

RISK ASSESSMENT MITIGATION PHASE – OVERVIEW

December 13, 2016

Agenda

<u>Topic</u>	Presenter	Start	End
SED Opening Remarks	SED	10:00 AM	10:05 AM
Overview and Approach	Chuck Manzuk	10:05 AM	10:25 AM
Risk Framework Overview	David Cheng	10:25 AM	10:55 AM
Quantitative Risk Analysis/Probabilistic Modeling	Mason Withers	10:55 AM	11:10 AM
Lessons Learned	Jamie York	11:10 AM	11:25 AM
Safety Culture	Tashonda Taylor, Wallace Rawls, Harish Shukla	11:25 AM	11:55 AM
Lunch		11:55 AM	12:45 PM
Risk Chapter: High-Pressure Pipeline	Maria Martinez	12:45 PM	1:25 PM
Risk Chapter: Wildfires	Mason Withers	1:25 PM	2:05 PM
Risk Chapter: Cyber Security	Scott King	2:05 PM	2:45 PM
Q&A and Wrap-Up		2:45 PM	3:00 PM

RAMP FILING OVERVIEW

RAMP Overview

- » This first formal RAMP filing identifies SoCalGas' and SDG&E's baseline assessment of safety risks to the public, their employees and their systems, and what potential mitigation measures have been considered.
- » Based on those potential mitigation measures, the utilities then propose certain mitigation measures to further reduce identified risks.
- » The costs of reducing identified risks are then quantified in the “Risk Spend Efficiency” or the “RSE.”
- » The Commission has ordered that RAMP be focused on safety-related risks and mitigating those risks.
- » This RAMP filing is a product of SoCalGas and SDG&E's September 2015 annual risk registry assessment.
- » As such, any events that occurred after September 2015 do not impact the risk registry or the 2015 risk assessment that was completed in September 2015.
- » As with any useful risk assessment, the subsequent risk registry is not static and changes annually. Risks that were separate may be combined, new risks may appear and the level of the risk may change over time.

Overview – RAMP & The General Rate Case (GRC)

- » The purpose of RAMP is not to request funding.
- » Any funding requests will be made in the GRC.
- » RAMP mitigation forecasts are provided only to estimate a range that will be refined with supporting testimony in the GRC.
- » SoCalGas and SDG&E have made efforts to identify where overlapping costs for mitigation measures could mitigate more than one risk.
- » This RAMP filing identifies costs associated with SoCalGas' and SDG&E's largest risks as of September 2015 but will not define the utilities' GRC requests, where the utilities will seek to mitigate other risks in addition to those identified in the RAMP filing.

General Guidance

- » The approach adopted by SoCalGas and SDG&E integrates the following:
 - In order to provide a comprehensive view of the risks addressed within the RAMP filing certain non-CPUC jurisdictional risks and associated costs (e.g. Federal Energy Regulatory Commission or FERC) have been included in the filing, but these will not carry over to the GRC filing.
 - The analysis and the resulting order of priority of mitigations were performed at the individual risk level, not across all risks.
 - The RAMP filing includes mandated compliance controls and mitigations, as well as ones identified by SoCalGas and SDG&E.
 - Ongoing spending on controls is needed to maintain the current levels of residual risks.

RAMP APPROACH

Risks Incorporated into the RAMP

Approach

Scope

Risks from the 2015 risk registry with Health, Safety and Environmental impact score of 4 and above

1

No injury or illness or up to an unreported negligible injury; no environmental impact

2

Minor injuries or illnesses to few public members or employees; environmental impact is immediately correctable or contained within small area

3

Minor injuries or illnesses to many public members or employees; Moderate and short-term impacts to environment

4

Few serious injuries or illnesses to public or employees; Significant and short-term impacts to environment

5

Many serious injuries or illnesses to public or employees; Significant and medium-term impacts to environment

6

Few fatalities and life threatening injuries to public or employees; Severe and long-term impacts to environment

7

Multiple fatalities and life threatening injuries to public or employees; Immediate, severe, and irreversible impacts to environment

Current Plan Baseline Costs

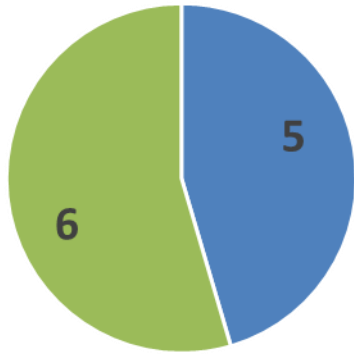
Use 2015 actuals to develop current plan costs in 2015 dollars
 Use 5 years of historical data if possible (i.e., 2011-2015)
 For costs that are harder to track, use estimates based on Subject Matter Expert input

Proposed Plan Forecasted Costs

Based forecast costs off 2015 actuals and historical data, where appropriate
 Use range estimates to forecast costs

