



Natural Gas Transmission and Distribution Survey

General Instructions

Mailing Address:

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Attention: SSD / Transmission & Distribution Survey

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Overview

The natural gas transmission and distribution (NG T&D) survey has been designed to improve California Air Resources Board (ARB) estimates of greenhouse gas emissions in California. ARB is collecting data for the 2007 calendar year in order to accurately gather activity data associated with NG T&D in California. This survey is not designed to meet ARB's requirements for mandatory reporting, nor is it to be used for compliance purposes. This survey pertains to all entities that own or operate natural gas pipelines in the State, regardless of their business size. The following instructions are provided as general guidelines to help fill out individual tables in the survey. Since this survey covers a wide range of NG T&D activities, some entities may not need to complete all tables in the survey (e.g., municipality NG distribution). In addition, if exact counts or measurements are not available, the best engineering estimates would be acceptable.

Who should fill out this survey?

Any entity that maintains operational control of the two natural gas pipeline categories defined below within the borders of the state of California is responsible for filling out the survey. Entity means a person, firm, association, organization, partnership, business trust, corporation, limited liability company, company, or government agency. Operational control is defined as the authority to introduce and implement operating, environmental, health and safety policies at the facilities.

Natural Gas Transmission: includes any entity that transports high pressure natural gas in interstate or intrastate large diameter pipelines. This includes, but is not limited to, compressor stations, meter and regulator (M&R) stations, or natural gas dehydration, along the transmission pipelines.

Natural Gas Distribution: includes any entity that delivers lower pressure natural gas to end users through smaller diameter pipelines. This includes, but is not limited to, meter and regulator stations, or regulator stations, along the distribution pipelines.

Submission Format.

Paper forms or Excel (Excel) electronic files, or a combination of paper and electronic files are acceptable. ARB provides paper and Excel templates to facilitate the process. However, it is preferable to have all data submitted electronically in Excel format.

Permitted and Non-Permitted Equipment.

This survey covers both air district permitted and non-permitted equipment.

Questions?

Please contact any of the following ARB staff for questions or assistance:

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General Instructions

Table 1 – Entity Demographics

Complete this table once for any entity that provides NG T&D services in California. Natural gas underground storage is not part of this survey. Another survey, the Oil & Natural Gas Industry Survey, has been sent out to collect underground storage activity data.

The contact person listed on this page has an overall responsibility for gathering data provided in the survey. Contact persons for individual facilities should be provided in Table 4 (Individual Facility Descriptions). A facility is defined as any property, plant, building, structure, stationary source, stationary equipment, or grouping of stationary equipment or stationary sources located on one or more contiguous or adjacent properties, in actual physical contact or separated solely by a public roadway or other public right-of way, and under common operational control, that emits or may emit any greenhouse gas.

Identify the appropriate sector the entity is involved in: natural gas transmission only, natural gas distribution only, or both. The annual volume of natural gas transported or distributed is the annual amount of gas delivered into the system, including unaccounted gas, which is the amount of gas for an entity's own use and unaccounted losses during transport.

For the transmission sector, the annual volume (Mscf) includes natural gas the entity transports for other entities (e.g., municipalities, large end-users) for a fee, sells directly to large end-users (e.g., industrial and commercial), or sells to other end-users (e.g., residential) in its distribution networks. Thus, the annual volume reported in the transmission sector would include the distribution sector, if any. Indicate the average molar concentrations (mole percent) of both methane (CH₄) and carbon dioxide (CO₂) of the gas.

For the distribution sector, the annual volume (Mscf) includes natural gas the entity sells to various end-users in its distribution networks. Indicate the average mole percent of both CH₄ and CO₂ of the gas.

Check the appropriate box for entity's employment corresponding to the number of direct employees or contracted employees within the state of California. Identify all trade groups or organizations of which the entity is a member.

Table 2 – Pipelines

Complete this table once per entity as an overview of pipelines in service. Much of the information requested is already provided by entities to the U.S. Department of Transportation (DOT) and the California Public Utility Commission (CPUC).

Natural Gas Transmission:

Estimate transmission pipeline length (miles) by material type and the number of annual blowdown events.

