Emissions trading bulletin

Climate Change (Stationary Energy and Industrial Processes) Regulations 2008: draft for consultation

No 8, October 2008

This bulletin explains, and should be read alongside, the draft Climate Change (Stationary Energy and Industrial Processes) Regulations (the draft regulations). The draft regulations are released to provide stationary energy and industrial processes (SEIP) participants with notice of the content of their proposed obligations under the New Zealand Emissions Trading Scheme (NZ ETS) as provided for in the Climate Change Response Act 2002 (the Act), and to give the opportunity for interested people to consider the proposals and make submissions.

The Act creates obligations for participants in the SEIP sectors from 1 January 2010. From this date, these participants' obligations will include collecting data and information and calculating emissions under section 62 of the Act by methods prescribed in the stationary energy and industrial processes regulations. The draft regulations specify requirements for collecting information and calculating emissions, and set out default emissions factors for activities that create an obligation under the NZ ETS. The draft regulations also cover matters such as commencement and interpretation.

This bulletin includes a discussion of a series of considerations that formed the basis of the methods in the draft regulations. In addition, areas and unresolved issues where specific submissions are sought are highlighted.

Background

The draft regulations set out methods for participants to monitor and calculate their emissions from activities in the SEIP sectors. They also cover methods for participants who purchase large amounts of coal or gas from an NZ ETS participant and choose to opt in to the NZ ETS, thereby taking on liability for NZ ETS participation for that coal or natural gas.

The final regulations will be made under section 163 of the Act.

SEIP participants are people who carry out an activity specified in Part 3 or 4 of Schedule 3 of the Act or Part 4 of Schedule 4 of the Act and who choose to register as a participant. The activities are:

- importing coal
- mining over 2000 tonnes of coal in a year
- importing more than 10,000 litres of natural gas in a year
- mining natural gas, other than for export
- using geothermal fluid for generating electricity or industrial heat
- combusting used oil, waste oil, used tyres or waste for generating electricity or industrial heat
- refining petroleum where the refining involves the use of intermediate crude oil products
- producing iron or steel
- producing aluminium
- producing clinker or burnt lime
- producing glass
- producing gold
- producing cable using a nitrogen cure process
- purchasing coal from one or more participants who mine coal where the total coal purchased exceeds 250,000 tonnes per year
- purchasing natural gas from one or more participants who mine natural gas where the total natural gas purchased exceeds two petajoules per year.

Note that industrial process activities also include importing sulphur hexafluoride (SF_6), for example for use in electrical switchgear, importing hydrofluorocarbons, for example for use as a refrigerant, and perfluorocarbons, and manufacturing sulphur hexafluoride, hydrofluorocarbons and perfluorocarbons.

These three activities are not currently covered by the draft regulations due to their later entry date to the NZ ETS of 1 January 2013. Officials are undertaking work on developing appropriate methods for these activities.

Engagement to date

The following engagement activities that relate specifically to the SEIP sectors have taken place.

- An early summary of methods for stationary energy and industrial processes was included in the NZ ETS Framework document released in September 2007.
- The NZ ETS cross-sector workshop series included content about methods for stationary energy and industrial processes.
- Officials have been working actively with the Stationary Energy and Industrial Processes Technical Advisory Group.

Discussion of major issues

Emissions calculation

Broadly, there are three ways in which regulations could provide for participants to calculate their emissions. The first is to specify in regulations a detailed method for each SEIP activity, specifying the data or other information that participants must collect, for example specifying sampling regimes, and setting out how that data is to be used to calculate actual emissions.

The second way is to group participants, for example miners of certain types of coal, and provide a default emissions factor by which each unit of production can be multiplied to determine obligations.

The third way is to create default emissions factors, but allow individual participants to apply for unique emissions factors specific to their activity.

Officials have considered each of these options in detail. While the first option (specifying methods and requiring calculation by each participant) may lead to the most accurate result, developing appropriate and specific methods would be difficult, reporting against them would create significant compliance costs for participants, and the potential increased accuracy in reporting they may provide could be relatively small.