RAMP Risks Overview

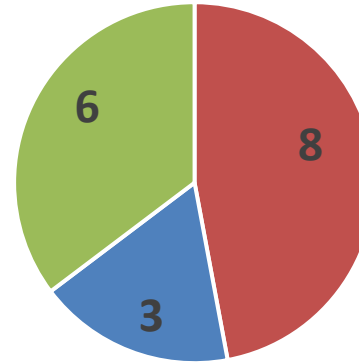
SoCalGas Risks Included in RAMP



Total: 11

■ Gas ■ Cross-Cutting

SDG&E Risks Included in the RAMP



Total: 17

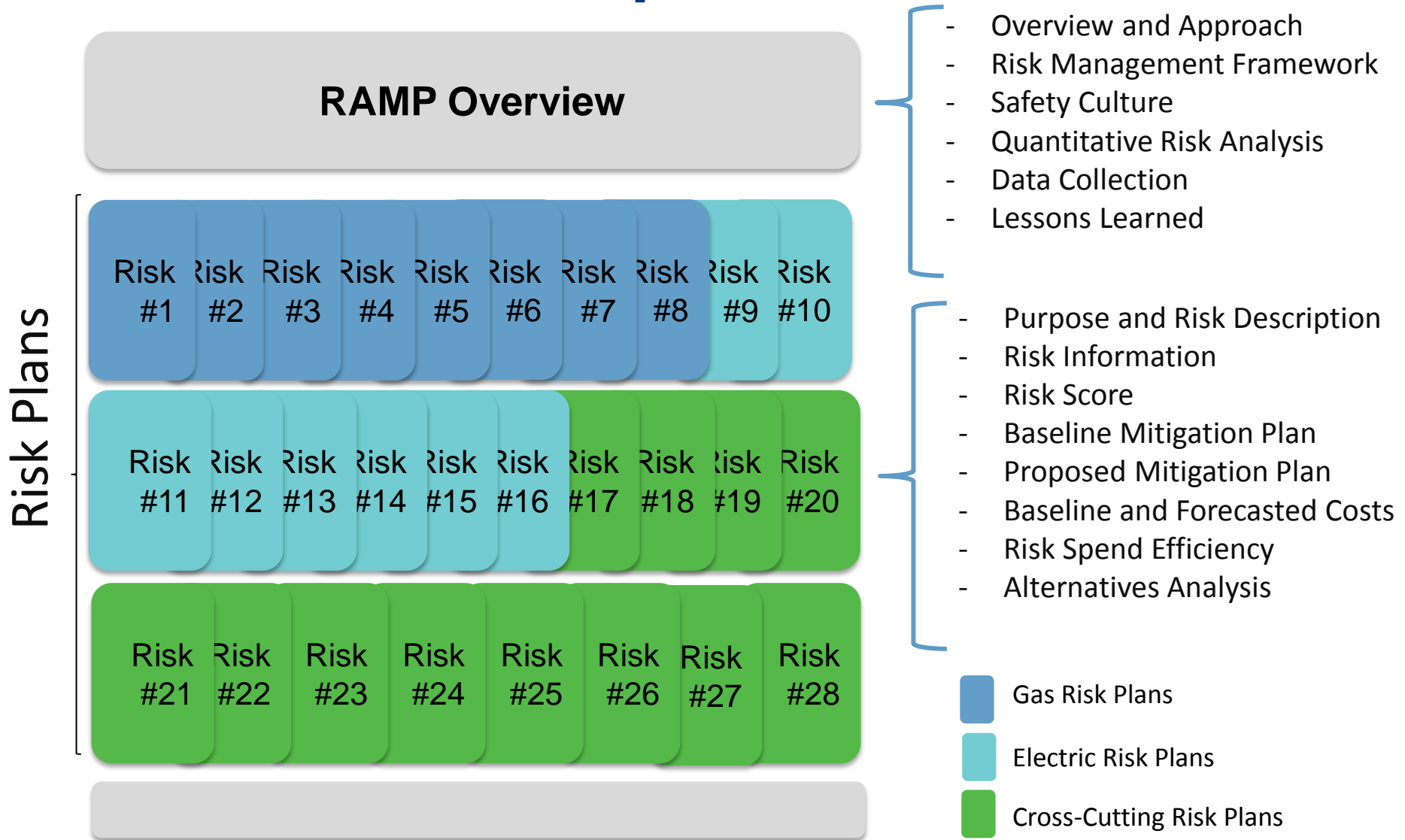
■ Electric ■ Gas ■ Cross-Cutting

Risk Type	Total
Gas	8
Electric	8
Cross-Cutting	12
Total	28

Risks Included in RAMP

	Gas	Electric	Cross-Cutting
SDG&E	Catastrophic Damage Involving Gas Infrastructure (Dig-Ins)	Wildfires Caused by SDG&E Equipment (Including 3rd Party Pole Attachments)	Employee, Contractor & Public Safety
		Distributed Energy Resources (DERs) Safety and Operational Concerns	
	Catastrophic Damage Involving High-Pressure Pipeline Failure	Major Disturbance to Electrical Service (e.g. Blackout)	Cyber Security
		Fail to Black Start	Workplace Violence
Aviation Incident		Records Management	
Catastrophic Damage Involving Medium-Pressure Pipeline Failure	Unmanned Aircraft System (UAS) Incident	Workforce Planning	
	Electric Infrastructure Integrity		
	Public Safety Events - Electric	Climate Change Adaptation	
SoCalGas	Catastrophic Damage involving Gas Infrastructure (Dig-Ins)		Employee, Contractor, Customer & Public Safety
	Catastrophic Damage Involving High-Pressure Pipeline Failure		Cyber Security
	Catastrophic Damage Involving Medium-Pressure Pipeline Failure		Workplace Violence
	Catastrophic Event Related to Storage Well Integrity		Records Management
	Physical Security of Critical Infrastructure		Workforce Planning
		Climate Change Adaptation	

RAMP Report Structure



Risk Mitigation Plan

There is a risk mitigation plan for each of the 28 risks in this Report. The plan is organized into the following sections:

- » **1. Purpose** – The definition of the risk
- » **2. Background** – Additional information to provide factual and, where appropriate, legal context for the RAMP Risk
- » **3. Risk Information** – Description of the risk classification, potential risk drivers, potential consequences, and how these components work into each respective Risk Bow Tie
- » **4. Risk Score** – Description of the reasonable worst case scenario (event) chosen to develop the risk score, an explanation of the assigned risk scores by impact area and frequency
- » **5. Baseline Risk Plan** – The 2015 controls established to address the risk
- » **6. Proposed Risk Plan** – The mitigations proposed to enhance or expand risk management activities
- » **7. Summary of Mitigations** – The baseline (2015) and forecast (in 2015 dollars) range of costs to implement the controls and mitigations
- » **8. Risk Spend Efficiency** – An explanation of the Risk Reduction as applied to the specific risk, the calculation of the RSE, and the RSE results
- » **9. Alternatives** – The two alternatives considered as part of the risk evaluation

Meeting the RAMP Requirements

Requirement

Approach

Prioritization of Risks & Description of Methodology

Used 2015 risk registry to identify key safety risks to include in the RAMP (those with safety score of 4 and above).
Used the tools described in the S-MAP, such as the 6-step risk management process, annual planning process, risk evaluation tool, risk registry, risk taxonomy and lexicon.

Current Controls & Baseline Costs

Identified controls in place in 2015 and associated costs (2011-2015) to manage key safety risks.

