East Harbour Management Services Ltd
PO Box 11-595, Wellington
New Zealand
Tel: 64-4-385-3398
Fax: 64-4-385-3397
E-mail: brian.white@eastharb.co.nz
www.nzgeothermal.org.nz

Submission on the Climate Change (Stationary Energy and Industrial Processes) and (Unique Emissions Factors) Regulations 2009 (Drafts for Consultation)

To Ministry for the Environment

On behalf of the New Zealand Geothermal Association

13 July 2009

Introduction

The New Zealand Geothermal Association (NZGA) would like to thank the Ministry for the Environment for the opportunity to comment on the draft Climate Change (Stationary Energy and Industrial Processes) Regulations 2009. The NZGA has worked within the process of regulation development through submissions on previous drafts and through meetings with MfE staff and other major users to discuss particular issues. We are disappointed with the progression from these inputs to the draft regulations as they currently stand, given their impending implementation. Wrong price signals are being given and thresholds need to be developed before these regulations can be workable, and can have the intended effect of encouraging the uptake of renewable energy forms, and especially of low emissions geothermal energy.

The New Zealand Geothermal Association (NZGA) is an independent, non-profit association that provides information on geothermal phenomena and utilisation for industry, government and educational organisations. In addition, the NZGA, as a member of the International Geothermal Association, contributes to the international exchange of information within the geothermal development industry. NZGA membership comprises participants, regulators, and interested parties within the geothermal community. It totals 220 members currently.

A Review of Basic Principles

It is the opinion of the New Zealand Geothermal Association that these draft regulations are now flawed:

- There are price signals that send the wrong message about the only renewable energy form covered by these regulations.
- There are critical elements such as thresholds and definitions that should be well bedded in to the regulations at this late stage, but which are still absent, and
- In the absence of thresholds there will be devastating effects on the direct users and small consumers.

The following paragraphs review the background, and what should be guiding principles.

The regulations have their origins in the politically accepted understanding that man's emissions of carbon into the atmosphere is directly impacting on climate. Further, markets have failed to recognise or pass-through the true cost of carbon on the environment and the

economy. This market failure requires an intervention by Government to bring a cost of carbon emissions into the marketplace. In short, this intervention has been done in New Zealand by the ratification of Kyoto Protocol obligations and liabilities, through the passing of the Climate Change Response Act 2002, through development of an Emissions Trading Scheme under the amended Act and soon through Regulations to implement the detail of these initiatives.

The intent of any value placed on carbon is that it should alter behaviour to encourage a move to lower carbon-emitting technologies. Commonly, this is re-expressed as a desire to maximise the uptake of renewable energy forms, which are associated with low emissions, to replace energy forms with higher emissions. Geothermal energy is one of these low carbon-emissions renewable resources that the policy is intended to encourage the uptake of. It is the only renewable energy form covered by the draft regulations.

The regulations underpinning the Climate Change Response Act should be working in the same direction as the Act, and in line with the principles behind the introduction of a cost on carbon. To highlight two points in the MfE discussion document on the regulations, the principles underpinning the methods for calculating emissions should "**send a clear price signal**, **with no perverse incentives**" and "**minimise transaction costs** for participants and the Government".

There are emissions of carbon dioxide and methane associated with the use of geothermal energy, but they cover a wide range from site to site and in most cases are far less than the emissions per MWh than emissions from fossil fuel sources. The geothermal industry has no objection to paying the carbon charge associated with these emissions, provided it fairly reflects the magnitude of the emissions on a project specific basis. Such emissions are readily measured and are constant enough with time that intermittent monitoring is sufficient.

These draft regulations do not meet these criteria. For undefined or new plants they introduce punitive default emissions factors for geothermal energy higher than the factors associated with high carbon-emitting fossil fuels (**more than 4 times the effective emissions factor applying to gas-fired combined cycle power stations and nearly 2 times the emissions factor for coal-fired power stations**). Through these punitive factors it forces users to seek unique emissions factors with their verification/transaction costs. While this is acceptable for the major plants, it represents a hurdle for small plants if no thresholds are given. The regulations currently fail to set threshold levels which means that the hundreds of small direct users down to household level may face these high transaction costs. The end result is that the **appearance** of the regulations works to discourage both existing and future use of geothermal energy in preference to fossil fuels, **in complete contradiction of the intent**.

