



Order Instituting Investigation into the November) Investigation 19-11-011
2019 Submission of San Diego Gas & Electric)
Company's Risk Assessment and Mitigation Phase.)

RISK ASSESSMENT MITGATION PHASE

WORKPAPERS TO

CHAPTER SDG&E-8

HIGH PRESSURE PIPELINE INCIDENT

November 27, 2019

Chapter	SDG&E-8			
Risk	High Pressure Gas Pipeline Incident (Excluding Dig-in)			

PHMSA Incident Rate

Number of Incidents_National

Type	Number of Incidents_ Excl. 3rd party dig-in			
	Transmission	Distribution_Main	Distribution_Service	Distribution Meters
MAOP > 60 psig	450	71	13	31

SDGE

Type	Miles			
	Transmission	Distribution_Main	Distribution_Service	Total
MAOP > 60 psig	234	281	3	518

National

Type	Miles			Meter
	Transmission	Distribution_Main	Distribution_Service	
MAOP > 60 psig	297553	83618	2288	120300

SDGE

Type	Meters		
	Residential	Industrial	Total
SDGE	842792	28561	871353

SDGE_excl

Type	Incident Rate			
	Transmission	Distribution_Main	Distribution_Service	Meters
MAOP > 60 psig	0.04	0.03		0.09

Chapter	SDG&E-8
Risk	High Pressure Gas Pipeline Incident (Excluding Dig-in)

Single Point

ID	Activity	Project Life	Cost Forecast (O&M, \$M)	Cost Forecast (Capital, \$M)			Pre-Mitigation		% risk reduction (use if % risk addressed not available) (%)	% Risk Reduction			RSE	Post-Mitigation	
				In Years	2022	2020	2021	2022		LORE	CORE	Safety	Reliability	Financial (\$M)	Single Point
		Single Point													
SDG&E-8-C4	TIMP	7	5.25	4.20	4.20	4.20	0	97		337.3%	337.3%	337.3%	22.47	1.41	96.95
SDG&E-8-C1	Cathodic Protection	64	0.00	0.31	0.31	0.31	0	97		9.8%	9.8%	9.8%	91.00	0.35	96.95
SDG&E-8-A1	Alternative: Proactive Soil Sampling	1	0.34	0.00	0.00	0.00	0	97		0.1%	0.1%	0.1%	0.12	0.32	96.95
SDG&E-8-A2	Alternative: Expanding Geotechnical Analysis	1	0.36	0.00	0.00	0.00	0	97		0.0%	0.0%	0.0%	0.04	0.32	96.95
SDG&E-8-C6-T1	Pressure Testing - Tranche 1: Phase 1B (PSEP)	7	5.87	0.00	0.00	2.50	0	97		133.5%	133.5%	400.4%	30.84	0.75	100.00
SDG&E-8-C3-T2	Pipe Replacement - Tranche 2: Phase 1B (PSEP)	64	0.00	4.43	26.03	84.32	0	97		15.4%	15.4%	46.2%	1.19	0.37	97.66

Low Alternative

ID	Activity	Project Life	Cost Forecast (O&M, \$M)	Cost Forecast (Capital, \$M)			Pre-Mitigation		% risk reduction (use if % risk addressed not available) (%)	% Risk Reduction			RSE	Post-Mitigation	
				In Years	2022	2020	2021	2022		LORE	CORE	Safety	Reliability	Financial (\$M)	Low Alternative
		Low Alternative													
SDG&E-8-C4	TIMP	7	5.25	4.20	4.20	4.20	0	12		337.3%	337.3%	337.3%	2.81	1.41	12.14
SDG&E-8-C1	Cathodic Protection	64	0.00	0.31	0.31	0.31	0	12		9.8%	9.8%	9.8%	11.40	0.35	12.14
SDG&E-8-A1	Alternative: Proactive Soil Sampling	1	0.34	0.00	0.00	0.00	0	12		0.1%	0.1%	0.1%	0.02	0.32	12.14
SDG&E-8-A2	Alternative: Expanding Geotechnical Analysis	1	0.36	0.00	0.00	0.00	0	12		0.0%	0.0%	0.0%	0.00	0.32	12.14
SDG&E-8-C6-T1	Pressure Testing - Tranche 1: Phase 1B (PSEP)	7	5.87	0.00	0.00	2.50	0	12		133.5%	133.5%	400.4%	5.27	0.75	15.20
SDG&E-8-C3-T2	Pipe Replacement - Tranche 2: Phase 1B (PSEP)	64	0.00	4.43	26.03	84.32	0	12		15.4%	15.4%	46.2%	0.20	0.37	12.86