Prioritization of Mitigation Alternatives

Prioritized mitigations in each risk using first generation risk spend efficiency calculations. Risk reduction was not a “one-size-fits-all” approach. The SMEs determined the best option using one of the following options:

- Qualitative (SME-based qualitative description of benefits)
- Execution metrics (e.g. miles of risky pipe replaced)
- Operational performance metrics (e.g. wires down)
- Enterprise performance metrics (e.g. OSHA Recordable Incident Rate)

Risk Mitigation Plan & Two Alternatives

Described two alternative mitigation plans that were considered per risk and explained why they were dismissed in favor of the proposed plan. Generally, the alternatives were as follows:

- Status Quo
- Adjust scope/pace of programs or activities
- Remove/add activities in mitigation plan

RISK MANAGEMENT FRAMEWORK

Risk Management Framework



Mapping to Cycla Model

Cycla Model	Corresponding Step in SoCalGas and SDG&E's Risk Management Process
1. Identify Threats	1. Risk Identification
2. Characterize Sources of Risk 3. Identify Candidate Risk Control Measures (RCMs)	2. Risk Analysis
4. Evaluate the Anticipated Risk Reduction for Identified RCMs	3. Risk Evaluation
5. Determine Resource Requirements for Identified RCMs 6. Select RCMs Considering Resource Requirements and Anticipated Risk Reduction	4. Risk Mitigation Plan Development and Documentation
7. Determine Total Resource Requirement for Selected RCMs 8. Adjust the Set of RCMs to be Presented in GRC Considering Resource Constraints 9. Adjust RCMs for Implementation following CPUC Decision on Allowed Resources	5. Risk-Informed Investment Decisions and Risk Mitigation Implementation
10. Monitor the Effectiveness of RCMs	6. Monitoring and Review

7x7 Evaluation Matrix

	Impact						
	7	6	5	4	3	2	1
	Catastrophic	Severe	Extensive	Major	Moderate	Minor	Negligible
Health, Safety, & Environmental: Endanger workplace or public safety; impact to surrounding environment; Long-term: 10+ years Medium-term: 3-10 years Short-term: 1-3 years	Fatalities: Many fatalities and life threatening injuries to the public or employees. Immediate, severe, and irreversible impacts to environment	Fatalities: Few fatalities and life threatening injuries to the public or employees. Severe and long-term impacts to environment	Permanent/Serious Injuries or Illnesses: Many serious injuries or illnesses to the public or employees. Significant and medium-term impacts to environment	Permanent/Serious Injuries or Illnesses: Few serious injuries or illnesses to the public or employees. Significant and short-term impacts to environment	Minor Injuries or Illnesses: Minor injuries or illnesses to many public members or employees. Moderate and short-term impacts to environment	Minor Injuries or Illnesses: Minor injuries or illnesses to few public members or employees. Environmental impact is immediately correctable or contained within small area	No injury or illness or up to an un-reported negligible injury. No environmental impact
Operational and Reliability: Disruption to company operations that could impact customers; may be measured in quantity of impacted customers, critical locations, loss of energy flows, and/or duration	> 1 MM customers affected; or impacts an entire metropolitan area, including critical customers; or disruption of service of more than a year due to permanent loss to a facility	>100 K customers affected; or impacts multiple critical locations and customers; substantial disruption of service greater than 1 months	> 50 K customers affected; or impacts multiple critical locations or customers; substantial disruption of service greater than 10 days	> 10 K customers affected; impacts single critical location or customer; disruption of service greater than 1 day	> 1 K customers affected; impacts single critical location or customer; disruption of service for 1 day	> 100 customers affected; impacts small area with no disruption to critical location or customer; disruption of service less than 1 day	< 100 customers affected; impacts small localized area with no disruption to critical location/customer; disruption of service less than 3 hours
Regulatory, Legal, & Compliance: Diminishing relationship and increased scrutiny by regulators or government agencies; ongoing media coverage forces outreach to policy makers/regulators; increasing stakeholder revolt or objections leading to increased oversight; loss of license, exclusivity, or monopoly	Actions resulting in closure, split, sale of the company, or criminal conviction	Cease and desist orders are delivered by regulators; Critical assets and facilities are forced by regulators to be shut down; revoking license, market-based rate authority, or monopoly	Governmental, regulatory investigation (including criminal), and enforcement actions lasting longer than one year; violations that result in fines/penalties and large non-financial sanctions	Violations that result in fines or penalties, or a regulator enforces non-financial sanctions, or significant new and updated regulations are enacted as a result of an event	Violations that result in fines or penalties	Self-reported or regulator identified violations with no fines or penalties	No impact to administrative impact only
Financial : Potential financial loss, including disallowance, legal actions or fines, replacement energy, remediation, damage to 3rd party properties, etc.	Loss > \$3 billion Ability to raise capital significantly impacted; or price greater than 25%; or potential insolvency	\$1 B - \$3 B Ability to raise capital is challenged; or decrease in stock price greater than 15%	\$100 MM - \$1 B Ability to raise capital becoming more difficult; or decrease in stock price greater than 5%	\$10 MM - \$100 MM	\$1 MM - \$10 MM	\$50 K - \$1 MM	< \$50 K
	Frequency/Likelihood						
	7	6	5	4	3	2	1
	Common	Regular	Frequent	Occasional	Infrequent	Rare	Remote
Frequency of an occurrence: How often does the risk event occur	> 10 times per year	1-10 times per year	Once every 1-3 years	Once every 3-10 years	Once every 10-30 years	Once every 30-100 years	Once every 100+ years

Risk Score Algorithm

» Risk score algorithm:

$$\text{Risk score} = \sum_{i=1}^n \text{weight}_i * \text{frequency}_i * 10^{\text{impact}_i}$$

Current weight values:

i	Category	Weight
1	Safety	0.4
2	Reliability	0.2
3	Compliance	0.2
4	Financial	0.2

Example: Per 7x7 matrix, frequency of 4 is once every 3-10 years. Value of 0.183 represents approximately once every 5.5 years.

