

# **Risk Assessment Mitigation Phase**

## **Risk Mitigation Plan**

### **Workforce Planning**

#### **(Chapter SDG&E-17)**

November 30, 2016

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## Executive Summary

Workforce Planning is the risk of the loss of employees with deep knowledge, understanding and experience in operations due to retirements. Employees age 62 or older who meet Company years of service requirements are eligible and considered likely to retire. The departure of employees who fill critical operational roles could affect employee and/or public safety, as their knowledge and experience is essential to safely operating and maintaining SDG&E's gas and electric systems.

SDG&E's 2015 baseline mitigation plan for this risk consists of four controls:

1. A variety of training and knowledge transfer programs,
2. Compliance and inspection programs,
3. Outside contractors/contingent labor, and
4. Employee engagement survey and action plans.

These controls focus on safety-related impacts (i.e., Health, Safety, and Environment) per guidance provided by the Commission in Decision 16-08-018, as well as controls and mitigations that may address reliability. The 2015 baseline mitigations will continue to be performed in the proposed plan. In addition, there will be an expansion of training associated with critical roles in various operational areas including Gas Operations, Customer Service Field, Electric Transmission and Distribution as well as Human Resources' Organizational Effectiveness. Key areas of focus will be job knowledge sharing, supervisor development and education about new technologies.

A risk spend efficiency was calculated for Workforce Planning. The risk spend efficiency is a new tool that was developed to attempt to quantify how the proposed mitigations will incrementally reduce risk. For Workforce Planning, the risk spend efficiency was completed at the risk portfolio level, with the activities grouped into one, aggregated mitigation. The methodology for calculating the risk spend efficiency was generally based on job proficiency data.

## **Risk: Workforce Planning**

### **1 Purpose**

The purpose of this chapter is to present the mitigation plan of San Diego Gas & Electric Company (SDG&E or Company) for the risk of Workforce Planning. SDG&E defines this risk as the loss of employees with deep knowledge, understanding and experience in Operations due to retirements. Employees age 62 or older who meet Company years of service requirements are eligible and considered likely to retire. The departure of employees who fill critical operational roles, could affect employee and/or public safety, as their knowledge and experience is essential to safely operating and maintaining SDG&E's gas and electric systems.

At the same time, the utility industry is undergoing a significant transformation. A main business objective for SDG&E is adopting new technologies in order to deliver the safest and most reliable services to its customers. This evolving technological environment is creating a demand for new, additional skillsets. The goal is to have experience in new/emerging technologies, while still maintaining necessary legacy knowledge. SDG&E's workforce planning mitigation strategies enable the thoughtful transition of retirement eligible employees and, where appropriate, the procurement of skills in new/emerging technologies. One example of orderly transition is the recent voluntary retirement program (VREP). Management offered a voluntary separation package to a select group of retirement eligible employees in areas believed to have skill surpluses to make room for thoughtful technology skill acquisition. SDG&E has periodically offered similar VREP programs in the past and a small percentage of employees with critical knowledge are expected to accept the recent VREP offering.

This analysis of the Workforce Planning risk, considered only safety-related critical roles where significant retirements are expected. Critical roles are ones that can be highly specialized, and employees in them tend to remain in these jobs for many years. During their tenure, they gain work experience which enables them to work with a heightened awareness towards safety. As employees in critical roles become eligible to retire, SDG&E needs to prepare to replace this collective knowledge and experience, in order to mitigate the risk to public and/or employee safety.

This risk is a product of SDG&E's September 2015 annual risk registry assessment cycle. Any events that occurred after that time were not considered in determining the 2015 risk assessment, in preparation for this Report. Note that while 2015 is used as a base year for mitigation planning, risk management has been occurring, successfully, for many years within the Company. SDG&E and Southern California Gas Company (SoCalGas) (collectively, the utilities) take compliance and managing risks seriously, as can be seen by the numerous actions taken to mitigate each risk. This is the first time, however, that the utilities have presented a Risk Assessment Mitigation Phase (RAMP) Report, so it is important to consider the data presented in this plan in that context. The baseline mitigations are determined based on the relative expenditures during 2015; however, the utilities do not currently track expenditures in this way, so the baseline amounts are the best effort of each utility to benchmark both capital and operations and maintenance (O&M) costs during that year. The level of precision in process and

outcomes is expected to evolve through work with the California Public Utilities Commission (Commission or CPUC) and other stakeholders over the next several General Rate Case (GRC) cycles.

The Commission has ordered that RAMP be focused on safety related risks and mitigating those risks.<sup>1</sup> In many risks, safety and reliability are inherently related and cannot be separated, and the mitigations reflect that fact. Compliance with laws and regulations is also inherently tied to safety and the utilities take those activities very seriously. In all cases, the 2015 baseline mitigations include activities and amounts necessary to comply with the laws in place at that time. Laws rapidly evolve, however, so the RAMP baseline has not taken into account any new laws that have been passed since September 2015. Some proposed mitigations, however, do take into account those new laws.

The purpose of RAMP is not to request funding. Any funding requests will be made in the GRC. The forecasts for mitigation are not for funding purposes, but are rather to provide a range for the future GRC filing. This range will be refined with supporting testimony in the GRC. Although some risks have overlapping costs, the utilities have made efforts to identify those costs.

SDG&E has a low average retirement rate as compared to other utilities. SDG&E's company historical, average 5-year retirement rate is 2.5%, compared to the utility industry average retirement rate of approximately 3%.<sup>2</sup> For the specific identified critical roles listed in this chapter, the 5-year historical average rate is 2.7% (or an average of 14 of 514 employees total eligible to retire), which is slightly higher than the Company-wide retirement rate.

Regarding critical roles, it is anticipated that the retirement rate will increase significantly in the next few years. In fact, overall SDG&E retirements are slightly on the upswing as of early 2016, tracking to be 3.9%, as a whole, by year end. Using factors including SDG&E's average retirement age of 62, eligibility requirements, and a range of retirement rates (13% minimum expected retirements each year; 25% maximum expected retirement rate) based historical averages for critical roles, it is estimated that by year end 2019, a cumulative 34% (or 167 out of 488 age 62+) of employees in critical roles are eligible and likely to retire.

As mentioned above, SDG&E's average retirement age is 62, which is comparable to the utility industry average. PricewaterhouseCoopers reports that the 2015 utility industry average retirement age is 61.5, which is also consistent with the Social Security partial benefits age of 62. Although the average retirement age is 62, employees could consider retiring at an earlier age, between 55 and 61 years of age consistent with Company policies. If this happens, then estimates indicate that a cumulative 57% (278 out of 488) of employees in critical roles would be retiring by the end of 2019. SDG&E does not believe this is a likely scenario; therefore, this chapter addresses the most likely range of retirement rates (between 13% and 25%). Figure 1 depicts the 13% retirement scenario, wherein 13% of retirements

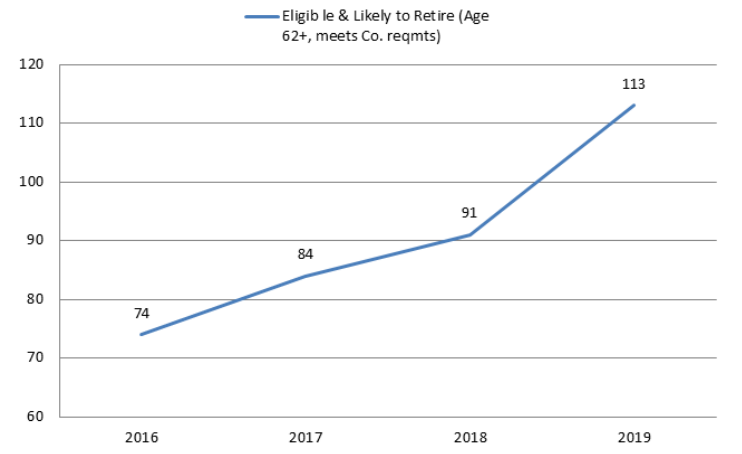
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<sup>1</sup> Commission Decision (D.) 14-12-025 at p. 31.

