

## Introduction

The Climate Change Response Act 2002 (the Act) creates obligations for people carrying out certain activities listed in the schedules of the Act to report greenhouse gas emissions as part of the New Zealand Emissions Trading Scheme (NZ ETS).

This bulletin explains, and should be read alongside, the Climate Change (Unique Emissions Factors) Regulations 2009 (UEF Regulations).

The Climate Change (Stationary Energy and Industrial Processes) Regulations 2009 (SEIP Regulations) and Climate Change (Liquid Fossil Fuel) Regulations 2008 (LFF Regulations) set out the data collection requirements and methods for participants in those sectors to calculate their emissions, including prescribed default emissions factors (DEFs).

The UEF Regulations outline requirements for participants in certain sectors to calculate and apply for approval to use a unique emissions factor (UEF) in place of a DEF to calculate and report on emissions.

## Eligibility

The opportunity to apply for approval to use a UEF is restricted to certain classes or categories of fuel. A UEF must also differ from the relevant DEF by more than the prescribed threshold.

In 2008, before developing and consulting on the SEIP and UEF Regulations, the Stationary Energy and Industrial Processes Technical Advisory Group recommended an emissions reporting model relying on DEFs but with access to UEFs. It was expected that this model would allow low-cost reporting with the use of UEFs enabling improved accuracy over time.

Feedback from consultation on the SEIP and UEF Regulations, meetings with firms and sub-sectors, and advice from independent experts has led to some

divergence from this original DEF/UEF reporting model. More detail on emissions reporting for the SEIP sectors can be found in ETS Bulletin No 13. There are now fewer activities where the DEF/UEF reporting model applies.

The eligible classes are outlined below.

### **A class of liquid fossil fuel (obligation fuel)**

Approval may be sought for a UEF relating to the carbon content of, and expected carbon dioxide associated with combustion of, an obligation fuel. The UEF must be based on sampling and analysis of representative samples of fuel and must differ from the corresponding DEF by more than 2 per cent.

### **A class or category of coal**

Approval may be sought for a UEF relating to the carbon content of, and expected carbon dioxide associated with downstream combustion of, a class of coal. It has been clarified that the broadest class of coal to which a UEF may apply is that of a coalfield; a class may be smaller than this if necessary to ensure the UEF accurately reflects the properties of the coal to which it applies.

The UEF must be based on analysis of at least three representative samples of coal taken at intervals of not less than a month. An application may only be made if the UEF is less than the prescribed threshold for the class of coal. Further information on thresholds can be found below and in the Appendix.

Approval may be sought for a UEF for fugitive coal seam gas relating to a category of coal mined from an underground coal mine. The UEF must be based on testing of representative samples of the exhaust air from mine ventilation shafts; measurements of exhaust air composition and flow rate already taken and used for ventilation and mine safety management may be used.



A coal purchasing participant may seek approval for a UEF relating to the methane and nitrous oxide emissions arising from the combustion of coal. The periodic source testing method outlined below must be used for a specific item of combustion equipment only. The results for one boiler or other item of equipment may be applied to other identical equipment, but may not be generalised to apply to combustion in other equipment that is merely similar.

### **A class of natural gas – methane and nitrous oxide**

A natural gas purchasing participant may seek approval for a UEF relating to the methane and nitrous oxide emissions arising from the combustion of natural gas. The periodic source testing method outlined below must be used for a specific item of combustion equipment only. The results for one boiler or other item of equipment may be applied to other identical equipment, but may not be generalised to cover combustion in other equipment that is merely similar.

### **A class of geothermal fluid**

Approval may be sought for a UEF relating to carbon dioxide and methane emissions associated with the use of steam or two-phase geothermal fluid. The UEF must be based on analysis of representative samples. If single-phase geothermal fluid or steam condensate is re-injected into underground reservoirs, the participant may make an adjustment to the UEF to deduct any carbon dioxide and methane contained in the re-injected fluid. This must be based on similar sampling and analysis of the steam or two-phase geothermal fluid.

There is no fixed exclusion threshold. It is the participant's responsibility to ensure the UEF is materially different from the relevant DEF, and to demonstrate this through appropriate testing and analysis of the estimated uncertainty associated with the sampling and testing undertaken. Further information on estimating uncertainty can be found below.

### **A class of used oil, waste oil, used tyres or waste**

Approval may be sought for a UEF relating to fossil-derived carbon dioxide emissions from a class of waste. This may be determined using the standard method of analysis of representative samples of the waste used as a fuel input. Alternatively, the periodic source testing method may be used to directly

measure non-biomass carbon dioxide emissions contained in the gas emitted from boiler or other combustion equipment stacks.

