



I.16-10-015/016 Workshop



**Risk Assessment and Mitigation Phase Report of San Diego Gas &
Electric Company, and Southern California Gas Company**
SED Review

March 15, 2017



Safety and Emergency Information

- In the event of an emergency, please proceed calmly out the exits.
- The Evacuation Location is the courtyard between the War Memorial Building and Opera House.
- It is located on the other side of City Hall. Exit the building at Van Ness and McAlister streets and walk past City Hall.



Practical Information

WiFi Access:

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Restrooms:

**out the Auditorium doors
and down the far end of the
hallway.**

Call in information:

- Phone line: 1-866-859-2737
Participant code: 1682922

Webex information:

- Link found on Daily Calendar.
- Meeting number: 745 489 354
- Meeting password: E@c63245



Agenda

- **10:00 – 10:15 Staff Introduction & Emergency Procedures**
- **10:15 – 12:00 SED Presentation of RAMP Analysis Report**
 - Overview
 - SDG&E-1 Wildfire Risk Mitigation
 - SCG-2 Employee, Contractor, Customer, and Public Safety
 - SCG-4 and SDG&E-10 High Pressure Pipeline
 - SCG-9 and SDG&E-14 Climate Change Adaption
- **11:40 – 12:00 Question and Answer**
- **12:00 - 1:15 Lunch Break**
- **1:15 – 2:30 Sempra Walk-Through Risk Spend Efficiency**
 - Electric Transmission and Distribution - Wildfire Risk
 - Gas Transmission and Distribution – High Pressure Pipelines
 - Crosscutting – Physical Security (and related risks e.g. Workplace Violence)
- **2:30 - 2:40 Break**
- **2:40 – 3:30 Continue**



RAMP Overview

- Purpose
- Approach
- Overall Strengths
- Overall Areas for Improvement
- RSE Summary



RAMP Overview

Objective: provide guidance to the utilities how to improve their spending plans.

- Have key safety risks have been assessed;
- Have alternatives have been fully considered and adequately discussed;
- Have the hardening inspection and repair programs proposed for wildfire mitigation spending been adequately analyzed and discussed;
- What are the gaps in identifying risks and mitigation options; and,
- Has the efficiency of risk mitigation funding, proposed spending been evaluated.



RAMP Overview

- Concerning Commissions GRC Decisions:
 - Improve Transparency
 - Improve Accountability
 - Ensure IOUs address safety issues
 - Assess how Report meets goals
 - Identify improvements for future RAMP reports



RAMP Overview

Approach

- The SED review was not to exhaustively analyze each risk identified.
- Summarize Strengths, Areas in Need of Improvement for each chapter.
- Selected a few risk chapters for a “deeper dive”.
 - Outline specifics of the utilities’ descriptions.
 - How the chapter met the established RAMP filing criteria.
- Review the Risk-Spend Efficiency (RSE).



RAMP Overview

Explanation of: Table of Risks, Drivers, Scores, Control Costs and Forecast Mitigation Costs:

Risk Chapter	Safety Scenario (Worst Case)	Drivers	Asset Scored	Total 2015 Control (000)	Forecast 2019* Mid-Pt O&M Forecast + Capex (000)
SCG -1 and SDG&E-2, Catastrophic Damage involving Third-Party Dig-Ins	A natural gas pipeline ruptures due to third-party excavation work in a populated business district during business hours, which results in fatalities, injuries, and substantial property damage.	<p>Employee Incident Due to Failure to:</p> <ul style="list-style-type: none"> adequately perform locate and mark tasks underground gas infrastructure respond to a one-call center request in the required timeframe perform “standby” duties when a third party is excavating in the vicinity of a high pressure gas pipeline <p>Contractor (Excavator) or Public Incident Due to Failure to:</p> <ul style="list-style-type: none"> comply with excavation laws or best practices re underground gas infrastructure call a one-call center or USA in required time frame for locate and mark prior to their excavation notify the Company before starting work, and Company does not “standby” near a high pressure gas pipeline 	233,365	\$22,967 SCG \$2,597 SDG&E	\$39,755 SCG \$3,684 SDG&E



RAMP Overview

Overall Strengths:

- Risks drivers were clearly identified.
- Complete narratives that described risks.
- Included the required elements of the RAMP.
- Clear descriptions of the risk scenarios.
- Listings of proposed mitigation measures.
- Clear intent of the mitigations.