By contrast, default emissions factors allow for easy compliance for small participants, and would impose the least compliance costs. In addition, New Zealand default emissions factors are currently used in calculating the national inventory from which New Zealand has determined its international climate change reporting obligations under the UNFCCC and the Kyoto Protocol, and in other jurisdictions.

While they may disadvantage some participants whose emissions are less than the default, this can be overcome by the third approach, the opportunity to apply for unique emissions factors. On balance, it is therefore proposed to adopt the third approach of providing default emissions factors but allowing firms to apply for unique emissions factors.

At present the process reflected in the draft regulations for determining the emissions of a participant follows the following basic formula.

- Total units of production, (specific to the SEIP activity)
- Plus or minus other relevant factors that may increase or decrease NZ ETS liability, such as venting, flaring or selling to opt-in participants, measured in that same unit
- Multiplied by a default emissions factor for that product or activity

However, as is discussed below, it is proposed that a process be added to the regulations to permit participants to obtain and calculate emissions by reference to a unique emissions factor.

The formula for opt-in participants will differ only insofar as the unit of production is replaced by a unit of purchase.

Officials are interested in submissions on the direct costs to participants to comply with these regulations, specifically the costs of data collection and the calculation of emissions based on the approach detailed above.

Point and unit of measurement

The point of measurement in the regulations is specific to the activity. Officials have worked with the SEIP TAG Sub-group to establish the most efficient measurement point for each activity. The criteria used to determine the best measurement point included that it:

- produced the least cost to the participant and the economy
- was consistent with the New Zealand inventory
- was pragmatic
- was simple

- was transparent
- was verifiable
- provided the best emissions coverage
- where possible, used existing processes and measurement points for other responsibilities such as Crown Minerals Act or Resource Management Act requirements.

Similarly, the unit of production or purchase is specific to the activity being assessed, for example mining coal is measured in tonnes whereas mining natural gas is measured in gigajoules.

Emissions factors

Emissions factors are an integral part of the method. In many ways they are a simple scientific calculation, but they still require some policy decisions such as how to set the default emissions factors in the first instance and how often to update them.

Setting default emissions factors

The draft regulations contain a list of default emissions factors for each stationary energy or industrial process activity or, in some cases, for sub-sets of that activity, for example mining different kinds of coal or mining natural gas at different fields. The level at which the proposed factor is set depends on the activity in question, and the extent to which generalisations are required.

Where only one participant is undertaking the activity, for example, smelting aluminium, the default emissions factor is intended to reflect the actual emissions of that single participant's activity. Where there are several participants, the factor has been set in a manner which is expected to, in combination with unique emissions factors, result in accurate overall reporting. This means setting the factor above the level of average emissions for the activity, expecting that participants whose emissions are lower than the default will apply for unique emissions factors, but not at a level so high above the average as to disadvantage small participants for whom the cost of gaining a unique emissions factor may be prohibitive.

Default emissions factors are expected to change from time to time, when informed by better information, including the number of participants who have sought a unique emissions factor and what those factors are, or a change in industry practice.

Many of the emissions factors set out in the list in Appendices 1 and 2 are intended to be reviewed by external parties and are therefore subject to further analysis and confirmation. The views of submitters are also sought on these emissions factors.

In addition, comments are sought on any other technical matters raised by regulations, in particular the following matters.

Officials do not currently hold information on the emissions factors associated with unprocessed gas in New Zealand. The upstream point of obligation requires use of an emissions factor for such gas that is relevant at the well-head. The factor in the regulations assumes that unprocessed gas has an emissions factor that is 35 percent higher than the weighted average of all gas fields, excluding Kapuni gas.

For the Kapuni field it assumes an emissions factor that is 10 percent higher than the Kapuni Low Temperature Separated gas emissions factor. The unprocessed gas factors are what drive the factors for venting and flaring. Officials therefore seek comment on the approach taken in the regulations, and any further information that can be provided by potential participants about the emissions related to unprocessed natural gas.

