

# NZETS Reporting requirements

## Used and Waste Oil, Used Tyres, and Waste



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



# Agenda

## Session 1

- Prescribed documents
- Emissions returns format
- Overview of draft regulations
- Worked examples - combusting wood waste and used oil
- Verification

## Session 2

- Overview of draft unique emissions factor regulations
- Worked examples – mass balance (used tyres) and CEM (wood waste)
- Verification
- Work ahead



# Prescribed documents

- Climate Change Response Act 2002
- Climate Change (...) Regulations 2009
- Participant Registration Forms
- Emissions Return Forms
- Standards (incorporated by reference)

## Non prescribed documents

- ETS Bulletin 10
- Workshop documents: emissions calculation forms
- Draft guidance materials (BECA)
- Consultant's report



# Emissions returns format

## Interim

- Based on calculation formulas as set out in regulations
- Reporting templates by activity – MS Excel based
- Signature

## Long term

- On line registry reporting tool



# Draft regulations: overview

- Measurement at point of combustion
- By total mass, energy content and default (or unique if exists) emissions factors
- Adjustment for obligation fuel component for used and waste oil



# Draft regulations: overview

Used oil:  $E = ((A \times CVa) - (B \times CVb)) \times EF \times 0.001$

Used tyres:  $E = F \times CVf \times EF \times 0.001$

Waste  $E = I \times CVi \times EF \times 0.001$



# Worked example

## Combusting wood waste

Regulations 20 – 22

$$E = I \times CV_i \times EF \times 0.001$$

emissions = tonnes of waste x calorific value x emission factor

Assumptions:

$I = 200,000$  tonnes of wood waste

$CV_i = 12$  MJ/kg

$EF = 1.87$ tCO<sub>2</sub>e/TJ

$$200,000 \times 12 \times 1.87 \times 0.001 = 4448\text{tCO}_2\text{e}$$



# Worked example

## Combusting used oil

Regulations 20 – 22

$$E = ((A \times CVa) - (B \times CVb)) \times EF \times 0.001$$

emissions = ((tonnes of used oil x calorific value) less (tonnes of obligation fuel component x calorific value)) x emission factor

Assumptions

A = 25000 tonnes, CVa = 40MJ/kg, B = 10000 tonnes

CVb = 43MJ/kg, EF = 71.47tCO<sub>2</sub>e/TJ

$$((25000 \times 40) - (10000 \times 43)) \times 71.47 \times 0.001 = 40738\text{tCO}_2\text{e}$$



# Verification

- Currently no third party verification required, unlike UEF regulations



# Questions

- Are there problems obtaining necessary detail for the energy content and amount of the proportion of obligation oil? Possible solutions?
- Regularity of sampling of fuel for CV value? E.g. Municipal waste
- May need to amend to include biogas and bio-liquids e.g. black liquor. Thresholds and units?



# Session 2

## Unique emission factors

- Eligibility test: the unique emission factor applied for must be below the threshold in Table 3
- Two approaches:
  - Mass balance (regulation 17) for where any non-biomass fuels are combusted in the class
  - Continuous emissions monitoring (regulation 18) for all classes

I.e. biomass combustion cannot use the mass balance approach to develop an UEF



# UEF process overview

## Mass balance approach

- For use where no or some biomass is combusted
- Sampling of fuels: at least monthly for six months and in accordance with prescribed standards
- Testing of samples for carbon and energy content

$$\text{UEF} = \text{EFC} + X + Y$$

$$\text{Where EFC} = (\text{C} \times 3.67 \times \text{F}) / \text{H}$$

Carbon content x non-biomass fraction x gross calorific value



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



# Worked Example

## UEF for used tyres

$$\text{UEF} = \text{EFC} + 0.03 + 0.004$$

$$\text{Where EFC} = (\text{C} \times 3.67 \times \text{F}) / \text{H}$$

(Carbon content x non-biomass fraction) / calorific value

Assuming weighted means of ten samples:

$$\text{C} = 90\%, \text{F} = 85\%, \text{H} = 0.030 \text{ TJ/t}$$

$$\text{EFC} = (0.9 \times 3.67 \times 0.85) / 0.030 = 93.585$$

$$\text{UEF} = 93.585 + 0.03 + 0.004 = 93.619 \text{ tCO}_2\text{e/TJ}$$

Meets eligibility threshold in Table 3



# UEF process overview

## CEM approach

- For all fuels
- Sampling of fuels: at least monthly for six months and in accordance with prescribed standards
- Testing of samples for energy content
- Measurement of volumetric flow rate from stacks
- Testing of gas streams for CO<sub>2</sub>, N<sub>2</sub>O and CH<sub>4</sub> concentrations