<sup>2</sup> U.S. Department of Energy, *Workforce Trends in the Electric Utility Industry*, 2006, p. 6.

occur each year; however, the retirement bubble still continues to grow through 2019, which heightens the need and importance of successful workforce planning and knowledge transfer.

**Figure 1: SDG&E Operations Critical Roles – Projected Retirement Bubble<sup>3</sup>**



The assessment and analysis presented herein focuses on Workforce Planning as it pertains to SDG&E’s electric and gas operations. For purposes of the Workforce Planning risk analysis, the following eight departments are considered “essential” to operations, and, therefore, encompass the critical roles:

1. Gas Operations
2. Customer Service Field and Smart Meter Operations
3. Kearny Maintenance and Operations
4. Electric Regional Operations
5. Electric Grid Operations
6. Construction Services
7. Electric Distribution Operations
8. Electric Transmission and Distribution Engineering

SDG&E applied its definition of essential operations to these eight departments based on comprehensive discussions with the director of each, as well as feedback from executive management. As stated previously, the risk analysis focused on the critical roles within these departments – roles that potentially could affect public or employee safety, which have a *likely* retirement risk. While other, non-operational

<sup>3</sup> Data as of January 31, 2016. Retirement bubble reflects the number *likely* (age 62+ & eligible) to retire, after the average 13% retirements are subtracted, and annual the incremental *likely* to retire are added in each year.

job functions are important to SDG&E, those jobs may not directly affect safety or have a retirement risk and, therefore, are excluded from the scope of this risk.

## 2 Background

For purposes of analyzing this risk, SDG&E first defined Operations as eight departments residing in the Electric Transmission and System Engineering, Electric Distribution Operations, Customer Services, and Gas Operations organizations. Next, critical roles within the eight organizations with a retirement risk were identified. A description of each essential department and associated critical roles is provided below. The tables show, for each critical role, the number of employees eligible to retire through 2019, as compared to the total number of employees in that role.<sup>4</sup>

### 1. Gas Operations

SDG&E’s gas distribution system consists of a network of approximately 14,600 miles of interconnected gas mains, services and associated pipeline facilities. The primary function of this steel and plastic pipeline network is to deliver natural gas from SDG&E’s transmission system to approximately 865,300 customer meters in an area of over 1,400 square miles. SDG&E routinely performs work to maintain the daily operation of the system, connect new customers, maintain the necessary capacity to serve all customers, replace damaged or deteriorating facilities, and relocate facilities to meet customer and governmental agency needs. This work is accomplished by approximately 340 employees, from front-line construction crews to technical planners and engineers. Examples of critical roles in this department include: Meter and Revenue System Protection Manager, Pipeline Operations Supervisor, District Operations Manager, Field Operations Supervisor, Locator, Working Foreman, Welding and Pipeline Inspection Supervisor, and Shop Services Supervisor.

**Table 1: Gas Operations – San Diego Critical Roles**

Gas Operations – San Diego Critical Role Retirement Range	2019	
	# Emps eligible to retire (age 62+)	Total # Emps
<b>Total</b>	<b>19</b>	<b>78</b>
<b>25% retirement rate</b>	<b>5</b>	
<b>Critical Roles avg. retirement rate (13%)</b>	<b>2</b>	

<sup>4</sup> Data as of 1/31/16.



## 2. Customer Service Field and Smart Meter Operations

Customer Service Field (CSF) consists primarily of field technicians who perform services at customer premises, including gas and electric meter work, establishing and terminating gas and electric service, lighting gas pilot lights, conducting customer appliance checks, investigating reports of gas leaks, investigating customer complaints of high bills, shutting off and restoring gas service for fumigation, responding to structure fires (e.g., to check for gas leakage/shut off gas service) and other emergency incidents, and other related field services for customers. Field technicians work from five different operating base locations that are dispersed throughout SDG&E's service territory, which spans more than 4,100 square miles from the California-Mexico border to southern Orange County. Examples of critical roles in this department include: Appliance Mechanic, Electric Meter Tester/Meter Test Electrician, Engineer I, Principle Engineer, Senior Engineer, and Service Technician.

**Table 2: CSF and Smart Meter Operations Critical Roles**

CSF & Smart Meter Operations Critical Role Retirement Range	2019	
	# Emps eligible to retire (age 62+)	Total # Emps
<b>Total</b>	<b>31</b>	<b>120</b>
<b>25% retirement rate</b>	<b>8</b>	
<b>Critical Roles avg. retirement rate (13%)</b>	<b>4</b>	

## 3. Kearny Maintenance & Operations

Kearny Maintenance and Operations (Kearny) is responsible for constructing and maintaining SDG&E's substation and transmission infrastructure and equipment throughout the service territory. Also, Kearny is responsible for the testing of protective rubber goods as well as testing, repairing and calibrating tools for electrical employees and other users at SDG&E. Examples of critical roles in this department include: Principle Engineer and Relay Specialist.

**Table 3: Kearney Critical Roles**

Kearny Critical Role Retirement Range	2019	
	# Emps eligible to retire (age 62+)	Total # Emps
<b>Total</b>	<b>3</b>	<b>7</b>
<b>25% retirement rate</b>	<b>1</b>	
<b>Critical Roles avg. retirement rate (13%)</b>	<b>&lt;1</b>	

#### 4. Electric Regional Operations

Electric Regional Operations (ERO) is responsible for the construction, operations, maintenance and restoration of power for SDGE’s electric distribution system. Other functions include: SDG&E’s training center for field operations functions, electric crew scheduling, helicopter operations and business system integration and operations. Examples of critical roles in this department include: Construction Project Coordinator, District Crew Dispatcher, Fault Finding Specialist,\* Inspector A, Senior Customer Project Planner, Troubleshooter,\* Working Foreman.\*

**Table 4: ERO Critical Roles**

ERO Critical Role Retirement Range	2019	
	# Emps eligible to retire (age 62+)	Total # Emps
<b>Total</b>	<b>66</b>	<b>137</b>
<b>25% retirement rate</b>	<b>17</b>	
<b>Critical Roles avg. rate rate (13%)</b>	<b>9</b>	

\*Linemen feed into the Fault Finding Specialist, Troubleshooter, and Working Foreman-Electric Distribution critical roles that have a retirement risk as defined in this chapter. (See Section 5.2.4)

#### 5. Electric Grid Operations

The Electric Grid Operations (EGO) organization is responsible for the safe, reliable, and efficient operation of SDG&E’s electric transmission system. This is achieved through compliance with associated North American Electric Reliability Corporation (NERC) Standards, transmission outage coordination and operations planning, training, and 24-hour real-time situational awareness of all transmission assets using EGO’s state of the art Energy Management System (EMS).

EGO works closely with the California Independent System Operator (CAISO) and Peak Reliability Coordinator, provides inter-departmental platforms vital to the integration of new transmission and generation projects, as well as the leadership needed so that critical facilities are secured in accordance with NERC physical and cyber security standards. In addition, assessments and optimal fulfillments of contractual obligations performed by EGO throughout the year make it so adequate readiness is always available to meet safety and reliability goals. Examples of critical roles in this department include: EMS Software Supervisor, Grid Business Process Manager, Grid Operations Services Manager, Mission Control Training Manager, and Engineers (Principle and Senior).

**Table 5: EGO Critical Roles**

EGO Critical Role Retirement Range	2019	
	# Emps eligible to retire (age 62+)	Total # Emps
<b>Total</b>	<b>4</b>	<b>12</b>
<b>25% attrition</b>	<b>1</b>	
<b>Critical Roles avg. attrition rate (13%)</b>	<b>1</b>	

## 6. Construction Services

Construction Services is responsible for the contract administration of gas and electric distribution infrastructure projects performed mainly by third-party contractors. The department also oversees SDG&E’s Vegetation Management compliance program, which includes contract administration, education and outreach, and inspection requirements as set forth by the CPUC. A large percentage of the organization’s workforce consists of Contract Administrators (CAs) who have prime responsibility for field oversight of these projects. Construction Services also is responsible for the management of high impact infrastructure projects. Examples of critical roles in this department include: Contract Administrator – Electric, Contract Administrator – Gas, Construction Advisor – Electric, Construction Advisor – Gas, and Construction Services Supervisor/Supervisor-Construction Services.

