

SDG&E, June 15th, 2023

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 2023 June Report

Appendix 6; Rev. 03/30/2023

Notes:

Use a formula-derived value with the formula used in the Annual Emissions column. Do not use a copy and paste-as-value.

At the end of Annual Emissions Column, add a summation total in a cell for a column total, and then highlight orange.

Response:

Customer Meter Total Leaks and Emissions:

Number of Meters	Meter Type	Emission Factor (Mscf/yr)	Annual Emissions (Mscf)
878,217	R	0.148	129,976.12
30,251	Commercial	0.051	1,542.80
1,439	Industrial	0.051	73.39
Sum Total			131,592

Category	Item	Value
Agriculture	Wheat	12.5
	Rice	8.7
	Corn	15.2
	Soybeans	9.1
	Cotton	6.3
	Barley	4.8
	Oats	3.2
	Beans	7.6
	Peas	5.4
	Lentils	2.9
Livestock	Cattle	18.3
	Poultry	22.1
	Pigs	14.7
	Goats	11.5
	Sheep	9.8
	Horses	7.2
	Birds	5.6
	Bees	3.4
	Fish	6.9
	Shellfish	4.1
Forestry	Timber	16.4
	Paper	13.8
	Resin	10.2
	Medicinal herbs	8.5
	Essential oils	7.1
	Flowers	5.9
	Seeds	4.3
	Grass	3.7
	Leaves	2.8
	Roots	2.1
Manufacturing	Textiles	19.6
	Leather	17.3
	Metals	15.1
	Plastics	12.9
	Chemicals	11.4
	Electronics	10.7
	Automotive	9.5
	Food processing	8.2
	Pharmaceuticals	7.8
	Construction	6.5
Services	Transport	14.2
	Trade	12.8
	Finance	11.6
	Healthcare	10.3
	Education	9.7
	Recreation	8.4
	Religion	7.9
	Government	6.7
	Non-profit	5.5
	Arts	4.2
Energy	Coal	17.8
	Natural gas	15.4
	Oil	13.9
	Solar	11.2
	Wind	9.6
	Hydro	8.1
	Geothermal	6.8
	Bioenergy	5.3
	Nuclear	4.7
	Renewable	3.5
Environment	Water	16.1
	Air	14.5
	Land	12.7
	Marine	11.3
	Atmosphere	10.1
	Oceans	9.4
	Mountains	8.6
	Plains	7.5
	Valleys	6.2
	Islands	5.1
Culture	Language	15.7
	Religion	14.3
	Art	12.9
	Music	11.5
	Dance	10.2
	Theater	9.8
	Cinema	8.4
	Literature	7.9
	History	6.6
	Tradition	5.4
Science	Physics	18.9
	Chemistry	17.2
	Biology	15.6
	Medicine	14.1
	Psychology	12.8
	Sociology	11.4
	Anthropology	10.7
	Geography	9.5
	History	8.2
	Philosophy	7.1
Technology	Computers	19.3
	Internet	17.7
	Mobile	16.2
	AI	14.8
	Robotics	13.5
	Space	12.1
	Energy	10.9
	Transport	9.6
	Communication	8.3
	Security	7.4
Health	Medicine	18.6
	Nutrition	17.1
	Exercise	15.5
	Rest	14.2
	Stress	12.9
	Mind	11.6
	Body	10.3
	Spirit	9.7
	Soul	8.4
	Heart	7.2
Education	Schools	17.4
	Universities	15.8
	Colleges	14.3
	High schools	12.7
	Elementary	11.2
	Kindergarten	9.6
	Preschool	8.1
	After school	6.8
	Summer	5.5
	Winter	4.2
Economy	GDP	16.8
	Inflation	15.2
	Unemployment	13.7
	Interest rates	12.1
	Exchange rates	10.6
	Trade balance	9.4
	Government spending	8.2
	Private sector	7.5
	Public sector	6.3
	Non-profit	5.1
Society	Family	15.9
	Community	14.4
	Neighborhood	12.8
	City	11.3
	Country	10.1
	World	9.5
	Humanity	8.6
	Nature	7.4
	Environment	6.2
	Universe	5.3
Religion	Christianity	18.1
	Islam	16.5
	Hinduism	14.9
	Buddhism	13.3
	Judaism	11.7
	Sikhism	10.2
	Confucianism	9.6
	Taoism	8.4
	Shinto	7.8
	Others	6.5
Arts	Painting	17.6
	Sculpture	16.1
	Architecture	14.5
	Design	12.9
	Fashion	11.4
	Music	10.7
	Dance	9.5
	Theater	8.2
	Cinema	7.8
	Literature	6.5
History	Prehistory	16.3
	Classical	14.7
	Medieval	13.2
	Renaissance	11.6
	Baroque	10.1
	Enlightenment	9.4
	19th century	8.6
	20th century	7.5
	21st century	6.2
	Future	5.1
Philosophy	Metaphysics	15.4
	Epistemology	13.8
	Axiology	12.2
	Logic	10.6
	Science	9.4
	Art	8.1
	Religion	6.8
	Politics	5.5
	Economics	4.2
	Law	3.1
Law	Constitution	14.1
	Legislation	12.5
	Regulation	11.3
	Case law	10.7
	Legal theory	9.5
	Legal history	8.2
	Legal education	7.8
	Legal profession	6.5
	Legal system	5.4
	Legal culture	4.2
Politics		

