



A  Sempra Energy utility®

Order Instituting Investigation into the November) Investigation 19-11-010
2019 Submission of Southern California Gas)
Company's Risk Assessment and Mitigation Phase.)

RISK ASSESSMENT MITGATION PHASE

WORKPAPERS TO

CHAPTER SCG-1

MEDIUM PRESSURE PIPELINE INCIDENT

November 27, 2019

Chapter	SCG-1			
Risk	Medium 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	-	149	136	139

SCG

Type	Miles			
	Transmission	Distribution_Main	Distribution_Service	Total
MAOP <= 60 psig	-	47396	50529	97925

National

Type	Miles			Meter
	Transmission	Distribution_Main	Distribution_Service	
MAOP <= 60 psig	-	1212344	924770	66075100

SCG

Type	Meters		
	Residential	Industrial	Total
SCG	5656526	273290	5929816

SCG_excl

Type	Incident Rate			Meters
	Transmission	Distribution_Main	Distribution_Service	
MAOP <= 60 psig	-	1.54		1.46

Chapter	SCG-1
Risk	Medium Pressure Gas Pipeline Incident (Excluding Dig-in)

Single Point

ID	Activity	Project Life In Years	Cost Forecast (O&M, \$M) 2022	Cost Forecast (Capital, \$M)			Pre-Mitigation Single Point		% risk reduction (use if % risk addressed not available) (%)	% Risk Reduction			RSE Single Point	Post-Mitigation Single Point	
				2020	2021	2022	LORE	CORE		Safety	Reliability	Financial (\$M)		LORE	CORE
				SCG-1-C8	Sewer Lateral Inspection Project (SLIP)	67	10.07	0.00		0.00	0.00	542	3		0.1%
SCG-1-C9	Distribution Riser Inspection Project	67	16.79	0.00	0.00	0.00	542	3		0.2%	0.2%	0.2%	6.21	543.28	2.92
SCG-1-C6	GIPP - Tranche 1: Medium Pressure	40	0.83	5.40	5.40	5.40	542	3		16.8%	16.8%	16.8%	319.61	633.22	2.92
SCG-1-C7-T1	DREAMS - Tranche 1: Plastic	68	0.87	140.00	140.00	170.00	542	3		13.8%	13.8%	13.8%	13.45	616.57	2.92
SCG-1-C7-T2	DREAMS - Tranche 2: Steel	68	0.18	60.00	60.00	73.00	542	3		1.4%	1.4%	1.4%	3.20	549.60	2.92
SCG-1-C3	Meter and Reg Maintenance	52	23.69	4.74	2.78	0.83	542	3		0.5%	0.5%	0.5%	2.35	544.52	2.92
SCG-1-A2	ALTERNATIVE: Soil Sampling Collection	1	82.60	0.00	0.00	0.00	542	3		0.2%	0.2%	0.2%	0.03	541.07	2.92
SCG-1-A1	ALTERNATIVE: Cathodic Protection – CP10's	68	0.00	11.00	11.00	11.00	542	3		0.0%	0.0%	0.0%	0.29	541.88	2.92
SCG-1-C1	CP Program	1	19.09	10.01	10.94	11.86	542	3		30.6%	30.6%	30.6%	5.06	707.77	2.92

Low Alternative

ID	Activity	Project Life In Years	Cost Forecast (O&M, \$M) 2022	Cost Forecast (Capital, \$M)			Pre-Mitigation Low Alternative		% risk reduction (use if % risk addressed not available) (%)	% Risk Reduction			RSE Low Alternative	Post-Mitigation Low Alternative	
				2020	2021	2022	LORE	CORE		Safety	Reliability	Financial (\$M)		LORE	CORE
				SCG-1-C8	Sewer Lateral Inspection Project (SLIP)	67	10.07	0.00		0.00	0.00	542	1		0.1%
SCG-1-C9	Distribution Riser Inspection Project	67	16.79	0.00	0.00	0.00	542	1		0.2%	0.2%	0.2%	1.23	543.28	0.58
SCG-1-C6	GIPP - Tranche 1: Medium Pressure	40	0.83	5.40	5.40	5.40	542	1		16.8%	16.8%	16.8%	63.58	633.22	0.58
SCG-1-C7-T1	DREAMS - Tranche 1: Plastic	68	0.87	140.00	140.00	170.00	542	1		13.8%	13.8%	13.8%	2.68	616.57	0.58
SCG-1-C7-T2	DREAMS - Tranche 2: Steel	68	0.18	60.00	60.00	73.00	542	1		1.4%	1.4%	1.4%	0.64	549.60	0.58
SCG-1-C3	Meter and Reg Maintenance	52	23.69	4.74	2.78	0.83	542	1		0.5%	0.5%	0.5%	0.47	544.52	0.58
SCG-1-A2	ALTERNATIVE: Soil Sampling Collection	1	82.60	0.00	0.00	0.00	542	1		0.2%	0.2%	0.2%	0.01	541.07	0.58
SCG-1-A1	ALTERNATIVE: Cathodic Protection – CP10's	68	0.00	11.00	11.00	11.00	542	1		0.0%	0.0%	0.0%	0.06	541.88	0.58
SCG-1-C1	CP Program	1	19.09	10.01	10.94	11.86	542	1		30.6%	30.6%	30.6%	1.01	707.77	0.58

