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Risk Assessment and Mitigation Phase
Cross-Functional Factor

(SCG/SDG&E-CFF-4)
Foundational Technology Systems

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CROSS-FUNCTIONAL FACTOR: FOUNDATIONAL TECHNOLOGY SYSTEMS

I. INTRODUCTION

This Foundational Technology Systems Cross-Functional Factor (CFF) Chapter describes how Foundational Technology Systems activities impact the risks described in Southern California Gas Company's (SoCalGas) and San Diego Gas & Electric Company's (SDG&E) Risk Assessment Mitigation Phase (RAMP) risk chapters.

SoCalGas and SDG&E (the Companies) present CFF information in this RAMP Report to provide the Commission and parties additional information regarding the risks and mitigations described in their RAMP risk chapters. CFFs are not in and of themselves RAMP risks. Rather, CFFs are drivers, triggers, activities, or programs that may impact multiple RAMP risks. CFFs are also generally foundational in nature. Therefore, SoCalGas and SDG&E's CFF presentation differs from their RAMP risk chapters (*e.g.*, no risk spend efficiency calculations or alternatives are provided). SoCalGas's and SDG&E's CFF chapters provide narrative descriptions of the CFF projects and programs that impact multiple SoCalGas and SDG&E RAMP risk chapters through the 2022-2024 timeframe. Related cost forecasts are provided as available, consistent with an expected test year (TY) 2024 general rate case (GRC) request.

As described below, Foundational Technology Systems is an enterprise-wide framework that provides a standardized approach for managing risk and safety across assets and activities. Therefore, the Foundational Technology Systems CFF spans multiple business lines and helps to mitigate several RAMP risks in this Report.

II. OVERVIEW

Foundational Technology Systems are necessary to provide safe and reliable service to the public. These systems are used in every aspect of operations, customer engagement, and emergency response. These systems include a significant portion of each company's software application systems, communication networks, monitoring systems, end-user systems, and hardware and software platforms hosted in data centers and on internal and external cloud platforms. The safety and reliability of operations depend on Foundational Technology Systems; thus, it is critical for these systems to be resilient and recoverable.

Three factors create a continuing need to invest in Foundational Technology Systems:

(1) Technology systems have become the foundation for operational, business, and customer engagement needs across the enterprise, where even the most routine tasks rely on an interdependent network of systems and services.

(2) Technology can quickly become obsolete and often requires lifecycle management activities such as maintenance, upgrades, and replacements to remain reliable and secure. Neglecting these activities may result in downstream impacts, performance issues, and/or security vulnerabilities.

(3) The industry is faced with constantly evolving threats from both domestic and foreign adversaries, as well as supply chain risks, third-party and insider threats, and natural hazards. Collectively, the dependency on technology systems, the pace of technology obsolescence, and the dynamic nature of technology threats, hazards, and risks requires that the Companies evaluate and leverage the latest solutions on the market and constantly adapt to securely, safely, and reliably provide services to the workforce and customers.

The initiatives associated with Foundational Technology Systems discussed herein work to reduce the frequency and consequences of technology-related system outages.[1] Technology outages can be caused by drivers such as ineffective processes, hardware malfunctions, legacy system infrastructure issues, natural disasters, power outages, software failures, or human error. A technology outage can have varied consequences to safety, business operations, customer service, and system reliability.

SoCalGas and SDG&E have identified three tenets – Resiliency, Recovery, and Lifecycle Management – that represent the Foundational Technology Systems initiatives outlined in this chapter, as described below:

