



Hale & Twomey

Establishing Unique Emissions Factors for the Emissions Trading Scheme

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Thinking Energy

1.0 Introduction

Regulations covering the Liquid Fossil Fuels under the Emissions Trading Scheme (ETS) are now in place (Climate Change (Liquid Fossil Fuels) Regulations 2008). The significant fossil fuels used in New Zealand have been given a default emissions factor to use in the calculation of carbon dioxide equivalent emissions.

However, in the event that a fuel is imported or removed from the refinery where the listed emissions factor is not appropriate or the fuel is not named, it would fall into the category of 'any other fuel that is directly combusted when used'. Participants have the choice of either using the default emissions factor (DEF) as set out in the Regulations or obtaining a unique emissions factor (UEF) specific to the new fuel.

At present the Regulations do not contain a mechanism to obtain unique emissions factors. This report outlines a process that could cover the development of a unique emissions factor and the issues that need to be covered by any legislation.

The stationary energy & industrial processes sector and the waste sector within the ETS also have the ability to use unique emissions factors and officials want to ensure that any mechanism is consistent (where possible) between the various sectors. Comment is made on the similarity of the processes required.

This report was presented to the Transport Fuels Technical Advisor Group (TF TAG) on 30 October 2008. Updates have been included in this report based on feedback from the presentation, questions circulated after the meeting and comments at a following TF TAG meeting on 5 December 2008.

2.0 Discussion on issues with unique emissions factors

This section discusses various issues that were raised by officials as areas that may need to be addressed in regulations covering unique emissions factors. The discussion is general to any sector using UEFs rather than just for the liquid fossil fuels sector.

The regulations for UEFs need to be developed in the context of the relevant section of the Climate Change Response (Emissions Trading) Amendment Act 2008 (shown below). The regulations state that the Chief Executive has the ability to approve a UEF and that a process for applying for a UEF is provided. The governing agency for UEFs (the same organisation as administering the whole ETS) will be responsible for processing applications.

Under Section 164 of the Act, the Governor General, on recommendation of the Minister, may make regulations -

- a) *providing for a process by which a participant may apply to the chief executive for approval to use a unique emissions factor;*
- b) *prescribing the information that must be collected to support an application for use of a unique emissions factor;*
- c) *prescribing the criteria for a unique emissions factor; which may include (but are not limited to)—*

- (i) *the percentage by which a unique emissions factor must vary from the default emissions factor, before an application for a unique emissions factor may be made;*
- (ii) *the types of greenhouse gases to be reflected in the unique emissions factor;*
- (iii) *how the unique emissions factor is to be calculated;*
- (iv) *any criteria by which the default emissions factor has been set, that reflect the matters in section 163(4); or*
- (v) *a requirement that the unique emissions factor be verified by a recognised verifier.*

To use a UEF process to obtain an emissions factor for calculating emissions, regulations would need to be in place at least three months prior to the calculation period (by the end of the third quarter for use in the following year). With stationary energy due for inclusion in the ETS from 1 January 2010, that means regulations will need to be in place (enacted) by the end of the third quarter 2009. This means a first draft of any regulations needs to be ready for consultation by the end of the first quarter 2009.

UEF regulations could be stand alone or could be included for each sector with those sector regulations (e.g. UEF process for liquid fuels included with other liquid fuels regulations).

2.1 Accreditation

Regulations covering the UEF process will need to cover who is accredited to measure or verify unique emissions factors. In some cases this may be laboratories testing product and then calculating emissions factors from the results; in others it may be verifiers checking that process emissions factors are developed correctly.

A suggestion is that the regulations could cover approved laboratories and verifiers by having a list of those accredited in a schedule of the regulations. However such a list is likely to be fluid which would make keeping it up to date difficult. The Engine Fuels Specifications Regulations 2008 and the Biofuel Obligation (Exempt Persons and Energy Content Values) Order 2008 both provide a model for how this might be done without a specific list. For example the Biofuel Obligation (Exempt Persons and Energy Content Values) Order 2008 clause 5 says (in relation to energy content rather than emission factors):

Persons credited to verify energy content values

The following persons are accredited for the purposes of verifying by statutory declaration the energy content value of a particular engine fuel determined under section 340(1) of the ACT:

- a) A person accredited to ISO/IEC 17025:2005¹ by this function by International Accreditation New Zealand; or*
- b) A person accredited to ISO/IEC 17025:2005 by this function by an overseas accreditation agency recognised under New Zealand's mutual recognition arrangements.*

Certainly such wording could cover suitable laboratories for testing and calculating emissions factors. It would need to be investigated whether it would cover process emission verifiers. Due to the relative complexity of the tests required to develop an emissions factor there are only likely to be a couple of laboratories that have suitable certification for each sector.