The annual number of blowdowns includes, but is not limited to, planned system venting for pipeline inspection and maintenance (I&M); emergency shutdown at facilities along the pipeline, including compressor stations and M&R stations; pressure relief valve venting; and blowdowns from pigging operations. This number should exclude compressor blowdowns, which are reported separately in Table 8. Indicate all facilities included in the blowdown estimate by checking the appropriate boxes. Please specify in "Other" for sources that are not listed. Estimate the annual volumes (Mscf) of gas vented, flared, or recovered (e.g., drafted down, pulled down, cross compressed, etc.). These volumes include the amounts from pigging blowdowns, but exclude those from compressor blowdowns, which are reported separately in Table 8.

Natural gas transmission accidents and dig-in events include, but are not limited to, accidental release of gas from the system and any unplanned maintenance. Report the annual number of such events and estimate the corresponding annual volume of gas losses.

In addition, report the annual number of pigging events and the number of launchers and receivers.

Natural Gas Distribution:

Estimate distribution mains pipeline length (miles) by material type.

Distribution services pipeline connects the mains pipeline to customer meters. Estimate the average pipeline length (ft), regardless of material type, and report the number of distribution services by pipeline type.

Similar to natural gas transmission, the annual number of blowdowns for natural gas distribution includes, but is not limited to, planned system venting for pipeline inspection and maintenance; emergency shutdown at facilities along the pipeline, such as M&R stations; pressure relief valve venting; and blowdowns from pigging operations. Indicate all facilities included in the blowdown estimate by checking the appropriate boxes. Please specify in "Other" for sources that are not listed. Estimate the annual volumes (Mscf) of gas vented, flared, or recovered (e.g., drafted down, pulled down, cross compressed, etc.). These volumes include the amounts from pigging blowdowns.

Natural gas distribution accidents and dig-in events include, but are not limited to, accidental release of gas from the system and any unplanned maintenance. Report the annual number of such events and estimate the corresponding annual volume of gas losses.

In addition, report the annual number of pigging events and the number of launchers and receivers.

Finally, provide the number of meters by customer category: commercial/industrial or residential.

Table 3 – Meter and Regulator Station Counts

This table provides an overview of the number of meter and regulator (M&R) stations by air district for an entity. Each entity needs to fill out this table multiple times when these facilities are spread out in several air pollution control or air quality management districts. Enter the total number of M&R stations over which the entity has operational control.

For other M&R stations that are not listed, please include them in “Distribution M&R or Regulation Station, unspecified pressure and location” and provide the number of units.

Table 4 – Combustion Facility Descriptions

This table provides detailed descriptions of combustion facilities, i.e., compressor stations, dehydration facilities, or any other facility which contains a combustion source. Fill out this table once per facility. An entity may need to fill out this table multiple times. In this case, it may be easier to submit the data electronically using the Excel templates provided. The reporting entity must create a unique facility identification (ID) that links this table to the subsequent tables. One way to generate this unique facility ID is to use an abbreviation of the entity’s name followed by a unique ID number (e.g., a facility at entity ABC could use ABC001). Identify the air pollution control or air quality management district in which the facility is located and its air district assigned ID, if available.

The contact person listed on this page has an overall responsibility for gathering data, and should be able to provide technical information on the facility operations.

Please indicate if this facility has access to grid electricity. If so, please describe the electricity service provided: its voltage (V), amperage (A), and phase.

Also, indicate the facility type from the list provided. If the facility type is not listed in the table, please specify it in “Other.”

Note:

If a natural gas distribution entity does not have any stationary combustion sources (e.g., line heaters, etc.), please skip to Table 14 and complete Tables 14-17.

Table 5 – Energy Consumption

This table is designed to capture energy consumption at a facility, including fuel consumed by equipment not requiring an air district permit (e.g., smaller than

50 hp). This table is filled out once per facility. An entity may need to fill out this table multiple times, so it may be easier to submit the data electronically using the Excel templates provided. Enter the unique facility ID from Table 4.

Report the annual energy consumption by fuel type in the units indicated (gallons/Mscf/MWh/specify units). Include fuel consumption from stationary sources only. This survey excludes mobile sources fuel consumption (e.g., cars and trucks).

For electricity consumption, bifurcate the annual amounts by source type: imported from grid or on-site generated. For the latter case, disaggregate the amount further into electricity used by the facility and electricity exported out of the facility.

If the fuel type is not listed, please specify in “Other” and report the annual amount in the appropriate units.

Table 6 – Combustion Equipment

The combustion equipment table captures data on stationary internal and external combustion sources. This table is filled out once per piece of equipment. A facility may need to fill out this table multiple times, so it may be easier to submit the data electronically using the Excel templates provided. Enter the unique facility ID from Table 4. The reporting facility will assign a unique equipment ID. The unique equipment ID could be the air pollution control or air quality management district assigned ID or a self-generated ID, using a similar procedure to generate a unique facility ID as described in Table 4.

