AREA SOURCE EMISSIONS FOR CALENDAR YEAR 2023
METHODOLOGY DOCUMENTATION
COMMERCIAL AND INDUSTRIAL NATURAL GAS COMBUSTION

DESCRIPTION OF CATEGORY

This category estimates the emissions of TSP, SO_X, NO_X, TOG, CO and NH3 from the combustion of natural gas in the commercial and industrial sectors, disaggregated into the six categories listed below.

CES	EIC	Description
58735	60-020-0110-0000	Commercial - Natural Gas - Space Heating
58743	60-030-0110-0000	Commercial - Natural Gas - Water Heating
94024	60-995-0110-0007	Commercial - Natural Gas - IC Engines
95025	60-995-0110-0008	Commercial - Natural Gas - Other
47142	50-995-0110-0000	Industrial - Natural Gas - Unspecified
66787	50-040-0110-0000	Industrial - Natural Gas - IC Engines

METHODOLOGY

Natural gas throughput data was provided by SoCalGas (Southern California Gas Company) for the commercial and industrial sectors. Throughput data for Long Beach, provided separately by SoCalGas, was incorporated into the total. The data was further segregated by end use (see Table 1) based on the factors specified by SoCalGas. All data were consistent with the 2024 California Gas Report.[1]

Table 1. 2023 total natural gas throughput (therms) by end use.

End Use	Commercial	Industrial
Space Heating	241,419,154	16,016,424
Water Heating	252,638,318	224,262,855
Other	306,091,075	1,374,969,217

To separate the point source contribution, gas throughput data from Annual Emissions Reporting (AER) was subtracted from the totals shown in Table 1. The subtraction was performed because point sources have distinct emission factors and are accounted for separately in the inventory. Table 2 provides the natural gas usage from 2023 AER excluding throughputs from electricity generation industries, while Table 3 provides the remaining usage after subtraction of the AER portion.

Table 2. 2023 AER throughput (therms) by sector.

Sector	AER throughput
Commercial	210,178,717.78
Industrial	571,027,555.35

[1] 2024 California Gas Report. Available at:
https://www.socalgas.com/sites/default/files/2024-08/2024-California-Gas-Report-Final.pdf

Table 3. 2023 natural gas throughput (therms) by end use after subtracting the AER contribution.

End Use	Industrial	Commercial
Space Heating	10,130,528	178,007,092
Water Heating	144,944,512	186,276,909
Other	888,873,359	225,689,040

The throughput in Table 3 was allocated to the county level using NAICS (North American Industry Classification System) 451 - Other Miscellaneous Retail Stores (commercial) and NAICS 339 - Miscellaneous Manufacturing (industrial) as surrogates. The same allocation factor was assumed for all end uses. Figures 1 and 2 demonstrate these surrogates on a sub-county basis. These data are consistent with the 2024 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) developed by the Southern California Association of Governments (SCAG).[2]

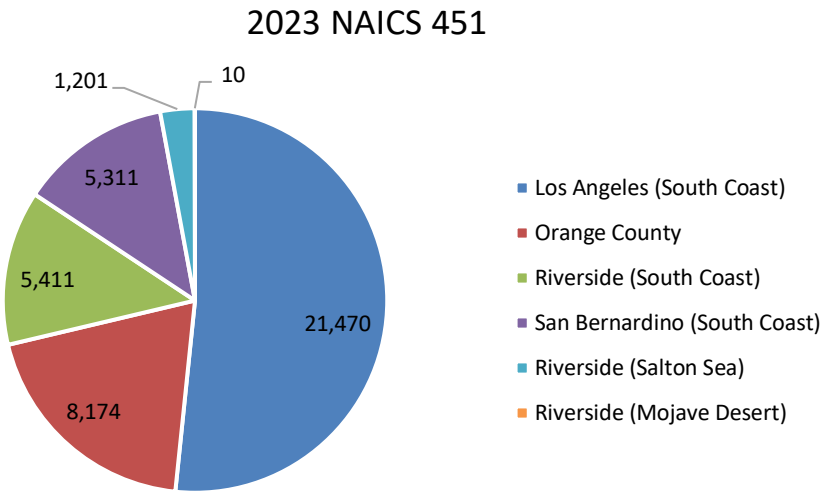

Figure 1. 2023 NAICS 451 (arbitrary units) was used to allocate throughput to the appropriate county and air basin.

