrect Operations	CCE1	Failure to replace customer meters may result in over billing on multiple accounts leading to non-compliance with CPUC requirements and impact to reputation or, may result in under billing on multiple accounts leading to financial loss to PG&E.
Other Outside Force	CCE21	Fire adjacent to assets that could destroy meter or regulator set may result in gas release leading to increased fire damage.
Other Outside Force	CCE3	Vandalism on meter set assembly may result in release of gas and ignition leading to public safety issue.



D. Stakeholder Roles and Responsibilities Matrix

The key contacts are stakeholders who are involved in each phase of the asset life cycle, managing and operating the assets to operate as planned.

Table 12 - Stakeholder Roles and Responsibility Matrix

Stakeholder Group	Primary Contact	Creation / Enhancement				Utilization	Maintenance	Decommission/ Dispose
		Conception	Design	Procedure	Construct /Start-up			
Compliance	Compliance Director	X	X	X	X	X	X	X
Meter Asset Engineering	Meter Asset Engineering Director	X	X	X	X			X
Customer Services	Gas Meter Programs Manager	X	X	X		X		X
Transmission and I&R	Gas T&D Pipeline Ops and Maint Director				X		X	X
Wholesale Marketing & Business Development	Wholesale Mktg and Bus Dev Director	X						X
General Construction	Gas T&D Construction Sr. Director				X			X
M&C Construction	M&C South and North Directors						X	X
Field Operations	Field						X	X

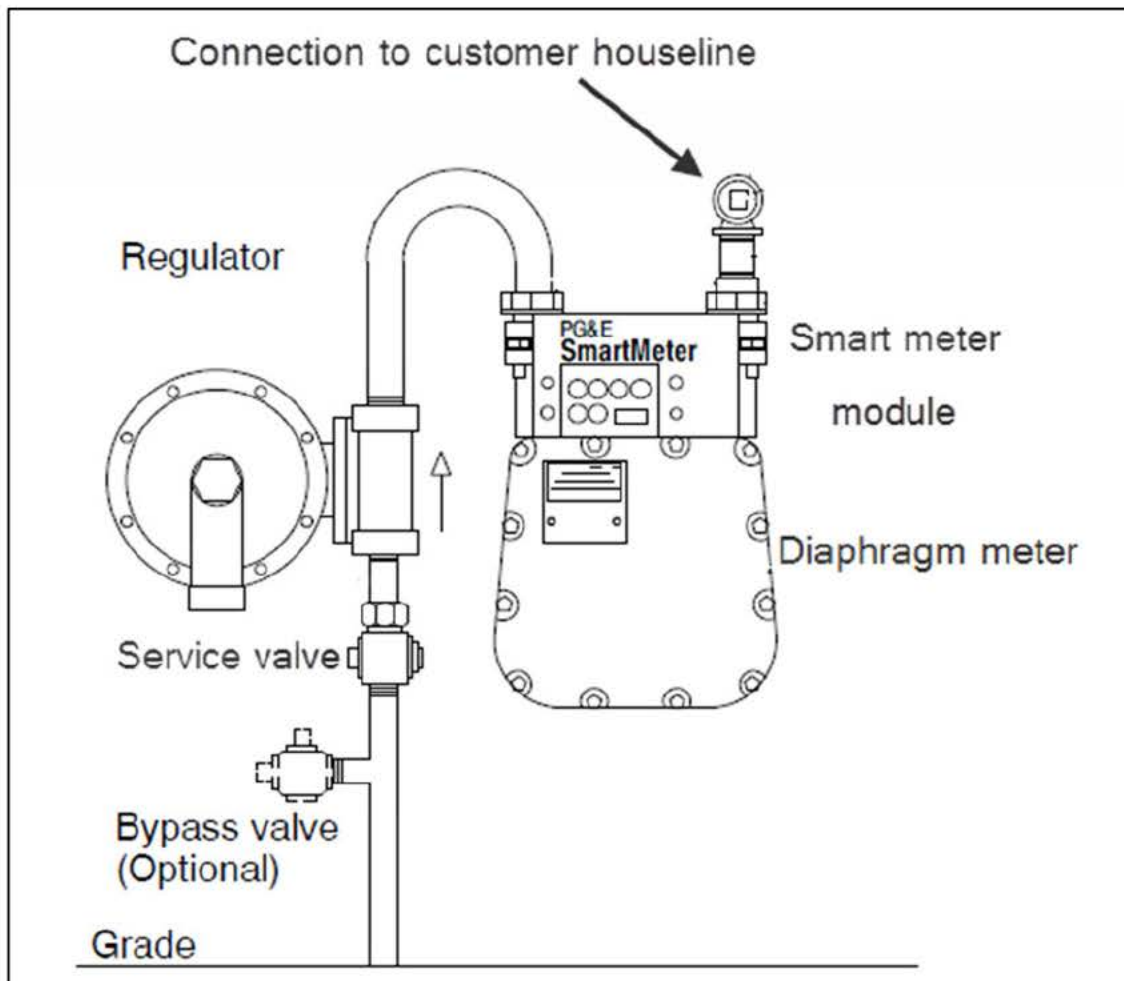


	Services North and South Directors							
Codes and Standards	Codes, Standards and Training Director		X		X	X	X	X