RAMP Overview

Areas for Improvement:

- Show the correlation between the risk and the mitigations proposed.
- Improve explanations to clearly defined mitigation alternatives.
- Improve explanations and support for risk-reduction analysis.
- Explain and support variables used for RSE calculations for alternatives.



RAMP Overview

Risk-Spend Efficiency – Observations

- RSE relative only to the Risk defined in each chapter.
- More transparency for detail RSE calculations needed.
 - SME provided rationale for mitigation impact.
 - Correlation of incident for mitigations impact metric.
- Increase use of empirical data.
- Develop performance metrics tied to risk mitigation.

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



RAMP Overview

RSE Cont.

- Change in Risk Score – SME vs Objective
- Duration of mitigation effect—Life of asset, project, GRC cycle, arbitrary, or SME.
- Cost of mitigation-importance-support for range of spend.



Thank You

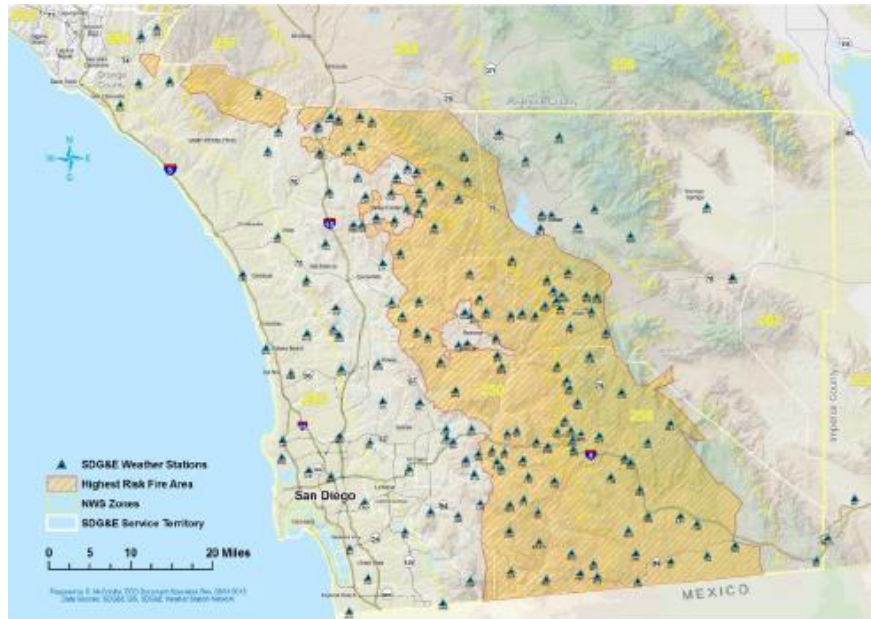


SDG&E

Risk Assessment Mitigation Phase

I.16-10-015/016

Wildfire Risk Mitigation



Martin Kurtovich, P.E., Senior Utility Engineer
Safety & Enforcement Division
Risk Assessment Section
March 15, 2017



Wildfire Risk Mitigation

- Scenario
- Proposed Budget
- Probabilistic Risk Modeling
- Mitigation Measures
- Fire Safety Program
- Risk Spend Efficiency
- Alternatives
- Recommendations



SDG&E Wildfire Worst Case Scenario

An ignition coming from an overhead SDG&E electric facility results in a catastrophic wildfire that causes multiple fatalities, numerous injuries, property damage, operational impacts, claims, and litigation.

Residual Frequency: 1-3 years Risk Score: 2,551,888

- The term “catastrophe” in the property insurance industry denotes a natural or man-made disaster that is unusually severe.
- An event is designated a catastrophe by the industry when claims are expected to reach a certain dollar threshold, **currently set at \$25 million**, and more than a certain number of policyholders and insurance companies are affected.