¹ ISO/IEC 17025 is the main standard used by testing and calibration laboratories. Laboratories will only be certified for defined tests so the certification needs to be specific to the test requested.

It was also questioned if the governing agency would need to do any checking of approved laboratories or verifiers. If the above approach is used (linking laboratories or verifiers to an external standard) then such checking will not be required. As part of the certification, regular audits of the laboratories take place. However the governing agency should retain the right to do its own testing if they chose to.

2.2 Testing and length of validity for UEFs

Questions were raised about what testing was required for a UEF and how long that UEF should then be valid for. In general (certainly for liquid fuels) the use of a single laboratory test and calculation is unlikely to be sufficient to establish a representative emission factor. The DEFs are based on measurement of the fuels over a reasonable period of time whereas a single sample may not be representative of the stream. The applicant should be required to demonstrate that the sample(s) are typical of the stream and put in place some methodology to ensure the calculated UEF remains valid (e.g. for a fuel stream perhaps quarterly testing to show the UEF is still representative or submission of evidence to show that the source of the fuel is the same as when tested).

Given a requirement to provide ongoing evidence of the suitability of a UEF, how long a UEF is valid for is not such an issue. Any review or ongoing testing required for UEFs should at least be annual as DEFs are going to be reviewed annually (at least for liquid fuels). [Note it is recommended DEF are reviewed annually to ensure they continue to accurately reflect emissions from the fuel they are covering].

2.3 Publication of UEFs

The Act required all UEFs to be published in the Gazette which means they will be available publically². In some cases participants may have wished to keep UEFs confidential to avoid the other participants 'free riding' on their work and protect against disclosing competitive activities (i.e. where an applicant has established a unique market solution which will become public knowledge once the UEF is published). While information has to be gazetted it might be able to be done in a way that only includes basic information to avoid giving competitive information where this is an issue.

2.4 Fees for application

There may need to be a fee for applying for a UEF and there is a question that this may be unfair to the first applicant for a UEF (they pay the fee and then others 'free-ride'). However even once a UEF is published there is still a question as to whether it is applicable to another participant. Therefore any participant who wishes to use a UEF should have to go through the application process to demonstrate that the UEF is relevant to their fuel/process.

Therefore while the first applicant may pay for the specific testing, all users of a UEF should pay an equivalent application fee. However covering the first applicants testing cost is likely to be difficult to manage through an administration process. Some benefit may be able to be gained from early use of the UEF (see section 2.6).

² Section 91 (3) requires gazetting of the name of participant, description of the activity and details of the UEF.

2.5 Difference between UEFs and DEFs

As noted in the Act, criteria for UEFs may require there to be a certain percentage difference between a UEF and the DEF that would normally apply. However it may be that the amount of variation from DEFs allowed will be different for different fuels. The variation allowed should depend on the typical variation in the emission factor of the fuel covered by the DEF and the measurement accuracy of the emissions factor. For liquid fuels the DEFs will change where there is an ongoing shift (trend movement) of more than 0.5%, although the expectation is that there may be a year on year movement of up to 1.0% (note individual samples can vary more than that). Therefore for liquid fuels a variation of at least 2% may be required before a UEF factor is considered (i.e. the variation needed for a UEF is quite a bit more than the variation within the fuel covered by the DEF).

Suitable variations for different fuels should be subject for consultation with participants and may need to be included as a schedule in the regulations.

2.6 Should UEFs be forward or backward looking?

There is an option to allow a UEF, once approved, to only be used for future calculations or allow it to be retrospectively applied.

In some cases a participant will not be able to test the fuel until it is available in the country and testing may take some time. Therefore an element of retrospective application seems reasonable. However to put the onus on applicants to establish a UEF as early as possible, any retrospective application should be limited (e.g. from up to three months before the date of application). A limited retrospective application as suggested may also be a way of giving an advantage to the first company that establishes a UEF.

