



Ministry for the  
**Environment**  
Manatū Mō Te Taiao



# **Guide to Reporting for** ***Natural Gas Activities*** **under the New Zealand** **Emissions Trading Scheme**

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# 1 Overview

As part of the New Zealand Emissions Trading Scheme (NZ ETS), stationary energy and industrial process participants are required to monitor and report on their greenhouse gas emissions from 1 January 2010. The details of these reporting obligations are set out in the Climate Change (Stationary Energy and Industrial Processes) Regulations 2009 (SEIP Regulations).<sup>1</sup>

Importers of more than 10,000 litres of natural gas in a year, and all miners of natural gas other than for export, are mandatory participants in the NZ ETS.

A purchaser of natural gas is able to opt in as a voluntary participant if they buy at least two petajoules of natural gas in a year directly from one or more gas mining participants.

Gas purchasers may apply for a unique emissions factor (UEF) for the N<sub>2</sub>O and CH<sub>4</sub> emissions from use of the gas in particular combustion equipment. There are no other UEF options for natural gas.

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<sup>1</sup> The Climate Change Response Act 2002 and related regulations are available at [www.legislation.govt.nz](http://www.legislation.govt.nz). Definitions of natural gas are outlined in the Climate Change Response Act 2002. Classes of gas are outlined in the SEIP Regulations.

## 2 Process for becoming a registered participant

Gas miners and importers, along with others in the stationary energy and industrial process sectors, will become mandatory participants when their reporting obligations begin on 1 January 2010. Surrender obligations begin to accrue on 1 July 2010.

The Act requires all mandatory participants to have registered as participants within 20 working days of carrying out the particular ETS activity. For most persons in the natural gas sector, this will be within 20 working days of 1 January 2010 ie, 1 February 2010.

To register as a participant you must:

- first, apply to open a holding account which will ultimately be used for surrendering and receiving NZUs. A participant who will be involved in more than one activity can use a single holding account for all activities.

To open a holding account, register as a user on the New Zealand Emission Unit Register (NZEUR) website at [www.eur.govt.nz](http://www.eur.govt.nz). Once the user registration is approved, use the online application form to open an account

- second, register as a participant by completing an online participant notification form at [www.eur.govt.nz](http://www.eur.govt.nz).

Gas purchasers wishing to opt in as voluntary participants may register at any time. After registering, NZ ETS obligations become mandatory. A person who applies for registration becomes a participant one year after they have been notified by the Chief Executive of the Ministry for Economic Development that their application has been entered on the participant register. Deregistration, or release from obligations under the NZ ETS, will take effect four years after notifying the NZEUR.

# 3 Importing Natural Gas

See *Climate Change (Stationary Energy and Industrial Processes) Regulations 2009: 12–14*

## 3.1 Overview

The formula for calculating emissions associated with importing natural gas accounts for downstream greenhouse gas emissions that will occur as a result of the natural gas being combusted.

These regulations allow greenhouse gas emissions from any imported natural gas which is subsequently re-exported to be explicitly deducted from your calculated emissions. Emissions associated with the mining, production, processing and transportation of the imported gas are not included.

## 3.2 Liquefied petroleum gas (LPG)

The regulations require LPG importers to collect data and report on the total tonnes imported of three classes of LPG-related product: propane, butane, and LPG with a propane content of 60 per cent by volume. Emissions factors for each class are listed in Table 4 of Schedule 2 of the regulations. For LPG mixes other than 60 per cent propane, the regulations provide an alternative calculation method based on the volume fraction of propane in the mix. This is described at Section 6 of this guide.

## 3.3 Liquefied natural gas

Although the only natural gas products currently imported into New Zealand are LPG and its constituents, the regulations provide for possible future imports of liquefied natural gas (LNG). Imports of LNG must be reported in energy terms. An optional storage adjustment is provided to allow for the possibility that natural gas imported as LNG is injected into or extracted from a storage facility during the year.