Baseline vs. Proposed Mitigation

Direct 2015 \$000

	Capital		O&M	
	2015	2017-2019 Annual Average	2015	2019 Average
Total Cost	\$107,350	\$357,975	\$30,590	\$38,380

In the future, review of RAMP report would be enhanced with provide a breakdown of proposed spending including documentation from risk modeling to support funding and activities



Probabilistic Risk Modeling

Wildfire Risk Reduction Model(WRRM)

Use to Examine Six Factors-

1. *Failure Rates*
2. *Change of Ignition*
3. *Environmental Conditions*
4. *Fire Behavior*
5. *Consequence (Impact)*
6. *Cost of Hardening Project*



Questions on Risk Modeling

- Where can one find background information on model?
- Is model stochastic or deterministic?
- How do you validate model results?
- Proprietary or off the shelf?
- Who is developer?
- How are hardening costs included in modeling?
- What is input data, what are model assumptions?
- What are model's weaknesses and strengths?
- How long has model been in use by SDG&E? Are other utilities also using this model?
- How was model specifically used to determine desired scope and funding for mitigation measures?
- How will model upgrade improve planning and response?

In the future, utilities should provide
1) technical documentation of risk modeling
2) have independent review of model results



Proposed Wildfire Mitigation Measures

1. Inspection, Repair, Maintenance and Replacement Programs
 2. Vegetation Management
 3. Design and Engineering Approaches
 4. Legal and Regulatory
 5. Rapid Response
 6. Monitoring and Detection
- In the future, utilities should specify whether capital costs are one time spend or will be incurred in future GRCs



RAMP Report

- Inspection, Repair, Maintenance and Replacement Programs
- Vegetation Management
- Design and Engineering Approaches
- Legal and Regulatory
- Rapid Response
- Monitoring and Detection Programs

