NZETS Reporting requirements

Using geothermal fluid for the purpose of generating electricity or industrial heat

Ministry for the Environment
Manatū Mō Te Taiao

Agenda

Session 1

- Prescribed documents
- Emissions returns format
- Overview of draft regulations
- Worked examples
- Verification

Session 2

- Overview of draft unique emissions factor regulations
- Worked examples
- 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- Draft guidance materials (BECA)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 steam separation or by fluid used depending on use
- By total steam mass and default (or unique if exists) emissions factors

Draft regulations: overview

- Single emissions formula:

$$E = A \times EF$$

Emissions = Number of tonnes of geothermal steam or geothermal fluid times default or unique emissions factor

- Default emissions factors set (mostly) at plant level. ‘Catch all’ default emission factor provided for new plants
- Fluid estimated only where fluid use is not related to steam production
- Amount of steam does not include well testing or bleeding

Worked example
Electricity generation

Regulations 18-19

E = A x EF

Assumptions:

A = 5,000,000 tonnes of steam

EF = 0.00689 tCO_2e/t steam

5,000,000 x 0.00689 = 34,450 tCO_2e

Worked example
Industrial heat

$$E = A \times EF$$

Assume:

A = 5,200,000 tonnes of 2-phase fluid

EF = 0.0055

1,200,000 x 0.0055 = 28,600 tCO_2e

Verification

- Currently no third party verification required, unlike unique emission factor regulations

Questions

- Robustness of existing default plant emission factors – certainty of data?
- Use of a ‘catch all’ DEF for new plants? Setting?
- Threshold for industrial heat use?
- Is there clarity on what steam is counted, and what isn’t?
- Ability to measure steam in mass?

Session 2
Unique emission factors

- Eligibility test: the unique emission factor applied for must be 5% below the default emission factor
- Method depends whether utilising geothermal steam or fluid
- Identical sampling and testing requirements - at least two samples over six months; titration and chromatography to determine CO_2 and CH_4 content

UEF process overview
Use of geothermal steam

- $EF_N = CO_2/t\ steam + (CH_4/t\ steam * 21)$

  Where EF_N is the emissions factor for the steam at separation or mix point N

- $UEF = (\sum(EF_N \times t\ steam_N/hr) / \sum(t\ steam_N/hr)) - EF_R$

  Where EF_R is the emissions factor for reinjected condensate

- Requires measurement of (t steam/hr) at each point to develop weighted average UEF for all steam production. Venture flow or annubar meter or other equipment with at least same level of accuracy

UEF process overview
Adjustment for reinjected condensate

- $EF_R = CO_2$/t condensate + (CH_4/t condensate * 21)

  Where EF_R is the condensate emissions factor

- Same sampling and testing requirements as for steam
- Not mandatory, default is zero

Worked Example
UEF for electricity generation

$UEF = (\sum(EF_N \times t\ steam_N/hr) / \sum(t\ steam_N/hr)) - EF_R$

Assuming new plant, mean of three samples, two steam separation points and condensate reinjected:

	A	B	R
EF_N	1.955 tCO_2e/t steam	0.921 tCO_2e/t steam	0.100 tCO_2e/t condensate
Steam	306 t/hr	139 t/hr	70t/hr

UEF = (1.955 + 0.921)/(306 + 139) – (0.10/70)

= 0.004991 tCO_2e/t steam

Threshold is 95% of 0.2120 tCO_2e/t steam (0.2014) thus meets test

UEF process overview
Using geothermal fluid

- Obtain at least two samples of 2-phase fluid over six months, test for CO_2 and CH_4 concentrations
- Calculate $EF_S = CO_2/t\ fluid_S + (CH_4/t\ fluid_S \times 21)$
- Calculate $UEF = EF_S - EF_T$

  Where EF_S is the CO_2e emissions factor for the class of geothermal fluid

  Where EF_T is the CO_2e emissions factor for reinjected fluid. Default is zero. Determined through the same sampling and testing requirements for EF_S and calculated as:

  $$EF_T = CO_2/t\ fluid_T + (CH_4/t\ fluid_T \times 21)$$

UEF process overview
Geothermal fluid worked example

$UEF = EF_S – EF_T$

Assume mean of test results are:

$EF_S = 0.0034\ tCO_2e/t\ fluid_S$

$EF_T = 0.0012\ tCO_2e/t\ fluid_T$

Therefore $UEF = 0.0034 – 0.0012 = 0.0022\ tCO_2e/t\ fluid$

Threshold is 95% of $0.0055\ tCO_2e/t$ fluid (0.0052), thus meets test

Verification

Matters to be verified (s13(1)(f) and s(14)(1)(e)) include:

- Sampling regime information
- Confirmation of accreditation of tester
- Test results
- Calculations made

Questions

- Use of UEF process to replace default emission factors – costs and benefits?
- Unit issue between steam and condensate – can they be mathematically comparable?
- Familiarity and use of prescribed standards and equipment?
- Adequacy of threshold compared to measurement and testing uncertainty?

So what's next?

- Submissions close 13 July
- Further engagement

- Questions?