Indicate the equipment type by checking the appropriate box, such as reciprocating engine (two- or four-stroke, lean or rich burn), boiler (glycol, amine, or other), heater, gas turbine, incinerator, or specify in “Other,” if the equipment is not listed. Specify other relevant data for the equipment: manufacturer, date of manufacture, and its rated capacity. In addition, estimate the annual average load (%) and hours of operation (hours), including thermal efficiency (%). Also, specify if a district permit is required for the equipment.

Select all control equipment for the combustion equipment and specify in “Other,” for other control equipment not listed.

Indicate the primary and secondary fuel type, if applicable, to power the equipment. For natural gas fuel, specify the average higher heat value (HHV) as well. Regardless of the fuel type, provide the annual fuel consumption and the corresponding method to estimate the amount: metered or calculated, in appropriate units (gallons/Mscf/specify units). For incinerators, thermal oxidizers, and flares, the annual fuel consumption excludes the amount of waste gas incinerated or processed, which is reported separately in Table 11.

At the end of the table, please describe the I&M program implemented for the equipment, such as visual inspection, routine performance tests, and overhaul

schedules. In addition, please indicate if the performed actions are recorded and if these records will be made available upon request.

Table 7 – Electric Equipment Prime Mover

Table 7 is intended to gather activity data for electric motors used as a compressor's prime mover. This table is filled out once per piece of equipment. Multiple tables may be needed per facility, so it may be easier to submit the data electronically using the Excel templates provided. Enter the unique facility ID from Table 4. In addition, the reporting facility will assign a unique equipment ID, similar to Table 6.

Also, provide other relevant information of the equipment: manufacturer, date of manufacture, rated size (hp), estimated annual operating hours (hours), and average load (%).

Table 8 – Compressors

This table links a compressor to a prime mover (i.e., a reciprocating engine or turbine from Table 6, or an electric motor from Table 7) that powers the compressor. Fill out this table once per compressor. Multiple tables may be needed per facility, so it may be easier to submit the data electronically using the Excel templates provided. If the compressor is powered by a reciprocating engine, enter the corresponding equipment ID from Table 6. If it is powered by an electric motor, enter the equipment ID from Table 7.

Select the compressor type. If the compressor type is not listed, please specify in "Other." For a centrifugal compressor, indicate the number of compression stages and the number of seals by type. For a reciprocating compressor, indicate the number of cylinders and frequency of rod packing replacement. For either compressor type, indicate if it is an integral compressor.

Indicate the starter type for the prime mover from Table 6. If the starter type is not listed or unknown, please specify in "Other" or select "n/a."

A compressor is operated in several different modes. For each mode listed, estimate the annual operating hours (hours) for the compressor. Estimate the annual volume (Mscf) of gas vented, flared, and recovered from engine starts and compressor blowdowns, excluding pipeline blowdowns that are reported in Table 3.

At the end of the table, please describe the I&M program implemented for the equipment, such as visual inspection, routine performance tests, and overhaul schedules. In addition, please indicate if the performed actions are recorded and if these records will be made available upon request.

Table 9 – Natural Gas Actuated Pneumatic Devices

Table 9 collects the number of various pneumatic devices in a facility, based on an actual count. It can also be estimated, for example, using the 1996 EPA/GRI Study,

Volume 5, page 68 (i.e., about 10 pneumatic devices per engine). Fill out this table once per facility. Multiple tables may be needed per entity, so it may be easier to submit the data electronically using the Excel templates provided. Copy the unique facility ID from Table 4.

If the exact type of pneumatic devices is unknown fill in the first row; otherwise, enter the device count in the appropriate row. Low- and no- bleed devices should be included in the device counts, they will be account for in columns 4, 5, and 6 (see next paragraph). For example, in the case of no-bleed, if 50% is entered, it will be assumed that 50% of the devices listed in column 2 or 3 are no-bleed. If the device type is not listed, please specify in "Other." **Note:** Gas assisted glycol recirculation pumps (Kimray pumps) should not be included in this table. They are addressed in Table 10 (Natural Gas Dehydration).

If information is available on the percent of equipment converted to low-bleed, or no-bleed devices, as well as the percent of units which have gas recovery, please provide in columns 4, 5 and 6. Gas recovery includes gas recovered and routed back to a low pressure system or gas recovered and routed to a vapor recovery system (e.g., flare, incinerator, carbon adsorber). If gas is routed to a vapor recovery system please fill out Table 11. Approximations are acceptable.