## 3.4 Information you are required to collect

The following information must be collected for each class of natural gas imported in the year:

Information to collect	How to collect
<ul style="list-style-type: none"><li>number of tonnes of each class of LPG imported</li></ul>	<ul style="list-style-type: none"><li>as recorded at the customs point</li><li>may be obtained from shipping documentation</li></ul>
<ul style="list-style-type: none"><li>number of tonnes of each class of LPG exported</li></ul>	<ul style="list-style-type: none"><li>as recorded at the customs point</li></ul>
<ul style="list-style-type: none"><li>number of terajoules of LNG imported</li></ul>	<ul style="list-style-type: none"><li>as recorded at the customs point</li><li>may be obtained from shipping documentation</li></ul>
<ul style="list-style-type: none"><li>number of terajoules of LNG exported</li></ul>	<ul style="list-style-type: none"><li>as recorded at the customs point</li></ul>

If including a storage adjustment for LNG:

Information to collect	How to collect
• terajoules injected into the facility	• between 1 January and 31 December in the year
• terajoules extracted from the facility	• between 1 January and 31 December in the year

### 3.5 Example calculation

Bunsen Burner Ltd imports 15,000 tonnes of propane and 10,000 tonnes of butane in a year. They mix the two at a 60:40 volume ratio in New Zealand to produce LPG for sale, and export 5000 tonnes of this LPG. The remaining 20,000 tonnes of LPG is sold in New Zealand. In addition, the firm imports 5000 tonnes of a different LPG mix, containing 50 per cent propane. The emissions factor for this mix is determined to be 3.007 tCO<sub>2</sub> per tonne using the method given later in this guide. The firm does not import any LNG.

The participant applies the calculation above to each of the four relevant classes:

Class of natural gas	Gas imported	Gas exported	Emissions factor (tCO <sub>2</sub> -e/t)	Storage adjustment	Emissions (tCO <sub>2</sub> -e)
Term used in regulations	A	B	EF	S	E
Propane	15,000 t	0	2.988		44,820
Butane	10,000 t	0	3.024		30,240
LPG (60:40)	0	5000 t	3.003		-15,015
LPG (50:50)	5000 t	0	3.007		15,035
<b>Total</b>					<b>75,080</b>

Propane imported (none re-exported):

$$E = (15,000 - 0) \times 2.988 = 44,820 \text{ tCO}_2\text{-e}$$

Butane imported (none re-exported):

$$E = (10,000 - 0) \times 3.024 = 30,240 \text{ tCO}_2\text{-e}$$

60:40 LPG exported (none imported):

$$E = (0 - 5000) \times 3.003 = -15,015 \text{ tCO}_2\text{-e}$$

50:50 LPG imported (none exported):

$$E = (5000 - 0) \times 3.007 = 15,035 \text{ tCO}_2\text{-e}$$

The total emissions to be reported for the activity of importing natural gas are:

$$TE = \Sigma E = 44,820 + 30,240 - 15,015 + 15,035 = 75,080 \text{ tCO}_2\text{-e}$$

# 4 Mining Natural Gas

See *Climate Change (Stationary Energy and Industrial Processes) Regulations 2009: 15–17*

## 4.1 Overview

The formula for calculating emissions associated with the activity of mining natural gas accounts for greenhouse gas emissions generated during the production, processing and eventual combustion of the natural gas. Any natural gas exported or sold to an opt-in participant may be explicitly deducted from your calculated emissions. Fugitive emissions lost during the distribution and use of natural gas have already been included in the equation and do not need to be reported on separately.

Data must be sourced from direct measurement of the carbon content and other properties of classes of natural gas by gas chromatography and other techniques at the point of sale. As the measured gas properties are used to calculate emissions instead of default emissions factors for CO<sub>2</sub>, no provision is made for unique emissions factors.

Emissions from venting, flaring and own use of gas during production and processing must be estimated using the hydrocarbon accounting system needed for process control.