For the steam conversion rate for geothermal, the draft regulations assume an average 7 tonnes of steam for each megawatt hour of electricity produced. Comment is sought on this approach.

Submissions are also sought on the relevant emissions factors for mined coal seam gas. As no coal seam gas is currently mined in New Zealand, there is little domestic information available to set the emissions factors on. At this stage, the regulations provide for the use of the same emissions factors as for untreated natural gas. However, officials are also exploring using international factors.

Unique emissions factors

Section 164 of the Act allows for regulations that relate to unique emissions factors. At a high level, where there are default emissions factors (such as are provided for in the draft SEIP regulations), regulations may enable a participant to seek a unique emissions factor if they meet the relevant criteria and follow the specified process or method.

Officials are working on developing an appropriate method for establishing unique emissions factors for use in SEIP activities and will develop regulations outlining the process by mid-2009. Further consultation will be undertaken on the proposals for unique emissions in 2009.

Use of calorific value

In some stationary energy activities the draft regulations require the reporting of calorific value of the fuel being imported or mined, and that this value is used in calculating emissions. Variation in the calorific value of different energy sources, for example classes of coal, combined with a default energy-based emissions factor allows for more accurate reporting of the actual emissions from an activity, and allows default emissions factors to be set in a less conservative way.

Opt-in

Some major consumers of coal and natural gas may wish to opt in to the NZ ETS. The Bill provides the opportunity for large users of coal and natural gas to take on NZ ETS obligations when they purchase 250,000 tonnes of coal or two petajoules of natural gas or more per annum. Methods for mandatory participants recognise that the liability for fuels sold to opt-in participants is passed on. Methods for opt-in participants are similar to those for mandatory participants, differing only in that obligations are for purchased rather than mined or imported fuels, with a measurement point for purchase rather than production.

'Ready for sale' coal

The measurement point for privately owned coal is the point where the coal is 'ready for sale'. This point has been chosen because measurements of coal at this point are already taken. Officials have chosen to use this concept in the draft regulations without including a specific definition in the interpretation section, but seek feedback on this approach.

Waste

The NZ ETS obliges participation of people who combust waste for electricity generation or industrial heat. This includes combustion of used or waste oil (unless it is already covered by the NZ ETS as an obligation liquid fossil fuel), used tyres or other waste. Waste made from biomass, or with a biomass component, requires different treatment because it has different implications for emissions accounting. Therefore, the methods reflect this different treatment by excluding the CO_2 component of biomass.

Stockpile and storage adjustments

The provisions in the draft regulations relating to stockpile and storage adjustments recognise that the amount of a particular energy source, for example natural gas, that passes the measurement point is not necessarily combusted in the same NZ ETS compliance period. However, dealing with this situation is made more difficult for an energy source like natural gas, as different emissions factors are applied to different fields. While this is of no concern with an upstream measurement point, for example the well-head for natural gas, gas from various sources can be combined in a storage facility. Because the natural gas is only accounted for when it leaves the storage facility, field-specific emissions factors cannot be used. Instead, the regulations provide for participants to use the default emissions factor for all other processed gas fields, or they may be able to apply for a unique emissions factor to reflect their specific situation.

Issues to be resolved

Fugitive emissions from coal mining

The Act includes a liability for fugitive methane emissions resulting from coal mining to be included in the NZ ETS liability of coal-mining participants. The draft regulations include calculation of this liability in the coal-mining methods, including default emissions factors associated with surface mining and underground mining at various depths. While these factors have been developed on the basis of best-practice advice from the Intergovernmental Panel on Climate Change, officials are aware that the properties of New Zealand coalfields may mean these default figures differ from emissions from New Zealand mines.