Frequency values:

Frequency rating	Value
1	0.005
2	0.018
3	0.058
4	0.183
5	0.577
6	3.162
7	31.623

Sample Risk Score Calculation

Illustrative risk example:

$$\text{Risk score} = \sum_{i=1}^n \text{weight}_i * \text{frequency}_i * 10^{\text{impact}_i}$$

Safety Impact	Reliability Impact	Compliance Impact	Financial Impact	Frequency
6	5	5	6	5

(Using frequency table, frequency 5 has value of 0.577)

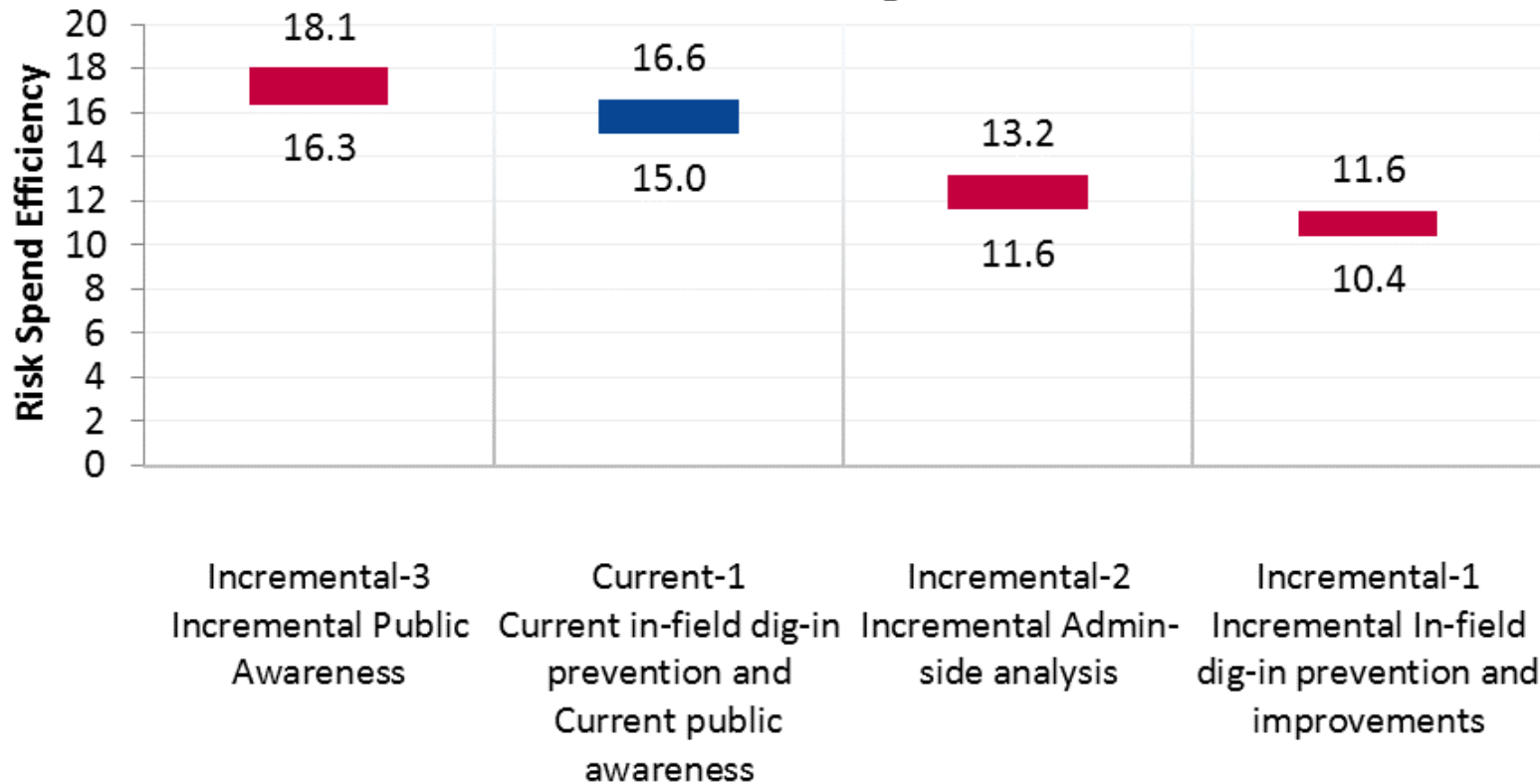
$$\begin{aligned} &= 0.4 * 0.577 * 10^6 \text{ [safety]} + 0.2 * 0.577 * 10^5 \text{ [reliability]} \\ &\quad + 0.2 * 0.577 * 10^5 \text{ [compliance]} + 0.2 * 0.577 * 10^6 \text{ [financial]} \\ &= 230,800 \text{ [safety]} + 11,540 \text{ [reliability]} + 11,540 \text{ [compliance]} \\ &\quad + 115,400 \text{ [financial]} \\ &= \mathbf{369,280} \end{aligned}$$

Risk Spend Efficiency Calculation

- Activities were aggregated into control/mitigation groupings based on the common triggers and risk reduction they provide
- Implementing a mitigation or control reduces risk – and thereby the risk score. In general;
 - Base controls: maintain the residual risk
 - Proposed mitigations: reduce the residual risk
- The relative value of the mitigation within each risk is represented by the Risk Spend Efficiency (RSE)
- $RSE = \text{Risk Score Improvement} \div \text{Cost of Mitigation (in thousands)}$
- Estimate effect of mitigation using one or more of the following methodologies:
 - Internal/external data
 - Third party ranking/metrics
 - Risk scoring using the 7x7
 - SME assessment

Sample Risk Spend Efficiency Ranges

**Risk Spend Efficiency Ranges,
SoCalGas - Dig-Ins**



QUANTITATIVE RISK ANALYSIS/PROBABILISTIC MODELING

Quantitative Analysis

Risk Name	Quantitative Assessment Status
Wildfire	Stochastic models in use
Electric Infrastructure Safety and Reliability	<p>Electric reliability probabilistic studies involving underground cable and other equipment.</p> <p>Substation transformer CBM project is in-flight.</p>
Aviation Incident	<p>Probabilistic study in use for our contractor and subcontractor flights.</p> <p>Non-utility aviation issues being addressed through studies of marker balls placement.</p>

Quantitative Analysis

Risk Name	Quantitative Assessment Status
Cyber Security	Risk assessments involving likelihoods and consequences have been undertaken and will continue to expand.
Catastrophic Damage involving Gas Infrastructure (Dig-Ins)	Numerical data for likelihoods and consequences is used to create relative risk scores. Future work hopes to integrate probabilistic methods and a more robust quantitative approach.
Distributed Energy Resources (DERs) Safety and Operational Concerns	Quantitative risk assessments involved likelihoods and consequences have been undertaken and continue to expand.