NZGA does support the introduction of project-specific unique emissions factors, provided these are readily obtained with minimal application fees, and that thresholds can be introduced that exempts small users from charge.

Another concern relates to implications for Maori and for the Crown in respect to Treaty obligations. An error with respect to the default emissions factor for the Crown Kawerau assets transferred to Ngati Tuwharetoa Geothermal Assets will be discussed later. However a number of Maori interests are preparing to invest Treaty settlement compensation in a range of activities, including considering geothermal investments, all subject to the default emissions rate of 0.212 t of CO_2e/t of steam. This default rate applying to their potential projects is 39 times the rate applying to Wairakei, 49 times the rate applying to Poihipi, 5 times the rate for Ohaaki, 31 times the rate for Mokai, 10 times the rate for Rotokawa and 8 times the rate that should apply for Kawerau. More seriously, and this emphasises the punitive nature of the default emissions factor, it is more than 4 times the effective factor applying to a gas-fired combined cycle station and nearly twice that of a coal-fired power station. Again, the opportunity exists for the individuals to apply for unique emissions factors, but the **appearance of the price signal** is contrary to the good that Government is intending through its Treaty settlement efforts.

While there may be justifications for each element within these regulations, it should be remembered that geothermal energy is part of the solution to high carbon emissions and associated effects, and should not be the target of punitive action relative to fossil fuels, or of an **appearance** of punitive action through a price signal.

Ability to Opt-in

In our previous submission we advocated the right to be able to opt-in for geothermal developers. Given the principles that should apply around carbon costs and these regulations, which should not see renewables disadvantaged in favour of high emission fossil fuels, we still hold that geothermal developers should have at least the same rights as fossil fuel developers. This would include the right to opt-in.

It appears that the option requires some critical size of consumption. For coal the critical consumption level is 250,000 t/year (equivalent to 5.6PJ/year) (clause 44). For natural gas the level is 2PJ/year (clause 47).

In the case of geothermal energy, Norske Skog Tasman at Kawerau receives around 6PJ/year of steam based on 14PJ/year of total flow from Ngati Tuwharetoa Geothermal Assets (NTGA), while various power stations would receive greater quantities of heat potentially from a different upstream company or joint venture. As a crude method of assessing the energy supply to various geothermal power stations, typical energy conversion efficiency is between 10 and 15% and load factors can be around 95%. This implies a 10MW geothermal station requires a total fluid take of around 2 - 3PJ/year. Examples with different upstream and downstream developers include the power stations at Rotokawa (35 and 132MW[1] each) and the new station at Kawerau (90-100MW).

It would seem that there are or could be a number of geothermal developers that could have a critical level of consumption (compared with coal or natural gas levels) to justify the opt-in option.

Thresholds

In discussions involving NZGA, MfE, Contact, Mighty River and Norske Skog Tasman the topic of thresholds was raised. Without thresholds and definition for “industrial heat” (or even “industrial processes” as used in the title of the regulations), the hundreds of geothermal wells and springs supplying individual spa pools and district heating schemes are all captured by these regulations. Through an reasonable default emissions factor, and through the new requirements in these regulations (only applying to geothermal energy) for every individual development to have its own factor, every user will face either punitive emissions factors or will have the costs of applying for a unique emissions factor and then perhaps the ongoing costs of testing and verification.

NZGA has recommended discussions between MfE and Inland Revenue in the development of these regulations. When a carbon tax was to be applied to emissions, IRD went down the track of looking at thresholds. For taxes, there is a principle that the cost of verification should not be a significant portion of the tax revenue expected.