Officials are engaging with owners of coal mines to evaluate and potentially adjust these factors to make them as accurate and robust as possible. Officials would like to establish a small working group to address these issues. Please contact us if you would like to be part of this group. Additionally, the opportunity to apply for a unique emissions factor for mine-specific coal seam gas emissions will be maintained.

Cable-making

Officials are aware that some methods for cable-making involve significant greenhouse gas emissions, so cable-making has been included as an industrial process activity with an NZ ETS liability. While the draft regulations include a default emissions factor, officials intend working with cable-makers to develop a New Zealand-specific default emissions factor or a more appropriate method that

accurately reflects practice in New Zealand.

Gold-mining

Producing gold is included as an industrial process in the NZ ETS. Officials understand that limestone can be used in different ways in the gold-producing process, and that not all of these may have significant, if any, greenhouse gas implications. Methods assume that all limestone used in gold production causes emissions. However, officials seek submissions from miners about the accuracy of this assumption.

Detail of emissions factors

This document contains some substantive background information relevant to the stationary energy and industrial processes draft regulations. The content of the draft regulations is made up of the core elements of the methods for monitoring and calculating emissions and includes default emissions factors.

The Appendices to this commentary provide a further breakdown of the components of the emissions factors for the various activities in the Schedules to the draft regulations. While it would be possible for this detail to be included in the draft regulations themselves, in our view it would merely be confusing to those using the draft regulations to include them.

Process for submissions

Submissions on the draft regulations and other proposals outlined in this bulletin are welcome before 15 December 2008. These submissions will inform the ongoing development of the regulations.

Please email your submission to emissionstrading@climatechange.govt.nz or post it to the Ministry for the Environment, PO Box 10362, Wellington 6143, New Zealand.

Where to go for more information

For more information about stationary energy and industrial process participants under the NZ ETS, refer to *The Framework for a New Zealand Emissions Trading Scheme* at www.climatechange.govt.nz or call 0800 CLIMATE (0800 254 628).

To view the draft Climate Change (Stationary Energy and Industrial Processes) Regulations 2008, visit www.climatechange.govt.nz

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Appendix 1: Emissions factors for stationary energy

Table 1 - Importing Coal

Emission Source Category	Emissions Source	Emissions Factor t CO_2-e / TJ				Total
		Oxidation Factor (CO_2 only)	CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	tCO_2-e / TJ
Coal	Lignite	0.980	109.250	0.43731	0.41230	107.915
	Sub-bituminous	0.980	95.000	0.06849	0.44681	93.615
	Bituminous	0.980	94.715	0.06849	0.44681	93.336
	Coking Coal	0.980	95.950	0.01397	0.47120	94.516
	Anthracite	0.980	95.950	0.06849	0.44681	94.546

Table 2 - Mining Coal

Emission Source Category	Emissions Source	Emissions Factor t CO2-e / TJ				Total
		Oxidation Factor (CO_2 only)	CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	tCO_2-e / TJ
Coal	Lignite	0.980	95.200	0.43731	0.44370	94.177
	Sub-bituminous	0.980	91.200	0.06849	0.44681	89.891
	Bituminous	0.980	88.800	0.06849	0.44681	87.539
	Anthracite	0.980	95.950	0.06849	0.44681	94.546

Table 3 - Fugitive Coal Seam Gas

Part A

Emission Source Category	**Emissions Source**	**Emissions Factor t CO_2-e/t coal**				**Total**
		Oxidation Factor (CO_2 only)	**CO_2 (GWP=1)**	**CH_4 (GWP=21)**	**N_2O (GWP=310)**	**tCO_2-e/t**
Fugitive emissions	Underground (including post-mining)					
	- Depth = <200 metres	0.980	-	0.1759	-	0.1759
	- Depth = 200<400 metres	0.980	-	0.2884	-	0.2884
	- Depth = >400 metres	0.980	-	0.3869	-	0.3869
	Surface (including post-mining)					
	- Overburden depth = <25 metres	0.980	-	0.0056	-	0.0056
	- Overburden depth = 25<50 metres	0.980	-	0.0183	-	0.0183
	- Overburden depth = >50 metres	0.980	-	0.0295	-	0.0295