Quantitative Analysis

» Direction

- Goal
 - Risk portfolio at commodity level
 - Risk assessment
 - Mitigation effectiveness assessment
 - Optimal budget allocation for each risk
 - Practical
 - Real world constraints
 - Financial realities
- Focus on top risks first
- Build organizational infrastructure

Example: Widget Risk

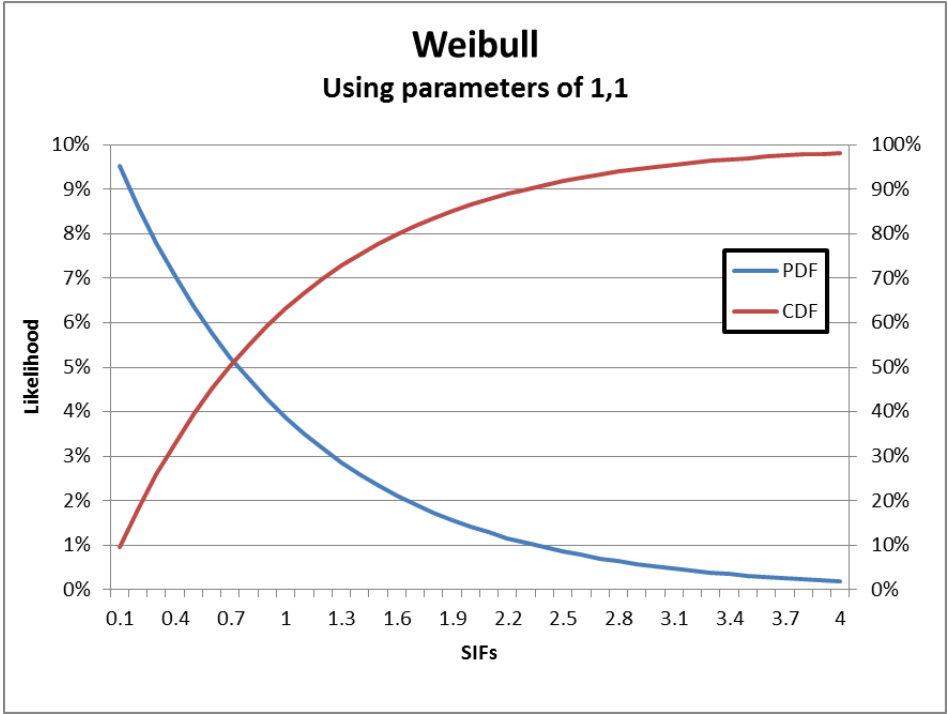
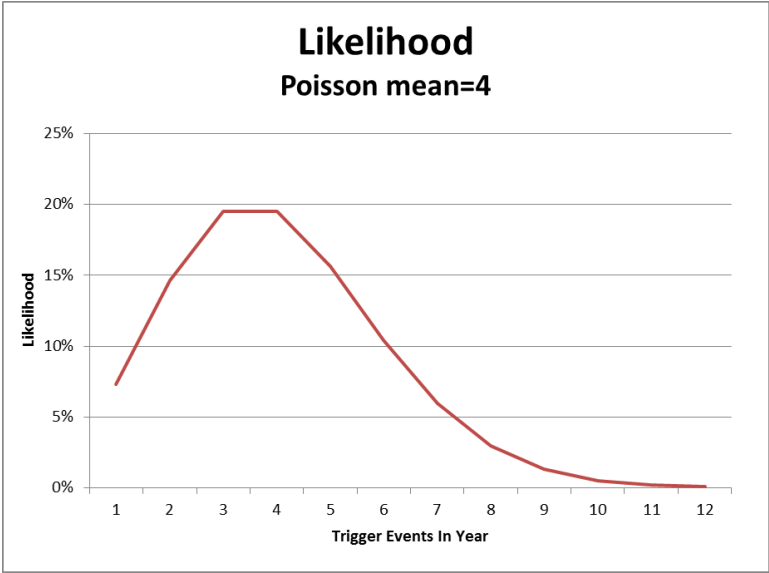
» Risk:



» Sample modeled data:

2	12%	0.41
4	7%	1.31
5	14%	0.78
2	12%	1.01
3	12%	0.40
5	13%	0.22
3	7%	0.15
2	17%	2.51
3	13%	1.82
2	10%	0.28
5	10%	1.81
3	13%	0.11
9	8%	1.02
2	12%	1.23
4	11%	

Example: Widget Risk



Example: Widget Risk

» Risk:



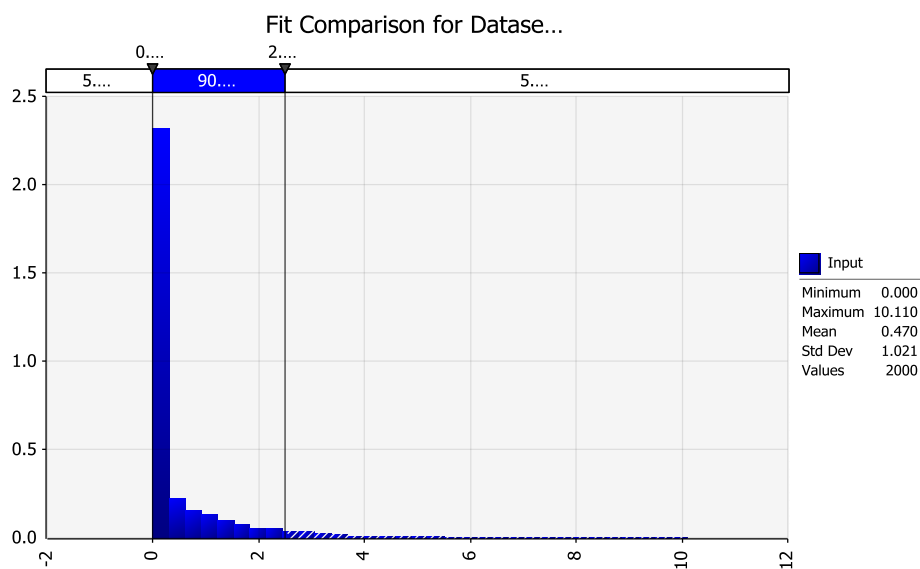
» Run Simulations:

- Year 1
 - Five triggering events occur
 - One of them lead to risk event
 - The risk event caused 0.35 SIFs
- Year 2
 - Three triggering events occur
 - None lead to risk event

Example: Widget Risk

» Sample modeled data:

Year	Output
1	0.35
2	0
3	0
4	0.27
5	1.97
6	3.54
7	0.98
8	0
9	0
10	0
11	0
12	0
13	0.19
14	0
15	0
16	0.02
17	0.03
18	0



Can calculate likelihood of big events, moderate events, etc. Can calculate P95.