## 4.2 Information you are required to collect

The following information must be collected for natural gas mined in the year:

Information to collect	How to collect
For each class of gas sold, including to opt-in participants or exported:	
<ul style="list-style-type: none"> <li>tonnes of each class of gas sold domestically during the year</li> <li>terajoules of each class of gas sold during the year</li> <li>mass fraction of carbon (<math>m_C</math>)</li> </ul>	<ul style="list-style-type: none"> <li>directly measured physical quantities</li> <li>at the point of sale ie, the first fiscal metre downstream of gas processing</li> <li>using gas chromatography for chemical properties according to standards specified in Regulation 16(3)</li> </ul>
<ul style="list-style-type: none"> <li>tonnes of each class of gas exported during the year</li> </ul>	<ul style="list-style-type: none"> <li>measured at the customs point</li> <li>gas can be exported directly or by a third party</li> </ul>
For each class of processing emissions (flaring, venting and own use):	
<ul style="list-style-type: none"> <li>tonnes of gas of each class from gas processing</li> <li>terajoules of gas of each class from gas processing</li> </ul>	<ul style="list-style-type: none"> <li>may be estimated</li> <li>using the processing facility hydrocarbon accounting system needed for process control</li> </ul>
For vented gas, you must also report::	
<ul style="list-style-type: none"> <li>mass fraction of carbon dioxide (<math>m_{CO_2}</math>) and methane (<math>m_{CH_4}</math>)</li> </ul>	<ul style="list-style-type: none"> <li>may be estimated</li> <li>using the processing facility hydrocarbon accounting system needed for process control</li> </ul>

### 4.3 Record keeping

The determination of carbon content in mined natural gas can be undertaken using high-precision measurement and analysis equipment which is already in place and used for commercial and technical management reasons.

A hydrocarbon accounting system (HAS) must be used to estimate and report on emissions from flaring, venting and the combustion of natural gas for own use upstream of the sales meter. The HAS is a process model used to manage the gas processing system and not all of the required parameters will be directly measured. The gas miner will need to provide records to show how the values reported were obtained.

Participants must retain sufficient records to enable the Chief Executive of the Ministry of Economic Development to verify the emissions a participant reports in their emissions return. Records must be retained for a period of at least seven years after the end of the year to which they relate.

### 4.4 Example calculation

Western Cape Pty Ltd is involved in natural gas mining activities at one field in New Zealand. In one year, the company sold 200,000 tonnes of pipeline gas (50,000 of which was to an opt-in participant) and 2675 tonnes of LPG of which 1000 tonnes was exported.

Activity	Quantity (tonnes/year)	Quantity (TJ/year)	Oxidation factor	Mass fraction of carbon	Emissions factor for carbon	Mass fraction CO <sub>2</sub> in vented gas	Mass fraction CH <sub>4</sub> in vented gas	Aggregate CH <sub>4</sub> & N <sub>2</sub> O emission factor	Emissions (tCO <sub>2</sub> -e)
Term used in regulations	C	D	OF <sub>GAS</sub>	m <sub>C</sub>	EF <sub>C</sub>	m <sub>CO2</sub>	m <sub>CH4</sub>	EF <sub>M+N</sub>	E
Mined gas – pipeline sales	200,000	9,351	1.0	0.698	3.6641	N/A	N/A	0.054	512,013
Mined gas – LPG sales	2675	131.8	0.995	0.82	3.6641	N/A	N/A	0.054	8,004
Exports	1000	49.3	0.995	0.82	3.6641	N/A	N/A	0.054	2,992
Sold to opt-in	50,000	2338	1.0	0.698	3.6641	N/A	N/A	0.054	128,003
Own use	4000	187	0.995	0.698	3.6641	N/A	N/A	0.054	10,189
Flaring	600	28	0.980	0.698	3.6641	N/A	N/A	0.054	1,505
Venting	1000	N/A	N/A	N/A	N/A	0.12	0.75	N/A	15,870
<b>Total</b>									<b>416,586</b>

The standard emission equation is  $E = (OF_{GAS} \times m_C \times EF_C \times C) + (D \times EF_{M+N})$

For sales gas:

Pipeline sales (include to opt in and for export):

$$(1.0 \times 0.698 \times 3.6641 \times 200,000) + (9351 \times 0.054) = 512,013 \text{ tCO}_2\text{-e}$$

LPG sales  $(0.995 \times 0.820 \times 3.6641 \times 2675) + (131.8 \times 0.054) = 8004 \text{ tCO}_2\text{-e}$