**Table 6: Construction Services Critical Roles**

Construction Services Critical Role Retirement Range	2019	
	# Emps eligible to retire (age 62+)	Total #Emps
<b>Total</b>	<b>18</b>	<b>48</b>
<b>25% retirement rate</b>	<b>5</b>	
<b>Critical Roles avg. retirement rate (13%)</b>	<b>2</b>	

## 7. Electric Distribution Operations

Electric Distribution Operations (EDO) operates 1,034 electric distribution circuits to provide safe and reliable service to SDG&E customers behind the 1.4 million electric meters in San Diego County and south Orange County. The EDO department consists of three sections:

- The Distribution Control Center, staffed with Distribution System Operators who oversee the planned switching during routine work and restoration switching steps during emergencies.
- An EDO workgroup that directly supports the control center with technology and process issues, especially ones related to the Supervisory Control and Data Acquisition (SCADA)

system. SCADA enables EDO to operate equipment remotely and to limit outage impacts to our customers.

- Another EDO workgroup that includes the Enterprise GIS Services (EGISS) section, which updates electric facility information in the GIS mapping system feeding into the circuit diagrams in the network management system utilized by the distribution control center.

Examples of critical roles in this department include: Distribution System Operator and Working Foreman – System Operator.

**Table 7: EDO Critical Roles**

EDO	2019	
Critical Role Retirement Range	# Emps eligible to retire (age 62+)	Total #Emps
<b>Total</b>	<b>2</b>	<b>23</b>
<b>25% retirement rate</b>	<b>&lt;1</b>	
<b>Critical Roles avg. retirement rate (13%)</b>	<b>&lt;1</b>	

### 8. Electric Transmission & Distribution Engineering

The Electric Transmission and Distribution (T&D) Engineering department's main role is the engineering and design of transmission, substation, and distribution projects for the Company in accordance with industry and Company standards. This includes developing and maintaining Company standards, and developing work methods and technical solutions to provide safe and reliable service to customers. The department consists of the following sections: Transmission Engineering & Design, Substation Engineering & Design, Electric Distribution Engineering, Civil/Structural Engineering, System Protection & Control Engineering, Customer Generation, Distributed Energy Resources, and Project Management & Drafting. Examples of critical roles in this department include: Construction Standards Administrator (includes Sr.), Drafting Supervisor, Electric Distribution Analyst (includes Senior), Lead Substation Project Designer, Principle Engineer, Senior Engineer, Substation Designer (includes Senior), Substation Team Lead, Substation Engineering & Design Manager, and Transmission Engineering Designer (includes Senior).

**Table 8: Electric T&D Engineering Critical Roles**

Electric T&D Engineering Critical Role Retirement Range	2019	
	# Emps eligible to retire (age 62+)	Total # Emps
<b>Total</b>	<b>24</b>	<b>63</b>
<b>25% retirement rate</b>	<b>6</b>	
<b>Critical Roles avg. retirement rate (13%)</b>	<b>3</b>	

### 3 Risk Information

As stated in the testimony of Jorge M. DaSilva in the Safety Model Assessment Proceeding (S-MAP) Application (A.) 15-05-002, “SDG&E is moving towards a more structured approach to classifying risks and mitigations through the development of its new risk taxonomy. The purpose of the risk taxonomy is to define a rational, logical and common framework that can be used to understand analyze and categorize risks.”<sup>5</sup> The Enterprise Risk Management (ERM) process and lexicon that SDG&E has put in place was built on the internationally-accepted ISO 31000 risk management standard. In the application and evolution of this process, the Company is committed to increasing the use of quantification within its evaluation and prioritization of risks.<sup>6</sup> This includes identifying leading indicators of risk. Sections 2 – 9 of this plan describe the key outputs of the ERM process and resultant risk mitigations.

In accordance with the ERM process, this section describes the risk classification, possible drivers and potential consequences of the Workforce Planning risk.

#### 3.1 Risk Classification

Consistent with the taxonomy presented by SDG&E and SoCalGas in A.15-05-002, SDG&E classifies this risk as a cross-cutting, people risk, associated with the organizational health function, as shown in Table 9.

**Table 9: Risk Classification per Taxonomy**

Risk Type	Asset/Function Category	Asset/Function Type
CROSS-CUTTING	PEOPLE	ORG. HEALTH

<sup>5</sup> A.15-05-002, filed May 1, 2015, at p. JMD-7.

<sup>6</sup> Testimony of Diana Day, Risk Management and Policy (SDG&E-02), submitted on November 14, 2014 in A.14-11-003.

### 3.2 *Potential Drivers*<sup>7</sup>

When performing the risk assessment for Workforce Planning, SDG&E identified potential indicators of risk, referred to as drivers. These include, but are not limited to:

- **Economic factors** - these can accelerate or delay retirement decisions, which may cause the shifting of retirement bubbles.
- **Increasing number of retirement-eligible critical employees** - this number is growing each year relative to the total pool of experienced employees.
- **Lack of job satisfaction** - may quicken the pace and increase the number of those seeking to retire.
- **Transition to newer and/or emerging technology** - longer-tenured, more experienced employees may struggle to adapt, which may lead to earlier retirements.
- **Increased demand for specialized skills** - may lead to competition in the industry, resulting in attrition and vacancies.
- **Company culture that encourages movement between jobs** – can make it difficult to gain knowledge and experience developed through “time in role.”

### 3.3 *Potential Consequences*

If one of the risk drivers listed above were to occur, resulting in an incident, the potential consequences, in a reasonable worst case scenario, could include:

- Few, serious injuries;
- Property damage;
- Inefficiencies due to less experienced employees;
- Disruption to operations;
- Regulatory scrutiny; and/or
- Adverse litigation and resulting financial impacts.

These potential consequences were used in the scoring of Workforce Planning that occurred during the SDG&E’s 2015 risk registry process. See Section 4 for more detail.

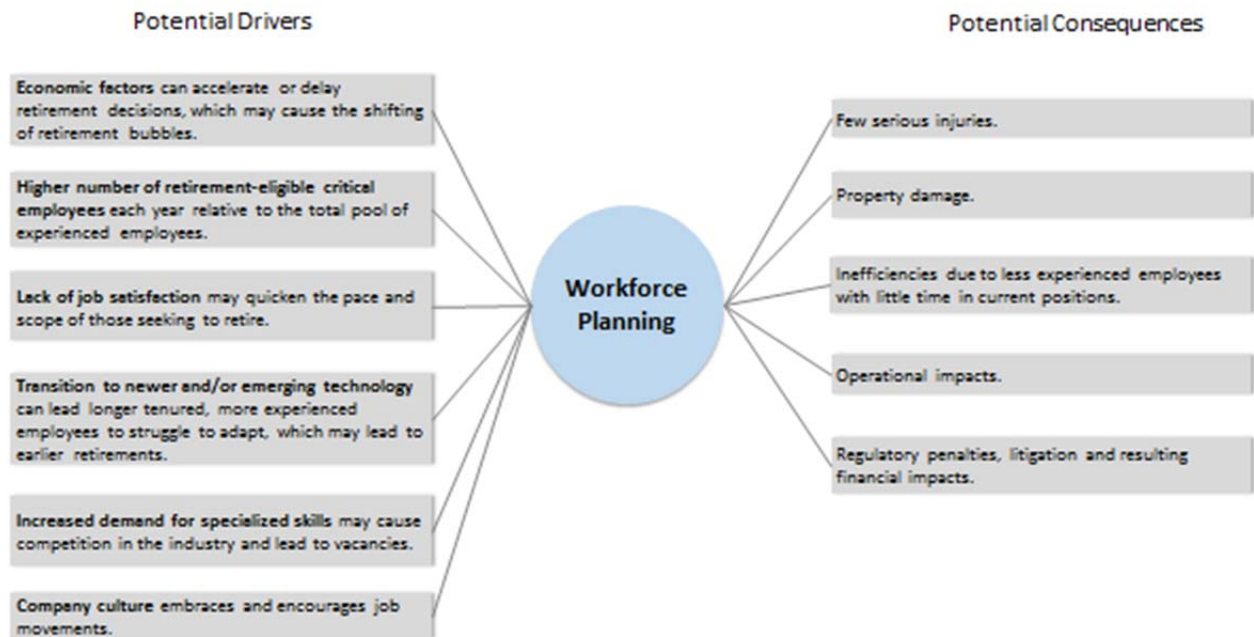
### 3.4 *Risk Bow Tie*

The risk “bow tie,” shown in Figure 2, is a commonly-used tool for risk analysis. The left side of the bow tie illustrates potential drivers that lead to a risk event and the right side shows the potential consequences of a risk event. SDG&E applied this framework to identify and summarize the information provided above.