High Alternative

ID	Activity	Project Life	Cost Forecast (O&M, \$M)	Cost Forecast (Capital, \$M)			Pre-Mitigation		% risk reduction (use if % risk addressed not available) (%)	% Risk Reduction			RSE	Post-Mitigation	
				In Years	2022	2020	2021	2022		LORE	CORE	Safety	Reliability	Financial (\$M)	High Alternative
		High Alternative													
SDG&E-8-C4	TIMP	7	5.25	4.20	4.20	4.20	0	238		337.3%	337.3%	337.3%	55.22	1.41	238.29
SDG&E-8-C1	Cathodic Protection	64	0.00	0.31	0.31	0.31	0	238		9.8%	9.8%	9.8%	223.66	0.35	238.29
SDG&E-8-A1	Alternative: Proactive Soil Sampling	1	0.34	0.00	0.00	0.00	0	238		0.1%	0.1%	0.1%	0.31	0.32	238.29
SDG&E-8-A2	Alternative: Expanding Geotechnical Analysis	1	0.36	0.00	0.00	0.00	0	238		0.0%	0.0%	0.0%	0.09	0.32	238.29
SDG&E-8-C6-T1	Pressure Testing - Tranche 1: Phase 1B (PSEP)	7	5.87	0.00	0.00	2.50	0	238		133.5%	133.5%	400.4%	73.45	0.75	241.34
SDG&E-8-C3-T2	Pipe Replacement - Tranche 2: Phase 1B (PSEP)	64	0.00	4.43	26.03	84.32	0	238		15.4%	15.4%	46.2%	2.83	0.37	239.00

SDG&E-8-C1: Cathodic Protection									
Attribute	Risk Reduction			Formula	Basis			Reference	Project Life
			Total		Scope	Effectiveness	Risk Addressed		
Safety	% Scope	72%	9.77%	Designated cathodic protection areas	Company designated areas	SME Estimate	Based on PHMSA data assessment		64
	% Effectiveness	95%		High					
	% Risk Addressed	14%		Corrosion-related incidents in sample					
Reliability	% Scope	72%	9.58%	Designated cathodic protection areas					
	% Effectiveness	95%		High					
	% Risk Addressed	14%		Corrosion-related incidents in sample					
Financial	% Scope	72%	9.58%	Designated cathodic protection areas			PHMSA data		
	% Effectiveness	95%		High					
	% Risk Addressed	14%		Corrosion-related incidents in sample					

SDG&E-8-C3-T2: Pipe Replacement - Tranche 2: Phase 1B (PSEP)

Attribute	Risk Reduction			Formula	Basis			Reference	Project Life
			Total		Scope	Effectiveness	Risk Addressed		
Safety	% Scope	93%	15%	<i>Fraction of Phase 1B miles</i>	SDGE designated Phase 1B pipe	SME Estimate	Based on PHMSA data assessment, vintage analysis, and the application of the non-HCA fraction. Significant property damage assumed (financial only).		64
	% Effectiveness	100%		<i>High</i>					
	% Risk Addressed	17%		<i>Corrosion and natural force-related incidents in sample</i>					
Reliability	% Scope	93%	15%	<i>Fraction of Phase 1B miles</i>					
	% Effectiveness	100%		<i>High</i>					
	% Risk Addressed	17%		<i>Corrosion and natural force-related incidents in sample</i>					
Financial	% Scope	93%	46%	<i>Fraction of Phase 1B miles</i>					
	% Effectiveness	100%		<i>High</i>					
	% Risk Addressed	50%		<i>Corrosion and natural force-related incidents in sample</i>					

