Climate Change (Emissions Trading and Renewable Preference) Bill

Advice from Dr Jan Wright
to the Finance and Expenditure Committee

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Countries that price carbon are likely to impose border taxes on imports from countries that do not price carbon.

The comparative greenhouse advantage of our dairy products, in particular, is being eroded, and the proposed Emissions Trading Scheme will help reverse this.

Recommendation 1:
That Part 1 of the bill establishing the Emissions Trading Scheme proceed with no further deferrals.

The Renewable Preference

The target of 90% renewable electricity by 2025 is a good target.

The moratorium will not be effective.

Other ways of reaching the target need to be pursued.

Recommendation 2:
That Part 2 of the bill – the moratorium on fossil fuel plants – not proceed in its current form.

Recommendation 3:
That other instruments to achieve the 90% renewable electricity target be developed as a priority.

Environmental effects of the ETS

The proposed Emissions Trading Scheme will have a range of environmental impacts – some positive and some negative.

None of the potential negative impacts on the environment should delay the implementation of the ETS or require major modifications of the proposed legislation.

The planting of exotic forest on land with high biodiversity value is probably the most significant potential negative environmental impact of the ETS.

The international carbon market is likely to become stratified, and carbon storage in regenerating indigenous forest would be likely to command a premium.

Recommendation 4:
That the committee consider adding a new sub-section to clause 28 of the bill to enable regulations to provide for discrimination between New Zealand units that produce significant environmental benefits beyond greenhouse gas reduction and other New Zealand units.

The bill should not provide a perverse incentive to participants in the ETS to obtain New-Zealand Units by carrying out illegal or unauthorized activities.

Recommendation 5:
That a clause be added to the bill that makes the ability of participants to gain carbon credits under the ETS contingent on their compliance with all relevant environmental legislation while undertaking the registered Schedule 4 activity.

1 Introduction

Thank you for the invitation to assist the committee in its consideration of the Climate Change (Emissions Trading and Renewable Preference) Bill.

Recently I recommended to the Local Government and Environment Committee that the Biofuel Bill should not proceed. My view on the Emissions Trading Bill is very different; the Emissions Trading Scheme (ETS) should be implemented, and with its major design features intact.

This advice falls into three parts: the first is concerned with the Emissions Trading Scheme; the second is concerned with the Renewable Preference; and the third is concerned with environmental effects of the ETS.

2 The Emissions Trading Scheme

2.1 We must pay one way or another

As a signatory to the Kyoto Protocol, New Zealand has agreed to reduce its greenhouse gas emissions during the first Kyoto commitment period (2008-2012) to its 1990 level of emissions, or to take responsibility for any excess. This is a legally binding target. This means, regardless of the existence of the ETS, New Zealand will pay for the greenhouse gases it emits above its Kyoto target.

The ETS is an economic instrument that will put a price on carbon within our economy. When it is completely implemented, the ETS will distribute the cost of Kyoto compliance among New Zealanders by allocating responsibility for emissions to the polluters. Thus, the ETS will incentivise the reduction of greenhouse gas emissions, although the effect will be small in the first five-year commitment period of 2008-2012.

2.2 Why use an economic instrument?

An economic instrument is an essential tool for reducing greenhouse gas emissions. This is because greenhouse gas emissions are ubiquitous; they are everywhere. An economic instrument allows us to reduce emissions everywhere in the economy.

In my submission on the Biofuel Bill, I drew attention to the great variation in the lifecycle greenhouse gas emissions from various biofuels produced from different feedstocks. Some – such as the production of ethanol from maize – are little better than petrol and diesel, while others are much better. However, these calculations are very difficult to do.

An economic instrument does these kinds of calculations for us by embedding them into our economic system in a cost-effective manner. A price on carbon puts the cost of emitting greenhouse gases directly into every monetary transaction. It ensures penetration into every production and consumption decision. Low carbon goods and services will become relatively cheaper; high carbon goods and services will become relatively more expensive.