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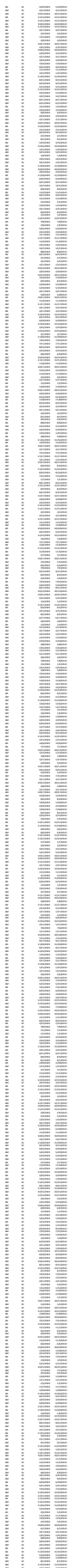


Figure 1 displays a 10x10 grid of 100 small plots, each showing the evolution of the number of nodes in a network over time. The x-axis represents time (0 to 100) and the y-axis represents the number of nodes (0 to 100). Each plot shows a different realization of the network growth process, with nodes appearing as black dots and edges as lines. The plots are arranged in a 10x10 grid, with the first row showing the initial state (0 nodes) and the last row showing the final state (100 nodes). The plots are labeled with their corresponding time steps (0 to 99) in the top-left corner.

Figure 1 displays a 10x10 grid of small plots, each showing the distribution of the number of non-zero elements in the product of two sparse matrices. The x-axis for each plot represents the number of non-zero elements in the first matrix, and the y-axis represents the number of non-zero elements in the second matrix. Both axes range from 0 to 100. The plots show a distribution of non-zero elements in the product matrix, with a peak around 50 non-zero elements. The distribution is roughly symmetric and bell-shaped, with a slight skew towards higher values. The plots are arranged in a 10x10 grid, with the first row and column showing the distribution for the first matrix having 0 non-zero elements, and the last row and column showing the distribution for the first matrix having 100 non-zero elements.

[illegible]

Figure 1 consists of 10 subplots, labeled (a) through (j), arranged vertically. Each subplot shows the probability distribution of the number of nodes in a cluster at a specific time step. The x-axis for all plots is 'Number of nodes in cluster', ranging from 0 to 10. The y-axis is 'Probability', ranging from 0.0 to 0.4. Subplot (a) shows a very high probability (around 0.35) for a cluster of 1 node, with other clusters having near-zero probability. As we move from (a) to (j), the distribution changes: the peak at 1 node decreases, and new peaks or significant increases appear at higher node counts (2, 3, 4, etc.), indicating that clusters are growing and merging over time. By subplot (j), the distribution is much broader, with probabilities spread across more node counts, though still showing some structure.

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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 2023 June Report
Appendix 6; Rev. 03/30/2023

At utilities request, fill out with two, three, or four categories that correspond to the bubble-size classification and label the type of leak, whether AG-Haz, or AG-Non-Haz. If highlighted cells are filled in, the other cells will auto-populate.

The term "Non-leaker EF" aligns with CARB's definition for "No Bubble EF" for the event of finding a leak even though not through bubble testing

Meter Classification (AG-Haz, AG-Non-Haz); Bubble Size Category	Total System Meters per survey Cycle	Meters on Annual Survey [M_{xA}]	Meters on Multi-Year Survey Cycles [M_{x}^{tot}]	Survey Interval (yrs) [I]	Meters Surveyed Annually from Multi-Year Survey Cycles [M_{xI}]	Total # of Leaks Detected from Survey [N_{xI}]	Annual Leak Rate [Leaks / Meter] $R_X = \frac{N_{xI}}{M_{xA} + (I \times M_{xI})}$	# of Unknown Leaks $N_{x,unk} = R_X \times (M_A^{tot} - M_{xI}) \times \frac{I}{2}$	Total # of Leaks Detected from O&M* [N_{xo}]
Not Applicable							-	-	
							-	-	
							-	-	
							-	-	
							-	-	
							-	-	
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							-	-	
							-	-	
Total	0	0	0	N/A	0	0		0	0