High Alternative

ID	Activity	Project Life In Years	Cost Forecast (O&M, \$M) 2022	Cost Forecast (Capital, \$M)			Pre-Mitigation High Alternative		% risk reduction (use if % risk addressed not available) (%)	% Risk Reduction			RSE High Alternative	Post-Mitigation High Alternative	
				2020	2021	2022	LORE	CORE		Safety	Reliability	Financial (\$M)		LORE	CORE
				SCG-1-C8	Sewer Lateral Inspection Project (SLIP)	67	10.07	0.00		0.00	0.00	542	7		0.1%
SCG-1-C9	Distribution Riser Inspection Project	67	16.79	0.00	0.00	0.00	542	7		0.2%	0.2%	0.2%	14.49	543.28	6.81
SCG-1-C6	GIPP - Tranche 1: Medium Pressure	40	0.83	5.40	5.40	5.40	542	7		16.8%	16.8%	16.8%	746.34	633.22	6.81
SCG-1-C7-T1	DREAMS - Tranche 1: Plastic	68	0.87	140.00	140.00	170.00	542	7		13.8%	13.8%	13.8%	31.40	616.57	6.81
SCG-1-C7-T2	DREAMS - Tranche 2: Steel	68	0.18	60.00	60.00	73.00	542	7		1.4%	1.4%	1.4%	7.48	549.60	6.81
SCG-1-C3	Meter and Reg Maintenance	52	23.69	4.74	2.78	0.83	542	7		0.5%	0.5%	0.5%	5.50	544.52	6.81
SCG-1-A2	ALTERNATIVE: Soil Sampling Collection	1	82.60	0.00	0.00	0.00	542	7		0.2%	0.2%	0.2%	0.07	541.07	6.81
SCG-1-A1	ALTERNATIVE: Cathodic Protection – CP10's	68	0.00	11.00	11.00	11.00	542	7		0.0%	0.0%	0.0%	0.67	541.88	6.81
SCG-1-C1	CP Program	1	19.09	10.01	10.94	11.86	542	7		30.6%	30.6%	30.6%	11.81	707.77	6.81

SCG-1-C1: Cathodic Protection (CP)									
Attribute	Risk Reduction			Formula	Basis			Reference	Project Life
	% Scope	% Effectiveness	Total		Scope	Effectiveness	Risk Addressed		
Safety	% Scope	100%	30.59%	Pipe operating at pressure of <=60 psi	SME Estimate	SME Estimate	Corrosion events based on assessment of PHMSA data. Multiple of residual risk based on extrapolation of steel pipe leak rate experience.		1
	% Effectiveness	95%		High effectiveness but not infallible					
	% Risk Addressed	32%		Corrosion-related events from SCG and SDGE incident sample					
Reliability	% Scope	100%	30.59%	Pipe operating at pressure of <=60 psi					
	% Effectiveness	95%		High effectiveness but not infallible					
	% Risk Addressed	32%		Corrosion-related events from SCG and SDGE incident sample					
Financial	% Scope	100%	30.59%	Pipe operating at pressure of <=60 psi					
	% Effectiveness	95%		High effectiveness but not infallible					
	% Risk Addressed	32%		Corrosion-related events from SCG and SDGE incident sample					