# UEF process overview

## CEM approach continued

Calculate rate of emissions

$$mr_{\text{gas type}} = (mw_{\text{gas type}} \times P \times F \times C) / (8.314 \times T)$$

Where  $mw_{\text{gas type}} = 0.044 \text{ t/kmole (CO}_2, \text{N}_2\text{O)}$  and  $0.016 \text{ t/kmole (CH}_4)$

P = gas stream pressure at time of concentration measurement (kPa)

F = gas stream flow rate (m<sup>3</sup>/second)

C = concentration of CO<sub>2</sub>, N<sub>2</sub>O or CH<sub>4</sub> in the gas stream

T = temperature (degrees Kelvin)

mr = rate of emissions of CO<sub>2</sub>, N<sub>2</sub>O or CH<sub>4</sub> (t/second)



# UEF process overview

## CEM approach continued

Calculate UEF – formula in regulation 18(1)(f) is incorrect

$$\text{UEF} = \frac{((m_{\text{r}_{\text{CO}_2}} \times t) / \text{TJ}) + ((m_{\text{r}_{\text{CH}_4}} \times t) / \text{TJ} \times 21) + ((m_{\text{r}_{\text{N}_2\text{O}}} \times t) / \text{TJ} \times 310)}{\text{H}}$$

But this formula is incorrect, should have been:

$$\text{UEF} = \frac{((m_{\text{r}_{\text{CO}_2}} \times t) + (m_{\text{r}_{\text{CH}_4}} \times t \times 21) + (m_{\text{r}_{\text{N}_2\text{O}}} \times t \times 310))}{\text{TJ}}$$

Where  $m_{\text{r}_{\text{CO}_2}}$  is rate of  $\text{CO}_2$  emitted (t/second) or zero if fuel is biomass  
 $t$  is 31,536,000 (seconds/year)

$H$  is mean calorific value of fuel samples (TJ/t)



# UEF process overview

## CEM example – combusting solid biomass

$$mr_{\text{gas type}} = (mw_{\text{gas type}} \times P \times F \times C) / (8.314 \times T)$$

Assume  $P = 1 \text{ atm (101.3 kPa)}$   
 $F = 0.283 \text{ m}^3/\text{min}^{-1}$   
 $\text{CH}_4 \text{ C} = 49 \text{ ppmv} = 49/1000000$   
 $\text{N}_2\text{O C} = 20 \text{ ppmv} = 20/1000000$   
 $T = 15^\circ\text{C (273 K)}$

$$mr_{\text{CO}_2} = 0$$

$$mr_{\text{CH}_4} = (0.016 \times 101.3 \times (0.283/60) \times 49 \times 10^{-6}) / (8.314 \times 273)$$
$$= 1.650 \times 10^{-10} \text{ tCH}_4/\text{second}$$

$$mr_{\text{N}_2\text{O}} = (0.044 \times 101.3 \times (0.283/60) \times 20 \times 10^{-6}) / (8.314 \times 273)$$
$$= 1.853 \times 10^{-10} \text{ tN}_2\text{O}/\text{second}$$



# UEF process overview

## CEM example continued

$$\text{UEF} = \frac{((m_{\text{CO}_2} \times t) + (m_{\text{CH}_4} \times t \times 21) + (m_{\text{N}_2\text{O}} \times t \times 310))}{\text{TJ}}$$

Assume 21 MJ/kg = 0.021 TJ/t  
total waste wood tonnes = 3600  
TJ = 3600 x 0.021 = 75.6

$$\begin{aligned}\text{UEF} &= ((1.650 \times 10^{-10} \times 31,536,000 \times 21) + (1.853 \times 10^{-10} \times 31,536,000 \times 310)) / 75.6 \\ &= (0.109 + 1.811) / 75.6 \\ &= 0.025 \text{ tCO}_2\text{e/TJ}\end{aligned}$$

Considerably below threshold (0.83tCO<sub>2</sub>e/TJ). Verification attention needed.



# Verification

Matters to be verified (s18(1)(g)) include:

- Sampling regime information
- Stack gas measurement regime information (note requirements under s18(2))
- Confirmation of accreditation of tester
- Calculations developing  $mr_{\text{gas type}}$  and UEF



# Questions

- Threshold for determining only biomass is being combusted so forced to use CEM? (3% in EU)
- Use of CEM to derive emissions estimates instead of emission factors?
- Familiarity and use of prescribed standards?



# So what's next?

- Submissions close 13 July
- Further engagement
- Questions?



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