Concern about high costs and job losses due to the ETS has recently been in the headlines. However, industry has a strong incentive to overstate predicted costs. The economic impact of the ETS can only be predicted by models – and modelling of the New Zealand economy is a very inexact science. In a 1999 United States study of regulatory cost estimates, economists found that policies based on economic instruments were especially prone to overestimation of costs.[1] The authors concluded that the flexibility inherent in economic instruments was a major cause of unanticipated technological innovation.

[1] Harrington *et al.*, 1999.

2.3 What kind of economic instrument?

Two main types of economic instruments can be used to put a price on carbon. One is a carbon tax; the other is a cap and trade system. With a carbon tax, the price is set and a response occurs in the form of lower carbon emissions. However, the level of market response is very difficult to predict. A cap-and-trade system works the other way round. The desired response – the cap – is set and the price emerges from the market.

(Note: The proposed ETS is not a cap-and-trade system because there is no NZ cap. However, it has been designed to link into a wider cap-and-trade system. The ultimate aim is a global cap.) A cap-and-trade system has clear advantages over a carbon tax for a number of reasons. First, it has been chosen as the framework for the Kyoto Protocol and subsequent international agreements are expected to follow the same framework. Second, it is consistent with setting a global cap on emissions, which is the ultimate goal. Third, trading delivers the outcome at least cost. Finally, it will allow the carbon price to float up and down. If New Zealand were to institute a carbon tax, the tax should be increased when carbon is traded at a higher price internationally. However, regularly changing the level of tax would be fraught with difficulties.

The major difficulty with setting up a cap-and-trade system is the initial allocations, which form a big part of the current turmoil around the New Zealand ETS. The same kinds of behaviours were seen when the fishing quota system was first introduced. Yet no one is now suggesting that we change this system.

2.4 Environmental trade barriers

Countries with, or intending to implement, carbon pricing schemes are increasingly considering proposals to impose restrictions on imports from countries with lower regulatory standards on climate change. Such measures seek to address the potential trade disadvantage which domestic industries face, compared with international competition from countries that do not price or regulate greenhouse gas emissions.

The European Commission, for example, has proposed a Directive, which would enable implementation of a European 'carbon equalisation system' unless stringent international agreement is reached on climate change measures for energy-intensive sectors.[2] A final decision on the need for and form of the scheme may not be taken until 2011. One of the proposed mechanisms, however, would require importers of goods from unregulated countries to purchase carbon credits for their imports via European ETS auctions.[3] Such a proposal would effectively require exporters from unregulated countries to pay for carbon credits at the European market price.

The United States Senate is also considering legislation[4] that would combine a new national cap-and-trade system for carbon emissions with charges on imports from countries with lower climate change regulatory standards, by requiring importers to buy US emission credits.[5]

[2] European Commission, 2008a.
[3] European Commission, 2008b.
[4] Senate of the United States, 2007.
[5] World Business Council for Sustainable Development, 2008.

Trade barriers such as these are a way for countries that price carbon to put pressure on those who do not or have lower regulatory standards on climate change. If we do not implement the ETS we risk damaging our international competitiveness. Further, New Zealand may face trade barriers that will take profits from our exporters to help other countries pay their Kyoto liability. New Zealand could instead be using those profits itself to invest in a less carbon-intensive economy.

2.5 Agriculture and Clean Green New Zealand

New Zealand brands itself to the world as 'clean and green'. If the reality is not consistent with this image, however, we damage not only our self-image but also our economy.

In 2006, the food miles issue made headlines in Europe with the call, especially strong in the UK, to "buy local". Of course, the miles that food travels is only one issue – the real concern is total greenhouse gas emissions. The carbon dioxide emitted during shipping of our agricultural produce to Europe is actually quite small.

Research done at Lincoln University showed that accounting for carbon dioxide emissions over the whole production cycle – lifecycle analysis – put our farmers well ahead of European farmers.[6] We do not keep our animals in heated barns – they do. For putting dairy milk solids on the shelves on UK supermarkets, our comparative carbon dioxide advantage was calculated to be two-to-one.