2016 SDG&E

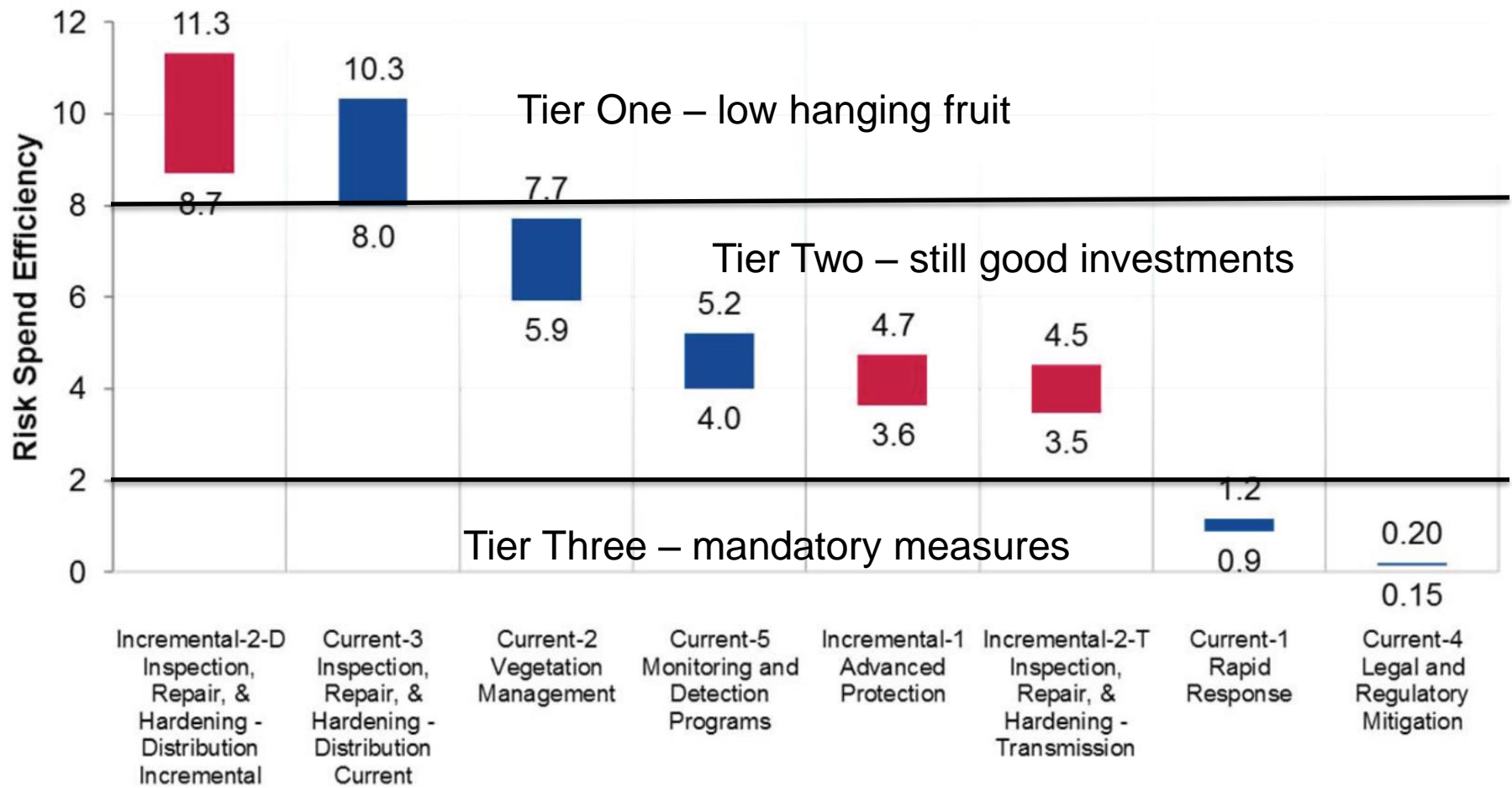
Fire Prevention Plan

- **Minimizing Sources of Ignition**
 - Mapping Sources of Ignition
 - Building Resiliency
- **Operational Practices for Reducing Risk**
 - System Management
 - Enhanced Vegetation Mgmt
 - Coordination with Telecom
 - Workforce Training
- **Mitigating the Threat of Fire**
- **Fire Suppression and Recovery**
- **Community Outreach and Public Awareness**



Risk to Spend Efficiency

Risk to Spend Efficiency



How does this chart indicate where greatest improvements in safety will occur?



Alternatives

Falling Conductor Protection

What is background on this technology –

- How was it developed and tested?
- How reliable? (70%?)
- If it is not fully developed, what are plans for further development and deployment?
- Why is considered a viable alternative by SDG&E for RAMP report?
- Not clear why FCPs are problematic for long circuits with branches near or at the end of circuits.
- Other documentation has stated that it is dependent on SCADA system improvements, how does that factor into deployment of FCPs?
- Are other utilities or organizations looking at this technology?

Undergrounding

Doesn't Rule 20D make this the most feasible option?



Areas for Improvement

1. Require FPP be developed for three year period that mirrors GRC timeframe and serve as overarching wildfire safety program plan that is directly related to RAMP Report.
2. Use of third parties with expertise in wildfire safety modeling and management to verify modeling results and resulting proposed activities.
3. Provide “working papers” – technical documentation that provides technical description of risk modeling, analysis of measures, impact on risk, associated cost ramifications, risk spend efficiencies and comparison of alternatives.
4. Identify new tools and emerging technologies such as DERMS and their role in SDG&E fire safety program.
5. Provide more detail on geographic distribution of safety risks and associated mitigation measures and predicted safety improvements that is consistent with new fire maps.



Thank You



**SDG&E & SoCalGas
Risk Assessment Mitigation Phase
I.16-10-015/016**



**Edwin A. Charkowicz
Safety & Enforcement Division
Risk Assessment Section**

March 15, 2017



SCG-2 Employee, Contractor, Customer, and Public Safety





SCG-2 Employee, Contractor, Customer, and Public Safety

Discussion Topics:

- Framing the Risk
- Span of Controls and Mitigations
- Drivers
- Mitigation Activities and Related Costs
- Strengths
- Areas of Improvement
- RSE
- Alternative Mitigations



SCG-2 Employee, Contractor, Customer, and Public Safety

The worst case scenario framing this cross-cutting risk:

“Employees and/or contractors did not follow a policy or procedure that results in fatalities – whether an employee, contractor, customer, or a member of the public. This could also have operational and regulatory impacts, and litigation and financial costs could also stem from this type of occurrence.”

Residual Risk Score of 233,365. Score based on high frequency score of 5 combined with high consequence scores, e.g. HSE score 6 (Life threatening and fatal impacts).



SCG-2 Employee, Contractor, Customer, and Public Safety

The chapter covers 11 control categories.

- 84 O&M projects and programs
 - 62 baseline, and
 - 22 proposed mitigation programs/projects.
- 6 of the control categories with 9 Capital Expenditure mitigation programs
 - 6 baseline, and
 - 3 proposed mitigation programs/projects.



