



# **Risk Assessment and Mitigation Phase**

## **(Chapter SCG-Risk-4-QWP) Incident Related to the Storage System (Excluding Dig-in) Workpapers**

**May 17, 2021**

<b>Overall Workpaper Description</b>	This workpaper file explains the risk scoring and Risk Spend Efficiency (RSE) quantification. It contains necessary information and sources for calculating the risk score and RSE for respective mitigations and controls filed in the 2021 RAMP.
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<b>"Master Inputs" Tab</b>	This sheet contains the major MAVF inputs for risk scoring
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<b>"RSE Summary" Tab</b>	This sheet presents a summarized view of RSE scoring
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<b>RSE Equation</b>	$\text{Risk Reduction} = (\text{Pre} - \text{Mitigated LoRE} * \text{Pre} - \text{Mitigated CoRE}) - (\text{Post} - \text{Mitigated LoRE} * \text{Post} - \text{Mitigated CoRE})$
	$\text{Discounted Time} = 1 - \left( \frac{1}{\frac{(1 + \text{Benefit Discount Rate})^{\text{Benefits Lifetime}}}{\text{Benefit Discount Rate}}} \right)$
	$\text{RSE per \$M} = \frac{\text{Risk Reduction} * \text{Discounted Time}}{\text{Total Cost (\$M)}}$

***Master Inputs***

**Discount Factors**

Benefit Discount Factor                      3.00%

**MAVF Framework**

	Range	Weight
Safety Index	20	60%
Reliability Index	1	23%
Financial Cost	500	15%
Stakeholder Satisfaction Index	100	2%

2021 RAMP  
 SCG-RISK-4-QWP  
 RSE Summary

ID	Mitigation Name	Lifetime Benefit	Total Cost (\$k)	% Change in LoRE
SCG-RISK-4-A02	ALTERNATIVE: Alternate technology for methane monitoring	5.0	\$3,800	0.22%
SCG-RISK-4-A01	ALTERNATIVE: Risk-based well casing inspection frequency	7.0	\$85,601	0.39%
SCG-RISK-4-C06	Compressor Overhauls	5.0	\$15,567	10.33%
SCG-RISK-4-C01	Integrity Demonstration, Verification, and Monitoring Practices	2.0	\$308,827	1.64%
SCG-RISK-4-C05	Storage Field Maintenance	1.0	\$34,347	45.65%
SCG-RISK-4-C07	Upgrade to Purification Equipment	1.0	\$20,082	4.35%
SCG-RISK-4-C04	Well Abandonment and Replacement	2.0	\$126,973	6.87%

2021 RAMP  
 SCG-RISK-4-QWP  
 RSE Summary

ID	Mitigation Name	Pre-Mitigated LoRE	CoRE Safety	CoRE Financial	CoRE Reliability
SCG-RISK-4-A02	ALTERNATIVE: Alternate technology for methane monitoring	0.29	855.06	3276.49	4902.81
SCG-RISK-4-A01	ALTERNATIVE: Risk-based well casing inspection frequency	0.29	855.06	3276.49	4902.81
SCG-RISK-4-C06	Compressor Overhauls	0.29	855.06	3276.49	4902.81
SCG-RISK-4-C01	Integrity Demonstration, Verification, and Monitoring Practices	0.29	855.06	3276.49	4902.81
SCG-RISK-4-C05	Storage Field Maintenance	0.29	855.06	3276.49	4902.81
SCG-RISK-4-C07	Upgrade to Purification Equipment	0.29	855.06	3276.49	4902.81
SCG-RISK-4-C04	Well Abandonment and Replacement	0.29	855.06	3276.49	4902.81

2021 RAMP  
 SCG-RISK-4-QWP  
 RSE Summary

ID	Mitigation Name	CoRE Stakeholder Satisfaction	CoRE	Post-Mitigated LoRE	Risk Reduction
SCG-RISK-4-A02	ALTERNATIVE: Alternate technology for methane monitoring	271.30	9305.65	0.29	5.91
SCG-RISK-4-A01	ALTERNATIVE: Risk-based well casing inspection frequency	271.30	9305.65	0.29	10.58
SCG-RISK-4-C06	Compressor Overhauls	271.30	9305.65	0.26	280.95
SCG-RISK-4-C01	Integrity Demonstration, Verification, and Monitoring Practices	271.30	9305.65	0.29	44.63
SCG-RISK-4-C05	Storage Field Maintenance	271.30	9305.65	0.16	1242.09
SCG-RISK-4-C07	Upgrade to Purification Equipment	271.30	9305.65	0.28	118.29
SCG-RISK-4-C04	Well Abandonment and Replacement	271.30	9305.65	0.27	187.04

2021 RAMP  
 SCG-RISK-4-QWP  
 RSE Summary

ID	Mitigation Name	Discounted Time	RSE per \$Million	Data Sources
SCG-RISK-4-A02	ALTERNATIVE: Alternate technology for methane monitoring	4.58	7.13	> Ten years of historical PHMSA incidents > Company data on forecasted methane meter installations > SME input
SCG-RISK-4-A01	ALTERNATIVE: Risk-based well casing inspection frequency	6.23	0.77	> Report for SCG from Integrity Engineering, 2020 > Company data on forecasted integrity assessments > SME input
SCG-RISK-4-C06	Compressor Overhauls	4.58	82.65	> Ten years of historical PHMSA incidents > Company data on compressor stations and forecasted compressor maintenance > SME input
SCG-RISK-4-C01	Integrity Demonstration, Verification, and Monitoring Practices	1.91	0.28	> Report for SCG from Integrity Engineering, 2020 > Company data on forecasted integrity assessments > SME input
SCG-RISK-4-C05	Storage Field Maintenance	0.97	35.11	> Ten years of historical PHMSA incidents > SME input
SCG-RISK-4-C07	Upgrade to Purification Equipment	0.97	5.72	> Ten years of historical PHMSA incidents > Company data on purification stations and forecasted purification station maintenance > SME input
SCG-RISK-4-C04	Well Abandonment and Replacement	1.91	2.82	> Report for SCG from Integrity Engineering, 2020 > Company data on well drilling and abandonment > SME input