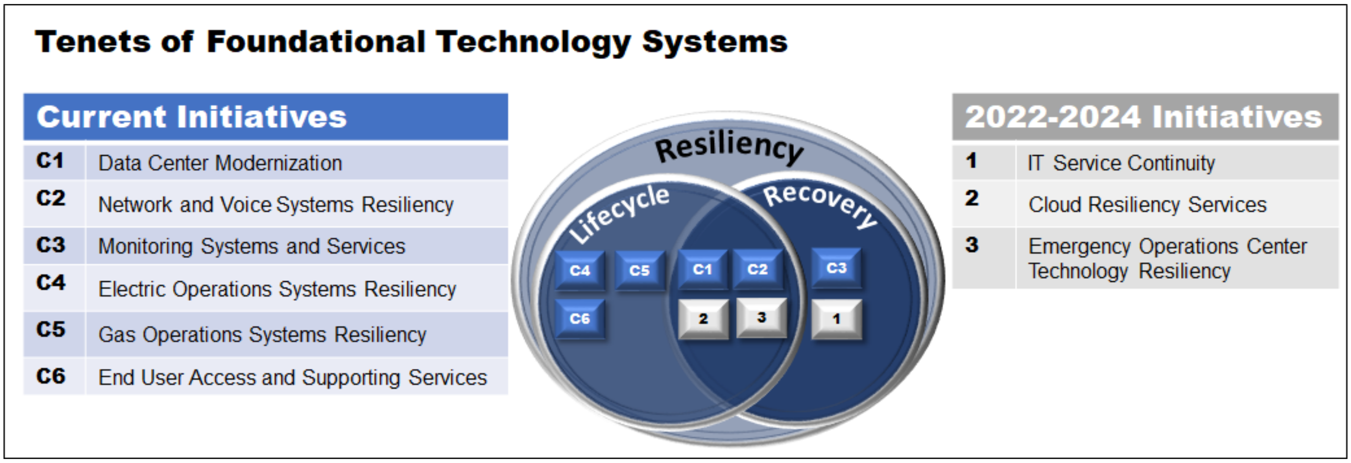
- **Technology resiliency** includes architectures, technologies, and processes for applications and infrastructure that focus on being prepared for any type of disruption – planned or unplanned – to mitigate the risk of downtime.

[1] The term "outage(s)" is used throughout this document interchangeably in reference to prolonged or extensive outages related to technology systems.

- **IT disaster recovery** is the ability to quickly recover systems and data after a disruption. Resilient systems and recovery work in tandem because increased resiliency reduces potential impacts and diminishes recovery implications.
- **Lifecycle management** is the holistic approach to maintenance, upgrades/replacement, and the planning process to ensure systems continue to operate as intended or to transition or retire legacy systems.

Figure 1 below shows the relationship between these tenets and the initiatives.

Figure 1



Tenets of Foundational Technology Systems

Current Initiatives	
C1	Data Center Modernization
C2	Network and Voice Systems Resiliency
C3	Monitoring Systems and Services
C4	Electric Operations Systems Resiliency
C5	Gas Operations Systems Resiliency
C6	End User Access and Supporting Services

2022-2024 Initiatives	
1	IT Service Continuity
2	Cloud Resiliency Services
3	Emergency Operations Center Technology Resiliency

III. ASSOCIATED RISK EVENTS

Technology system outages can impact the frequency or consequences of the Companies' RAMP risks or Cross-Functional Factors and the ability to provide safe and reliable service. Foundational Technology System risks are not limited to one risk or risk event but rather impact several risks contained within this RAMP report. Given the varying degree by which an outage can impact the Companies' risks, only the risks that rely most heavily on technology systems are highlighted in this section.

- **Wildfire** - Wildfires Involving SDG&E Equipment, addressed in RAMP chapter SDG&E-Risk-1, may be more likely to occur without the use of monitoring tools dependent on Foundational Technology Systems. For example, SDG&E has various situational awareness programs that use advanced technologies to monitor weather conditions to evaluate the fire potential in SDG&E's service territory. If these situational awareness programs (*e.g.*, weather monitoring applications, cameras, and dashboards) did not operate or function as intended, there could be adverse consequences. Unmonitored equipment failure due to outages in electronic monitoring and data management systems could cause ignitions and wildfires. For example, SDG&E uses critical software applications to track vegetation growth in relation to the electric infrastructure. One particular application supports all orders for vegetation management work and facilitates monitoring and response to vegetation-related events. SDG&E's wildfire mitigation programs, therefore, are susceptible to the overall health of Foundational Technology Systems.