SCG-2 Employee, Contractor, Customer, and Public Safety

There are five potential drivers of employee, contractor, customer and public risk:

- Deviation from policies or procedures, fundamental safety principles, or general safety rules, or other legal or regulatory safety requirements.
- Motor vehicle laws or safe driving practices are not followed.
- Workplace hazards posed to employees.
- Unidentified Gas hazards or untimely response to identified gas hazards.
- Effective corrective actions to prevent a reoccurrence are not instituted.

SCG-2 Employee, Contractor, Customer, and Public Safety

Company Risk ID (Chapter)	Control/ Mitigation	Control			Cumulative Capex Range 2017-2019		2017-2019	% Incr. in Capex from Control to Avg Capex	2019		2019 Mid-Pt O&M + Forecast Capex	% Incr. from 2015 to 2019
		2015 Capital	2015 O&M	Control Total	Low	High	Mid-Pt Capex		O&M Range Avg.	% O&M 2015 - 2019 Forecast		
SCG-02: C1/M1	Policy, procedures, standards, and ESCMP ¹	-	5,299	5,299	-	-	-	N/A	5,235	-1%	5,235	-1%
SCG-02: C2/M2	Employee skills training ¹	-	11,475	11,475	-	-	-	N/A	14,310	25%	14,310	25%
SCG-02: C3/M3	Employee refresher training ¹	1,055	8,845	9,900	2,850	3,483	3,167	200%	11,667	32%	14,833	50%
SCG-02: C4/M4	Contractor management and traffic control ²	3,065	8,411	11,476	8,274	10,113	9,194	200%	9,211	10%	18,405	60%
SCG-02: C5/M5	QA, job observations, field rides, and job monitoring ¹	58	6,265	6,323	156	192	174	200%	6,666	6%	6,840	8%
SCG-02: C6/M6	Safety communications and first responder liaison ¹	-	3,830	3,830	-	-	-	N/A	4,115	7%	4,115	7%
SCG-02: C7/M7	Environmental services monitoring	-	900	900	-	-	-	N/A	1,087	21%	1,087	21%
SCG-02: C8/M8	Safety, industrial hygiene, wellness, and emergency services/programs ¹	-	7,798	7,798	2,031	2,483	2,257	N/A	13,071	68%	15,328	97%
SCG-02: C9/M9	PPE and safety equipment	-	2,582	2,582	2,264	2,767	2,516	N/A	4,547	76%	7,062	174%
SCG-02: C10/M10	Gas facility and pipeline inspections ^{1,2}	-	54,468	54,468	-	-	-	N/A	84,537	55%	84,537	55%
SCG-02: C11/M11	Safety-related field orders (leaks, appliance check and unusual use, etc.)	-	20,251	20,251	-	-	-	N/A	23,250	15%	23,250	15%
SCG-02 TOTAL		4,178	130,124	134,302	15,575	19,038	17,307	314%	177,692	37%	194,999	45%



SCG-2 Employee, Contractor, Customer, and Public Safety

Strengths:

- Description of controls, CUE DR helpful.
- Clearly outlined the risk, risk drivers, risk scenario and the proposed mitigation measures
- Outlined plans for enhancing existing mitigations and new mitigation programs/projects in context to risk reduction.



SCG-2 Employee, Contractor, Customer, and Public Safety

Areas for Improvement:

- Use of statistics and metrics was limited.
- Unclear correlation between risk and risk mitigations for operational incidents.
- Lack of customer and public metrics.
- Limited metrics affect reliability of RSEs.
- Transparency of assumptions used for RSE development.



SCG-2 Employee, Contractor, Customer, and Public Safety

Risk-Spend Efficiency:

- Δ in risk score based on 55% risk reduction.
- Focus on OSHA and CMVI incidents.
- Single data point versus 5-year average.
- CUE data request – sparse explanations.
- Choice of incident metrics could impact result.



SCG-2 Employee, Contractor, Customer, and Public Safety

Alternative Mitigations:

- Increase frequency of refresher training.
- Modernize training techniques.
 - No RSE for alternatives.