Leakage Category	Emission Factor (Mscf/day/leak)	Emissions from Leaks Detected from Survey (Mscf)	Emissions from O&M* Leaks Detected (Mscf)	Estimated Emissions from Unknown Leaks (Mscf)	Total Estimated Emissions from Leaks (Mscf)
Facility/Material					
AG-Haz					
AG-Non Haz					
Unknown Leak EF					
Non-leaker EF (Undetected Leaks)					
Total	N/A	0	0	0	0

SDG&E, June 15th, 2023

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 2023 June Report
Appendix 6; Rev. 03/30/2023

Notes:

Use a formula-derived value with the formula used in the Annual Emissions column. Do not use a copy and paste-as-value.

At the end of Annual Emissions Column, add a summation total in a cell for a column total, and then highlight orange.

Include items like the following in this tab (Note whether emissions are included in the MSA EF used to estimate emissions for the MSA population and show only the event count.):

Gas vented during all Regulator Change outs due to other than vent leakage.

Large Customer MSA Regulator Inspection - External Regulator Inspections. List avg. amount vented.

Large Customer MSA Regulator Inspection - Regulator change out & Internal Reg. Inspection. List avg. amount vented.

Diaphragm - CSF Read & Verify - List amount vented thru meter during read & verify order for decreased usage.

Diaphragm - CSF Clock Test - List amount vented during Clock Test

Diaphragm - CSF Registration Check - List amount ventedn during Registration Checks

Diaphragm Size 1,2,3 Meter Change Out - List avg. gas vented on Size 1 Meter Change Out

All Meter Change Out Size 4 thru 28 - List avg. gas vented for Size 5 to 10 Meter Change outs

Field Meter Test of Diaphragm & Rotary - List avg. gas vented for Size 9 Meters

Customer Orifice Meter Plate Insp. - Orifice Plate Inspected Monthly. List avg. amount vented

Response:

Customer Meter Blowdowns:

Number of Blowdowns	Meter Type	Emission Factor (Mscf/yr)	Annual Emissions (Mscf)	Explanatory Notes / Comments
1,151	CI	0.005	5.76	All Meter Change Out Size 4 thru 28 - Use avg. gas vented of 5 scf for Size 5 to 10 Meter Change outs
90	CI	0.005	0.45	Field Meter Test of Diaphragm & Rotary - Use avg. gas vented of 5 scf for Size 9 Meters
93	CI	0.015	1.40	Filter Changeout + straight Filter Removal - Estimated avg. gas vented = 15 scf/ea.
1,602	CI	0.006	9.61	Large Customer MSA Regulator Inspection @ 6 scf/insp. - Sum of Regulator change out/2 + Internal Reg + IPR + straight reg removal.
673	CI	0.002	1.35	Large Customer MSA Regulator Inspection - External Regulator Inspections @ 2 scf/insp. At SDGE External Reg inspection done at meter change out.
13,567	CI/R	0.000625	8.48	Diaphragm - CSF Clock Test - Vent 0.625 scf/inspection during Clock Test and Registration Checks
21,602	CI/R	0.000625	13.50	Diaphragm - CSF Registration Check - Vent 0.625 scf/inspection during Clock Test and Registration Checks
20,934	CI/R	0.001	20.99	Diaphragm Size 1,2,3 Meter Change Out - Use avg. gas vented of 1 scf on Size 1 Meter Change Out
276	CI/R	0.001	0.28	Customer MSA Size 1-2 Standard Pressure Removals. Assumed avg vent 1 scf
40	CI/R	0.003	0.12	Customer MSA Size 3-4 Standard Pressure Removals. Assumed avg vent 3 scf
65	CI	0.005	0.33	Customer MSA Size 5+ Standard Pressure Removals. Assumed avg vent 5 scf
19	CI	0.03	0.57	Transmission maintained - Filter Changeout or Filter Inspection w/parts replacement - Estimated avg. gas vented = 30 scf/ea.
4	CI	0.02	0.08	Transmission maintained - Relief Valve Inspection at Customer MSAs - Estimated avg. gas vented = 20 scf/insp. (annual test with Nitrogen, gas vented is volume of gas in valve)
3	CI	0.002	0.01	Transmission maintained gas chromatographs/analyzers - 2 scf/inspection
10	CI	0.025	0.25	Transmission maintained meters - 25 scf/inspection
5	CI	0.002	0.01	Transmission maintained Pneumatic Device Annual Inspection - Estimated avg. gas vented = 2 scf/insp. (Actuators & Controllers)
2	CI	0.02	0.04	Producer Relief Valve Transmission maintained Inspection at Customer MSAs - Estimated avg. gas vented = 20 scf/insp.
7	CI	0.03	0.21	Producer Filter Changeout or Filter Inspection w/parts replacement - Estimated avg. gas vented = 30 scf/ea.
2	CI	0.025	0.05	Producer Meters - 25 scf/inspection
7	CI	0.002	0.01	Producer Gas chromatographs/analyzers - 2 scf/inspection
11	CI	0.002	0.02	Producer Pneumatic Device Annual Inspection - Estimated avg. gas vented = 2 scf/insp. (Actuators & Controllers)
Sum Total			63	