- **Emergency Management and Climate Change Adaptation -** The inability to utilize electronic communication methods during a wildfire could inhibit a coordinated internal or external response to an event, which could create safety implications for the public and the workforce. Various emergency notification systems allow the Companies to alert customers and public safety partners regarding important safety notices. As discussed in the Wildfire section above, SDG&E's Weather Awareness System, dashboards, and other meteorology applications provide real-time situational awareness necessary for efficient wildfire response. For any activation, including wildfire response and Public Safety Power Shutoff (PSPS) events, the Emergency Operations Center (EOC) relies on critical safety and monitoring systems. During emergency events, the EOC's function could be impaired due to a technology outage.
- **Records Management, Enterprise Asset Management, Dig-ins, and Gas Incidents -** The availability and accessibility of accurate electronic data across the Companies can be affected during an outage. Many operational procedures depend on real-time data in order to conduct safe operations. If a technology outage were to occur, the lack of accessible data may result in an increased frequency of dig-in incidents, as accurate asset information is important to efficiently perform locate and mark activities. Enterprise Geographic Information System (GIS) is one example that uses asset records and data such as equipment type or valve position (open or closed) to create digital maps. These tools enable field personal to layer-in additional information onto the map, such as roads and facilities. During an outage, if employees in the field cannot access these

systems, marking of underground electric and natural gas facilities become inefficient and potentially less accurate. The underground service alert ticket management system allows excavators to request a callout for utilities, this technology coupled with the mobile GIS application reduces the likelihood of a dig-in. For electric transmission and distribution, GIS includes the electric connectivity model that feeds the electric network management application, allowing for the safe and reliable operation of the electric system. If these critical systems were unavailable, it could impact the performance of gas and electric operations at both Companies.

- **High-Pressure System Incident -** An outage could also increase the impact related to the Companies' Incident Related to the High-Pressure System RAMP risk chapters. As discussed in RAMP chapters SCG-Risk-1 and SDG&E-Risk-3, these risks are defined as the damage caused by a high-pressure pipeline that results in serious injuries, fatalities, and/or damage to the infrastructure. Pressure monitoring systems proactively detect operational issues to prevent safety incidents on the gas system. An incident on the high-pressure system could have exacerbated safety consequences if the incident is not detected using Foundational Technology Systems. Remediation and response efforts after high-pressure incidents during an outage could be hindered without access to supporting applications.
- **Gas Storage Incident -** SoCalGas's gas storage system's monitoring capabilities could be affected and require human intervention during a prolonged outage. SoCalGas utilizes advanced leak-detection technologies and practices that allow for early detection of leaks, helping to quickly identify anomalies. SoCalGas monitors the pressure of wells around-the-clock.. In addition, real-time wellhead gas monitors for leak detection and upwind/downwind ambient monitoring and SoCalGas meteorological stations are maintained using Foundational Technology Systems.
- **Electric Infrastructure Integrity -** Electric Infrastructure Integrity could be compromised as a result of an outage. As explained in RAMP chapter SDG&E-Risk-2, the Electric Infrastructure Integrity risk is defined as the risk of an asset

failure, caused by degradation, age, or operation outside of design criteria due to unexpected events or field conditions. The safe operation of electric infrastructure depends on many technological tools and applications for asset monitoring and awareness in the field. For example, SDG&E's outage and distribution management systems are systems used by distribution operators to support safe operations related to outage restoration. Supervisory Control and Data Acquisition (SCADA) provides operational data from electric assets in order to proactively monitor for and remediate asset failure. SCADA reduces the need for field personnel to perform manual operations, thus minimizing the safety risks to employees and/or contractors.

IV. 2020 PROJECT AND PROGRAMS

A. Data Center Modernization

This initiative enhances the data center infrastructure and applications to improve the recoverability, resiliency, and availability of the Companies' business systems. A data center is a physical location (facility) that houses networked (connected) information technology (IT) infrastructure, such as servers, and is primarily used to receive, store, process, and transmit large volumes of data. For example, a data center is used to store customer account data and process customer billing. Activities in this initiative relate to all three tenets of Foundational Technology Systems – resiliency, recovery and lifecycle management enhancements and upgrades.