Thank You



**SDG&E & SoCalGas
Risk Assessment Mitigation Phase
I.16-10-015/016
High Pressure Pipeline Failure**



**Fred Hanes, P.E., Sr. Utilities Engineer
Safety & Enforcement Division
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March 15, 2017



SCG-4 and SDG&E-10 High Pressure Pipeline

- Scenario and Strengths
- Areas for Improvement
 - RSE
 - Alternatives
- Dynamic Segmentation Analysis



Scenario and Strengths

- *A natural gas high pressure pipeline failure in a populated residential area resulting in fatalities, injuries, and property damage. The incident resulted in reliability concerns in the surrounding gas network threatening curtailments and loss of core customers.*
- Risk Drivers
- Risk Score = 36,950 (low freq, hi impact)
- Current Controls (Part 192)
- Proposed Mitigations

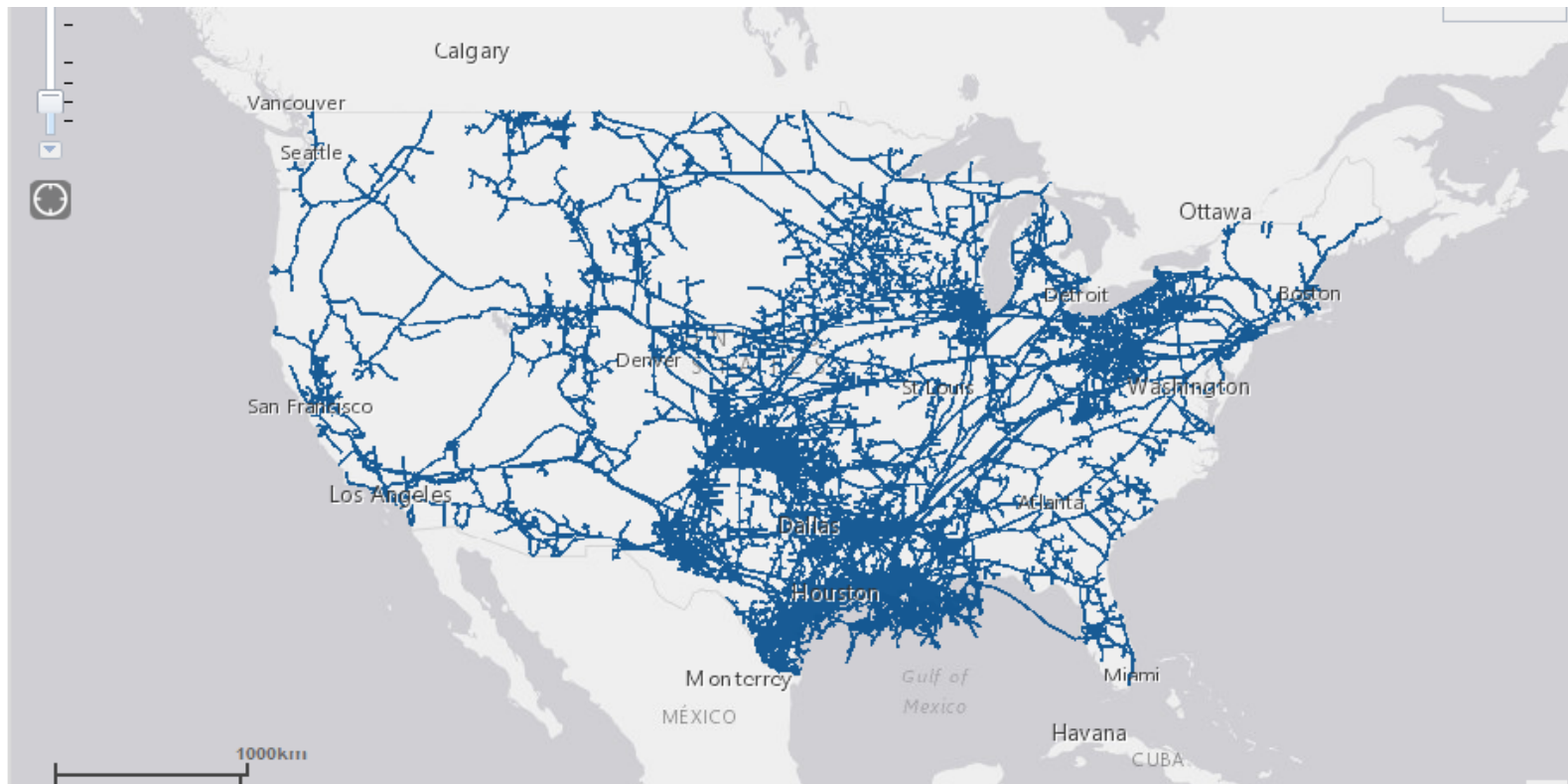


Areas for Improvement

- Current RSE Assumptions
 - Louisiana comparison example
 - Corrosive environment
 - Compliance with Part 192
 - ? More miles of pipe in Louisiana?