Example: Widget Risk

» Risk:



» Re-Run Simulations:

- Observed differences in output.
- Develop an RSE-like value to estimate value of mitigation

Quantitative Analysis

» Model output

- The current level of risk
- Effectiveness of mitigation
 - Expected value
 - At P95 or P99

» Portfolio approach

- In future, with models built, and mitigations and constraints identified
 - Input a \$ amount and model determines best course of action
 - With “levels of interest”, could determine appropriate budget levels

LESSONS LEARNED

Lessons Learned – Specific to SoCalGas & SDG&E

» Risk Evaluation

- Document risk scenarios
- Revisit risks annually to reflect new information
- Provide data to support scores, to the extent feasible

» Data Collection

- Currently evaluating increasing the amount of data collected and tracked

» Accounting Systems

- Currently evaluating accounting systems to determine if modifications are needed to incorporate risk attributes

» Quantification of Risk Reduction

- Improve risk reduction efforts
- Align investment decisions with risk benefits in the future

Lessons Learned – Advice for Other Utilities

» Scope of Risks

- Include primarily safety mitigations, consistent with Senate Bill 705 and CPUC directives, rather than all mitigations
- Group projects/programs that address the same drivers or consequences at the beginning
- Determine the most fitted risk for overlapping activities and include all applicable costs

» Process Improvements

- Frequent communication and gain participation early
- Provide considerable time for quantifying the risk reduction
- Complete costs prior to calculating risk reduction efforts
- Manage expectations with regard to risk reduction

SAFETY CULTURE

Commitment to Safety Statement

SoCalGas and SDG&E's long-standing commitment to safety focuses on three primary areas:

- » employee safety
- » customer safety
- » public safety

This safety focus is embedded in what we do and is the foundation for who we are—from initial employee training, to the installation, operation and maintenance of our utility infrastructure, and to our commitment to provide safe and reliable service to our customers.

SDG&E Employee Safety Journey

Culture and Employee Engagement are the Foundations of all Safety Activities

Gary Tehan Safety Leadership Award
established, honored tradition continues

Circle of Safety
driving behavior adopted

Behavior Based Safety
peer observations in operating districts

Safety Committee Congress
forum to energize and educate

Incident Review Team "Stop the Job" initiative

Yard Stretching
starts the day

Office Ergonomics
Remedy software

Grant Valentine Team Safety Award
established

Vehicle Ergonomics

OpEx Mobile Data Terminal design

1st Annual **Contractor Safety Summit**

Occupational Health Nurse Program

expanded with telemedicine & add'l office

AGA
2015 Industry Leadership Award (DART rate)

Daily Report
visibility

Employee Safety Pledge

OSHA Rates:

1998
8.65

2000
6.90

2002
5.38

2004
4.45

2006
4.92

2008
4.11

2010
3.07

2012
2.26

2014
2.20

2016 YTD
2.15

Smith System®
training for safe driving

Executive Safety Council
increased executive focus and dialogues with employees

Workforce focused **Electric safety subcommittee** implemented

SIMS (Safety Information Mgmt System) and metrics

Safety in Motion® for body mechanics in field operations

Grassroots Culture Teams
start projects in districts

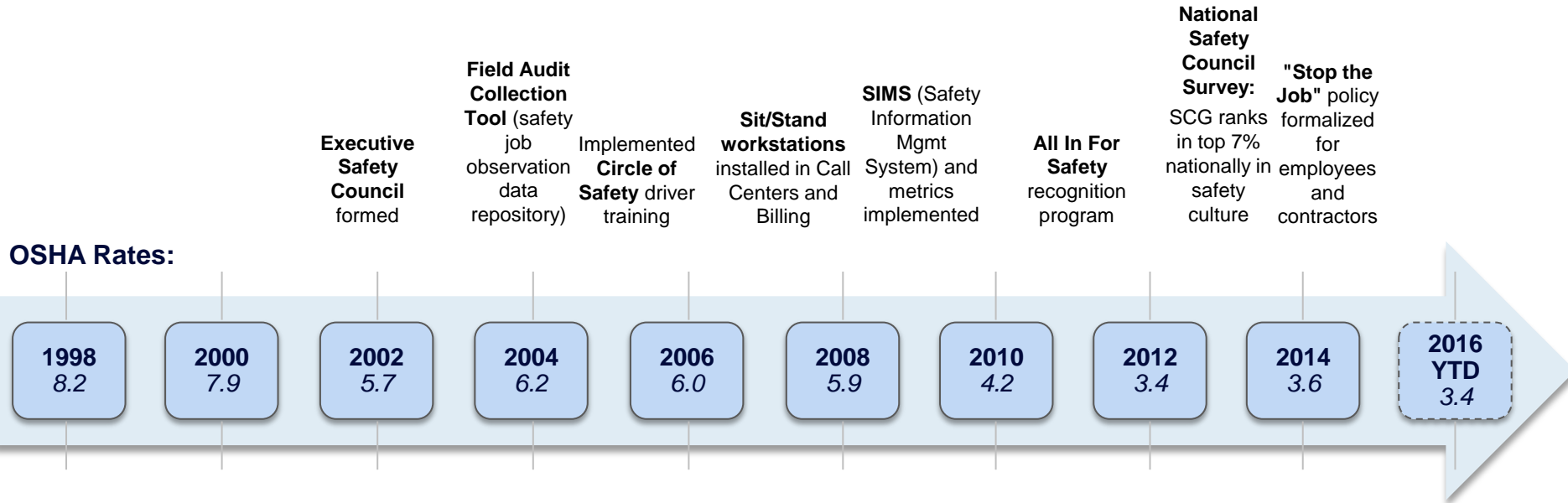
Driving Campaigns & guest speakers

National Safety Council Survey
SDG&E ranks in top 7% nationally in safety culture

Gas Safety Subcommittee
launched with union support

SoCalGas Employee Safety Journey

Culture and Employee Engagement are the Foundations of all Safety Activities



Executive Safety Council formed

Field Audit Collection Tool (safety job observation data repository)

Implemented **Circle of Safety** driver training

Sit/Stand workstations installed in Call Centers and Billing

SIMS (Safety Information Mgmt System) and metrics implemented

All In For Safety recognition program

National Safety Council Survey: SCG ranks in top 7% nationally in safety culture
"Stop the Job" policy formalized for employees and contractors

OSHA Rates:

1987
Smith System® driver training implemented with refresher courses and continuing education

Environmental and Safety Compliance Management Program process implemented

Remedy Office Ergonomics training begins

Pilot Occupational Health Nurse Pilot Program implemented
Safety in Motion® for body mechanics implemented in field operations

Safety Culture Change training
Expanded Occupational Health Nurse Program Added Telemedicine and more locations

Safety in Motion® training expanded
Safety Culture Tools training

AGA Peer Review conducted

Employee, Contractor & Public Safety

- » Safety "Golden Rules"
- » Training & Awareness Campaigns
- » Technology
- » Innovative public safety programs in daily operations
- » Contractor Accountability & Oversight
- » Communications
- » Health & Wellness
- » Committees, Councils, Forums, Teams

Safety Barometer Survey

- » Administered by National Safety Council (NSC), an independent, non-profit organization with demonstrated expertise in perception surveys
- » Purpose is to engage employees in sharing their perception of safety and to help identify improvement opportunities
- » Survey offered to all employees
- » Survey results compared with 580 companies in the NSC database
- » Both SoCalGas and SDG&E are sustaining a very high level of employee perception about their safety cultures relative to other companies

HIGH-PRESSURE PIPELINE



High-Pressure Pipeline

WILDFIRES

Wildfire Risk

» Executive Summary

- Fire Risk is a top risk at SDG&E
- Much research has been undertaken to address problem, culminating in the content in the annually filed Fire Prevention Plan
- SDG&E has baseline mitigation plan
- Risk assessment of each portion of the plan, resulting in Proposed Mitigation plan

Wildfire Risk

- » Potential Drivers for Wildfire:
 - Downed conductor
 - Vegetation contact
 - Vehicle contact
 - Third party attachment
 - Equipment failure
 - Foreign Object contact
 - Equipment or employee operations

Wildfire Risk

- » Baseline mitigation plan has 6 components:
 - Inspection, repair, maintenance and replacement program
 - Vegetation management
 - Design and Engineering Approaches
 - Legal and Regulatory
 - Rapid Response
 - Monitoring and Protection Programs

Wildfire Risk

» Baseline mitigations

- Inspection, Repair, Maintenance and Replacement
 - Adherence to GO 165
 - Expanded QA/QC program
 - Fire Risk Mitigation (FiRM)
- Vegetation Management
 - Compliance with government programs
 - Exceed minimum regulatory requirements in certain circumstances
- Design and Engineering Approaches
 - Use weather and fuel data
 - Create strict standards to focus on high risk areas
 - Replace poles as necessary

Wildfire Risk

» Baseline mitigations

- Legal and Regulatory
 - Aerial markers
 - Avian Protection
- Rapid Response
 - Coordination of first responders
 - Mobilize resources prior to and during risk events
- Monitor and Detection Programs
 - Weather monitoring predictive and real-time
 - Fuel data

Wildfire Risk

» Proposed mitigations

- Inspection, Repair, Maintenance and Replacement
 - Continuation of FiRM program with increased spending
 - Increase of analysis and replacement of overhead conductor
 - Cleveland National Forest (Transmission and Distribution)
- Vegetation Management
 - Continuance of program
 - Joint inspection with CalFire
- Design and Engineering Approaches
 - Continued risk focus

Wildfire Risk

» Proposed mitigations

- Legal and Regulatory
 - Continuance of programs
- Rapid Response
 - Continuance of programs with need for larger budget due to longer portion of year where necessary
- Monitor and Detection Programs
 - Continuance of program
 - Real-time fire information sharing system
 - Real-time imaging from aircraft during fire

Wildfire Risk

» Mitigation effectiveness

- Incremental System Hardening, Inspection & Repair Programs – Distribution (incremental)
- System Hardening, Inspection & Repair Programs – Distribution (baseline)
- Vegetation Management (baseline)
- Advanced Detection (incremental)
- Advanced Protection (incremental)
- System Hardening, Inspection & Repair Programs – Transmission (incremental)
- Rapid response (baseline)
- Legal and Regulatory Mitigation (baseline)

Wildfire Risk

» S-MAP

- Wildfire Risk Reduction Model
 - Strong analytical tool that has confirmed other studies
 - Likely expanding to WRRM OPS (in pilot)
 - Utilized data to assist with RSE calculation
- SDG&E continually improving its efforts

» Fire Safety OIR

- Leadership role in developing maps to identify areas of risk

CYBER SECURITY

Cybersecurity Risk

- » Many possible ways a public safety event can occur via cyber risk
- » An example of one low frequency, high impact risk scenario is a threat disrupting energy delivery via a cyber attack
- » Mitigation approach:
 - Operate cybersecurity infrastructure to efficiently address multiple risks with reusable solutions
 - Focus additional efforts on prioritized controls and practices

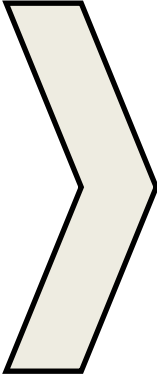
Cybersecurity

- » Cybersecurity risks defined using a recognized matrix of critical security controls (Center for Internet Security)
- » Individual security controls are evaluated and ranked using the 7x7 model
- » Risk alone does not shape strategic cybersecurity planning
- » The Department of Energy (DOE) Cybersecurity Capability Maturity Model (C2M2) is used to evaluate cyber program maturity
- » Control risks are mapped to C2M2 model
- » Combined risk/maturity model used to define cybersecurity program priorities, projects, and improvements

Utilize Standard Frameworks

- » Center for Internet Security (CIS) develops and maintains Critical Security Controls model (CSC 20)
 - Detailed control families
 - Cited in Feb 2016 California Data Breach Report
- » Department of Energy publishes the Cybersecurity Capability Maturity Model (C2M2)
 - Tool to assess cybersecurity maturity across 10 maturity domains
 - Used nationally by many Electric and Natural Gas companies
 - Recommended by industry trade and peer organizations

S-MAP Recap

CIS Controls	MAPPING	C2M2 Maturity Domain
Continuous vulnerability assessment and remediation		Threat and vulnerability management (TVM)
Red teaming and penetration testing		RATED: Medium maturity <input type="radio"/> CAUSE: Process and skillset gaps <input checked="" type="radio"/> <input type="radio"/>
RATED: High risk <input checked="" type="radio"/> CAUSE: Lack of trained resources and tools <input type="radio"/> <input type="radio"/>		ACTION: Investment in technology, training, and specialized resources <input type="radio"/> <input type="radio"/> <input checked="" type="radio"/>