Aging and overly complex system infrastructure can increase the probability of outages. The Data Center Modernization initiative focuses on simplifying and standardizing the Companies' data center infrastructure to reduce risks related to aging and obsolete systems and drive resilient operations. Part of a resilient data center strategy includes creating a secondary data center to mitigate effects of a natural disaster and minimize recovery time during outage events. Also, part of this strategy is to ensure data and system capacity requirements are met and easily scalable as needed.

Data center modernization improves and secures our data center network by isolating and separating each of the Companies' workloads, limiting the spread of the impact to the rest of the systems. It also improves the core hardware and simplifies the network design for the new server environment. In addition, an upgrade and expansion to the current backup and recovery systems further enhances the recoverability of applications and systems at the secondary data center.

B. Network & Voice System Resiliency

This initiative enhances network and voice systems through maintenance and improved functionality. As a result, the risk of communication failures or lack of communication in remote locations of the service territory is reduced. Activities in this initiative are associated with the tenets of resiliency, recovery and lifecycle management enhancements and upgrades.

Networks are foundational at the Companies and enable the operation of key safety and reliability capabilities. In the event of an operational emergency, the inability to communicate in remote sites could inhibit the Companies' ability to receive information and respond to incidents. As part of this initiative, critical communication infrastructure and systems in the data center and in remote worksites leverage maintenance and improved functionality. The improvement of network and voice functionality minimizes the safety and operational risks associated with the inability to communicate in areas of the service territory without access to commercial cell coverage. For example, the implementation of a private Long-Term Evolution (LTE) network in SDG&E's service territory enables crews working in remote locations to remain connected to operations. Additionally, dispatch systems rely on technology to operate and communicate with employees. An outage may prevent the Companies from dispatching employees in a timely manner or responding to customer requests.

The Customer Contact Centers, which require a very robust and resilient network and phone systems, are also enhanced as part of this initiative. It is essential that customers can contact a call center to report safety-related and time-sensitive situations. Network issues impacting voice and Customer Contact Center Interactive Voice Response (IVR) functions can impede the Companies' ability to field safety-related emergency calls from customers. IVR is one of several main channels for enabling self-service for customers. The application acts as a first channel of customer support, so that customer calls are expeditiously addressed. An outage impacting data and communication tools in a contact center may inhibit the Companies' ability to respond to safety issues and meet customers' needs. Upgraded voice, IVR, and data technologies has allowed the Companies to communicate using a global standard to meet current and future communications needs.

C. Monitoring Systems and Services

This initiative enhances the IT system monitoring capabilities and dashboard software used to proactively identify potential issues and allow for early detection, which helps mitigate the risk of outages. Activities in this initiative include resiliency and recovery enhancements and upgrades.

This initiative improves the Companies' critical monitoring system's resilience by creating a failover capability for the system and establishing a framework and foundational capabilities for monitoring systems and applications in the cloud. These capabilities provide identification of network, system, and application anomalies, which allows support teams the ability to identify and potentially prevent an incident. The implementation of application performance monitoring capabilities provides insights into the health and performance of critical applications. This initiative improves the Companies' ability to monitor an application's availability by simulating user transactions against the application.

D. Electric Operations Systems Resiliency

This initiative enhances electric operations resiliency through electric system application upgrades and lifecycle management activities, allowing SDG&E to more effectively manage and operate the electric distribution and transmission grid.

Many critical applications that are used in day-to-day operations on the electric system require upgrades, enhancements, or replacements in order to operate effectively. Several examples are described below:

- Technology and application enhancements impacting the Corrective Maintenance Program (CMP) are made as part of this initiative. Enhancements to the CMP mobile application allows field employees to more effectively perform the CMP function and conduct required electric operations.
- GIS mobile application replacement and enhancement is also conducted as part of this initiative. GIS is used to identify location and specifics of equipment installed in the field, which reduces the incorrect identification and operation of assets.
- The grid management system used by distribution operators to conduct safe operations during outage restoration is linked to the call center and dispatch to predict electric outages and expedite the restoration of power to customers.