In this submission, NZGA suggests several ways of looking at possible de minimis levels, including:

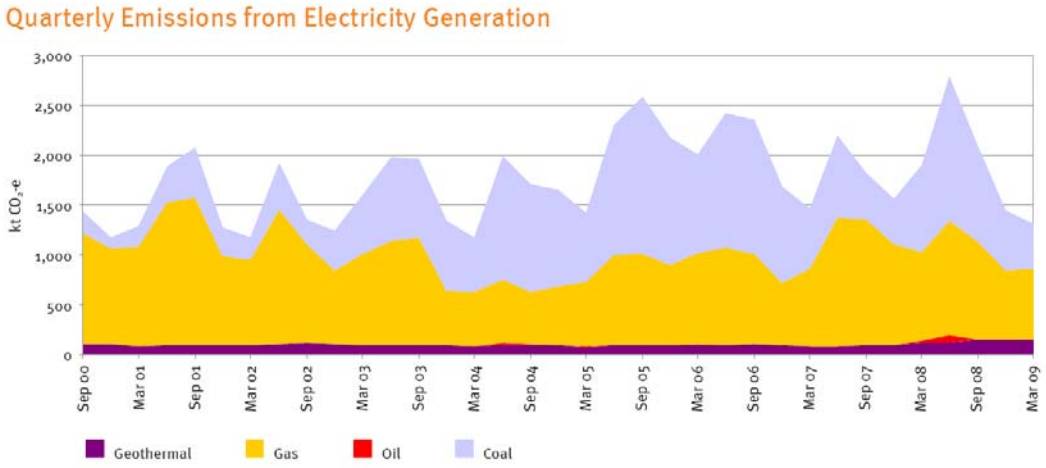
- Considering a threshold relative to the costs of measuring emissions,
- Considering that all emissions associated with brine from already flashed liquids is below significance levels, and
- Reviewing the list of direct heat users to define large scale applications that might be termed “industrial”.

Thresholds Relative to the Cost of Measurement

Take a single source of geothermal fluid. Cost for sampling and testing could be of the order of $250/time, with 4 samples currently required per year under these regulations implying a sampling cost of $1,000. Add in a charge for verification (say $200) to bring the cost of sampling and verification to $1,200/year. Using IRD criteria, the revenue to justify this level of verification should be at least 10 times this cost i.e. $12,000. A reasonable emission rate would be about 1.7% of steam with a charge of about $25/tonne of CO_2. This implies a threshold flow rate of $12,000/$25/t/0.017 = 28,200 tonnes/year of steam (say 30,000 tonnes/year of steam). If a limit was expressed in terms of tonnes of steam then this would exclude coverage of all those small consumers that receive fluid at less than 100^{o}C, but would still leave many users (homes and, hotels and pools) in Rotorua and Taupo exposed to a charge.

Thresholds Relative to Significance Levels

It could be argued that all geothermal emissions are below a threshold of significance across the whole country when considering total emissions (although major users are quite prepared to face appropriate charges). For example, the following graph copied from the MED Quarterly Energy Update for March 2009 shows geothermal contribution relative to fossil fuels for electricity generation. Total geothermal emissions for electricity generation are shown by the purple line at the bottom of this graph. It should be noted that this graph shows contributions from the various generation sources, and does not show the cumulative total. If cumulative totals were shown, then the total geothermal emissions would be a barely visible line.



We would refer back to Ian Thain's supporting report for MfE (backed up by the work of Kevin Brown). This showed that for the new Kawerau power station gas in the stage flash steam was at 3.8% while gas in the second stage flash steam was only 0.3% by weight. When the relative amounts of steam flashed off at different pressures is considered it is seen that about 95% of all gas initially in the two-phase flow is separated off in the first stage of flashing. NZGA contends that, bearing in mind the almost insignificance of any geothermal emissions relative to the total shown in the graph above, and the smaller fraction of plants (or processes) that will be receiving brine for which steam has already flashed off, then the remaining 5% of gas that might be present is truly below all significance levels. When discussing small fractions of small fractions of small fractions, such applications must fail any significance test.