SDG&E, June 15th, 2023

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 2023 June Report

Appendix 6; Rev. 03/30/2023

Notes:

This worksheet is intended to capture the actual number of equipment and components in this asset category that vent emissions as a part of their design and normal function. By listing the number and types of components (not captured elsewhere in other templates) that vent emissions we hope to obtain information that may provide insight into how to evolve to a method of reporting emissions based on the actual number of units and types emitting rather than a crude population based estimate.

Currently, the component related leaks are accounted for in the population based estimate for MSAs and any estimate of emissions associated with this list of equipment and components will not be added to that total. This tab is not intended to replace or supplant the Vented and Blowdown Emissions tab which are activity based emissions.

No emissions estimates from this worksheet should be included in Appendix 8, as this is being collected for informational purposes at this time.

Use a formula-derived value with the formula used in the Annual Emissions column. Do not use a copy and paste-as-value.

At the end of Annual Emissions Column, add a summation total in a cell for a column total, and then highlight orange.

Response:

Customer Meter Component/Equipment Vented Emissions:

ID	Geographic Location	Device Type	Bleed Rate	Manufacturer	Number of Days Emitting	Engineering or Manufacturer's based Estimate of Emissions	Annual Emissions (Mscf)	Explanatory Notes / Comments
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Sum Total	0
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In Response to Data Request, Description and Definition of Required Contents (If not self-explanatory)	
Meter Leaks, Population Based	
Number of Meters	
Meter Type	CI = commercial or industrial meter R = residential meter
Emission Factor (Mscf/yr)	
Annual Emissions (Mscf)	
Identified MSA Leaks, Leaker	
ID	
Geographic Location	GIS, zip code, or equivalent
Meter Classification (Commercial/Industrial or Residential)	If available, indicate whether the meter is commercial or industrial "CI", or a residential "R" meter. If that information is not available then note as "N/A". CI = Commercial or Industrial R = Residential N/A = not available
Leak Classification (Grade)	AH = Above Ground Hazardous AN = Above Ground Non-hazardous AM = Above Ground Non-hazardous Minor If Above Ground, and operator uses the Bubble grading methodology with an alphanumeric grade, then provide an explanation for the meaning each grade in the notes above the table. For example: A = grade A - Large Leak or equates to with AH above with an approximate EF of 10,2035 scfh. B = grade B - Equates to AN above with an approximate EF of 0.5138 scfh. Etc. If the MSA leak is Below ground and not included in DM&S , then use the following grades: 1 = grade 1 2 = grade 2 3 = grade 3 N = Non-Graded
Leak Discovery Method	S = Routine Leak Survey M = O&M (e.g. O&M activities, third party reports, customer odor reports, etc.)
Discovery Date (DD/MM/YY)	
Leak Repair Date (MM/DD/YY)	Use the date the leak ceases emitting NG. The final repair may be completed after the leak has been stopped.
If not repaired by 12/31/xx List the Scheduled Date of Repair (DD/MM/YY)	If leak is open, specify the scheduled date of repair Otherwise type "M," signifying that the leak is being monitored with no scheduled date of repair Then, provide the reason for not scheduling a repair in Comments column.
Reason for Not Scheduling a Repair	If repair hasn't been scheduled, then provide the reason for not scheduling a repair in this column. If using a reason code, then provide a table with codes and corresponding explanations.
Number of Days Leaking	Leak Duration (in days) = End Date + 1 day - Start date End Date: The repair date or December 31st of subject year, which ever is earlier. Start Date: If discovered by survey use January 1st or prior survey date whichever is more recent, or if an O&M or customer called in leak, then use discovery date for start of the leak. (Leaks carried over should use January 1st as start date for emissions calculations.) For O&M discovered leaks, assume that the leak begins with the discovery date <u>thru</u> repair date or December 31st of subject year, whichever is earlier.
Number of Days to Repair.	Leak Discovery date minus repair date or 12/31 of the subject year plus 1 = number of days to repair for the subject year. Addition of 1 day to include the date repaired.
Comments or Additional Information	
Meter Leaks, Leak Count, Leaker	
Meter Classification (AG-Haz, AG-Non-Haz); Bubble Size Category	Utilities should add rows according to their bubble size categories and nomenclature, and should include a no-bubble category. For example, include a row for each: Foam/ Indeterminate; Bubbles; Soap Blown Off; and No Bubbles.
Total System Meters per survey Cycle	
Meters on Annual Survey $[M_{x,2}]$	
Meters on Multi-Year Survey Cycles $[M_{x,Total}]$	
Survey Interval (yrs) $[I]$	
Meters Surveyed Annually from Multi-Year Survey Cycles $[M_{x,i}]$	
Total # of Leaks Detected from Survey $[N_{x,i}]$	