Improved integration with the SCADA system provides a number of safety benefits such as outage detection, recloser operation to mitigate fire risk and the de-energization of electrical equipment. This activity is responsible for issuing safety documents used for switching operations.

- Condition Based Maintenance is an application that uses data collected from transformers and other substation monitors to notify maintenance crews of any potential equipment failures/malfunctions. This application is continuously improved as warranted.

E. Gas Operations Systems Resiliency

This initiative enhances the resiliency of gas operations through application system upgrades and lifecycle management activities required for safe operations. These safety systems reduce the risk of gas incidents and improve recoverability after an incident. Activities in this initiative include resiliency and lifecycle management enhancements and upgrades.

Applications that prevent gas emergencies depend on Foundational Technology Systems. The enhancements within this initiative impact multiple applications needed for safe operations. Several examples are described below:

- Field sensors that collect, manage, and present real-time data to monitor the safety of the gas system. Electronic gas pressure monitoring and alarm data is sent to SCADA and stored in a real-time reporting system, where it is monitored by operators and engineers.
- GIS provides field crews with accurate asset information to prevent the incorrect identification and operation of assets and reduce the likelihood of a gas incident.
- SCADA is essential Operational Technology used to manage gas system infrastructure. SCADA allows for the remote operation of devices and data gathering/monitoring. With SCADA operations, there is a decreased need for field personnel to perform manual operations, which reduces employee-related safety incidents.

F. End-User Access and Supporting Services

This initiative enhances the security of Company systems and software by upgrading the tools and technology used for remote access. The threats and risks presented by malicious attempts to access Company systems have the potential to result in major safety, operational, and business impacts. Activities in this initiative include resiliency and lifecycle management enhancements and upgrades.

The projects in this initiative enable end-users to remotely access the Companies' systems and networks through secure and reliable laptops, desktops, and communication software. Remote access software upgrades enable employees and contractors to securely access virtual desktops remotely to conduct work. Additional context on this initiative tied to end-user access and supporting services is outlined in the Emergency Preparedness and Response and Pandemic chapter (SDG&E-CFF-3), which includes activities associated with the COVID-19 Pandemic response.

V. 2022-2024 PROJECTS AND PROGRAMS

Many of the activities discussed in the 2020 Projects and Program section above are expected to continue during the TY 2024 GRC. For purposes of this RAMP, a project or program that continues, and the size and/or scope of that activity will be modified, is included and further described in the activity for 2022-2024 below.

A. IT Service Continuity

The IT service continuity initiative, along with the Data Center Modernization initiative, will improve the ability of critical systems to recover from outages through better governance and new technology enhancements. Activities in the IT service continuity initiative include resiliency and recovery enhancements and upgrades.

This initiative involves the rollout of a new IT Service Continuity Management program, which focuses on developing the processes for technology resilience. Efficient program design will be essential in allowing the Companies to quickly resume service after an outage. As part of the service continuity strategy development, application and data center recovery processes and business impact analyses (BIA) will be developed to minimize outage impacts based on business priorities. Disaster recovery tests, which improve the ability to respond to an outage, will be conducted as part of this initiative. The maturity of recovery strategy through automation will allow for quick resumption of critical systems. Annual maturity assessments will be conducted as part of this initiative.

B. Cloud Resiliency Services

Cloud technology is the delivery of computing services – including servers, storage, databases, networking, software, analytics, and intelligence – to offer faster innovation, flexible resources, and economies of scale. Cloud enables the Companies' systems to be more resilient through highly available services, redundant systems, rapid deployment, and a robust suite of automated recovery capabilities across the technology portfolio. Activities in this initiative include resiliency, recovery, and lifecycle management enhancements and upgrades.

The Companies are investing in building cloud foundations, starting with the use of cloud processes, tools, and capabilities that enable resilient cloud-based business applications. Cloud allows the Companies to purchase the exact computing resources required and offers the flexibility to more quickly adjust the amount of resources needed and enables the Companies to capture increased operational efficiency by taking advantage of the cloud platforms' expertise in infrastructure management. In addition, cloud platforms allow the Companies to cost-efficiently take advantage of significant investments in new capabilities made by the cloud providers.