As such, **NZGA recommends** that plant (direct use or electricity generation) receiving brine that has had steam flashed off and separated in a previous process should be exempt from any emissions factor and be regarded as outside the coverage of these regulations.

[1] The 132MW Nga Awa Purua station is currently under construction and will be commissioned in 2010

Thresholds Based on a Definition of Industrial Processes

While somewhat surprising, it appears that these regulations related to "stationary energy and industrial processes" still lack a definition of "industrial processes". Wikipedia defines Industrial processes as follows "Industrial processes are procedures involving chemical or mechanical steps to aid in the manufacture of an item or items, usually carried out on a very large scale. Industrial processes are the key components of heavy industry."

Scale of operation is an integral part of the definition of industrial process. One way of looking at "industrial processes" may be to consider the 80/20 principle. If the 80/20 rule applied then 80% of emissions might be concentrated in the emissions of 20% or less of the users – these would be large scale users potentially covered by a definition of "industrial". A survey has recently been undertaken of direct users of geothermal energy[2]. It should be pointed out that only a small portion of users would carefully monitor use. Total assessed primary energy use was 9,552PJ/year so 80% of this would be 7,642PJ/year. The following list of projects from major to minor would consume this level of energy:

Plant	Energy Use (TJ/Year)	Cumulative Energy Use (TJ/year)	Comments	
Kawerau Industrial supplies	5,224	5,224	Industrial	Clearly should be included
NETCOR tourism facility	820	6,044	Commercial tourism (not industrial), receives flashed brine only so should be exempt	
Ohaaki kilns	438	6,482	Industrial but receives flashed brine only so should be exempt	
Tenon kilns	431	6,913	Industrial	Possible industrial/ commercial transition point
Mokai glasshouse	300	7,213	Commercial (not industrial), and assessed in Ian Thain's report as having zero emissions due to total reinjection of gas	
Waikite pool	275	7,488	Commercial (not industrial), and receiving fluid from a spring that has already flashed off its gas so not associated with anything other than natural emissions	
Wairakei Prawn farm	270	7,758	Commercial (not industrial), receives flashed brine only so should be exempt, at the 80% of cumulative direct use transition point	
Geotherm glasshouses	27	7,785	Commercial (not industrial), and below the 80% threshold that might define large scale	
Hanmer Springs	15	7,800	Non-industrial, and below the 80% threshold that might define large-scale	
Many others	<15	9,552		

[2] White, B. R. (June 2009) *An Updated Assessment of Geothermal Direct Heat Use in New Zealand.* A report for the New Zealand Geothermal Association with funding by the Energy Efficiency and Conservation Authority.

Firstly, let us consider how useful the 80/20 rule has been in defining large users. The Wairakei Prawn Farm lies at the transition point covering 80% of all direct use of geothermal energy. The next applications are an order of magnitude less in energy consumption so are clearly in a different class and would not be considered large scale. The next group of applications would also not be considered of an industrial nature bringing in the broad spectrum of pool and hotel and home heating applications. So the 80/20 rule has some validity in defining a class of large scale users.

However, a review of the list of applications indicates many of these are intuitively what may be described as commercial applications i.e. not "heavy industry", so not the intended subject of regulations directed at "stationary energy and industrial processes". Thus the 80% threshold defines a combination of commercial and industrial applications, such that further refinement is needed to define a group of industrial processes. In the list above, the first apparently industrial applications appear above a threshold of 430TJ/year of energy use (consumer energy).

The NZGA **recommends** that a threshold for industrial processes using geothermal energy be defined as those processes using more than 400TJ/year of geothermal energy on a consumer basis (i.e. after deduction of the heat rejected from the process to surface or via reinjection). All direct uses below this level should be exempt from emissions charges.

Even at this level, NZGA notes that a non-industrial application might still be inadvertently captured by this threshold (especially if the flashing rule suggested above is not taken up). In those circumstances, an alternative threshold would be at say 2PJ/year (therefore only capturing the Kawerau industrial supplies). This higher level is based on the opt-in threshold for natural gas, and is assumed to define a "large scale" for natural gas users.