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<sup>7</sup> An indication that a risk could occur. It does not reflect actual or threatened conditions.

Figure 2: Risk Bow Tie



## 4 Risk Score

The SDG&E and SoCalGas ERM organization facilitated the 2015 risk registry process, which resulted in the inclusion of Workforce Planning as one of the enterprise risks. During the development of the risk register, subject matter experts assigned a score to this risk, based on empirical data to the extent it is available and/or using their expertise, following the process outlined in this section.

### 4.1 Risk Scenario – Reasonable Worst Case

There are many possible ways in which an electric infrastructure integrity incident can occur. For purposes of scoring this risk, subject matter experts used a reasonable worst case scenario to assess the impact and frequency. The scenario represented a situation that could happen, within a reasonable timeframe, and lead to a relatively significant adverse outcome. These types of scenarios are sometimes referred to as low frequency, high consequence events. The subject matter experts selected a reasonable worst case scenario to develop a risk score for Workforce Planning:

- A less-experienced employee fills a position recently vacated by a long-time experienced employee due to retirement and due to lack of experience, the employee performs work that gives rise to serious injuries.

Note that the following narrative and scores are based on this scenario; they do not address all consequences that can happen if the risk occurs.



## 4.2 2015 Risk Assessment

Using this scenario, subject matter experts then evaluated the frequency of occurrence and potential impact of the risk using SDG&E’s 7X7 Risk Evaluation Framework (REF). The framework (also called a matrix) includes criteria to assess levels of impact ranging from Insignificant to Catastrophic and levels of frequency ranging from Remote to Common. The 7X7 framework includes one or more criteria to distinguish one level from another. The Commission adopted the REF as a valid method to assess risks for purposes of this RAMP.<sup>8</sup> Using the levels defined in the REF, the subject matter experts applied empirical data to the extent it is available and/or their expertise to determine a score for each of four residual impact areas and the frequency of occurrence of the risk.

Table 10 provides a summary of the Workforce Planning risk score in 2015. This risk has a score of 4 or above in the Health, Safety, and Environmental impact area and, therefore, was included in the RAMP. These are residual scores because they reflect the risk remaining after existing controls are in place. For additional information regarding the REF, please refer to the RAMP Risk Management Framework chapter within this Report.

**Table 10: Risk Score**

Residual Impact				Residual Frequency	Residual Risk Score
Health, Safety, Environmental (40%)	Operational & Reliability (20%)	Regulatory, Legal, Compliance (20%)	Financial (20%)		
4	3	3	2	3	255

## 4.3 Explanation of Health, Safety, and Environmental Impact Score

As indicated in the reasonable worst case scenario, a less experienced workforce may lead to unintended safety consequences. SDG&E scored this risk a 4 (major) in the Health, Safety, and Environmental impact category as it has the potential to result in one or more serious injuries or illnesses to the public or employees.

## 4.4 Explanation of Other Impact Scores

Based on the selected reasonable worst case risk scenario, SDG&E gave the following scores to the remaining residual impact areas:

- **Operational and Reliability:** A score of 3 (moderate) was given to this impact area, which is defined in the 7X7 matrix as greater than 1,000 customers affected. The actions of less experienced personnel could potentially cause operational disruptions of this magnitude. Inefficiencies due to less experienced employees also contributed to the determination of this score.

<sup>8</sup> D.16-08-018 Ordering Paragraph 9.



- **Regulatory, Legal and Compliance:** An incident that occurs because of a less experienced workforce could result in potential regulatory, legal or compliance consequences, such as violations. Based on this, SDG&E scored this risk impact area a 3 (moderate).
- **Financial:** The incident caused by a less experienced worker, could result in monetary impacts that result from a violation. However, SDG&E believes that the potential financial impact would be minor, or a score of 2, which is defined in the 7X7 matrix as a potential financial loss between \$50,000 and \$1 million.

#### 4.5 *Explanation of Frequency Score*

The frequency score of 3 (infrequent) was based on SDG&E's knowledge of the business and historical experience. This score also took into account SDG&E's continuing efforts in implementing and growing a strong safety culture that not only starts with new employees, but also continues through those employees as they near retirement.

## 5 **Baseline Risk Mitigation Plan<sup>9</sup>**

As stated above, SDG&E defines Workforce Planning risk as the loss of employees with deep knowledge, understanding and experience in Operations due to retirements. The 2015 baseline mitigations discussed below include the current evolution of the utilities' risk management of this risk. The baseline mitigations have been developed over many years to address this risk. They include the amount to comply with laws that were in effect at that time.

Subject matter experts (i.e., Directors) in each of the eight essential operational areas described in Section 2 identified the baseline mitigation plan controls in place for the Workforce Planning risk. These include a variety of training and knowledge transfer programs, compliance and inspection programs, outside contractors/contingent labor, and employee engagement survey and action plans. These controls focus on safety-related impacts<sup>10</sup> (i.e., Health, Safety, and Environment) per guidance provided by the Commission in D.16-08-018,<sup>11</sup> as well as controls and mitigations that may address reliability.<sup>12</sup> Accordingly, the controls and mitigations described in Sections 5 and 6 address safety-related impacts primarily. Note that the controls and mitigations in the baseline and proposed plans are intended to address various Workforce Planning incidents, not just the scenario used for purposes of risk scoring.

These baseline plan control activities are further described below, organized by essential operations area:

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<sup>9</sup> As of 2015, which is the base year for purposes of this Report.

<sup>10</sup> The Baseline and Proposed Risk Mitigation Plans may include mandated, compliance-driven mitigations.

<sup>11</sup> D.16-08-018 at p. 146 states "Overall, the utility should show how it will use its expertise and budget to improve its safety record" and the goal is to "make California safer by identifying the mitigations that can optimize safety."

<sup>12</sup> Reliability typically has an impact on safety. Accordingly, it is difficult to separate reliability and safety.

1. Gas Operations

- **Operator Qualification** - Operator Qualification (OpQual) Gas Standard G8113, is a federally- mandated law that states that any person who performs a gas pipeline construction-related activity that influences safety of the pipeline, and/or inspects, operates or maintains an existing operating gas pipeline, must be trained and tested in the task that they are performing.
- **Environmental and Safety Compliance Management Program (ESCMP)** - SDG&E maintains an ESCMP to address compliance requirements, awareness, goals, monitoring and verification related to all applicable environmental, health and safety laws, rules and regulations, and company standards.
- **SDG&E Combination Welding School** – 14 weeks of instruction on SDG&E combination welding training

2. CSF & Smart Meter

- **Operations Qualification** – See description under Gas Operations in this section.
- **ESCMP** – See description under Gas Operations in this section.
- **Appliance Mechanic Class** – A four-week class training that includes: Fundamentals of Natural Gas, Electric Troubleshooting, Carbon Monoxide Investigations, Leak Investigations, and Purging Large Meter Sets.
- **Apprentice Electric Meter Tester Program** - A three-year competency-based apprentice training program that consists of “hands on” competency and skill testing.
- **Metering School** – A third-party training program that covers the principles of metering engineering (i.e., all the various meter forms, how they function, the specific metering application, and equipment and tools).
- **Service Technician Training** – 11-week class training, four-week ride-along in field, one-week qualification. Training includes: Gas fundamentals, appliance familiarization, meter reading, gas controls, gas pressures and regulators, venting, carbon monoxide, fundamentals of electricity, advanced schematics and electrical troubleshooting, indoor/outdoor gas leaks, first responder/incident command, gas and electric meter sets and changes, and heating equipment.