[2] https://scag.ca.gov/connect-socal

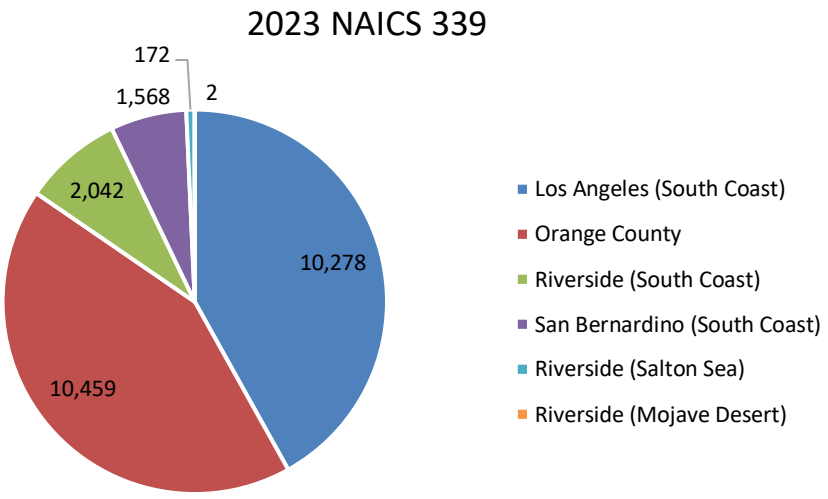

Figure 2. 2023 NAICS 339 (arbitrary units) was used to allocate throughput to the appropriate county and air basin.

The internal/external combustion ratio derived from AER throughput data (see Figure 3) was then applied to calculate the throughputs for the respective categories. The electricity generation facilities were excluded from AER throughput data. For the industrial categories, this ratio was applied to the total usage as there are only two relevant CES (Current Employment Statistics). However, there are separate CES for space and water heating in the commercial sector. Thus, the ratio was only applied to the throughput for the "Other" end uses.

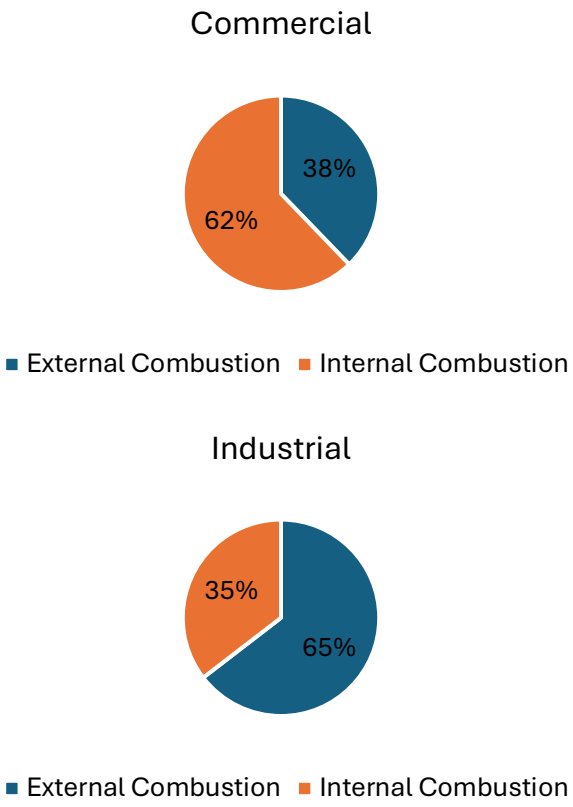

Figure 3. The relative contribution of internal and external combustion in the industrial and commercial sectors as determined from average of 2020 through 2023 AER throughput data.

NOx emission factors for the base year were determined based on compliance with South Coast AQMD's rules and proposed control measures (see Table 3). Emission factors from AP-42 (Compilation of Air Pollutant Emissions Factors from Stationary Sources) were assumed for all other pollutants (see Table 4).[3] Ammonia emission factors were extracted from U.S. EPA (Environmental Protection Agency)'s reports (see Table 5).[4,5]

[3] https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors
[4] https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100ERTR.TXT
[5] https://www.epa.gov/sites/default/files/2015-08/documents/eiip_areasourcesnh3.pdf

Table 4. NOx emission factors (lbs/mmscf) by CES.