Approval may be sought for a UEF relating to the methane and nitrous oxide emissions arising from the combustion of a class of waste.

The periodic source testing method outlined below must be used for a specific item of combustion equipment only. The results for one boiler or other item of equipment may be applied to other identical equipment, but may not be generalised to apply to combustion in other equipment that is merely similar.

## **Exclusions**

Considerable feedback was received on exclusion thresholds for UEF applications. An explicit or fixed threshold has been replaced by an uncertainty threshold for geothermal fluid and waste. This allows applicants in these sectors to apply for approval to use any UEF that is lower than the DEF as long as it differs by more than the total associated uncertainty. An explicit threshold has been retained for coal and liquid fossil fuels.

In all cases, the choice of threshold is intended to strike a balance between the need to:

- manage the risk of 'adverse selection' (see Appendix)
- ensure the UEF is materially different from the DEF
- enable more accurate reporting of emissions
- reduce compliance costs for applicants.

### **Fixed thresholds**

Liquid fossil fuels have to meet very tight technical specifications which results in consistent emission factors over time. Consequently, the option of a UEF application in the liquid fuels sector is only necessary to provide for the introduction of new fuels. A fixed threshold of 2 per cent difference from the DEF is intended to allow new fuels entering the market to seek a UEF. The DEFs are also expected to be updated regularly to reflect any small changes in the properties of fuels currently used in New Zealand.

A fixed threshold has been retained for coal. This is set in tandem with the default emissions factors specified in the SEIP Regulations, based on data relating to domestic coal properties. Further explanation is provided in the Appendix.



## Uncertainty thresholds

In response to submissions, there is no fixed threshold for UEF applications for a class of waste or geothermal fluid. Instead, there is a general obligation on the applicant to demonstrate that the proposed UEF is materially different from the DEF and not just a result of sampling and testing variability. The policy intention is to allow for UEFs where a case can be reasonably made that the UEF is materially different from the DEF that would otherwise apply.

For waste combustion, there is greater variability of input properties and combustion processes than for coal. Where the fuel is known to contain non-biomass, options are available to use periodic testing of actual stack emissions or sampling of the fuel inputs. These options are intended to ensure UEF applications are feasible for this sub-sector.

Geothermal fluid used for generating electricity and industrial heat is characterised by emissions variability across fields, technology and time. The testing and sampling procedures outlined are based on standard industry techniques and should ensure UEFs can be regularly updated at reasonable cost to reflect actual emissions.

## Excluded activities

Not all activities covered under the SEIP Regulations can apply for a UEF.

- For the natural gas sector, the method of calculating emissions from mining or purchasing gas is based on direct measurement of the actual carbon content of various classes of gas. A calculation method has been provided to allow for variation in the composition of imported LPG.
- For the activity of refining petroleum, only one firm will be subject to NZ ETS obligations. The DEFs in the SEIP Regulations should accurately reflect actual emissions for that individual firm.
- For each industrial process, emissions calculation methods are based on the amount of pure chemical substance used in the process, which gives rise to a fixed volume of emissions. Participants are able to use internal processes to allow for variation in the amount of pure substance contained in process inputs.

No UEF process has been provided for sub-categories of emissions which are outside the control of the participant, for example miners of coal or

natural gas cannot apply for a UEF for methane and nitrous oxide arising from combustion occurring after the point of sale.

## UEF framework

An application for approval of a UEF must:

- describe the class or category of fuel 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 statement signed by a recognised verifier 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.

## Sampling, testing and analysis

### Standard method

The standard method used in the UEF Regulations allows applicants to estimate a UEF for a class of fuel by sampling and analysis of fuel samples in accordance with prescribed standards.

Representative samples must be analysed to determine specific characteristics such as the carbon, methane or carbon dioxide content of the class of fuel. In the case of waste, carbon dioxide emissions associated with a biomass component are explicitly excluded.

This data is then used to develop a carbon dioxide emissions factor. Together with the methane and nitrous oxide emissions factors, the UEF can be calculated in carbon dioxide equivalent terms. Approval may then be sought to use this UEF in place of a DEF in an annual emissions return.

### Periodic source testing method

Periodic source testing provides an alternative method for estimating a UEF by direct sampling and analysis of the gas emitted. This approach applies to gas from combustion of a specific waste stream, coal or natural gas, and more broadly to fugitive coal seam methane from underground mines.

The gas is sampled periodically and analysed to determine the methane and nitrous oxide concentration. In the case of waste, carbon dioxide from biomass sources is also measured but then excluded from the final UEF calculation.