SCG-1-C3: Meter and Regulator (M&R) Maintenance												
Attribute	Risk Reduction			Formula	Basis			Reference	Project Life			
			Total		Scope	Effectiveness	Risk Addressed					
Safety	% Scope	2%	0.60%	<i>Selected regulator stations/total regulator stations</i>	SCG replacements	SME Estimate	Based on assessment of PHMSA data, reduction impact based on SME estimate		52			
	% Effectiveness	100%		<i>Mitigated issues</i>								
	% Risk Addressed	30%		<i>Reg station incidents in sample, 5x risk reduction impact</i>								
Reliability	% Scope	2%	0.60%	<i>Replacing x regulator stations/total regulator stations</i>								
	% Effectiveness	100%		<i>Mitigated issues</i>								
	% Risk Addressed	30%		<i>Reg station incidents in sample, 5x risk reduction impact</i>								
Financial	% Scope	2%	0.60%	<i>Replacing x regulator stations/total regulator stations</i>							PHMSA data	
	% Effectiveness	100%		<i>Mitigated issues</i>								
	% Risk Addressed	30%		<i>Reg station incidents in sample, 5x risk reduction impact</i>								

SCG-1-C6: Gas Infrastructure Protection Project (GIPP)

Attribute	Risk Reduction		Formula	Basis			Reference	Project Life	
		Total		Scope	Effectiveness	Risk Addressed			
Safety	% Scope	81%	17%	<i>Selected locations/total locations</i>	SCG inspection/re mediations	SME Estimate	Based on assessment of PHMSA data	40	
	% Effectiveness	95%							<i>High effectiveness</i>
	% Risk Addressed	22%							<i>Outside force damage/total incidents from sample</i>
Reliability	% Scope	81%	17%	<i>Selected locations/total locations</i>					
	% Effectiveness	95%							<i>High effectiveness</i>
	% Risk Addressed	22%							<i>Outside force damage/total incidents from sample</i>
Financial	% Scope	81%	17%	<i>Selected locations/total locations</i>			PHMSA data		
	% Effectiveness	95%							<i>High effectiveness</i>
	% Risk Addressed	22%							<i>Outside force damage/total incidents from sample</i>

SCG-1-C7-T1: DREAMS - Vintage Integrity Plastic Plan (VIPP)

Attribute	Risk Reduction			Formula	Basis			Reference	Project Life
			Total		Scope	Effectiveness	Risk Addressed		
Safety	% Scope	6%	14%	<i>Miles replaced/Identified miles</i>	Identified miles of plastic pipe	SME Estimate	Based on an assessment of PHMSA data, residual risk multiplier based on comparison of vintage versus modern pipe		68
	% Effectiveness	100%		<i>High number</i>					
	% Risk Addressed	213%		<i>Plastic pipe events from SCG, SDGE incident sample</i>					
Reliability	% Scope	6%	14%	<i>Miles replaced/Identified miles</i>					
	% Effectiveness	100%		<i>High number</i>					
	% Risk Addressed	213%		<i>Plastic pipe events from SCG, SDGE incident sample</i>					
Financial	% Scope	6%	14%	<i>Miles replaced/Identified miles</i>					
	% Effectiveness	100%		<i>High number</i>					
	% Risk Addressed	213%		<i>Plastic pipe events from SCG, SDGE incident sample</i>					

SCG-1-C7-T2: DREAMS - Bare Steel Replacement Program (BSRP)

Attribute	Risk Reduction			Formula	Basis			Reference	Project Life
			Total		Scope	Effectiveness	Risk Addressed		
Safety	% Scope	1%	1.4%	<i>Miles replaced/Identified miles</i>	Identified miles of steel pipe	SME Estimate	Corrosion events based on assessment of PHMSA data. Multiple of residual risk based on extrapolation of steel pipe leak rate experience.		68
	% Effectiveness	100%		<i>High number</i>					
	% Risk Addressed	97%		<i>Steel pipeline events from SCG, SDGE incident sample</i>					
Reliability	% Scope	1%	1.4%	<i>Miles replaced/Identified miles</i>					
	% Effectiveness	100%		<i>High number</i>					
	% Risk Addressed	97%		<i>Steel pipeline events from SCG, SDGE incident sample</i>					
Financial	% Scope	1%	1.4%	<i>Miles replaced/Identified miles</i>					
	% Effectiveness	100%		<i>High number</i>					
	% Risk Addressed	97%		<i>Steel pipeline events from SCG, SDGE incident sample</i>					