E. Meter Assemblies

Figure 6 - Domestic Diaphragm Meter Set Assembly

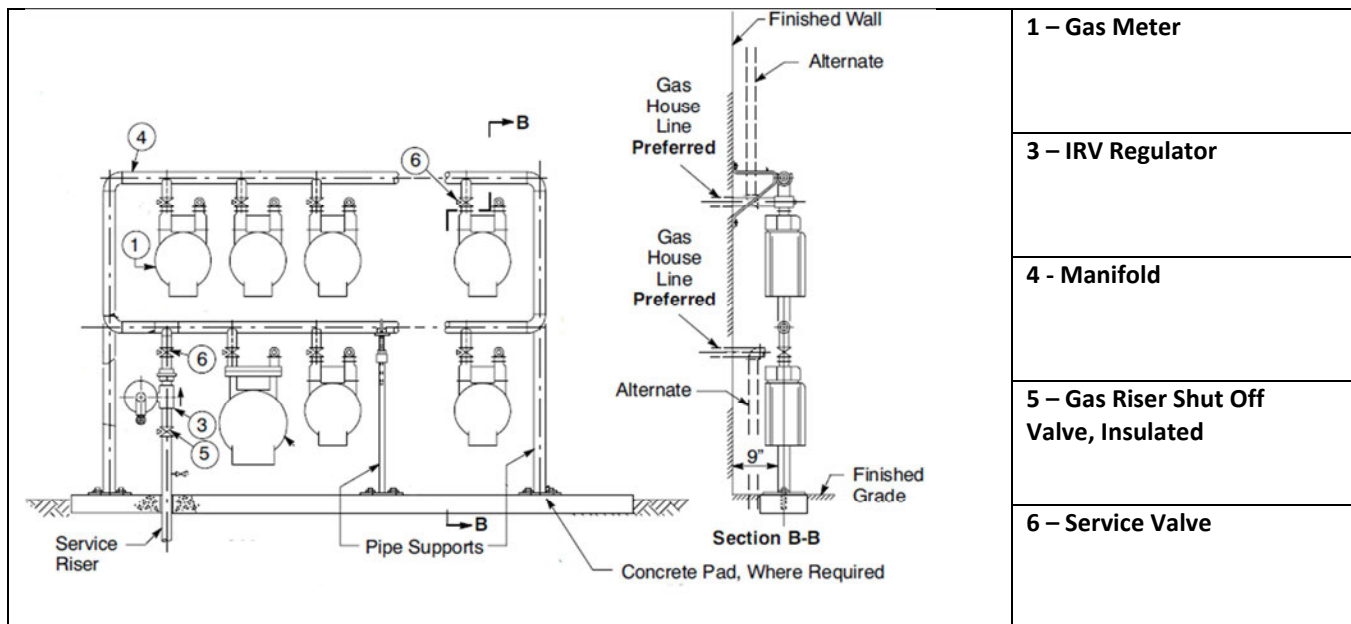


Source: Gas Standards: 400-800 (#3 CONNECTION SIZE) DIAPHRAGM GAS METER INSTALLATION. Revision 0