This initiative focuses on foundational components like the high-speed connection to the cloud platforms, the secured flow of information, and the ability to monitor our critical systems running in the cloud.

C. Emergency Operations Center (EOC) Technology Resiliency

This initiative allows for the improvement of IT services and systems needed for the EOC to continue functioning during an EOC activation. Activities in this mitigation include resiliency, recovery, and lifecycle management enhancements and upgrades.

The EOC utilizes numerous safety systems to respond to emergencies effectively and to operate a unified command with critical community stakeholders and partners. Maintaining communications with customers is critical during an emergency event. Communication tools allow the Company to notify customers and public safety partners of PSPS and other emergency events.

The future state for EOC critical systems is to enable modernization of EOC applications by adopting a cloud-based platform service and modifying systems to run in multiple geographic locations. Details involve migrating the EOC applications running on our internal infrastructure and some of our critical GIS applications into a cloud environment. For resiliency, the Companies will enable a local and multi-region recovery approach. To manage the new environments, the Companies will establish more structured and automated processes to develop and manage EOC applications and services. This will reduce the risk of an unavailable system during EOC activations and also improves notifications of emergency events to both customers and public safety partners.

VI. COSTS

The table below contains the 2020 recorded and forecast dollars for the programs and projects discussed in this CFF. Some of the dollars reflected below may also be reflected in the SoCalGas Asset and Records Management, SDG&E Asset Management, and SDG&E Wildfires Involving SDG&E Equipment (SCG-CFF-1, SDG&E-CFF-1 and SDG&E-Risk-1) Chapters.

SoCalGas Costs (Direct After Allocations, in 2020 $000)[2]

Line No.	Description	Recorded		Forecast			
		2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
1	Data Center Modernization	24,944	2,276	65,534	83,738	2,049	2,618
2	Network & Voice System Resiliency	10,880	3,862	40,176	51,335	3,476	4,442
3	Monitoring Systems and Services	2,535	1,583	7,070	9,033	2,222	2,839
4	Gas Operations Systems Resiliency	20,068	6,526	109,051	139,342	5,873	7,505
5	End User Access and Support Services	1,513	1,640	30,419	38,869	1,724	2,203
6	IT Service Continuity	0	2,709	14,455	18,470	2,555	3,265
7	Cloud Resiliency Services	0	203	3,130	3,999	3,989	5,097
8	Emergency Operations Center (EOC) Technology Resiliency	1,424	983	3,505	4,478	884	1,130

[2] Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include company loaders, with the exception of vacation and sick. The costs are in 2020 dollars and have not been escalated in forecasts beyond 2020.

SDG&E Costs (Direct After Allocations, in 2020 $000)[3]

Line No.	Description	Recorded		Forecast			
		2020 Capital	2020 O&M	2022-2024 Capital (Low)	2022-2024 Capital (High)	TY 2024 O&M (Low)	TY 2024 O&M (High)
1	Data Center Modernization	20,568	1,801	13,411	17,136	1,621	2,071
2	Network & Voice System Resiliency	41,129	4,359	82,541	105,469	3,923	5,013
3	Monitoring Systems and Services	1,519	1,018	4,800	6,134	1,543	1,971
4	Electric Operations Systems Resiliency	26,740	3,031	89,918	114,895	2,728	3,486
5	Gas Operations Systems Resiliency	3,004	2,031	16,122	20,600	1,828	2,336
6	End User Access and Support Services	2,590	1,117	18,999	24,277	1,201	1,534
7	IT Service Continuity	0	2,230	9,720	12,420	2,099	2,682
8	Cloud Resiliency Services	4,601	159	3,130	3,999	3,137	4,008
9	Emergency Operations Center (EOC) Technology Resiliency	0	901	7,655	9,781	811	1,036

[3] Costs presented in the workpapers may differ from this table due to rounding. The figures provided are direct charges and do not include company loaders, with the exception of vacation and sick. The costs are in 2020 dollars and have not been escalated in forecasts beyond 2020.