SDG&E-8-C6-T1: Pressure Testing - Tranche 1: Phase 1B (PSEP)									
Attribute	Risk Reduction			Formula	Basis			Reference	Project Life
			Total		Scope	Effectiveness	Risk Addressed		
Safety	% Scope	31%	133%	<i>Fraction of pressure testing work</i>	SDGE designated pressure testing miles	SME Estimate	Based on PHMSA data assessment, vintage analysis, and the application of the HCA fraction. Significant property damage assumed (financial only).		7
	% Effectiveness	95%		<i>High</i>					
	% Risk Addressed	457%		<i>Corrosion and natural force-related incidents in sample</i>					
Reliability	% Scope	31%	133%	<i>Fraction of pressure testing work</i>					
	% Effectiveness	95%		<i>High</i>					
	% Risk Addressed	457%		<i>Corrosion and natural force-related incidents in sample</i>					
Financial	% Scope	31%	400%	<i>Fraction of pressure testing work</i>				PHMSA data	
	% Effectiveness	95%		<i>High</i>					
	% Risk Addressed	1370%		<i>Corrosion and natural force-related incidents in sample</i>					

SDG&E-8-C4: Transmission Integrity Management Program (TIMP)

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life
		Total		Scope	Effectiveness	Risk Addressed		
Safety	% Scope	43%	337%	<i>Transmission system fraction to be assessed</i>	SDGE targeted % of system	SME Estimate	Based on PHMSA data assessment. Residual risk multiplier based on estimate of significant failure risk stemming from the interruption of pipeline condition assessments	7
	% Effectiveness	95%		<i>High</i>				
	% Risk Addressed	829%		<i>In-scope incidents from sample</i>				
Reliability	% Scope	43%	337%	<i>Transmission system fraction to be assessed</i>	SDGE targeted % of system	SME Estimate	Based on PHMSA data assessment. Residual risk multiplier based on estimate of significant failure risk stemming from the interruption of pipeline condition assessments	7
	% Effectiveness	95%		<i>High</i>				
	% Risk Addressed	829%		<i>In-scope incidents from sample</i>				
Financial	% Scope	43%	337%	<i>Transmission system fraction to be assessed</i>	SDGE targeted % of system	SME Estimate	PHMSA data	7
	% Effectiveness	95%		<i>High</i>				
	% Risk Addressed	829%		<i>In-scope incidents from sample</i>				

SDG&E-8-A1: Proactive Soil Sampling Collection

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life			
		Total		Scope	Effectiveness	Risk Addressed					
Safety	% Scope	100%	0.1%	Proposed sampling at a fixed rate per mile	SME Estimate	Based on PHMSA data assessment		1			
	% Effectiveness	1%							<i>100% of soil to be sampled as a one-time effort</i>		
	% Risk Addressed	14%							<i>Minimal</i>		
Reliability	% Scope	100%	0.1%	Proposed sampling at a fixed rate per mile	SME Estimate	Based on PHMSA data assessment			1		
	% Effectiveness	1%								<i>100% of soil to be sampled as a one-time effort</i>	
	% Risk Addressed	14%								<i>Minimal effectiveness</i>	
Financial	% Scope	100%	0.1%	Proposed sampling at a fixed rate per mile	SME Estimate	Based on PHMSA data assessment	PHMSA data			1	
	% Effectiveness	1%									<i>100% of soil to be sampled as a one-time effort</i>
	% Risk Addressed	14%									<i>Corrosion-related significant events in company history</i>

SDG&E-8-A2: Expanding Geotechnical Analysis

Attribute	Risk Reduction			Formula	Basis			Reference	Project Life
			Total		Scope	Effectiveness	Risk Addressed		
Safety	% Scope	1%	0.04%	<i>Very few potential sites</i>	SME Estimate	SME Estimate	Based on PHMSA data assessment		1
	% Effectiveness	50%		<i>Median</i>					
	% Risk Addressed	9%		<i>Fraction of historical experience</i>					
Reliability	% Scope	1%	0.04%	<i>Very few potential sites</i>	SME Estimate	SME Estimate	Based on PHMSA data assessment		1
	% Effectiveness	50%		<i>Median</i>					
	% Risk Addressed	9%		<i>Fraction of historical experience</i>					
Financial	% Scope	1%	0.04%	<i>Very few potential sites</i>	SME Estimate	SME Estimate	Based on PHMSA data assessment	PHMSA data	1
	% Effectiveness	50%		<i>Median</i>					
	% Risk Addressed	9%		<i>Fraction of historical experience</i>					