CES	Source of EF	NOx EF
47142 Industrial – Natural Gas – Unspecified	Rule 1147 NOx Reductions from Miscellaneous Sources	56.26
66787 Industrial – Natural Gas – IC Engines	Rule 1110.2 Emissions from Gaseous and Liquid Fueled Engines	42.60
58735 Commercial – Natural Gas – Space Heating	CMB-03 (2012 AQMP) Reductions from Commercial Space Heating	125.02
58743 Commercial – Natural Gas – Water Heating	Rule 1146.2 Emissions of Oxides of Nitrogen from Large Water Heaters and Small Boilers and Process Heaters	25.01
95024 Commercial – Natural Gas – IC Engines	Rule 1110.2 Emissions from Gaseous and Liquid Fueled Engines	42.60
95025 Commercial – Natural Gas – Other	Rule 1147 NOx Reductions from Miscellaneous Sources	57.30

Table 5. US EPA AP-42 emission factors (lbs/mmscf).

Applicable CES	AP-42 Category	TOG	CO	SO_2	PM
47142 Industrial – Natural Gas – Unspecified, 58735 Commercial – Natural Gas – Space Heating, 58743 Commercial – Natural Gas – Water Heating, 95025 Commercial – Natural Gas – Other	Large and small boilers	11	84	0.6	7.6
95024 Commercial – Natural Gas – IC Engines, 66787 Industrial – Natural Gas – IC Engines	4-stroke lean-burn engines	40.5 [1]	589 [1]	0.6	10

[1] TOG and CO emission factors provided by rule staff

Table 6. US EPA's NH3 emission factors (lbs/mmscf).

CES	Source of EF	NH3 EF
47142 Industrial – Natural Gas – Unspecified	EPA's Report- Development and Selection of Ammonia Emission Factors[6]; Table 5-2.	3.2
66787 Industrial – Natural Gas – IC Engines	EPA's Report- Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources[7]; Table III-1, page 33.	6.56
58735 Commercial – Natural Gas – Space Heating	No measured data available. Assumed negligible.	0.00
58743 Commercial – Natural Gas – Water Heating	No measured data available. Assumed negligible.	0.00
95024 Commercial – Natural Gas – IC Engines	EPA's Report- Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources[7]; Table III-1, page 33).	0.60
95025 Commercial – Natural Gas – Other	EPA's Report- Development and Selection of Ammonia Emission Factors[6]; Table 5-2.	0.49

[6] https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100ERTR.TXT
[7] https://www.epa.gov/sites/default/files/2015-08/documents/eiip_areasourcesnh3.pdf

SUMMARY AND NEW EMISSIONS

Below, prospective SIP/AQMP emissions for the year 2023 are compared with 2023 milestone year emissions from the 2022 AQMP, which used 2018 as the base year with projections based on the socioeconomic forecast from the 2020 RTP.

SCAB CES 47142 industrial external combustion emissions for year 2023, tons per day (tpd)

Pollutants	2022 AQMP	Prospective SIP/AQMP
TOG[1]	0.36	0.97
NOx	1.87	4.98
CO	2.74	7.43
SOx	0.02	0.05
PM2.5	0.25	0.67
NH3	1.5	0.28

[1] 2022 AQMP emissions use the emissions factor for TOG, consistent with AP-42

SCAB CES 66787 industrial internal combustion emissions for year 2023, tpd

Pollutants	2022 AQMP	Prospective SIP/AQMP
TOG	2.77	1.97
NOx	2.91	2.07
CO	40.33	28.61
SOx	0.04	0.03
PM2.5	0.68	0.49
NH3	0.20	0.32

SCAB CES 58735 commercial space heating emissions for year 2023, tpd

Pollutants	2022 AQMP	Prospective SIP/AQMP
TOG	0.21	0.25
NOx	2.43	2.83
CO	1.60	1.90
SOx	0.01	0.01
PM2.5	0.14	0.17
NH3	0.00	0.00

SCAB CES 58743 commercial water heating emissions for year 2023, tpd

Pollutants		Prospective SIP/AQMP
TOG	0.24	0.26
NOx	0.56	0.59
CO	1.85	1.99
SOx	0.01	0.01
PM2.5	0.17	0.18
NH3	0.00	0.00

SCAB CES 95024 commercial internal combustion emissions for year 2023, tpd

Pollutants	2022 AQMP	Prospective SIP/AQMP
TOG	0.71	0.72
NOx	0.74	0.76
CO	10.27	10.53
SOx	0.01	0.01
PM2.5	0.17	0.18
NH3	1.86	0.01

SCAB CES 95025 commercial external combustion emissions for year 2023, tpd

Pollutants	2022 AQMP	Prospective SIP/AQMP
TOG	0.25	0.12
NOx	1.31	0.62
CO	1.92	0.91
SOx	0.01	0.01
PM2.5	0.17	0.08
NH3	0.26	0.01

APPENDIX

Overall, NOx emissions are higher for both commercial and industrial categories with industrial external combustion having the largest increase compared to previous inventory.