Part B - Combusting Coal Seam Gas

Emission Source Category	Emissions Source		Emissions Factor t CO_2-e/t gas			Total
		Combustion Efficiency	CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	tCO_2-e/t
Fugitive emissions	Difference between flaring and venting (ie, the reduction in GWP)	NA	NA	NA	NA	17.885

Table 4 - Importing Natural Gas

Emission Source Category	Emissions Source		Emissions Factor tCO_2-e/GJ			Total
		Oxidation Factor (CO_2 only)	CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	tCO2-e/GJ
Natural gas	Commercial propane	0.995	0.05960000	0.00002195	0.00017670	0.05950065
	Commercial butane	0.995	0.06140000	0.00002195	0.00017670	0.06129165
	LPG (P60:B40)	0.995	0.06040000	0.00002195	0.00017670	0.06029665
	Liquefied natural gas	0.995	0.05247000	0.00006806	0.00004779	0.05232350

Table 5 - Mining Natural Gas

Part A - Unprocessed Natural Gas

Emission Source Category	Emissions Source	Emissions Factor tCO_2-e/GJ				Total
		Oxidation Factor (CO_2 only)	CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	tCO_2-e/GJ
Natural gas	Maui	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Kapuni	0.995	0.09251000	0.00007487	0.00005257	0.09217489
	Kapuni LTS	0.995	0.09251000	0.00007487	0.00005257	0.09217489
	McKee	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Kaimiro	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Waihapa/TAWN	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Mangahewa	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Turangi	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Pohokura	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Ngatoro	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Rimu/Kauri	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Coal seam gas	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	All other fields (excluding coal seam gas)	0.995	0.07363990	0.00002646	0.00002790	0.07332606

Part B – Flaring Natural Gas

Emission Source Category	Emissions Source	Emissions Factor t CO2-e / GJ				Total
		Oxidation Factor (CO_2 only)	CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	tCO_2-e/GJ
Natural gas	Maui	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Kapuni	0.995	0.09251000	0.00007487	0.00005257	0.09217489
	Kapuni LTS	0.995	0.09251000	0.00007487	0.00005257	0.09217489
	McKee	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Kaimiro	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Waihapa/TAWN	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Mangahewa	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Turangi	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Pohokura	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Ngatoro	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Rimu/Kauri	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	Coal seam gas	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	All other fields (excluding coal seam gas)	0.995	0.07363990	0.00002646	0.00002790	0.07332606

Part C – Venting Natural Gas

Emission Source Category	Emissions Source	Emissions Factor tCO_2-e/GJ				Total
		Oxidation Factor (CO_2 only)	CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	tCO_2-e/GJ
Natural gas	Maui	1.000	0.00159328	0.29238459	-	0.29397787
	Kapuni	1.000	0.01945115	0.20408138	-	0.22353253
	Kapuni LTS	1.000	0.01945115	0.20408138	-	0.22353253
	McKee	1.000	0.00159328	0.29238459	-	0.29397787
	Kaimiro	1.000	0.00159328	0.29238459	-	0.29397787
	Waihapa/TAWN	1.000	0.00159328	0.29238459	-	0.29397787
	Mangahewa	1.000	0.00159328	0.29238459	-	0.29397787
	Turangi	1.000	0.00159328	0.29238459	-	0.29397787
	Pohokura	1.000	0.00159328	0.29238459	-	0.29397787
	Ngatoro	1.000	0.00159328	0.29238459	-	0.29397787
	Rimu/Kauri	1.000	0.00159328	0.29238459	-	0.29397787
	Coal seam gas	1.000	0.00463123	0.31667800	-	0.32130922
	All other fields (excluding coal seam gas)	1.000	0.00159328	0.29238459	-	0.29397787

