

[Company Name], [Date Submitted]

Rulemaking (R.) 15-01-008 to Adopt Rules and Procedures Governing Commission Regulated Natural Gas Pipelines and Facilities to Reduce Natural Gas Leaks Consistent with Senate Bill 1371, Leno.

In Response to Data Request, R15-01-008 2021 June Report

Appendix 9; Rev. 05/07/21

System Categories	Emission Source Categories	Emission Factor Sources	Description [in natural gas volume]
Transmission Pipeline	Transmission Pipeline Leaks	Engineering Estimate	Emissions estimated from size of breach / pressure / duration calculation
	All damages (as defined by PHMSA)	Engineering Estimate	Emissions estimated either from modelling or size of breach / pressure / duration
	Transmission Pipeline Blowdowns	Engineering Estimate	Unique equipment volume (corrected for pressure and temperature)
	Pneumatic Devices - Pneumatic/Hydraulic Valve Operators, and Turbine Valve Operators	MRR	Low Continuous Bleed = 0.0336 Mscf/day/dev Intermittent Bleed = 0.0576 Mscf/day/dev High Continuous Bleed = 0.4457 Mscf/day/dev Hydraulic Valve Operator = TBD Turbine Valve Operator = TBD
	Pressure Relief Valves	MRR	Pressure relief valve = 0.9518 Mscf/day/dev
	Odorizer (Odorizer and Gas Sampling Vents)	TCR	1.27 Mscf/yr/odorizer (if manufacturing specs are available, use the manufacturing specs instead of the default emission factor)
Transmission M&R	M&R Stations - Direct Industrial Sales	MRR	# of leaks > 10,000 ppm x Subpart W EF (ref: Table W-3 of Subpart W of Part 98) Direct Sale = 12.2 Mscf/yr/station Non-compressor components Valve = 0.1572 Mscf/day/dev Connector = 0.1399 Mscf/day/dev Open-ended line = 0.276 Mscf/day/dev Pressure relief valve = 0.0492 Mscf/day/dev Meter = 0.0728 Mscf/day/dev
	M&R Stations - Transmission-to-Transmission Company Interconnect	MRR	# of leaks > 10,000 ppm x Subpart W EF (ref: Table W-3 of Subpart W of Part 98) Trans-to-trans = 1,554.8 Mscf/yr/station Non-compressor components Valve = 0.1572 Mscf/day/dev Connector = 0.1399 Mscf/day/dev Open-ended line = 0.276 Mscf/day/dev Pressure relief valve = 0.0492 Mscf/day/dev Meter = 0.0728 Mscf/day/dev
	Transmission M&R Leaks	MRR	# of leaks > 10,000 ppm x Subpart W EF (ref: Table W-3 of Subpart W of Part 98) Non-compressor components Valve = 0.1572 Mscf/day/dev Connector = 0.1399 Mscf/day/dev Open-ended line = 0.276 Mscf/day/dev Pressure relief valve = 0.0492 Mscf/day/dev Meter = 0.0728 Mscf/day/dev
	Transmission M&R blowdown	Engineering Estimate	Unique equipment volume (corrected for pressure and temperature)