3.0 Mechanism for calculating unique emissions factors for liquid fossil fuels

This section looks at the process for establishing a UEF for the liquid fossil fuels sector. Key requirements for allowing a UEF are discussed and then a process is proposed. How this might be incorporated into regulations and a discussion on future work required is then covered.

3.1 Key requirements of any mechanism

1. Demonstration that there is a valid reason why the DEF for the most similar fuel does not cover the applicant fuel (or if no similar fuel, why the 'any other fuel' DEF is not appropriate)
2. Ensuring that there is a reasonable difference between the UEF and the most similar fuel DEF (to ensure it is not just measurement or normal quality variation being used to establish a UEF)
3. Who is certified to calculate emissions factors?
4. The basic calculation methodology including:
 - a. Which gases are to be included in calculation
 - b. That it should be based in carbon dioxide equivalent terms
 - c. Units to be the same as the DEF it will replace
 - d. Basis of calculation should be similar to those used for DEFs (may need to lay out the calculation and specify the particular test with certain fuels)

5. Ensuring that any UEF calculation is appropriate for all the fuel it is applying to (i.e. a single test of one batch may not be suitable for ongoing application to a fuel)

3.2 Outline of proposed mechanism

In the following section the group tasked with managing UEF applications and monitoring them is referred to as the 'admin agency'. An outline of the proposed process for obtaining a UFE is detailed below.

Process

1. A company believes that a fuel they produce/import/supply meets the requirement for a UEF. That is:
 - a. It can be demonstrated (through composition analysis, supply source, etc) that none of the DEFs in the regulations cover this fuel
 - b. It is likely to be more than x% different than the otherwise applicable emissions factor [where x may be different for different fuels – as a strawman 2% for liquid fuels is proposed]
2. Company gets a representative sample (or samples) tested and an emissions factor calculated, following the agreed methodology, by a laboratory/verifier that meets the requirements outlined in the regulations (note the sampling process will probably need to be done, or at least supervised, by the laboratory/verifier).
3. The company applies to the admin agency with the following:
 - a. Details of the fuel including a justification of why this should be differentiated it from fuels covered by the DEFs
 - b. Demonstration that the sample taken is representative of the fuel stream and what ongoing testing is planned to ensure the UEF calculation continues to be representative of the fuel it is being applied to
 - c. The UEF along with details of any testing results and calculations used to develop the UEF
4. The admin agency then checks:
 - a. That the fuel does differ by the agreed percentage for this type of fuel from the applicable (if any) DEF
 - b. That the fuel does not reasonably fit into another category covered by a DEF
 - c. That the tester/verifier has the appropriate certification
 - d. That the calculation methodology used is in line with that used to calculate the DEFs for this fuel type
 - e. That the company is putting in place an acceptable process to ensure the UEF calculated remains valid for this fuel
5. If all the checks are met, the agency would then notify the company that the UEF has been accepted and can be used in their emissions calculation for this fuel from anytime after three months prior to the date of application. If the checks are not fully met, the agency would either advise the company what additional information is required or decline the application.
6. The admin agency would then gazette and publish the UEF noting what fuel it applies to and who applied for it in line with Section 91 (3) of the Act.
7. Once made public other companies can use the UEF for similar fuel, although they still need to go through a process of applying to the admin agency for permission to use it. In this case they need to demonstrate applicability by supplying the information in 3 (a) and (b) rather than redoing the testing/verification. They will

only be able to use the factor from three months prior to the date of their application to the admin agency.

3.3 Work required to finalise mechanism/Feedback

As unique emissions factors are not likely to be a major issue with liquid fuels, the work process to complete this work should not be onerous. As biofuels are zero rated in the ETS there will be no complication from new biofuels.

Consultation: Consultation can take place through the Liquid Fuels TAG group. Initially consultation can take place using this document. There are a number of questions that companies may wish to debate such as confidentiality of UEFs so there may be a need for a further meeting to discuss these issues before draft regulations are developed. There would then be another consultation round as part of the regulation making process as set out in the ETS Act. Comments from this initial TAG group consultation have been included in italics.

The following are areas requiring consultation for liquid fossil fuels.