Some Specific Comments

Climate Change (Stationary Energy and Industrial Processes) Regulations 2009

Part 1 3 Interpretation – should include definitions of "geothermal user" and "industrial processes"

Clause 19 Formulas – We note that despite the simple formula, under the Unique Emissions Factors Regulations, there is provision for an allowance for reinjection. Thank you for taking notice of our submissions on this.

Schedule 2 Table 5 Emissions factors – NZGA does support the proposed use of project-specific emissions factors provided that exemptions apply for small users. The project-specific factors avoid the need for considering the type of cycle and avoids consideration of whether a project is a heat or power project. However, these emissions factors continue to show errors for Kawerau and for the default value shown for "any other plant or process using geothermal steam to produce electricity of industrial heat". The default value sends completely the wrong message. Further, you specifically refer to plant that receives no steam (so minimal gas) such as the Wairakei Binary Cycle plant (note the correct spelling of "Wairakei") for application of an emissions factor.

Steam from Ngati Tuwharetoa Geothermal Assets is from the same (or similar) reservoir as that supplying the MRP 100MW station (Kawerau II), so should at least have a similar gas content. In recent work Norske Skog Tasman advisors have advised that the gas content in the steam they receive is approximately 3% by mass. The current default value of more than 10% gas is an error, and we understand that Mighty River Power will be offering a correction in their submission.

Your default value for all unlisted "plant or process" sends completely the wrong message, by being so high. Typical steam consumption of a geothermal power station is around 8t/MWh. If geothermal steam had 21% gas then emissions per MWh (for a condensing power station) would be 8 x 0.21 = 1.68 t CO_2e/MWh i.e. 1,680g/kWh. For comparison, the equivalent rate for a gas-fired combined cycle power station is 400 g/kWh and for a coal- fired power station is 900-1,000 g/kWh. We **strongly object** to any implication that geothermal generally is such

a polluter. Geothermal energy is a low emissions technology for which price signals should be supportive rather than favouring the high emissions fuels of coal and gas. In discussions, the MfE response is that this rate is being applied to induce all geothermal users (hundreds and possibly over 1,000 individual users if the thresholds we suggest are not applied) and developers down the road of applying for unique emissions factors and undertaking all of the dedicated monitoring associated with that. This is **discriminatory**.

Realistic emissions levels for geothermal energy in New Zealand will be around 140 g CO_2e/kWh (based on the weighted average emissions factor reported in the MED Quarterly Update for March 2009) suggesting that the default emissions factor should be around 0.0175 tCO_2e/t steam (based on 8 tonnes of steam/MWh).

To emphasise how erroneous these default levels are, at Wairakei, a back-pressure turbine was installed in 1996. It is not strictly a part of A Station, B Station or the Binary Plant. As such this will be subject to a default emissions factor just under 40 times that of the listed Wairakei plant despite receiving steam from the same source and passing it through to A and B Stations.

You now specifically reference plants that receive no steam (so minimal gas) such as the Wairakei Binary Cycle plant in listed classes for application of an emissions factor. While it is obvious to the developers which of their units (e.g. some units at Mokai, Rotokawa and Ngawha) receive no steam, there are wrong messages being put across about potential applications of charges to non-emitters. The regulations should clearly put charges on emitters and should not apply charges to non-emitters. At this stage we repeat the recommendation that plant receiving already-flashed brine (such as the Wairakei Binary Cycle plant) should be exempt, emissions being below all reasonable thresholds.

Climate Change (Unique Emissions Factors) Regulations 2009

Clause 4 (4) Application for a Unique Emissions Factor – we are pleased to see that the emissions factor can be retrospective. This means that the user only faces a threat of punitive charges but should only face an appropriate charge once he has made the necessary commitments to monitoring emissions.

It should be made clear that once a unique emissions factor has been applied for with appropriate documentation, it has the same validity as a default emissions factor and can apply in perpetuity if the user so desired. Repeated measurement is especially punitive if applied to small-scale developers.