In Response to Data Request, Description and Definition of Required Contents (If not self-explanatory)	
Annual Leak Rate [Leaks / Meter]	$R_X = \frac{N_{XL}}{M_{XA} + (I \times M_{XI})}$
# of Unknown Leaks	$N_{X,unk} = R_X^- \times (M_X^{tot} - M_{XI}) \times \frac{I}{2}$ <p>If the operator changed the leak survey cycle during the report year that requires more detailed calculations based on the approved calculation methodology to determine the number of unknown leaks an additional worksheet may be added to show the calculations.</p>
Total # of Leaks Detected from O&M*	
[N _{X,L}]	
All Damages	
ID	
Geographic Location	GIS, zip code, or equivalent
Damage Type	E = Excavation Damage N = natural force damage O = other outside force damage
Meter Type	CI = commercial or industrial meter R = residential meter
Leak Classification (Grade)	AH = Above Ground Hazardous AN = Above Ground Non-hazardous AM = Above Ground Non-hazardous Minor
Discovery Date (DD/MM/YY)	
Leak Repair Date (MM/DD/YY)	Use the date the leak ceases emitting NG. The final repair may be completed after the leak has been stopped.
If not repaired by 12/31/xx List the Scheduled Date of Repair (DD/MM/YY)	If leak is open, specify the scheduled date of repair. Otherwise type "M," signifying that the leak is being monitored with no scheduled date of repair. Then, provide the reason for not scheduling a repair in the Column provided.
Reason for Not Scheduling a Repair	Provide the reason for not scheduling a repair.
Number of Days Leaking	<p>If date and time stamp are reliable and used consistently by respondent, then emissions may be calculated based on actual time leaking. E.G. Repair time - damage event time = duration of event.</p> <p>If respondent has average or historical leak duration based on the nature and circumstances of damages, then these may be applied to like damage events. The emissions factors should be adequately supported and explained in the filing.</p> <p>If actual time stamps and historical averages are not available, then whole days should be used in the engineering calculation. The leak begins with the damage event date thru repair date or December 31st of subject year, whichever is later. E.G. Days Leaking = Repair date - date of damage + 1 day.</p>
Engineering Estimate (Mscf/Day)	
Annual Emissions (Mscf)	
Explanatory Notes / Comments	
Vented and Blowdown Emissions	
Number of Blowdowns	For metering set assembly (MSA)
Meter Type	CI = commercial or industrial meter R = residential meter
Emission Factor (Mscf/event)	
Annual Emissions (Mscf)	
Explanatory Notes / Comments	
Component Vented Emissions	
ID	
Geographic Location	GIS, zip code, or equivalent
Device Type	C = connector OE = open-ended line M = meter P = pneumatic device PR = pressure relief valve V = valve O = other devices
Bleed Rate	L = low bleed I = intermittent bleed H = high bleed NA = not applicable
Manufacturer	
Number of Days Emitting	Because the emissions are a factor of design or function, these emissions counted for the entire year.
Engineering or Manufacturer's based Estimate of Emissions	
Annual Emissions (Mscf)	<p>The emissions should be based on 365 days times the actual volume emitting if known, or the approved Emissions Factor.</p> <p>Note whether the emissions are based on actual volumetric measures in the next column.</p>
Explanatory Notes / Comments	