Part D - Processed Natural Gas

Emission Source Category	Emissions Source	Emissions Factor tCO_2-e/GJ				Total
		Oxidation Factor (CO_2 only)	CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	tCO_2-e/GJ
Natural gas	Maui	0.995	0.05217000	0.00006806	0.00004779	0.05202500
	Kapuni	0.995	0.05320000	0.00006806	0.00004779	0.05304985
	Kapuni LTS	0.995	0.08410000	0.00006806	0.00004779	0.08379535
	McKee	0.995	0.05430000	0.00006806	0.00004779	0.05414435
	Kaimiro	0.995	0.06520000	0.00006806	0.00004779	0.06498985
	Waihapa/TAWN	0.995	0.05445100	0.00006806	0.00004779	0.05429460
	Mangahewa	0.995	0.05230000	0.00006806	0.00004779	0.05215435
	Turangi	0.995	0.05564000	0.00006806	0.00004779	0.05547765
	Pohokura	0.995	0.05512000	0.00006806	0.00004779	0.05496025
	Ngatoro	0.995	0.05306500	0.00006806	0.00004779	0.05291553
	Rimu/Kauri	0.995	0.05370000	0.00006806	0.00004779	0.05354735
	Coal seam gas	0.995	0.07363990	0.00002646	0.00002790	0.07332606
	All other fields (excluding coal seam gas)	0.995	0.05891192	0.00007487	0.00005257	0.05874480

Part E - Liquefied Petroleum Gas

Emission Source Category	Emissions Source	Oxidation Factor (CO_2 only)	Emissions Factor tCO_2-e/GJ CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	Total tCO_2-e/GJ
Natural gas	Commercial Propane	0.995	0.05960000	0.00002195	0.00017670	0.05950065
	Commercial Butane	0.995	0.06140000	0.00002195	0.00017670	0.06129165
	LPG (P60:B40)	0.995	0.06040000	0.00002195	0.00017670	0.06029665

Part F - National Average Specification Natural Gas

Emission Source Category	Emissions Source	Oxidation Factor (CO_2 only)	Emissions Factor tCO_2-e/GJ CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	Total tCO_2-e/GJ
Natural gas	National average (specification gas)	0.995	0.05355629	0.00006806	0.00004779	0.05340436

Table 6 - Geothermal Steam

Emission Source Category	Emissions Source	Emissions Factor tCO_2-e / t steam				Total
		Oxidation Factor (CO_2 only)	CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	tCO_2-e / t
Geothermal	Wairakei	NA	0.00367	0.00180	-	0.00547
	Mokai	NA	0.00585	0.00059	-	0.00644
	Ohaaki	NA	0.03557	0.00630	-	0.04187
	Poihipi	NA	0.00420	0.00012	-	0.00432
	Rotokawa	NA	0.01629	0.00312	-	0.01942
	Ngawha	NA	0.07745	0.01807	-	0.09552
	Kawerau	NA	0.08576	0.01664	-	0.10240
	Tarawera	NA	0.09762	0.01894	-	0.11655
	All other fields	NA	0.03701	0.01066	-	0.04767

Table 7 - Used Oil, Waste Oil, Used Tyres or Waste

Part A - Used Oil and Waste Oil

Emission Source Category	Emissions Source	Emissions Factor tCO_2-e/t waste				Total
		Oxidation Factor (CO_2 only)	CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	tCO_2-e/t
Used oil and waste oil	Non organic used and waste oil	1.000	2.9393	0.02659	0.05234	3.0182
	Organic used and waste oil	NA	1.3538	0.00767	0.01510	0.0228
	Blended organic or non-organic used or waste oil	1.000	2.9393	0.02659	0.05234	3.0182

Part B - Used Tyres

Emission Source Category	Emissions Source	Emissions Factor tCO_2-e/t waste				Total
		Oxidation Factor (CO_2 only)	CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	tCO_2-e/t
Used tyres	Used tyres	1.000	1.4264	0.00662	0.01302	1.4461