3. Kearny

- **ESCMP** – See description under Gas Operations in this section.

- **Relay School/Classes** – Provides understanding of SDG&E's relays, electric system, and protection schemes to develop ability to identify problems, troubleshoot outages and restore substation/transmission events.

#### 4. ERO

- **ESCMP** – See description under Gas Operations in this section.
- **CPUC General Order 165 - Corrective Maintenance Program** – SDG&E is required to inspect its electric distribution system according to the CPUC General Order 165 (GO 165). GO 165 establishes inspection cycles and record-keeping requirements for utility distribution equipment. In general, utilities must patrol their systems once a year in urban areas, and once every two years in rural areas (SDG&E performs all patrols on an annual basis). Utilities must conduct detailed inspections every 3-5 years, depending on the type of equipment. For detailed inspections, utilities' records must specify the condition of inspected equipment, any problems found, and a scheduled date for corrective action. Utilities are required to perform intrusive inspections of distribution wood poles depending on the age and condition of the pole and prior inspection history.
- **Apprentice Lineman Program** - SDG&E has a three-year, state-approved, apprenticeship program for the development of journeymen electrical workers, with certification by the Joint Apprentice Committee. Electric overhead and underground training for apprentices is required to last 155 weeks over a three-year period. The training introduces basic electrical education and awareness, communication, familiarization with safety rules, proper personal protective equipment, use of tools, material, equipment, and work practices associated with high voltage overhead electrical work. In the third year, the apprentices gain field experience working under the supervision of Journeyman Lineman.<sup>13</sup>
- **Fault Finder & Relief Fault Finder classes** – Teaches essential knowledge and skills to safely and reliably perform Relief Fault Finding for SDG&E's system. Includes the Inspect Corrective Maintenance Program (CMP), and Overhead & Underground (GO 165).
- **Progressive Planner Training programs** – Class and on-the-job training to obtain skills and knowledge in providing new upgrades to electrical services to industrial, commercial and residential buildings. Examples of topics covered are: rate information, service requirements, material needs, load management, conservation techniques and metering installations.

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<sup>13</sup> There are in place strong development and acquisition plans to mitigate the retirement risk for Linemen; however, lineman also can fill critical roles such as Fault Finding Specialist, Troubleshooter, and Working Foreman-Electric Distribution.

- **Troubleshooter Training Program** – Training on electric service restoration and outage repair, inspections under the CMP and the Overhead and Underground (CPUC Gen Order 165).
  - **Working Foreman Development Program** – Teaches working foreman essential knowledge and skills to safely oversee their crews, public safety, and all aspects of the work in the field.
5. EGO
- **ESCMP** – See description under Gas Operations in this section.
  - **Engineer Intern/Associate Program** - Intern/Associate entry level engineer rotation program that provides the inexperienced engineer an opportunity to acquire experience and proficiency in performing fundamental engineering work.
  - **Management Advisory Group (MAG)** - MAG team helps keep engineers on track and grow throughout the organization. Discussions around interns, associates, rotation of engineers, engineer presentations, succession planning.
6. Construction Services
- **Operations Qualification** – See description under Gas Operations in this section.
  - **ESCMP** – See description under Gas Operations in this section.
  - **Outside Contractors/Contingent Labor** – Used for workload peaks.
7. EDO
- **ESCMP** – See description under Gas Operations in this section.
  - **Joint Transmission System Operator (TSO)/Distribution System Operator (DSO) training program** - Training program to operate the switches of the Electric Transmission and Distribution systems in a safe and reliable manner.
8. Electric T&D Engineering
- **ESCMP** – See description under Gas Operations in this section.
  - **Industry and Trade Training Workshops** - Current training consists of continuing education or industry-sponsored workshops for new technologies. Such technologies include power electronic-based devices and advanced communication systems to build and operate a "smart" reliable electric power grid.

- **SDG&E Project Management/Planner Training Class** - Content of the class includes skills and knowledge to provide new upgrades to existing electrical services to industrial, commercial and residential buildings.
  - **Substation Design Training Classes** – Training on SDG&E substation electrical and structural designs.
  - **High Performing Leader I (formerly Supervisor Toolkit)** - This comprehensive 10-month leadership development program is for new leaders in the SDG&E and shared services organizations.
  - **Outside Contractors/Contingent Labor** – The use of supplemental workforce on an as-needed basis.
9. Human Resources (HR) Organizational Effectiveness
- **Engagement Survey and Action Planning** – Approximately every 18 months, SDG&E surveys all employees to obtain input on their overall engagement and their supervisor’s effectiveness. Action plans are put into place for those departments with lower scores for the directors and supervisors to increase employee engagement and satisfaction via methods such as coaching, training, and team building.

## 6 Proposed Risk Mitigation Plan

SDG&E will continue to perform the 2015 baseline mitigations outlined in Section 5, to, in most cases, maintain the current residual risk level. In addition, SDG&E is proposing to expand or add mitigations during the 2017- 2019 timeframe. These incremental changes are described below.

1. Gas Operations
  - **Supervisor University** - The program includes specific and consistent technical, business, and systems training to adequately equip a potential Supervisor candidate to be 80% proficient at graduation.
2. CSF & Smart Meter
  - **Job Knowledge Sharing Program** – The 2017 program is geared to share knowledge on meter engineering. Various methods will be used to promote knowledge sharing from employees in critical roles, who also may be retiring. These methods will include, but are not exclusive to: interviews, lunch and learns, knowledge sharing workshops, and mentoring).
  - **Third-Party Metering Engineering School** – In 2017 there will be third-party Electric Metering Engineering training in Texas or Seattle for employees to attend. Training will cover the principles of metering engineering, all the various meter forms, how they function, the specific metering application, and equipment and tools.

3. Construction Services

- **Contract Administrator training modules** – There will be new Contract Administrator training modules to supporting training at monthly meetings

4. Electric T&D Engineering

- **Job Knowledge Sharing Program (Pilot)** - This program is geared to share knowledge across the Electric Transmission and System Engineering division. Various methods will be used to promote knowledge sharing from employees in critical roles, who also may be retiring. These methods will include, but are not exclusive to: interviews, lunch & learns, knowledge sharing workshops, and mentoring).
- **In-House Utility Technology Training Program** – An SDG&E program to develop and provide training and refreshers on new utility technologies, such as smart-grid operations, distributed generation, line sensing and power quality devices, and SCADA controls.
- **Engineering Outside Contractors:** The use of experienced external engineering contractors to supplement internal staff.
- **Substation Design Program** – A substation design training program that will include written tests to achieve measureable status and formal classes based on reviewed designs to determine which areas are lacking in experience.
- **Transmission Engineering Design Program** – SDG&E will develop a required, internal transmission engineering training program. It will formalize the QA/QC program around design review and job package creation practices to provide consistency.

5. HR Organizational Effectiveness

- **Supervisor Effectiveness Program** – This will be a Supervisor development program, beginning in the essential Operations areas, and then will expand to all, that enhances supervisor knowledge, leadership skills, safety awareness and policy knowledge in order to mitigate risks associated with retirement and knowledge loss. HR Organizational Effectiveness eventually will provide this training to all Operations departments.

## 7 Summary of Mitigations

Table 11 summarizes the 2015 baseline mitigation plan, the risk driver(s) a control addresses, and the 2015 baseline costs for the Workforce Planning Risk. While control or mitigation activities may address both risk drivers and consequences, risk drivers link directly to the likelihood that a risk event will occur. Thus, risk drivers are specifically highlighted in the summary tables.

SDG&E does not account for and track costs by activity, but rather, by cost center and capital budget code. So, the costs shown in Table 11 below were estimated using assumptions provided by SMEs and available accounting data.