It is not so well known that there was a second Lincoln University report a year later that repeated the exercise with all the agricultural greenhouse gases, not just carbon dioxide, but methane and nitrous oxide as well. Our comparative greenhouse advantage with dairy produce slipped from two-to-one to four-to-three.[7] This is not a comfortable margin.

A recent study by AgResearch and Landcare into farm intensification warns us not to sit on our laurels. The authors of the 2007 study conclude that current intensification of dairy farms – through increased use of maize silage and nitrogen fertiliser in particular – reduces the greenhouse gas and energy use efficiency of New Zealand farms.[8] They warn that the trend for intensification on New Zealand dairy farms means that our comparative advantage with EU farms is diminishing. (Note: The importation of increasing amounts of palm kernel meal from Indonesia and Malaysia is another development in the wrong direction.)

The direction of change on our farms is towards emitting more greenhouse gases. Bringing agriculture into the ETS will incentivise farmers to go in the other direction.

Maintaining the comparative greenhouse advantage of our agriculture is an important reason for New Zealand to adopt carbon pricing.

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[6] Saunders *et al*., 2006.
[7] Saunders *et al.*, 2007.
[8] Ledgard *et al.*, 2007.

2.6 Recommendation

An economic instrument is essential – we must price carbon. A trading scheme is the best way to implement this. Without the ETS, we risk facing trade barriers that will damage our international competitiveness. Further, because of the threat of a significant consumer backlash against our agricultural goods overseas, agriculture must be brought into the scheme on its due date to maintain our comparative greenhouse gas advantage.

I recommend that Part 1 of the Bill establishing the Emissions Trading Scheme proceed with no further deferrals.

3 The Renewable Preference

Part 2 of the Climate Change (Emissions Trading and Renewable Preference) Bill is a proposed amendment to the Electricity Act 1992. This amendment would establish a mandatory preference for renewable sources of electricity via a 10-year moratorium on new baseload fossil-fuelled generation capacity (with some exemptions). The amendment takes the form of adding a new Part 6A titled "Limitation on new fossil-fuelled thermal electricity generating capacity".

3.1 The renewable electricity generation target

In October 2007, the government released the New Zealand Energy Strategy and adopted a target for renewable electricity generation of 90 percent by 2025. The 90 percent target is a commendable goal. With a few exceptions such as Iceland and Norway, New Zealand is better placed to achieve this than other countries. Placing a price on carbon via the ETS will decrease the cost of electricity from renewable sources relative to the cost of electricity from fossil fuels. There is, however, no assurance that this will enable the 90 percent target to be achieved.

Note that it is impossible to guarantee the achievement of the target in a particular year through any means. This is because the 'renewable percentage' achieved in a particular year will depend significantly on the amount and timing of rain falling into the hydro catchments in that year, and to a lesser degree on other factors.

3.2 The moratorium – a major dilemma

The moratorium has been proposed to help New Zealand reach the 90-percent goal. It is intended to prevent the 'lock-in' of fossil fuel power plants that could emit carbon dioxide for 30 years or more and 'crowd out' investment in renewables.

There is, however, a dilemma at the heart of the moratorium, resulting from two types of gas-fired power plant that are run at different load factors.

Load factor is the amount of electricity actually generated by a power plant in a year divided by the amount that could be generated in that year. A baseload plant will have a high load factor (70 to 90 percent) and a peaking plant will have a low load factor (10 percent or less). (An explanation of baseload, mid-range and peaking is given in Appendix A).

The ability to vary the load factor of a fossil fuel plant can provide some flexibility to respond to the price signal of a carbon cost. This holds for a diesel plant like Whirinaki, a coal plant like Huntly, and an open-cycle gas turbine (OCGT) plant like the Huntly P40. The load factor for these three kinds of fossil fuel plants can be varied.

The same flexibility does not hold for a combined-cycle gas turbine (CCGT) like the Taranaki Combined Cycle plant. CCGTs must run as baseload with a high load factor to maintain their high efficiency.

Compare a coal plant with a CCGT, both of the same capacity (megawatts), The CCGT can run at least three times as long as the coal plant, and still emit less carbon dioxide. However, the CCGT would not qualify for an exemption, whereas the much less carbon-efficient coal plant would.