- Process for applying for a UEF
 - *Participants thought the proposed process appears reasonable*
 - *Some concern that it may take some time to obtain a UEF for a new fuel: a company could be penalised if it had to use the default emissions factor for other fuels. A solution could be to assign the new fuel the closest DEF in the interim rather than the factor for "other fuels". A time limit for the processing of applications may also be appropriate.*
 - *Some participants questioned whether a fee for application is justified if the Government want to encourage accurate measurement of emissions (therefore encouraging UEF where applicable)? Perhaps an option is to give a refund could be given if UEF application successful.*
- Any issues with laboratory/verifier certification
 - *Participants noted that laboratories would need to meet standard set by independent body (e.g. IANZ/NATA –ISO17025) for the required test methods (note certification is test specific)*
 - *Furthermore, the precision of such tests needs to be taken into account when determining small differences in carbon content per unit of volume, mass or energy as the case may be. This in turn will influence the number of samples that require testing in order to produce a statistically significant data set. Another complication is that the 'true' values for a given new fuel can differ from one sample to the next due to variations in chemical composition, so the statistical process used must be able to take account of both test method precision and sample variation.*
 - *There is a possible conflict of interest if the applicant also owns the laboratory doing the testing. However other regulations have this exposure (e.g. energy content for biofuels) and do not see it as an issue.*
- What percentage variation between a UEF and a DEF is appropriate for liquid fuels?
 - *Participants noted the variation should be materially significant (both technically and financially) and supported a level around the 2% level. For example the difference between the emission factors specified in the draft regulations for regular and premium petrol is 2.4%.*

- *It may be possible to get very good precision for existing fuels by performing many measurements on batches drawn from a representative variety of sources, and averaging the results. This may not be as easy to do for a new fuel though, at least initially, since early sources may prove to be unrepresentative and samples insufficient in number. Unfortunately, it could be some time before an optimal percentage can be established.*
 - *An analysis of current default factors was circulated (included in Appendix 1) which show the current factors cover most of the range. This chart highlights UEF are unlikely with liquid fuels unless it is a completely new fuel type. However it was also noted ranges might overlap for different types of fuel (e.g. a diesel type fuel with an emissions factor closer to jet fuel).*
 - *Fuel emulsions (blend of petroleum fuels with water) were also discussed. The simple option for handling emulsion fuels is to only count the petroleum component emissions as with biofuels (suitable if blended in New Zealand). However if the presence of water changes the likely emissions from the petroleum component because of the way it burns then UEFs would need to be developed for the fuels based on experimental data (this would be quite sophisticated testing so may rely on overseas testing done).*
- Would the same percentage factor cover all liquid fuels?
 - *Participants thought that the same percentage variation would cover all liquid fuels*
 - Is three months retrospective use of an UEF appropriate, not enough or too much?
 - *Participants agreed that use should be related to the date of application for a UEF and any time allowed for use before this date should be limited (views varied between no additional time and six months before date of application).*
 - *Officials are also considering options including an option where as long as the application was in before the end of January it could be back dated until the beginning of the previous year (effectively a maximum of 13 months backdating)*
 - What information should be gazetted for each UEF?
 - *Some participants would prefer confidential UEF but this is not an option as regulations require them to be gazetted.*
 - *By gazetting an application it allows other parties to challenge a UEF if they feel there are any issues (which is good process)*
 - *Other applicants wanting to use a gazetted UEF should not be allowed any retrospective use of the UEF.*
 - Do you agree that any participant wanting to use a UEF needs to make an application or that any participant should be free to use a published UEF?
 - *Variety of views from participants – some supporting a fee before use and others that other companies should be free to use the UEF once gazetted.*

Other areas of additional work:

- Confirmation of the correct terminology to use to cover suitable laboratory testing facilities
 - *Covered above (similar terminology to the Engine Fuels specification regulations or Biofuels regulations covering laboratory accreditation).*
- Spelling out the calculation methodology required
 - *Covered in the next section*