USA Gas Transmission



Source: US Energy Information Administration

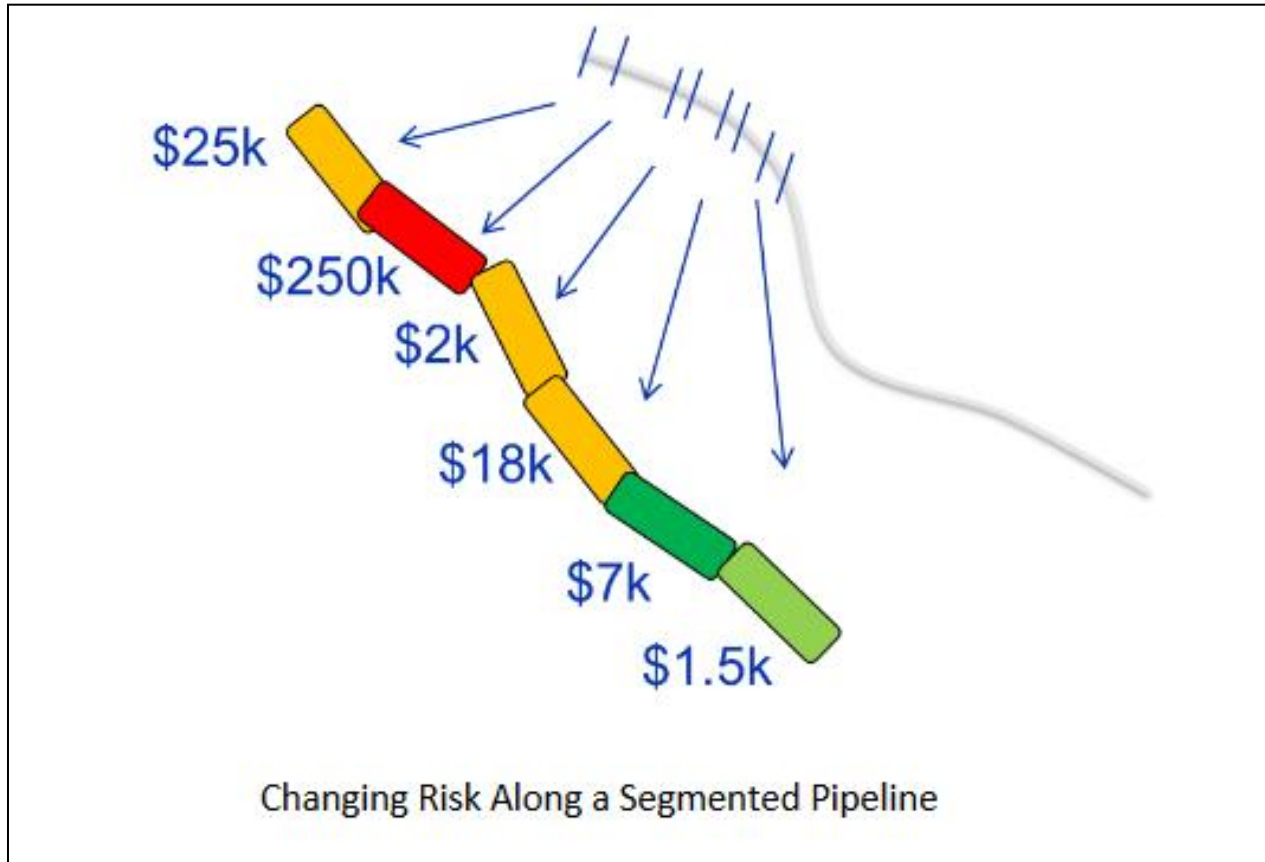


Areas for Improvement

- Mitigations and Alternatives
 - No RSE presented
- Cost-Benefit across Risks?