Note: Not all components required for some installations

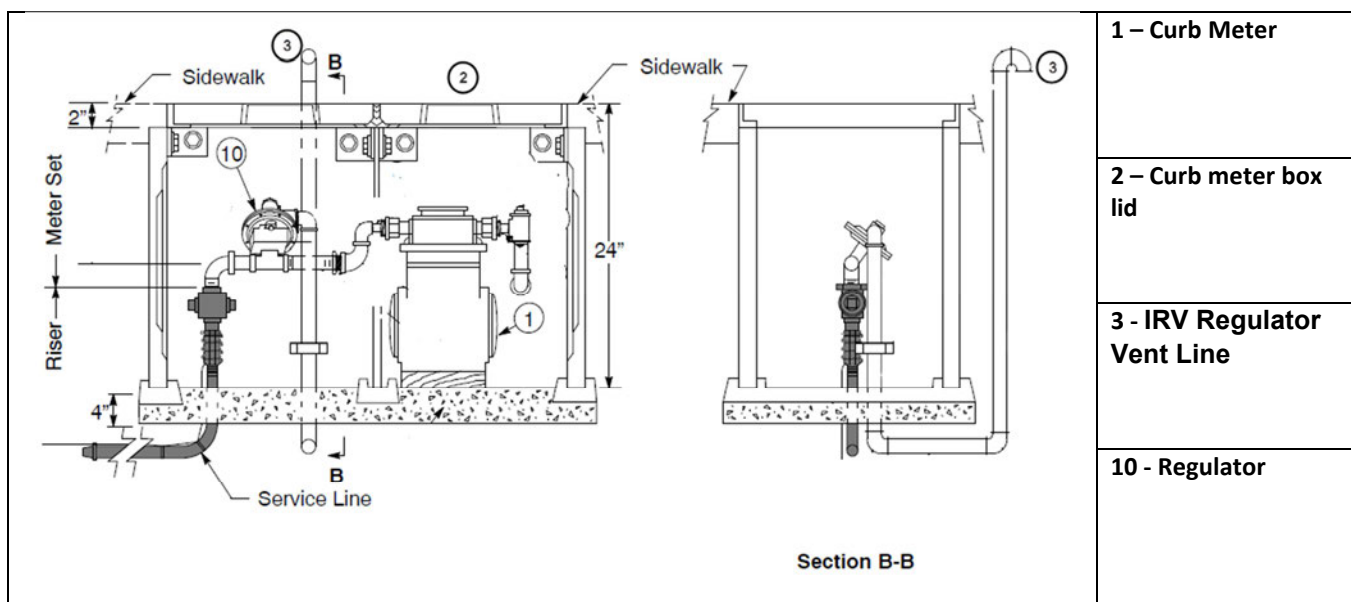


Figure 7 - Stacked Manifold Meter Installation



Source: Gas Standards: GAS METER MANIFOLDING. Revision 2

Figure 8 - Curb Meter Installation (Profile View)



Source: Gas Standards; CURB METER INSTALLATIONS. Revision 3



F. Glossary of Acronyms and Abbreviations

The following is a glossary of acronyms and abbreviations used in this asset management plan and related documents.

Table 13 - Acronyms and Abbreviations

Acronym	Meaning
AC	Alternating Current
AC	Atmospheric Corrosion
AF	Asset Family
AFO	Asset Family Owner
AHS	Asset Health Scorecard
AMP	Asset Management Plan
AMR	Automated Meter Reading
ANSI	American National Standards Institute
APD	Abnormal Peak Day
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
Bcf	Billion cubic feet
BHP	Brake Horsepower
BTU	British Thermal Unit
C&P	Compression & Processing
CAP	Corrective Action Program
CC&B	Customer Care and Billing
CCE	Customer-Connected Equipment
CCR	California Code of Regulations
CDD	Critical Document Database
CFH	Cubic Feet per Hour
CFR	Code of Federal Regulations
CIS	Close Interval Survey
CM	Corrective Maintenance
CNG	Compressed Natural Gas
CNL	Compensated Neutron Log
CoF	Consequence of Failure

Acronym	Meaning
CP	Cathodic Protection
CPP	Casing Potential Profile
CPUC	California Public Utilities Commission
CSRP	Copper Service Replacement Program
CWD	Cold Winter Day
DC	Direct Current
DCVG	Direct Current Voltage Gradient
DHSV	Downhole Safety Valve
DIMP	Distribution Integrity Management Program
DOGGR	Division of Oil, Gas and Geothermal Resources
DOT	Department of Transportation
ECA	Engineering Critical Assessment
ECDA	External Corrosion Direct Assessment
EORM	Enterprise and Operational Risk Management
ERM	Enterprise Risk Management
ERW	Electric Resistance Welded
ESD	Emergency Shut Down
ESZ	Emergency Shut-down Zone
ETS	Electrolysis Test Station
FIMP	Facility Integrity Management Program
FM	Facility Maintenance
FPI	Future Performance Indicator
GC	Gas Chromatograph
GDCC	Gas Distribution Control Center
GGE	Gas Gallon Equivalents



Acronym	Meaning
GHG	Greenhouse Gas
GIS	Geographic Information System
GMPCP	Gas Meter Performance Control Program
GPRP	Gas Pipeline Replacement Program
GRC	General Rate Case
GRN	Gamma Ray Neutron
GSDB	Gas Storage Database
GSE	Gas Safety Excellence
GSR	Gas Service Representative
GT	Gas Transmission
GTI	Gas Technology Institute
GT&S	Gas Transmission and Storage
HAZOP	Hazard and Operability
HCA	High Consequence Area
HP	High Pressure
HP	Horsepower
HPR	High Pressure Regulator
I/O	Input/Output
I/W	Injection/Withdrawal
IA	Information Assurance
IC	Internal Corrosion
ICDA	Internal Corrosion Direct Assessment
IGIS	Integrated Gas Information System
IJ	Injection
ILI	In-Line Inspection
IM	Integrity Management
IMLAP	Internal Metal Loss Action Plan
INGAA	Interstate Natural Gas Association of America
I&R	Instrument & Regulation
IRV	Internal Relief Valve
KPI	Key Performance Indicator