**Table 11: Baseline Risk Mitigation Plan<sup>14</sup>**  
(Direct 2015 \$000)<sup>15</sup>

ID	Control	Risk Drivers Addressed	Capital <sup>16</sup>	O&M	Control Total <sup>17</sup>	GRC Total <sup>18</sup>
1	Gas Operations	<ul style="list-style-type: none"> <li>• Economic factors</li> <li>• A higher number of retirement eligible critical employees each year</li> <li>• Lack of job satisfaction</li> <li>• Transition to newer and/or emerging technology</li> <li>• Increased demand</li> </ul>	There were no retirements in critical roles within Gas Operations in 2015.			
2	CSF & Smart Meter		n/a	340	340	270
3	Kearny Maintenance & Ops		n/a	20	20	0
4	Electric Regional Operations		n/a	1,070	1,070	1,060
5	Electric Grid Operations		n/a	10	10	0
6	Construction		n/a	10	10	10

<sup>14</sup> Recorded costs were rounded to the nearest \$10,000.

<sup>15</sup> The figures provided in Tables 11 and 12 are direct charges and do not include Company overhead loaders, with the exception of vacation and sick. The costs are also in 2015 dollars and have not been escalated to 2016 amounts.

<sup>16</sup> Pursuant to D.14-12-025 and D.16-08-018, the Company is providing the “baseline” costs associated with the current controls, which include the 2015 capital amounts. The 2015 mitigation capital amounts are for illustrative purposes only. Because projects generally span several years, considering only one year of capital may not represent the entire mitigation.

<sup>17</sup> The Control Total column includes GRC items as well as any applicable non-GRC jurisdictional items. Non-GRC items may include those addressed in separate regulatory filings or under the jurisdiction of the Federal Energy Regulatory Commission (FERC).

<sup>18</sup> The GRC Total column shows costs typically presented in a GRC.



	Services	for specialized skills and lead to vacancies • Company culture embraces and encourages job movements				
7	Electric Distribution Operations		There were no retirements in critical roles within Electric Distribution Operations in 2015.			
8	Electric Transmission & Distribution Engineering		n/a	330	330	70
9	HR – Organizational Effectiveness		n/a	80	80	0
	<b>TOTAL COST</b>		n/a	\$1,860	\$1,860	\$1,410

Table 12 summarizes SDG&E’s proposed mitigation plan and associated projected ranges of O&M expenses for 2019. There are no capital costs for the baseline and proposed mitigations. It is important to note that SDG&E is identifying potential ranges of costs in this plan and is not requesting funding approval. SDG&E will request approval of funding in its next GRC. There are non-CPUC jurisdictional mitigation activities addressed in RAMP; the costs associated with these will not be carried over to the GRC. As set forth in Table 12, the utilities are using a 2019 forecast provided in ranges based on 2015 dollars.

Subject matter experts used average labor costs for roles expected and/or required to participate in the training and knowledge sharing activities, along with per-person course costs where available.



**Table 12: Proposed Risk Mitigation Plan<sup>19</sup>**  
(Direct 2015 \$000)

ID	Mitigation	Risk Drivers Addressed	2017-2019 Capital <sup>20</sup>	2019 O&M	Mitigation Total <sup>21</sup>	GRC Total <sup>22</sup>
1	Gas Operations	<ul style="list-style-type: none"> <li>Economic factors can accelerate or delay retirement decisions, which may cause the shifting of retirement bubbles.</li> <li>A higher number of retirement-eligible critical employees each year relative to the total pool of experienced employees.</li> <li>Lack of job satisfaction may quicken the pace and scope of those seeking to retire.</li> <li>Transition to newer and/or emerging technology can lead longer tenured, more experienced employees to struggle to adapt, which may lead to earlier retirements.</li> <li>Increased demand for specialized skills may cause competition in the industry and lead to vacancies.</li> </ul>	n/a	\$200 - 430	\$200 - 430	\$160 - 380
2	Customer Service Field & Smart Meter Ops		n/a	610 - 1,150	610 - 1,150	480 - 900
3	Kearny		n/a	20-60	20-60	0
4	ERO		n/a	1,900 - 3,580	1,900 - 3,580	1,880 - 3,540
5	EGO		n/a	10 - 30	10 - 30	0 - 10
6	Construction Services		n/a	50 - 560	50 - 560	10 - 60
7	EDO		n/a	30-40	30 - 40	20 - 30
8	Electric Transmission & Distribution		n/a	770 - 1,070	770 - 1,070	230 - 300
9	HR Organizational Effectiveness		n/a	30 - 120	30 - 120	30 - 120

<sup>19</sup> Ranges of costs were rounded to the nearest \$10,000.

<sup>20</sup> The capital presented is the sum of the years 2017, 2018, and 2019 or a three-year total. Years 2017, 2018 and 2019 are the forecast years for SDG&E's Test Year 2019 GRC Application.

<sup>21</sup> The Mitigation Total column includes GRC items as well as any applicable non-GRC items.

<sup>22</sup> The GRC Total column shows costs typically represented in a GRC.

		<ul style="list-style-type: none"> <li>Company culture embraces and encourages job movements.</li> </ul>				
	<b>TOTAL COST</b>			\$3,620 - \$7,040	\$3,620 - \$7,040	\$2,810 - \$5,340

<input type="checkbox"/>	Status quo is maintained
<input checked="" type="checkbox"/>	Expanded or new activity
*	Includes one or more mandated activities

While all the mitigations and costs (baseline and proposed) presented in tables above mitigate the Workforce Planning risk, some of the mitigations also mitigate other risks presented in the RAMP Report. Most of the costs and benefits associated with the training classes in this risk’s baseline plan, which are also continuing in the proposed plan, are also included in the risk of Employee, Contractor and Public Safety. However, generally, the apprenticeship programs are only included in this risk. The incremental programs are specific to this risk as well.

## 8 Risk Spend Efficiency

Pursuant to D.16-08-018, the utilities are required in this Report to “explicitly include a calculation of risk reduction and a ranking of mitigations based on risk reduction per dollar spent.”<sup>23</sup> For the purposes of this Section, Risk Spend Efficiency (RSE) is a ratio developed to quantify and compare the effectiveness of a mitigation at reducing risk to other mitigations for the same risk. It is synonymous with “risk reduction per dollar spent” required in D.16-08-018.<sup>24</sup>

As discussed in greater detail in the RAMP Approach chapter within this Report, to calculate the RSE the Company first quantified the amount of Risk Reduction attributable to a mitigation, then applied the Risk Reduction to the Mitigation Costs (discussed in Section 7). The Company applied this calculation to each of the mitigations or mitigation groupings, then ranked the proposed mitigations in accordance with the RSE result.

### 8.1 General Overview of Risk Spend Efficiency Methodology

This subsection describes, in general terms, the methods used to quantify the *Risk Reduction*. The quantification process was intended to accommodate the variety of mitigations and accessibility to applicable data pertinent to calculating risk reductions. Importantly, it should be noted that the analysis described in this chapter uses ranges of estimates of costs, risk scores and RSE. Given the newness of

<sup>23</sup> D.16-08-018 Ordering Paragraph 8.

<sup>24</sup> D.14-12-025 also refers to this as “estimated mitigation costs in relation to risk mitigation benefits.”

RAMP and its associated requirements, the level of precision in the numbers and figures cannot and should not be assumed.