Part C - Non Organic Waste

Emission Source Category	Emissions Source	Emissions Factor tCO_2-e/t waste				Total
		Oxidation Factor (CO_2 only)	CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	tCO_2-e/t
Non Organic waste	Non Organic waste	1.000	1.2070	0.00662	0.01302	1.2266

Part D - Organic Waste

Emission Source Category	Emissions Source	Emissions Factor tCO_2-e/t waste				Total
		Oxidation Factor (CO_2 only)	CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	tCO_2-e/t
Organic waste (excludes CO_2)	Organic waste other than biogas or wood	NA	1.3538	0.00767	0.01510	0.0228
	Biogas	NA	5.5983	0.00126	0.03558	0.0368
	Wood	NA	1.0727	0.00308	0.01213	0.0152

Table 8 – Refining Petroleum

Emission Source Category	Emissions Source	Emissions Factor tCO_2-e/t product				Total
		Oxidation Factor (CO_2 only)	CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	tCO_2-e/t
Refining	Refinery gas	0.995	5.4984	0.00123	0.03494	5.5345
	Fuel oil	0.990	3.0160	0.00254	0.00375	3.0223
	Bitumen	0.990	3.1167	0.00253	0.00373	3.1229
	Other intermediate crude oil	0.990	3.1440	0.00270	0.00399	3.1507

Appendix 2: Emissions factors for industrial processes

Table 1 - Producing Iron or Steel

Emission Source Category	Emission Source	Emissions factor (tonne/tonne) Oxidation Factor (CO_2 only)	CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	Total tCO_2-e/t
Producing iron or steel	***by activity***					
	Mass reducing agents	NA	3.67	NA	NA	3.67
	Limestone use	NA	0.44	NA	NA	0.44
	Dolomitic limestone (dolomite) use	NA	0.48	NA	NA	0.48
	Carbon inputs	NA	3.67	NA	NA	3.67

Table 2 - Producing Aluminium

Emission Source Category	Emission Source	Emissions factor (tonne/tonne) Oxidation Factor (CO_2 only)	CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	Total tCO_2-e/t
Producing aluminium	***by activity***					
	Consumption of anodes	NA	3.67	NA	NA	3.67

Table 3 - Producing Clinker or Burnt Lime

Emission Source Category	Emission Source	Oxidation Factor (CO_2 only)	Emissions factor (tonne/tonne) CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	Total tCO_2-e/t
Producing clinker	***by activity***					
	Production of clinker	NA	0.54	NA	NA	0.54
Producing burnt lime	Production of burnt lime	NA	0.79	NA	NA	0.79
	Production of burnt dolomitic lime	NA	0.91	NA	NA	0.91

Table 4 - Producing Glass

Emission Source Category	Emission Source	Oxidation Factor (CO_2 only)	Emissions factor (tonne/tonne) CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	Total tCO_2-e/t
Producing glass	***by activity***					
	Soda ash use	NA	0.42	NA	NA	0.42
	Limestone use	NA	0.44	NA	NA	0.44
	Dolomitic limestone (dolomite) use	NA	0.48	NA	NA	0.48

Table 5 - Producing Gold

Emission Source Category	Emission Source	Oxidation Factor(CO_2 only)	Emissions factor (tonne/tonne) CO_2(GWP=1)	CH_4(GWP=21)	N_2O(GWP=310)	Total tCO_2-e/t
Producing gold	***by activity***					
	Limestone use	NA	0.44	NA	NA	0.44
	Dolomitic limestone (dolomite) use	NA	0.48	NA	NA	0.48

Table 6 - Producing Cable

Emission Source	Oxidation Factor (CO_2 only)	Emissions factor (tonne/tonne) CO_2 (GWP=1)	CH_4 (GWP=21)	N_2O (GWP=310)	CO_2-e
Producing Cables					
Using the nitrogen cure process	N/A	N/A	N/A	1.57	486.7