A UEF calculated under Regulations 21–23 can only be applied to the class of fuel and the particular combustion equipment used during sampling. It may be applied to several boilers or combustion facilities, if the combustion equipment is identical in design.

All data used to calculate the UEF must be determined over the same measurement period. Several samples of exhaust gases might be taken over a measurement period to obtain greater accuracy of emissions rates, energy input or other variables.

Several measurement periods might be needed to determine representative emission factors underpinning the UEF application for the full range of expected operating conditions for the combustion equipment or mine over the year or period to which the UEF is applied.

## Representativeness

For each sector, the regulations provide requirements on the sampling and testing that have to be carried out in a particular year to support an application for approval of a UEF. These various requirements are designed in part to ensure the UEF will be materially different from the corresponding DEF.

In all cases, the sampling must be representative. In the regulations,

‘representative, in relation to samples of a fuel or to calculations, means taken or made at a sufficient frequency and duration to produce data that may be reliably extrapolated to provide estimates of, as relevant, -

- (a) the properties of a class or fuel:
- (b) emissions across the full range of operating conditions.’

Representativeness applies to more than just sampling across time; it could refer to the key property varying physically, such as a different mix of steam wells, mining coal at different depths within a seam, or even a change in operating conditions at a plant. The responsibility lies with the applicant to ensure the representativeness of the proposed UEF for the fuel to which it is intended to be applied.

## Estimated uncertainty

An estimate of the uncertainty associated with the sampling and testing that supports the proposed UEF should be made by the applicant.

The uncertainty associated with a UEF is likely to be from three main sources:

- errors associated with measurements required to

calculate the UEF

- errors associated with the sampling regime underlying the measurements
- the inherent variability associated with the physical system driving the emissions.

The technology applied to physical measurements, like gas volume and gas concentrations in a gas stream, will have an associated uncertainty from which quantitative estimates of the measurement errors in the proposed UEF can be made.

Consideration must also be given to the significance of any sampling error. This may be a qualitative exercise, but should be robust enough to enable the verifier to assess sampling representativeness.

The variability of the underlying driver of emissions (for example, operating mode, reservoir change or input choice) must also be considered in assessing the overall uncertainty of the proposed UEF.

For geothermal fluid and waste applications, where there is an uncertainty threshold, a statistical significance test of uncertainty must be applied to demonstrate that the 90 per cent confidence interval of the UEF estimate lies below the DEF.

## Verification

A UEF application must be accompanied by a statement signed by a recognised verifier stating that the sampling, testing and calculation of the UEF have met all the requirements of the regulations and that the UEF meets any prescribed threshold. A list of recognised verifiers will be provided on the administrator’s website (the Ministry of Economic Development).

A recognised verifier must be either a chartered accountant or a chartered professional engineer. The verifier must also have either 100 working days verification experience obtained in the three years before the application, or at least five years post-qualification work experience. The recognised verifier may lead a team to undertake verifications.

A number of submissions requested no pre-verification of UEF applications, given the specification of sampling and testing standards in the regulations. Other submissions requested broadening the eligibility criteria beyond chartered accountants and engineers to other professions such as lawyers, or limiting eligibility to technical experts.

However, verification is itself not a technical exercise. It is a process by which the chief executive can gain assurance that the required procedures were followed appropriately by the applicant. In most cases, this



does not require detailed expertise in the applicant's industry, but rather knowledge of the requirements of the relevant UEF Regulations and assurance experience.

## Expiry of a UEF

A number of submitters requested greater clarity on when a UEF would expire. This is specified in the Act. According to section 91(2)(b),

'An approval [of a UEF] ceases to have effect on the earliest of the following dates:

- (i) the date of a material change in any of the information or factors on which the approval is based; or
- (ii) the date of a material change to this Act or to any regulations to which the approval relates; or
- (iii) the date on which any of the conditions to which the approval is subject cease to be met or complied with.'

## Plan for ongoing testing and material change

A plan for ongoing testing must be submitted as part of the UEF application. The purpose of this plan is to enable the participant to identify whether a material change occurs in any of the information or factors on which approval to use a UEF has been granted. The composition of the plan for ongoing testing is not specified in the regulations. It is, however, expected that a sampling and testing regime equivalent to that used for the original UEF application should be sufficient to identify any material changes.

Material change relates to the significance of a difference or change and the likelihood that the observed difference or change is real and not just the consequence of random chance. Statistical significance tests can be applied to demonstrate materiality. The uncertainty associated with an estimated UEF, along with the frequency, duration and representativeness of sampling and testing, will be the main drivers in determining materiality.