Clause 6 (a) (iii) Criteria for class of fuel for which unique emissions factors may be used – this clause makes no sense with the current draft regulations. It states that the chief executive may approve a unique emissions factor only if the geothermal fluid is not larger than a class specified in Part A or B of Table 5 discussed above. No size is actually specified in this table – only names of plants.

If this is meant to imply that some maximum size was intended beyond which every development should be subject to a default factor unrelated to their actual emissions factor then we observe that this is not in the spirit of the regulations, and such large users should still have the ability to apply for unique emissions factors. Both the proposed Te Mihi and Tauhara stations will be larger than any station or application to date and should actually be associated with low emissions per MWh.

If some minimum size was intended to be present in the tables then we would **strongly object** to small users being forced to operate under the current punitive default emissions factor. That would:

- likely bring an end to the uptake of direct use applications as it currently stands,
- may force closure of existing facilities,

- may discourage distributed energy applications that other parts of Government have been actively trying to encourage and

- bring an increased load on our fossil-fired power stations when heat is required.

Clauses 13 and 14 related to sampling of fluids. The clauses related to sampling of fluids should state the appropriate ISO standards "or standards to the satisfaction of the verifier". Several reliable techniques have been developed. In terms of Clause 14 (2) (a) (iii) this erroneously refers to the single phase test for the two-phase situation. The frequency of sampling should not be specified at a frequency greater than that set out for emissions calculations internationally, which are currently set at once every 4 months (not 3 months as in the draft regulations).

Under clause 13 (3) (a) there is reference to "venture" flow meters. This should refer to "venturi" flow meters and a global search should be made through the document for similar errors.

Part 3 21 Recognition of verifiers. In terms of competent people capable of verifying results, there are laboratories with skilled scientists and technicians that would have greater credibility as verifiers of chemical sampling and analysis than an accountant or an engineer. We think the opportunity to recognise verifiers should be broadened.

Consultants Report

We do not want to get into criticism of the report prepared by Ian Thain. It would have been valuable to have proof checked this before publishing it. As an example, I am sure the title of the report should have been "Review of Carbon Emissions Factors in Draft Stationary **Energy** and Industrial **Processes** Regulations: Using Geothermal Fluid" in line with the title of the regulations, rather than referring to stationary "engines" and industrial "process".

With any analysis of geothermal energy there is always the risk of falling into a focus on electricity generation and minimising the direct heat "industrial process" application. In the second paragraph of his report, Ian shows he had fallen into that trap by specifying in bold text that emissions for geothermal fields should all be expressed on a "**power plant basis** rather than on a **field basis**." Ian has subsequently captured some direct heat uses at Kawerau and at the Tenon Taupo facility in his report, but he has omitted consideration of the hundreds of individual direct use applications to homes and offices around New Zealand, all of which appear to be captured by these regulations (without thresholds being present). He is right in favouring factors on a project basis but in having a focus on power he did not properly consider the implications of the huge number of individual direct users captured by the regulations as currently drafted.

If greater consideration had been given to the management of these small users rather than specify all classes of geothermal emissions in term of these individual "power plants" then a very different solution to class definition may have been developed.

Conclusion

The NZGA is concerned that there are distortionary price signals being sent through these regulations and has recommended alternative values to be used. The NZGA has concerns for the impact on small users of geothermal energy under the current regulations, whether for heat or electricity.

Thresholds need to be defined to ensure these regulations cover industrial processes. NZGA recommends a threshold for industrial processes using geothermal energy should be defined as those processes using more than 400TJ/year of geothermal energy on a consumer basis (i.e. after deduction of the heat rejected from the process to surface or via reinjection). All direct uses below this level should be exempt from emissions charges.

Taking significance into account, **NZGA recommends** that plant (direct use or electricity generation) receiving brine that has had steam flashed off and separated in a previous process should be exempt from any emissions factor and be regarded as outside the coverage of these regulations.

We would be happy to be involved in any further consultation.

Yours faithfully

Brian White
Executive Officer
New Zealand Geothermal Association
Ph 0274 771 009 Email brian.white@eastharb.co.nz