### ***8.1.1 Calculating Risk Reduction***

The Company's SMEs followed these steps to calculate the Risk Reduction for each mitigation:

1. **Group mitigations for analysis:** The Company "grouped" the proposed mitigations in one of three ways in order to determine the risk reduction: (1) Use the same groupings as shown in the Proposed Risk Mitigation Plan; (2) Group the mitigations by current controls or future mitigations, and similarities in potential drivers, potential consequences, assets, or dependencies (e.g., purchase of software and training on the software); or (3) Analyze the proposed mitigations as one group (i.e., to cover a range of activities associated with the risk).
2. **Identify mitigation groupings as either current controls or incremental mitigation:** The Company identified the groupings by either current controls, which refer to controls that are already in place, or incremental mitigations, which refer to significantly new or expanded mitigations.
3. **Identify a methodology to quantify the impact of each mitigation grouping:** The Company identified the most pertinent methodology to quantify the potential risk reduction resulting from a mitigation grouping's impact by considering a spectrum of data, including empirical data to the extent available, supplemented with the knowledge and experience of subject matter experts. Sources of data included existing Company data and studies, outputs from data modeling, industry studies, and other third-party data and research.
4. **Calculate the risk reduction (change in the risk score):** Using the methodology in Step 3, the Company determined the change in the risk score by using one of the following two approaches to calculate a Potential Risk Score: (1) for current controls, a Potential Risk Score was calculated that represents the increased risk score if the current control was not in place; (2) for incremental mitigations, a Potential Risk Score was calculated that represents the new risk score if the incremental mitigation is put into place. Next, the Company calculated the risk reduction by taking the residual risk score (See Table 10 in this chapter.) and subtracting the Potential Risk Score. For current controls, the analysis assesses how much the risk might increase (i.e., what the potential risk score would be) if that control was removed.<sup>25</sup> For incremental mitigations, the analysis assesses the anticipated reduction of the risk if the new mitigations are implemented. The change in risk score is the risk reduction attributable to each mitigation.

### ***8.1.2 Calculating Risk Spend Efficiency***

The Company SMEs then incorporated the mitigation costs from Section 7. They multiplied the risk reduction developed in subsection 8.1.1 by the number of years of risk reduction expected to be realized by the expenditure, and divided it by the total expenditure on the mitigation (capital and O&M). The result is a ratio of risk reduction per dollar, or RSE. This number can be used to measure the relative efficiency of each mitigation to another.

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<sup>25</sup> For purposes of this analysis, the risk event used is the reasonable worst case scenario, described in the Risk Information section of this chapter.

Figure 3 shows the RSE calculation.

### Figure 3: Formula for Calculating RSE

$$\text{Risk Spend Efficiency} = \frac{\text{Risk Reduction} * \text{Number of Years of Expected Risk Reduction}}{\text{Total Mitigation Cost (in thousands)}}$$

The RSE is presented in this Report as a range, bounded by the low and high cost estimates shown in Table 12 of this chapter. The resulting RSE scores, in units of risk reduction per dollar, can be used to compare mitigations within a risk, as is shown for each risk in this Report.

#### 8.2 Risk Spend Efficiency Applied to This Risk

SDG&E analysts used the general approach discussed in Section 8.1 above in order to assess the RSE for the Workforce Planning risk. The RAMP Approach chapter in this Report provides a more detailed example of the calculation used by the Company.

The risk reduction associated with the aforementioned projects was estimated using research, proprietary data and information from SDG&E, along with input from subject-matter experts. The reasonable worst case scenario used to calculate the relative benefits of the mitigations was: a less experienced electric employee fills a position recently vacated by a long-time experienced employee due to retirement, and due to lack of experience, the employee performs work that gives rise to serious injuries. The current controls were analyzed as one group. Incremental mitigations were analyzed as one group, also.

#### Analysis of Current Controls Grouping

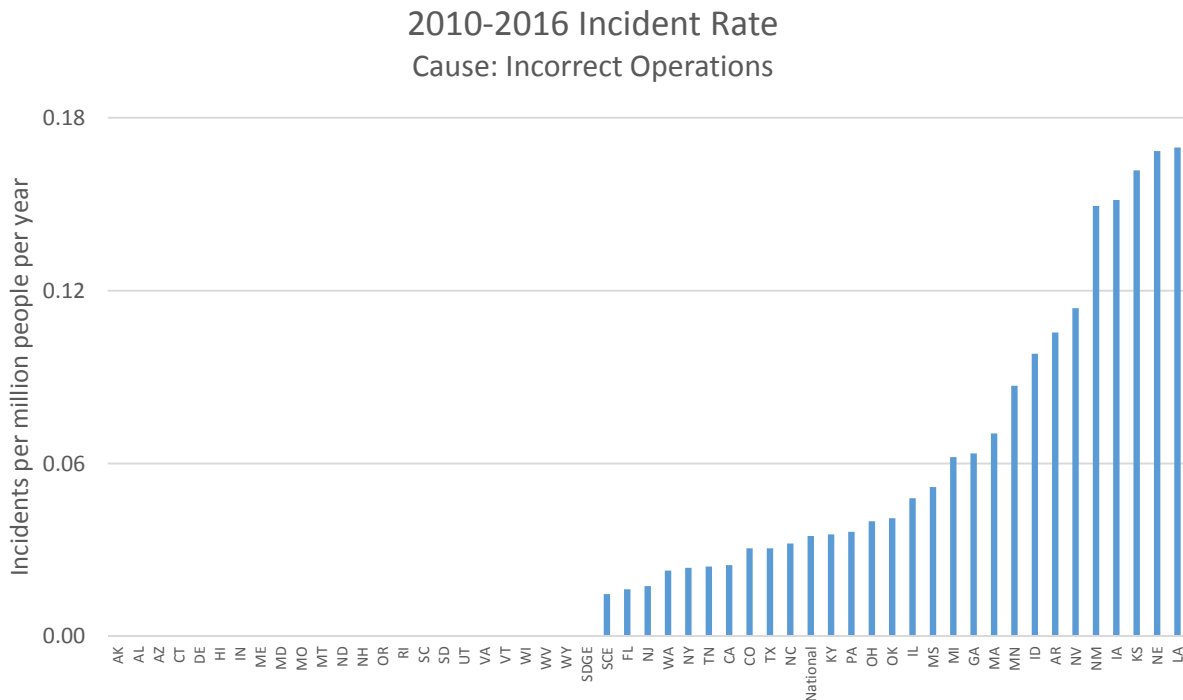
The Federal Pipeline and Hazardous Materials Safety Administration (PHMSA) collects historical information on significant gas incidents from all causes. The cause that is most closely-related to employee human error is incorrect operations.

Analysts postulated that eliminating workforce planning and training would result in an upward trend in the level of human error, and that this could be represented by an increase in incident rate from incorrect operations. It is assumed that at some point in the future, poor performance would increase to the level of the worst-performing state in the nation, and it is assumed that such a point in time would occur in one decade.

This is believed to be an effective proxy because, in the absence of training, proper employee development, and workforce planning, one can expect to have a workforce that is ill-prepared to make the best decisions and conduct ongoing safe operations. In addition, this is believed to be a conservative approach, since all major utilities have planning and training functions, including those that operate in the worst-performing state. The data represents minimum performance degradation expectations.

Mitigated risk can be calculated by multiplying residual risk by the ratio of future incident count expectations to the current expectation. The chart shown below contains the incident rates due to incorrect operations of all 50 states, of SoCalGas, and the national average. SDG&E is among the states with zero incidents per million people per year, and the worst-performing state is Louisiana at 0.1697 incidents per million people per year. Using SDG&E's service population of 3.6 million people, the incident rates can be converted to an incident expectation, given by the following calculation:

$$\begin{aligned}
 \text{Expected Incident Rate} &= \Delta(\text{Incident Rate}) * \text{Service Population} \\
 &= (0.1697 - 0) \text{ incidents per million people per year} * 3.6 \text{ million people} \\
 &= 0.611 \text{ incidents per year}
 \end{aligned}$$



The incident frequency corresponding to the residual risk analysis is 0.058 incidents per year. Considering that a decade will not have elapsed by the end of year 2019, a ½ coefficient is applied to the residual risk multiplier. The calculation is shown below:

$$\begin{aligned}
 \text{Residual Risk Multiplier} &= \frac{\text{Incident Rate from select Causes}}{\text{Incident Rate from all Causes}} * \text{Decade coefficient} \\
 \text{Residual Risk Multiplier} &= \frac{0.611 \text{ incidents per year}}{0.058 \text{ incidents per year}} * \frac{1}{2} \\
 \text{Residual Risk Multiplier} &= 5.3
 \end{aligned}$$

This implies that the mitigated risk frequency is 5.3 times the residual risk frequency.

### Analysis of Incremental Mitigations Grouping

A benchmarking study estimated that 34.2% of utility workers industrywide are eligible for retirement through the end of year 2019. Consequently, it is expected that there is going to be a temporary drop in the level of workforce job proficiency.