Transmission Compressor Stations	Compressor station - Equipment leaks from valves, connectors, open ended lines, pressure relief valves, and meters (using leak detection)	MRR	Leaker EFs-Compressor Station (Component Leaks identified per survey use the following EFs) # of leaks > 10,000 ppm x Subpart W EF (ref: Table W-3 of Subpart W of Part 98) Compressor Components Valve = 0.3562Mscf/day/dev Connector = 0.1342 Mscf/day/dev Open-Ended Line = 0.4145 Mscf/day/dev Pressure Relief Valve = 0.9518 Mscf/day/dev Meter = 0.4639 Mscf/day/dev Other = 0.0984 Mscf/day/dev Non-compressor components Valve = 0.1541 Mscf/day/dev Connector = 0.1370 Mscf/day/dev Open-ended line = 0.2705 Mscf/day/dev Pressure relief valve = 0.0482 Mscf/day/dev Meter = 0.0703 Mscf/day/dev Other = 0.0984 Mscf/day/dev
	Compressor Station - Transmission storage tanks	MRR	Direct measurement of tank vapor vent stack + operating hours (pg 218-219 of Regulation for MRR)
	Compressors (Centrifugal) - Transmission--data collection will require time spent in modes (active, pressurized idle, de-pressurized idle), compressor venting	MRR	Direct measurement x operating hours (operating mode)
	Compressors (Reciprocating) - Transmission--data collection will require time spent in modes (active, pressurized idle, de-pressurized idle)compressor rod packing venting	MRR	Direct measurement x operating hours (operating mode)
	Compressor station - Equipment and pipeline blowdowns	MRR	Eq. W - 14A # of blowdowns * piping volume
	Compressor Station - Natural gas pneumatic device venting	MRR	Low Continuous Bleed = 0.0336 Mscf/day/dev Intermittent Bleed = 0.0576 Mscf/day/dev High Continuous Bleed = 0.4457 Mscf/day/dev
Distribution Mains and Services Pipelines	Distribution Mains (Below-Ground Leaks)	GRI (1996)	Unprotected Steel Main = 0.1548 Mscf/day/leak Protected Steel Main = 0.0612 Mscf/day/leak Plastic Main = 0.2988 Mscf/day/leak
	Distribution Mains (Above Ground Leaks) - Not MSA	GRI (1996)	Unprotected Steel Main = 0.1548 Mscf/day/leak Protected Steel Main = 0.0612 Mscf/day/leak Plastic Main = 0.2988 Mscf/day/leak
	Distribution Service (Below-Ground Leaks)	GRI (1996)	Copper = 0.0226 Mscf/day/leak Unprotected Steel Service = 0.0600 Mscf/day/leak Protected Steel Service = 0.0276 Mscf/day/leak Plastic Service = 0.0089 Msc/day/leak
	Distribution Service (Above-Ground Leaks) - Not MSA	GRI (1996)	Copper = 0.0226 Mscf/day/leak Unprotected Steel Service = 0.0600 Mscf/day/leak Protected Steel Service = 0.0276 Mscf/day/leak Plastic Service = 0.0089 Msc/day/leak