## Conditions of approval

The chief executive may approve the use of a UEF to report on emissions on an ongoing basis. This approval may be subject to conditions, which will be notified to the applicant along with the approval.

Such conditions may include:

- a fixed period for use of a UEF
- the submission of results from ongoing testing
- a requirement to reduce the level of uncertainty associated with the UEF
- any other conditions.

## Review

The Government may review the operation of the regulations at any time. There will be a formal opportunity to review the regulations and their methods during scheduled reviews of the operation and effectiveness of the NZ ETS. The first review is to be completed by 1 January 2012.

## Further information

To read the Climate Change (Stationary Energy and Industrial Processes) Regulations 2009, Climate Change (Unique Emissions Factors) Regulations 2009 and background documents, and for further information on the New Zealand Emissions Trading Scheme, visit [www.climatechange.govt.nz](http://www.climatechange.govt.nz)

Material incorporated by reference in the UEF Regulations, such as sampling or measurement standards, is available for inspection free of charge at the offices of the Ministry of Economic Development in Auckland, Christchurch and Wellington. Enquiries about buying any of these standards should be directed to [enquiries@standards.co.nz](mailto:enquiries@standards.co.nz).

For more information on registering as a participant in the New Zealand Emissions Trading Scheme and filing an emissions return, visit [www.eur.govt.nz](http://www.eur.govt.nz).

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## Appendix: Rationale for UEF threshold for the coal sector

In the coal sector, New Zealand's inventory reports emissions according to average emissions factors across the industry. Providing for unique emissions factors (UEFs) creates an 'adverse selection' risk and potential financial liability for the Crown.

Adverse selection arises from the likelihood that participants with lower observed emissions factors will apply to use a UEF rather than a DEF, while those with higher emissions factors will benefit from a DEF set below their actual emissions factor. This would result in a divergence between New Zealand's National Inventory and the NZ ETS. The Crown would consequently receive fewer emissions units from coal sector participants than it would be required to surrender under the Kyoto Protocol.

To manage this adverse selection risk, the DEF was set slightly above the underlying distribution mean of emissions factors for New Zealand coal, and a UEF exclusion threshold set below the DEF. The DEF and UEF thresholds were designed to collectively deliver an outcome equivalent to setting the DEF at the underlying distribution mean and not allowing UEFs.

A range of views on this proposal were received during consultation. Some submitters expressed a view that the DEF should be set at the distribution mean with no UEF threshold applied, suggesting that the taxpayer should carry the potential adverse selection cost. Others expressed a view that the DEF should be set at the distribution mean with a very high exclusion threshold applied, considerably reducing the numbers eligible to apply for UEFs but protecting the taxpayer somewhat. Yet others expressed support for the DEF with no UEF threshold.

The joint DEF/UEF model has been retained as this delivers an overall unbiased outcome with no group of participants significantly adversely affected, while minimising administrative costs of UEF applications.

Table 1 outlines the calculation of coal DEFs and the UEF exclusion threshold.

The DEF is approximately 0.4 standard deviations above the mean (about the 65th percentile), while the UEF exclusion threshold is one standard deviation below the DEF.

The DEF is based on a survey of the average CO<sub>2</sub>-only emissions factor for domestic coals provided by CRL Energy as outlined in the Appendix to Bulletin 13; the 'expected mean' emission factor below is the 'total' emission factor from that Bulletin.

This combination of DEF level and UEF threshold is expected to result in:

- around one-third of participants benefiting from a DEF below their expected emissions factor
- just under 40 per cent of participants being required to use a DEF close to, and within the bounds of normal reporting uncertainty, their expected emissions factor
- around one-quarter of participants with expected emissions factors significantly below the DEF being able to apply for a UEF if they choose to.

The structure of this DEF/UEF model will be reviewed as part of the review of the operation and effectiveness of the NZ ETS due to be completed by the end of 2011.

**Table 1: Mining and purchasing coal**

Class	Expected mean ( <i>'Total' from Bulletin 13</i> )	DEF tCO <sub>2</sub> -e/TJ ( <i>from Bulletin 13</i> )	Standard Deviation	UEF threshold tCO <sub>2</sub> -e/TJ ( <i>DEF minus one standard deviation</i> )
Lignite – all other fields	94.415	94.79	0.9441	<b>93.85</b>
Lignite – Waimumu and Roxburgh	91.587	91.95	0.9170	<b>91.04</b>
Sub-bituminous	90.491	90.64	0.3810	<b>90.26</b>
Bituminous	87.693	88.15	1.1410	<b>87.01</b>