- Deciding on how much of the calculation methodology for emission factors needs to be spelt out in the regulations versus what could be left to be determined by government policy alone.
 - *The calculation methodology should be simple in most cases and should be able to be spelt out in broad terms in the regulations with the onus on the applicant to justify the detail. The selection of the appropriate test method is a more fundamental issue since different methods can give different results.*
- When is a DEF no longer relevant (i.e. when is a DEF superseded by a UEF and when does a UEF become a DEF)?
 - *This question was not specifically asked of participants. As a proposal if a DEF is not used in any emissions calculations in the previous year's submissions it should be proposed that it be dropped (through consultation with an equivalent of the TAG team). Once at least three participants use a UEF there should be a process of consultation where it is proposed that this UEF becomes a DEF.*

3.3.1 Emission Calculation Process (further work)

To calculate an emission factor for a new fuel, testing needs to calculate the carbon content and density. The emissions factor needs to include emissions from CO₂, CH₄ and N₂O and be expressed in tCO₂e/kl the same as default emission factors.

The appropriate test methods are:

Density: ASTM D1298/ISO3675
Carbon content: ASTM D5291-02³

The CO₂ emissions factor is calculated by:

$$\text{Emissions Factor (tCO}_2\text{/kl)} = \text{Carbon content (\%mass)/100} * \text{density (kg/l)} * 44/12$$

However the unique emissions factor (UEF) needs to include an allowance for CH₄ and N₂O emissions. It is recommended that the appropriate factors used for the most similar fuel are used for these factors and added to the above calculation as follows:

$$\text{UEF (tCO}_2\text{e/kl)} = \text{Emissions factor(tCO}_2\text{/kl)} * 0.99 \text{ (oxidation factor)} + \text{emissions factors for CH}_4 \text{ and N}_2\text{O (tCO}_2\text{/kl)}$$

The company making the application should demonstrate that the density and carbon content used in the above calculation are representative for the new fuel. This would require at least two independent samples in the initial testing and a proposed ongoing testing regime (e.g. retesting each quarter in the first year and then some statistical method to show that quality of the new fuel is staying in the same band as that initial tested).

3.3.2 Implementation of unique emissions factor process

Given the number of applications for liquid fuel UEFs are expected to be limited, it would be best to incorporate the process for managing UEFs into the processes for managing the rest of the scheme, such as DEFs, opt in/out, etc. Once the legislation is in place the requirements for managing the UEF process include:

- Having an identified position for submitting UEF applications
- Formalising the process for processing applications (including requirements for how quickly they should be turned around, resources available, etc)

³ Advice from Barry Blackett (BP technical manager) and Andrew Campbell based on analysis of the method is that accuracy of lighter products (diesel, jet and gasoline) will only be about 0.5% mass.

- Having an identified resource who can manage the processing of these applications (using either internal or external resources as specified in the process)
- Having a database system (or similar) so flags are raised when further information is expected from companies to support the continued use of an UEF
- Combining the annual review of DEFs with a review of the continued applicability of UEFs. This review should also cover the situation where what was a UEF should now become a DEF (e.g. a new fuel has become mainstream).

4.0 Common elements applying to calculation of any unique emissions factor for the ETS

In general much of the discussion on the process for developing UEFs for liquid fuels would also apply to UEFs in other sectors. Some of the differences include:

- UEFs for the stationary energy sector in particular are likely to be far more common than the liquid fuels sector. Therefore the administration resource requirement may be greater, although, as with liquid fuels, the officials' role is one of process management rather than actually doing a great deal of groundwork.
- The amount of variation from a DEF allowed before a UEF can be used is likely to be fuel dependent. This is because the natural variation of each fuel is different along with its measurement accuracy. While the principles used to establish the variation factor should be the same, it is likely that one may need to be developed for each group of fuels (e.g. one for coal, one for gas, etc) and each process.
- Where verifiers are required for process emissions there may be no straight-forward certification reference that can be used in any legislation. If this is the case, alternatives need to be explored (preferably working off some external certification rather than including a list of acceptable verifiers in the legislation).

There may need to be some adjustment to what is acceptable for ensuring continued applicability of the UEF depending on the fuel. For instance there may be less variation in some of the fuel streams compared with liquid fuels so a single sample can be more representative (therefore less frequent samples may be required on an ongoing basis). What is decided in this area should also relate to any decisions around frequency of review of DEFs.

Appendix 1: Plot of default emissions factors

The following graph plots the emission factors for the default liquid fossil fuels. It highlights that the default emission factors of the commonly used liquid fossil fuels almost cover a continuous range between 2.1 and 3.1 tCO₂/kl.