For processing emissions:

$$\text{Own use gas} \quad (0.995 \times 0.698 \times 3.6641 \times 4000) + (187 \times 0.054) = 10,189 \text{ tCO}_2\text{-e}$$

$$\text{Flared gas} \quad (0.980 \times 0.698 \times 3.6641 \times 600) + (28 \times 0.054) = 1505 \text{ tCO}_2\text{-e}$$

$$\begin{aligned} \text{Vented gas (using the equation } V = [m_{\text{CO}_2} + (21 \times m_{\text{CH}_4})] \times C) \\ [0.12 + (21 \times 0.75)] \times 1000 = 15,870 \text{ tCO}_2\text{-e} \end{aligned}$$

The total emissions to be reported for the activity of mining natural gas are:

$$\begin{aligned} \text{TE} = \Sigma(\text{E}_{\text{FIELD}}) &= (512,013 + 8004) + 10,189 + 1505 + 15,870 - 2992 - 128,003 \\ &= 416,586 \text{ tCO}_2\text{-e} \end{aligned}$$

# 5 Purchasing Natural Gas

*See Climate Change (Stationary Energy and Industrial Processes) Regulations 2009: 48–50*

## 5.1 Overview

The formulas for calculating emissions associated with the activity of purchasing natural gas account for greenhouse gas emissions which occur as a result of combustion. Any purchased natural gas which is exported may be explicitly deducted from the calculation.

For each class of pipeline gas purchased from a miner (described in the regulations as classes other than LPG, butane, or propane) there are two reporting options:

- a) **standard formula:** using direct measurement of the carbon content of the natural gas by gas chromatography (the standard formula used by gas miners), or
- b) **field-specific formula:** a default emissions factor can be used if the natural gas is purchased from one of the fields listed in Table 10 of Schedule 2.

Any propane, butane and LPG purchased from a gas miner must also be accounted for. Emissions factors are listed in Table 4 of Schedule 2 of the regulations. For LPG mixes other than 60 per cent propane, the regulations provide a calculation method based on the volume fraction of propane in the mix. The calculation is described later in this guide.

An opt-in participant may apply for approval to use a Unique Emissions Factor (UEF) for the CH<sub>4</sub> and N<sub>2</sub>O that arise from natural gas used in particular combustion equipment. Gas used in that equipment must be reported as a separate class.

## 5.2 Information you are required to collect

The following information must be collected for each class of natural gas purchased from a natural gas miner in the year:

Information to collect	How to collect
<ul style="list-style-type: none"> <li>number of tonnes of each class of gas purchased or exported</li> </ul>	<ul style="list-style-type: none"> <li>as measured at the point of sale</li> </ul>
<ul style="list-style-type: none"> <li>number of terajoules of each class of gas purchased or exported</li> </ul>	<ul style="list-style-type: none"> <li>as determined through gas chromatography*</li> <li>can be generated independently by the purchaser or supplied by the gas miner at the time of sale</li> </ul>
AND, if option a) above is used:	
<ul style="list-style-type: none"> <li>mass fraction of carbon in each class of natural gas</li> </ul>	<ul style="list-style-type: none"> <li>as determined through gas chromatography*</li> <li>can be generated independently by the purchaser or supplied by the gas miner at the time of sale</li> </ul>
AND, if including a storage adjustment:	
<ul style="list-style-type: none"> <li>terajoules injected into the facility</li> </ul>	<ul style="list-style-type: none"> <li>between 1 January and 31 December in the year</li> </ul>
<ul style="list-style-type: none"> <li>terajoules extracted from the facility</li> </ul>	<ul style="list-style-type: none"> <li>between 1 January and 31 December in the year</li> </ul>

\* The standards and testing methods for gas chromatography are given in Regulation 49

## 5.3 Example calculation

Smalls Manufacturing Ltd purchases natural gas from two different NZ ETS natural gas mining participants. Smalls Manufacturing has decided that, as it reaches the two petajoule threshold for opt-in participation, it will participate in the NZ ETS.

Smalls purchases 2000 TJ of Kaimiro gas, and 20,000 tonnes of gas from another field for which it is able to account for emissions using the standard formula. None of this supply is exported. It also injects 400 TJ of gas into a storage facility.