Dynamic Segmentation



Source: W. Kent Muhlbauer, www.pipelinerisk.net



Dynamic Risk Segmentation

- For each unique risk segment or element:
 - Identify Exposure, Resistance, Mitigation
 - Calculate Probability of Failure
 - Assign Cost of Failure
- You get dollar costs of Risks



Risk Management

- Apples-to-Apples
 - Assign dollar loss values to each risk segment
 - Determine mitigation costs per segment
- Compare cost saved to mitigation cost



Thank You



**SDG&E & SoCalGas
Risk Assessment Mitigation Phase
I.16-10-015/016
Climate Change Adaptation**



**Arthur O'Donnell, PPS
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Risk Assessment Section**

March 15, 2017





Climate Change Adaptation

Climate Change Adaptation is a long-term strategy for dealing with the expected drivers and potential consequences of significant changes to weather patterns and ecological conditions posed climate change.

The underlying assessment of risk drivers, identified threats and consequences are similar for each of the utilities – the residual risk scoring outcome for both utilities is identical.

Each utility has a distinguishable set of adaptation actions and strategies which lead to very different proposals for potential mitigations and expected costs.





Climate Change Adaptation

SoCal Gas Worst Case

- An extreme rain event known as El Nino has hit the SoCal Gas territory after several years of drought resulting in high risk areas giving way to land/mudslides and flooding low-lying areas. There are damages to access roads and multiple exposures of high pressure pipelines along with one of the pipelines failing. Multiple year projects are required involving extensive permitting and repairs to restore the infrastructure with millions of dollars in costs.

SDG&E Worst Case

- Extreme winds in SDG&E's Fire Threat Zone during a time of drought and elevated temperatures could cause a wire down event leading to a wildfire. This type of event could result in few serious injuries, service disruptions, and regulatory, legal and financial impacts.





Climate Change Adaptation

- SDG&E appear to be focused on planning and forecasting, such as continuing meteorological support and working in collaboration with climate advisory groups, academics and consultants.
- SoCal Gas is projecting increased geological hazard analysis, strain gauge installation for improved system monitoring, and a larger investment in capital expenditures related to improving slope stability and erosion control.





Climate Change Adaptation

SDG&E forecasts minimal changes to its mitigations.

- Proposed mitigations for SDG&E appear to be focused on planning and forecasting, such as continuing meteorological support and working in collaboration with climate advisory groups, academics and consultants. Spending from minimal \$20,000/year to \$483,000 in 2017-2019.

SoCal Gas is projecting increased geological hazard analysis, strain gauge installation for improved system monitoring, and a larger investment in capital expenditures related to improving slope stability and erosion control.

- Projected spending for adaptation mitigations would rise from \$700,000 for control activities in 2015 to as much as \$14 million - \$19 million for capital and O&M spending in the 2017-2019 period.





Climate Change Adaptation

Risk Spend Efficiency

- Neither SDG&E nor SCG provided a risk-spend efficiency calculation for Climate Change Adaptation mitigations, “because there is no linkage to adaptive or corrective actions which would have a measurable effect on the probability of their predicted safety consequences.”





Climate Change Adaptation

Mitigation Alternatives and Analysis

SDG&E's cursory showing related to mitigation alternatives is essentially a binary choice:

1. Add more expertise through hiring a climatologist, or
2. Continue the status quo.

The SoCal Gas mitigation alternatives narrative is singularly focused on use of satellite data:

1. Use publicly available data, or
2. Reduce satellite monitoring with increased use of Strain Gauges.

Lack of analysis or lack of imagination?





Climate Change Adaptation

Areas for Improvement

- SDG&E failed to discuss some of the utility's existing efforts to assess vulnerability to utility substations located in coastal areas that might be subject to sea-level rise as a result of climate change.
- Especially useful in terms of thinking about future mitigation projects is the South Bay substation relocation project approved by the Commission (in D.13-10-005 and amended in D.15-01-006).





Climate Change Adaptation

- Perhaps the utility felt that because there is no pending GRC project ask along these lines, it was not relevant to the current RAMP, but clearly it should be incumbent upon utility planners to begin thinking and preparing for future consequences – which could appear sooner than currently anticipated.
- For both utilities, it might be wise to refine the expected timeline for planning for Climate Change impacts from 50-100 years, to a 20-50 year horizon.





Thank You

For Additional Information:

www.cpuc.ca.gov/RiskAssessment