The analysis used an estimate of net workforce proficiency as a proxy to estimate the risk reduction from the incremental mitigations. This is believed to be an effective proxy because as less experienced personnel are replacing employees in large numbers, it can be assumed that there will be a decline in workforce proficiency for some period. Further it was assumed here that there is a direct correlation between proficiency and safety.

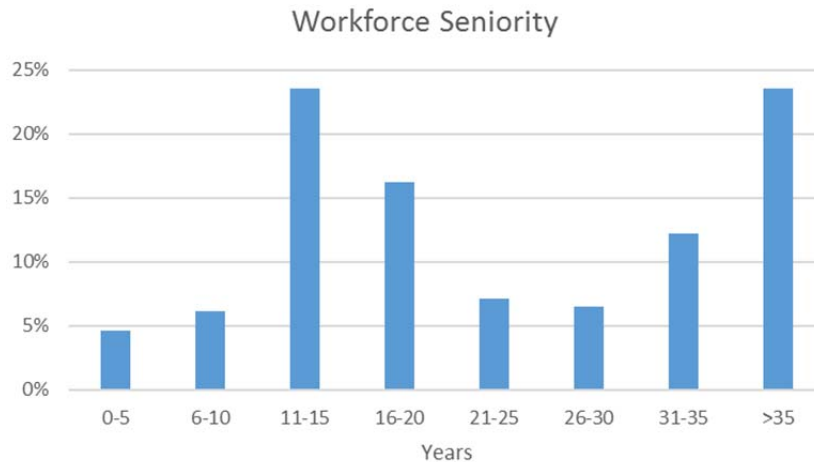
In order to define the benefit in terms of a percent improvement in workforce proficiency, it is important to know how proficiency evolves for technical employees as a function of experience. Based on productivity information for engineers,<sup>26</sup> the function displayed below was derived:



The above curve can be matched with a second curve that shows the range of work experience to get the desired net workforce proficiency. Although actual work experience is not tracked for SDG&E employees, years of seniority is tracked and serves as a representative parameter. The curves below show the current state of the workforce for employees having a safety-related jobs.

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<sup>26</sup> Jaber, Mohamad. Learning Curves Theory, Models & Applications, p. 376.



Merging the proficiency curve with the job seniority curves yields the current net workforce proficiency. To get the future state of the net workforce proficiency the job seniority curves need to be modified by assuming a first in/first out pattern. The net result from these calculations is a 44% improvement in proficiency. Thus, the implied benefit is 44% of the residual risk.

### **8.3 Risk Spend Efficiency Results**

Based on the foregoing analysis, SDG&E calculated the RSE ratio for each of the proposed mitigation groupings. Following is the ranking of the mitigation groupings from the highest to the lowest efficiency, as indicated by the RSE number:

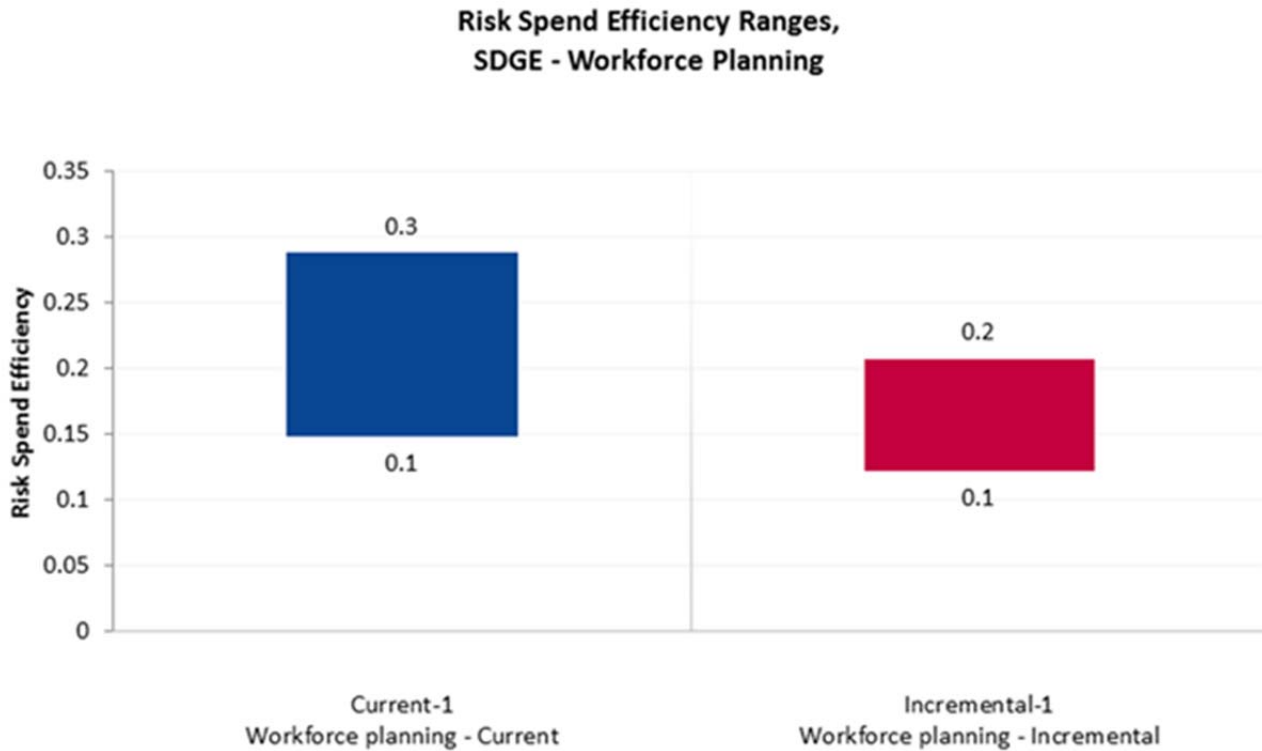
1. Workforce Planning (current controls)
2. Workforce Planning (incremental mitigations)

Figure displays the range<sup>27</sup> of RSEs for each of the SDG&E Workforce Planning risk mitigation groupings, arrayed in descending order.<sup>28</sup> That is, the more efficient mitigations, in terms of risk reduction per spend, are on the left side of the chart.

<sup>27</sup> Based on the low and high cost ranges provided in Table 12 of this chapter.

<sup>28</sup> It is important to note that the risk mitigation prioritization shown in this Report, is not comparable across other risks in this Report.

**Figure 4: Risk Spend Efficiency**



## 9 Alternatives Analysis

SDG&E considered alternatives to the proposed mitigations as it developed the incremental mitigation plan for the Workforce Planning risk. Typically, alternatives analysis occurs when implementing activities, and with vendor selection in particular, to obtain the best result or product for the cost. The alternatives analysis for this risk plan also took into account modifications to the proposed plan and constraints, such as budget and resources.

### 9.1 Alternative 1 – Increases to Contract Labor

SDG&E considered increasing its contract labor as an alternative, rather than backfilling critical roles with Company employees. But in the interest of both employee and public safety, SDG&E prefers to keep “core knowledge” in-house. Additionally, the cost to use contract labor to fill all “critical roles” is estimated to be 20% - 50% higher than using in-house employees. Nonetheless, contract labor may be used to supplement the workforce for peak/seasonal needs. Accordingly, SDG&E prefers its proposed plan to backfill vacancies due to retirements with new employees, and train them to meet Company standards, anticipating that these employees would have a long-standing career with SDG&E.



## **9.2 Alternative 2 – Maintain Current Mitigations**

SDG&E also considered the status quo. In other words, SDG&E would do nothing else to mitigate this risk other than the baseline activities in place in 2015. The current training plans have enabled SDG&E to achieve low historic OSHA recordable rates. However, emerging technologies require additional, new training. Further, when discussing workforce and succession planning to meet the future needs of SDG&E's Operating groups, additional training was deemed necessary. For example, the streamlining of processes, a corporate focus, requires existing training to be updated. Therefore, this alternative was dismissed as it would not meet the future needs of SDG&E Operations.