At the end of the table, please describe the I&M program implemented for the equipment, such as visual inspection, routine performance tests, and maintenance schedules. In addition, please indicate if the performed actions are recorded and if these records will be made available upon request.

Note:

If a NG T&D entity does not use any dehydration units, please skip to Table 13 and complete Tables 13-17.

Table 10 – Natural Gas Dehydration

This table collects information on gas dehydration processes, if any, along the transmission pipelines. However, it excludes any dehydrators associated with underground storage. Fill out this table once per facility. Multiple tables may be needed per entity, so it may be easier to submit the data electronically using the Excel templates provided. Enter the unique facility ID from Table 4.

Select the dehydrator type and enter annual volume (Mscf) of natural gas dehydrated. For a glycol dehydrator, provide the required information for calculating fugitive emissions from the system, including glycol recirculation rate (gallons/hour), and flash tank and contactor pressures (psia). In addition, indicate if a gas assisted recirculation pump (i.e., Kimray pump) is present and if any stripped gas is used.

Finally, indicate if a vapor recovery system is employed. Data for vapor recovery will be collected in Table 11.

Table 11 – Vapor Recovery & Emergency Flare

Table 11 collects information on the treatment of off-gas from a glycol dehydrator or any other gas routed through the system (i.e. pneumatic vents from Table 9) before it is released to the atmosphere. Fill out this table once per facility. Multiple tables may be needed per entity, so it may be easier to submit the data electronically using the Excel templates provided. Enter the unique facility ID from Table 4.

Select the recovery unit type: flare, thermal oxidizer, incinerator, or carbon adsorber. Also, indicate if it is used for routine vapor recovery or emergency situations. For flares, thermal oxidizers, and incinerators, indicate the size (Btu/hour), annual throughput (scf), and combustion efficiency (%).

In addition, indicate the average molar concentration (mole %) of CH₄ and CO₂ of the treated gas. This information can be obtained from a gas chromatograph (GC) speciation. The same speciation can also be used to compute the carbon mole ratio (CMR), using the following formula:

$$CMR = \sum \left[\frac{\text{mole \% hydrocarbon}}{100} \right] * \text{Number carbons in hydrocarbon}$$

Carbon mole ratio is the sum of the number of carbons in each hydrocarbon species weighted by its mole fraction.

Natural Gas Speciation	(Mole %)
Methane (CH ₄)	94.7
Ethane (C ₂ H ₆)	1.3
Propane (C ₃ H ₈)	0.8
Butane (C ₄ H ₁₀)	0.4
Pentane (C ₅ H ₁₂)	0.2
Other Hydrocarbons (C ₆₊)*	0.1
N ₂	0.6
CO ₂	1.9
Total	100.0

*Assuming each of the C₆₊ hydrocarbons contains the same six carbons.

$$\text{Carbon Mole Ratio} = 0.947*1 + 0.013*2 + 0.008*3 + 0.004*4 + 0.002*5 + 0.001*6 = \underline{1.03}$$

For carbon adsorbers, indicate the size of the unit (ft³), annual throughput (scf), and methane capture efficiency (%).

In addition, please indicate the average molar concentration (mole %) of CH₄ and CO₂ of the treated gas. These molar concentrations can be obtained from a GC speciation.

Tables 12 to 17 – U.S. EPA Natural Gas STAR Program

The U.S. EPA Natural Gas STAR (STAR) program is a voluntary partnership with the natural gas industry that started in 1993. The STAR program encourages natural gas companies to share and adopt proven and cost-effective technologies and improved management practices that increase operational efficiencies and reduce methane emissions.

The main objective of Tables 12-17 is to capture market penetration (MP) of such technologies and practices at an entity. MP refers to the number of installations implemented, from program commencement to the present, divided by the total number of available opportunities for installations, expressed in percentage.

Regardless of your entity membership in the STAR program, please complete these tables once per entity. Indicate in the appropriate box “Yes” or “No” if your entity has taken advantage of the STAR program. The description stated in the first column is hyperlinked to the STAR program website. Hold CTRL key down and click (Word) or click (Excel) on the link for detailed information on the specific technology/practice listed.

In the remaining two columns, please estimate the MP of the STAR program for your entity and provide a brief description of why, if applicable, the program has not been adopted.