SCG-1-C8: Sewer Lateral Inspection Project (SLIP)									
Attribute	Risk Reduction			Formula	Basis			Reference	Project Life
			Total		Scope	Effectiveness	Risk Addressed		
Safety	% Scope	14%	0.10%	<i>Locations to be inspected/total locations</i>	Identified locations for inspection	SME Estimate	Based on assessment of PHMSA data		67
	% Effectiveness	100%		<i>Fully remediated with conflict removal</i>					
	% Risk Addressed	1%		<i>Sewer conflicts in significant incident sample</i>					
Reliability	% Scope	14%	0.10%	<i>Locations to be inspected/total locations</i>	Identified locations for inspection	SME Estimate	Based on assessment of PHMSA data		67
	% Effectiveness	100%		<i>Fully remediated with conflict removal</i>					
	% Risk Addressed	1%		<i>Sewer conflicts in significant incident sample</i>					
Financial	% Scope	14%	0.10%	<i>Locations to be inspected/total locations</i>	Identified locations for inspection	SME Estimate	Based on assessment of PHMSA data	PHMSA data	67
	% Effectiveness	100%		<i>Fully remediated with conflict removal</i>					
	% Risk Addressed	1%		<i>Sewer conflicts in significant incident sample</i>					

SCG-1-C9: Distribution Riser Inspection Project (DRIP)									
Attribute	Risk Reduction			Formula	Basis			Reference	Project Life
			Total		Scope	Effectiveness	Risk Addressed		
Safety	% Scope	34%	0.24%	<i>Locations to be inspected/total locations</i>	Identified locations for inspection	SME Estimate	Based on PHMSA data assessment		67
	% Effectiveness	100%		<i>High effectiveness</i>					
	% Risk Addressed	1%		<i>Riser issues in significant incident sample</i>					
Reliability	% Scope	34%	0.24%	<i>Locations to be inspected/total locations</i>					
	% Effectiveness	100%		<i>High effectiveness</i>					
	% Risk Addressed	1%		<i>Riser issues in significant incident sample</i>					
Financial	% Scope	34%	0.24%	<i>Locations to be inspected/total locations</i>					
	% Effectiveness	100%		<i>High effectiveness</i>					
	% Risk Addressed	1%		<i>Riser issues in significant incident sample</i>					

SCG-1-A1: Cathodic Protection (CP10s)									
Attribute	Risk Reduction			Formula	Basis			Reference	Project Life
			Total		Scope	Effectiveness	Risk Addressed		
Safety	% Scope	1%	0.02%	<i>Units to be replaced/total units</i>	SME Estimate	SME Estimate	Based on PHMSA data assessment		68
	% Effectiveness	95%		<i>High effectiveness</i>					
	% Risk Addressed	2%		<i>Historical information reported to PHMSA</i>					
Reliability	% Scope	1%	0.02%	<i>Units to be replaced/total units</i>	SME Estimate	SME Estimate	Based on PHMSA data assessment		68
	% Effectiveness	95%		<i>High effectiveness</i>					
	% Risk Addressed	2%		<i>Historical information reported to PHMSA</i>					
Financial	% Scope	1%	0.02%	<i>Units to be replaced/total units</i>	SME Estimate	SME Estimate	Based on PHMSA data assessment	PHMSA data	68
	% Effectiveness	95%		<i>High effectiveness</i>					
	% Risk Addressed	2%		<i>Historical information reported to PHMSA</i>					

SCG-1-A2: Soil Sampling Program									
Attribute	Risk Reduction			Formula	Basis			Reference	Project Life
			Total		Scope	Effectiveness	Risk Addressed		
Safety	% Scope	100%	0.17%	<i>100% of soil to be sampled in one-time effort</i>	Entire system targeted	SME Estimate	SME Estimate	PHMSA data	1
	% Effectiveness	1%		<i>Minimal</i>					
	% Risk Addressed	17%		<i>Same as plastic DREAMS program</i>					
Reliability	% Scope	100%	0.17%	<i>100% of soil to be sampled in one-time effort</i>					
	% Effectiveness	1%		<i>Minimal</i>					
	% Risk Addressed	17%		<i>Same as plastic DREAMS program</i>					
Financial	% Scope	100%	0.17%	<i>100% of soil to be sampled in one-time effort</i>					
	% Effectiveness	1%		<i>Minimal</i>					
	% Risk Addressed	17%		<i>Same as plastic DREAMS program</i>					