Activity	Quantity (tonnes/ year)	Quantity (TJ/year)	Emissions factor tCO <sub>2</sub> -e/TJ	Mass fraction carbon	Default EF	Emissions (t CO <sub>2</sub> -e/TJ)
Term used in regulations	C	D	EF	mC	EFM +N	E
Purchased gas: Kaimiro		2000	55.14			110,280
Purchased gas: other field	20,000	1080		81.5%	0.054	59,783
Storage adjustment	N/A	400	53.64	N/A	N/A	21,456
<b>Total</b>						<b>148,607</b>

Kaimiro gas (field-specific formula):

$$E = 55.14 \times 2000 = 110,280 \text{ tCO}_2\text{-e}$$

Other field (standard formula):

$$E = (0.815 \times 3.6641 \times 20,000) + (1080 \times 0.054) = 59,783 \text{ tCO}_2\text{-e}$$

Storage adjustment:

$$S = (400 - 0) \times 53.64 = 21,456 \text{ tCO}_2\text{-e}$$

The total emissions to be reported for the activity of purchasing natural gas are:

$$TE = 110,280 + 59,783 - 21,456 = 148,607 \text{ tCO}_2\text{-e}$$

# 6 Unique emissions factors

## 6.1 Overview

An opt-in natural gas participant may apply for a unique emissions factor (UEF) for the N<sub>2</sub>O and CH<sub>4</sub> emissions from use of the gas in particular combustion equipment. The periodic source testing option must be followed to measure the concentration of nitrous oxide and methane and physical properties of stack gases, and to calculate a UEF. There are no other UEF options for natural gas.

## 6.2 Applications

The UEF must be based on the sampling, testing and calculation methods set out in regulation, the results of which must be independently verified.

An application for approval of a UEF must:

- describe the class of natural gas and the particular combustion equipment covered by the UEF, with well-defined parameters so that the fuel may be easily identified and accounted for separately from fuel that is not within the class
- be accompanied by a verifier's statement and a plan for ongoing testing
- be submitted to the Chief Executive of the Ministry for Economic Development by 31 January in the year following the first year to which the UEF relates.

## 6.3 Verification

The sampling, testing and calculations undertaken to develop a UEF must be independently verified. A recognised verifier must review the records provided by the applicant and assess these against the process outlined in the regulations to establish and calculate the UEF. A list of recognised verifiers will be posted at [www.eur.govt.nz](http://www.eur.govt.nz).

## 6.4 Use of a unique emissions factor

Details of approved unique emissions factors, including the name of the participant and any conditions of approval, will be published in the *New Zealand Gazette*.

If approved by the Chief Executive of the Ministry of Economic Development, a unique emissions factor may be used until:

- there is a material change in any of the information or factors on which the Chief Executive's approval was based, or the relevant legislation, or
- any conditions to which the approval is subject cease to be met or complied with.

To help determine when a material change might occur, participants are required to submit a plan for ongoing sampling and testing with their application. The Chief Executive may also grant approval subject to any conditions considered appropriate. This could, for example, include a requirement to submit the results of ongoing testing at a later date.

## 7 Accounting for Liquefied Petroleum Gas other than 60:40

*See Climate Change (Stationary Energy and Industrial Processes) Regulations 2009: 14 and 50*

Emissions factors for the three defined classes of LPG-related product: propane, butane, and LPG with a propane content of 60 per cent by volume, are provided in the regulations. For LPG mixes that differ in a material way from one of these classes, an alternative calculation method can be used based on the volume fraction of propane in the mix.

Step one: calculate a CO<sub>2</sub>-only emissions factor from the volume fraction of propane:

$$EF_{LPG} = 3.0289 - \frac{18.09 \times v_{PRO}}{572.6 - (65.9 \times v_{PRO})}$$

Step two: add an emissions factor for CH<sub>4</sub> and N<sub>2</sub>O and apply an oxidation factor to  $EF_{LPG}$  :

$$EF = (0.995 \times EF_{LPG}) + 0.0099$$

The resulting emissions factor should be rounded to three decimal places.