Acronym	Meaning
LUAF	Lost and Unaccounted For
LNG	Liquefied Natural Gas
LOB	Line of Business
LoF	Likelihood of Failure
LP	Low Pressure
LRCV	Line Rupture Control Valve
M&C	Measurement and Control
M&O	Maintenance and Operations
MAME	Meter Asset Management and Engineering
MAOP	Maximum Allowable Operating Pressure
MASCP	Maximum Allowable Surface Casing Pressure
MAT	Major Activity Type
MCC	Motor Control Center
Mcf	Thousand cubic feet
MFL	Magnetic Flux Leakage
MMcf	Million cubic feet
MIC	Microbiologically Induced Corrosion
MIT	Mechanical Integrity Test
ML	Microlog
MMCFD	Millions of Cubic Feet per Day
MOP	Maximum Operating Pressure
MPP	Meter Protection Program
MPR	Material Problem Reporting
MSA	Meter Set Assembly
MTTF	Mean Time to Failure
MTTR	Mean Time to Repair
MTU	Meter Transmitting Units
MWC	Major Work Category
NDE	Non-Destructive Examination
NFPA	National Fire Protection Association



Acronym	Meaning
NOV	Notice of Violation
NOx	Nitrogen Oxides
OBS	Observation
OEM	Original Equipment Manufacturer
OPF	Over-Pressure Frequency
OPP	Over-Pressure Protection
OSHA	Occupational Safety and Health Administration
PAP	Public Awareness Plan
PCC	Provider Cost Center
PCM	Pipeline Current Mapper
PG&E	Pacific Gas and Electric
PHA	Process Hazard Analysis
PHMSA	Pipeline and Hazardous Materials Safety Administration
PIR	Potential Impact Radius
PLC	Programmable Logic Controller
PLM	Pipeline Maintenance
PM	Preventive Maintenance
PMC	Periodic Meter Change
PRCI	Pipeline Research Council International
PS	Portable Supply
psig	Pounds per Square Inch Gauge
PSRS	Project Status Reporting System
PSSR	Pre-Startup Safety Review
QRA	Quantitative Risk Assessment
RCC	Risk and Compliance Committee
RCV	Remote Control Valves
RIM	Records Integrity Management
RMP	Risk Management Procedure
RTU	Remote Terminal Unit
SAP	Systems, Applications, Products

Acronym	Meaning
SCADA	Supervisory Control and Data Acquisition
SCC	Stress Corrosion Cracking
SCCDA	Stress Corrosion Cracking Direct Assessment
SLA	Service Level Agreement
SMC	Statistical Meter Control
SME	Subject Matter Expert
SMYS	Specified Minimum Yield Strength
SP	Spontaneous Potential
STPR	Strength Test Pressure Report
SWD	Salt Water Disposal
SWGR	Switchgear
T&R	Transmission & Regulation
TCS	Turner Cut Station
TIMP	Transmission Integrity Management Program
TOX	Thermal Oxidizers
TPL	Tangible Property List
TSA	Transportation Security Administration
UPSV	Uphole Safety Valve
USA	Underground Service Alert
USGS	United States Geological Survey
UVIR	UltraViolet InfraRed
VAC	Volts Alternating Current
VFD	Variable Frequency Drives
VIDED	Vehicular Improvised Explosive Device
WD	Withdrawal
WELL	Well Integrity Management Program
WRO	Work Requested by Others
WSS	Whiskey Slough Station



G. Change Log

The following table summarizes revisions since the previous publication of GP-1103: Customer Connected Equipment Asset Management Plan, Revision 2, 8/12/2015.

Table 14 - Asset Management Plan Change Log

Date	Section	Change	Reason for Change	Implication of Change
2/11/15	Entire Asset Management Plan	Reformatted structure and streamlined content	Address feedback from internal and external plan stakeholders	
7/01/16	Entire Asset Management Plan	Updated charts and table	Updated with current data	
7/01/16	Section 4	Added one objective and refined one existing objective	New objective identified	
7/01/16	Appendix C	Revised Asset Family Risks	Risk Scores and risk ranking updated to align with 2016 Risk Register Refresh	