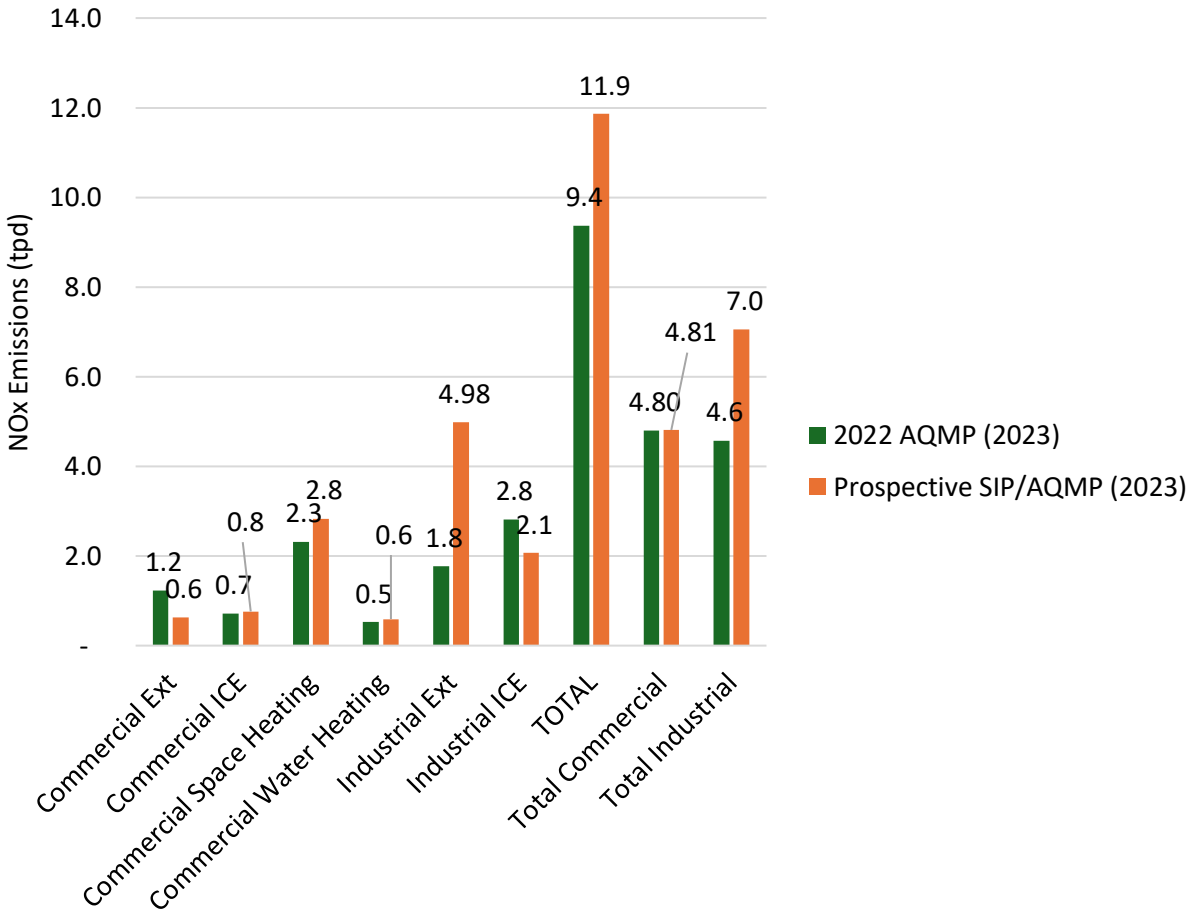

Figure 1. A comparison of the updated and previous emissions inventories for NOx emissions related to commercial and industrial natural gas combustion.