NOTE: The above is an illustrative example only

RAMP Summary

» Cyber Risk Management Approach

- Maximize types of risks addressed by practices and controls (Enterprise solutions vs. point solutions)
- Maintain current security posture with respect to evolving threat and risk
- Mitigation activities and costs grouped by NIST CSF

» Cost Estimates

- Included O&M Labor and Non-Labor estimates
- Capital projects based on August 2016 roadmap
- All costs provided in a conservative range
- Included placeholder estimates for carry over and unanticipated projects
- Midrange target costs as baseline to maintain posture

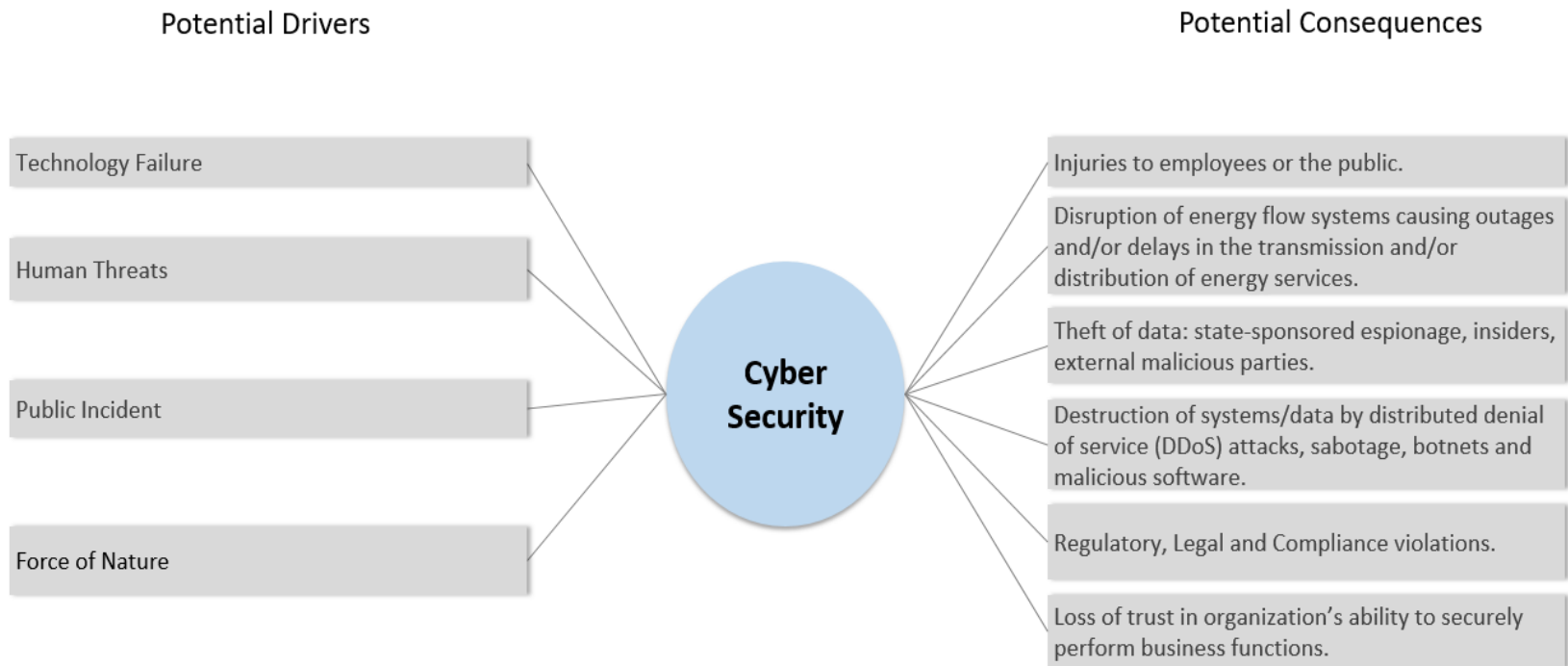
Align with NIST Risk Framework

- » Identify
 - Security policy framework
 - Asset management
 - Risk assessments
 - Threat intelligence
 - Risk management
- » Protect
 - Manage asset access
 - Cyber security awareness and training
 - Protective technologies
 - System maintenance
- » Detect
 - Monitor security events
 - Anomaly detection
 - Security event detection and escalation
- » Respond
 - Cybersecurity incident response
 - Incident triage and analysis
 - Communications and coordination
 - Lessons learned
 - Readiness exercises
- » Recover
 - Resume normal operations post cybersecurity incident
 - Capability largely resides in other business units

Note: Illustrative examples, not inclusive of all activities performed

Risk Lexicon

- » Left side illustrates risk drivers
- » Right side illustrates risk consequences



Risk Mitigations

- » Identify
 - Compliance Records Management – implement a system of recordkeeping dedicated to compliance records to better support regulatory auditing.
 - Enterprise Threat Intelligence – automate distribution of threat intelligence to business and system owners to improve Cyber Security risk awareness and engagement.
- » Protect
 - Web Applications and Database Firewalls – improve protective capabilities for web applications and databases to reduce the likelihood and impact of an incident.
 - Host Based Protection – improve host-based protections for direct attacks and to prevent attackers from pivoting to a host from a neighboring host
- » Detect
 - Insider Threat Detection/Prevention – leverage emerging technologies to improve the detection of insider threat activities and the related risk impacts.
 - Perimeter Tap Infrastructure Redesign – improve the performance and visibility into network traffic to limit impacts of incidents.
- » Respond
 - Incident Response Secure Collaboration – implement a secure, out-of-band communication capability to coordinate and support incident response activity.
 - Security Orchestration – automate and support enhancements to the workflow related to responding to and analyzing escalated events to better manage and learn from cyber events.
- » Recover
 - Information Security technology backup and recovery – refresh backup and recovery for sensitive information security systems to ensure the return to a safe and secure risk posture.

Note: Activities illustrated not all inclusive and can change based on evolving threat landscape

Alternatives

- » RAMP Filing
 - Addresses risks appropriately based on evolving threats
 - Financially responsible, balance between risk and cost efficiency
- » Alternative 1 – Address everything
 - Unlimited budget
 - Risk ratings not important
- » Alternate 2 – Delay Implementation
 - Constrained budget
 - Only highest risks are addressed

Questions?