	Distribution Main, Pressure Relief Valves	MRR	Pressure relief valve = 0.00696 Mscf/day/dev
	Distribution Mains and Services blowdown	MRR	Equation W-14A, Eq. W-35, Eq. W-36
	All damages (as defined by PHMSA)	MRR	Equation W-14A, Eq. W-35, Eq. W-36
	Pneumatic Devices - Pneumatic/Hydraulic Valve Operators, and Turbine Valve Operators	Engineering Estimate	Manufacturer Supplied Information (e.g., Bristol, Becker, Moore, etc)
Distribution M&R Stations	Distribution Above grade M&R Station Leaks (> 300 psi)	GRI (1996)	1,684.5 Mscf/yr/station
	Distribution Above grade M&R Station Leaks (100 - 300 psi)	GRI (1996)	896.5 Mscf/yr/station
	Distribution Above grade M&R Station Leaks (< 100 psi)	GRI (1996)	40.6 Mscf/yr/station
	Distribution Below grade M&R Station Leaks (> 300 psi)	GRI (1996)	12.176 Mscf/yr/station
	Distribution Below grade M&R Station Leaks (100 - 300 psi)	GRI (1996)	1.840 Mscf/yr/station
	Distribution Below grade M&R Station Leaks (< 100 psi)	GRI (1996)	0.964 Mscf/yr/station
	Distribution M&R Station, Leaker Based	MRR	Leaker EFs (Component Leaks identified per survey use the following EFs) Connector = 0.043Mscf/day/dev Block Valve = 0.014 Mscf/day/dev Control Valve = 0.240 Mscf/day/dev Pressure Relief Valve = 0.007 Mscf/day/dev Orifice Meter = 0.005 Mscf/day/dev Regulator = 0.020 Mscf/day/dev Open-Ended Line = 0.671 Mscf/day/dev
	M&R Stations - Farm Taps	MRR	# of leaks > 10,000 ppm x Subpart W EF (ref: Table W-3 of Subpart W of Part 98) Farm Tap = 12.2 Mscf/yr/station Leaker EFs (Component Leaks identified per survey use the following EFs) Connector = 0.043Mscf/day/dev Block Valve = 0.014 Mscf/day/dev Control Valve = 0.240 Mscf/day/dev Pressure Relief Valve = 0.007 Mscf/day/dev Orifice Meter = 0.005 Mscf/day/dev Regulator = 0.020 Mscf/day/dev Open-Ended Line = 0.671 Mscf/day/dev
	Distribution M&R Station Blowdowns	Engineering Estimate	Average Pressure x Average Volume x # of inspections & Maintenance Activities
	Distribution M&R Station Pneumatics	Engineering Estimate	Manufacturer Supplied Information (e.g., Bristol, Bettis Actuators, etc)
Commercial, Industrial and Residential Meters	Residential Meters	GRI (1996)	0.148 Mscf/yr/meter
	Commercial and Industrial Meters	GRI (1996)	0.051 Mscf/yr/meter
	Vented Emission from MSA	Engineering Estimate	Estimated volume release by MSA and activity type
Underground Storage	Dehydrator Vents - Storage	GRI (1996)	One of the following three cases per dehydrator facility 1. Glycol dehydrator with VRU and thermal oxidizer = 0 Mscf 2. Glycol dehydrator with no control device = Engineering Estimate 3. Desiccant dehydrator = 2.23E-03 mt CH4/MMscf (Alternative: Eq. 5 in MRR)
	Storage - piping leakage	MRR	Leaker EFs-Storage Station, Gas Service (Component Leaks identified per survey use the following EFs) Connector = 0.1342 Mscf/day/dev Valve = 0.3562 Mscf/day/dev Pressure Relief Valve = 0.9518 Mscf/day/dev Open-Ended Line = 0.4145 Mscf/day/dev Meter = 0.4639 Mscf/day/dev Other = 0.0984 Mscf/day/dev Population EFs-Storage Wellheads, Gas Service (For all un-surveyed components use the following EFs) Connector = 0.0002 Mscf/day/dev Valve = 0.0024 Mscf/day/dev Pressure Relief Valve = 0.0041 Mscf/day/dev Open Ended Line = 0.0007 Mscf/day/dev
	Storage - surface casing leakage	Engineering Estimate	TBD
	Storage - Wellhead leakage	MRR	Leaker EFs-Storage Wellheads, Gas Service (Component Leaks identified per survey use the following EFs) Connector (other than flanges) = 0.0288 Mscf/day/dev Valve = 0.1080 Mscf/day/dev Pressure Relief Valve = 0.0984 Mscf/day/dev Open-Ended Line = 0.0600 Mscf/day/dev Flange = 0.0912 Mscf/day/dev Other = 0.0984 Mscf/day/dev Population EFs-Storage Wellheads, Gas Service (For all un-Surveyed components, use the following EFs) Connector = 0.0002 Mscf/day/dev Valve = 0.0024 Mscf/day/dev Pressure Relief Valve = 0.0041 Mscf/day/dev Open-Ended Line = 0.0007 Mscf/day/dev
	Storage - Compressor & blowdowns	Engineering Estimate	Eq. 13 of MRR (piping volume x # of blowdowns)
	Storage - Wellhead Rework blowdown and bring-in	Engineering Estimate	Eq. 9,10,11,12 of MRR
	Pressure Relief Valves	MRR	Pressure relief valve = 0.9518 Mscf/day/dev.
	Pneumatic Devices - Pneumatic/Hydraulic Valve Operators, and Turbine Valve Operators	MRR	Low Continuous Bleed = 0.0336 Mscf/day/dev Intermittent Bleed = 0.0576 Mscf/day/dev High Continuous Bleed = 0.4457 Mscf/day/dev Hydraulic Valve Operator = TBD Turbine Valve Operator = TBD