It should not be assumed however, that building gas-fired power plants is a good idea. Even in a CCGT, half of its energy is lost when it is converted to electricity. Neither should it be assumed that a moratorium is a bad idea.

A moratorium on baseload fossil fuel plants is an appealing concept, but the design of the one proposed in Part 2 would not be useful. A CCGT would not qualify for an exemption. On one hand, that seems good because baseload fossil fuel plants would not be built. On the other hand, CCGTs emit less carbon dioxide per kilowatt-hour of generated electricity than other fossil fuel plants. And the load factor of these other types of fossil fuel plants can be increased when the moratorium is lifted. That is the dilemma.

3.3 The exemptions

There is no need to seek to resolve the dilemma regarding the desirability of CCGTs. It is academic, because the moratorium would not be effective.

The bill imposes a ban *on connection or operation of new fossil-fuelled thermal generation plants* for 10 years, with five exemptions. Details of the exemptions will be set out in regulations proposed by the Minister of Energy. The five exemptions are listed in proposed subsection 62G of the Electricity Act, to be inserted under cl 67 of the bill.

The exemptions in the bill are drafted in a way that would make it very difficult for the Minister to reject virtually any fossil fuel plant. This means the moratorium as expressed in the bill would have little, if any, effect.

My staff have worked on amending these exemptions to give the moratorium some ‘teeth’ and have made a little progress, but have been unable to make improvements that adequately meet our concerns.

Our work on these exemptions is in Appendix B.

3.4 Recommendations

The target of 90 percent renewable electricity is a worthy one. However, the moratorium is not an effective tool to achieve this goal.

I recommend that Part 2 of the bill – the moratorium on fossil fuel plants – not proceed in its current form.

Other tools are available to government to incentivise investment in renewable electricity:

1. Ensure that electricity comes into the ETS, on time as proposed in the bill. Placing a price on carbon will decrease the cost of electricity from renewable

sources relative to the cost of electricity from fossil fuels, and make investment in renewables more attractive to generators.

2. Expose consumers to the carbon price signal. In general, only medium to large businesses are exposed to the electricity spot market. For others, there is no price signal conveying the higher price of peak electricity – it is averaged out. Peak demand is met by fossil fuel generation, so the price of carbon for most consumers will be averaged across all purchased kilowatt-hours, regardless of whether their source is fossil fuel or renewable.

3. An under-used way of addressing a supply shortfall is by reducing demand. Greater investment in demand-side management is needed. New Zealand is not a leader in this or even a fast follower. We are a sluggish follower.

4. Make full use of the suite of tools available under the Resource Management Act 1991 to facilitate renewable energy projects, including timely release of National Policy Statements, such as the proposed National Policy Statement on Renewable Electricity Generation.

5. There may be more valuable uses for gas. The rapidly increasing price of oil might, for example, make running cars on compressed natural gas (CNG) attractive again.

6. The Minister could give the state-owned generators some specific direction, for example, investing extra profits in renewables.

I recommend that other instruments to achieve the 90 percent renewable electricity target be developed as a priority.

4 Environmental effects of the ETS

A scoping report for the environmental assessment of the proposed emissions trading scheme (ETS) was released in April 2008.[9] At the request of the Climate Change Leadership Forum, this office has conducted an independent review[10] of that report ('the Cawthron Report'). The purpose of the review was to:

- assess whether the potential environmental effects of the ETS have been comprehensively identified and prioritised
- identify the potential environmental impacts that may require changes to the bill or addressing through other means.

The review was publicly released on 14 May 2008 and is available on the PCE website. This section contains the key findings of my review of the Cawthron Report and two recommendations for amendments to the bill.

4.1 No reason to delay the ETS

There are many ways in which the ETS and associated initiatives could affect the environment. Those are described in the Cawthron Report and prioritised in my review of the report.

Many of the pressures created by the ETS will have positive environmental effects, of which the most significant and likely to occur are those of:

- increased afforestation on terrestrial biodiversity,[11] freshwater biodiversity and sediment yields to coastal environment
- reduced nutrient and sediment run-off from agriculture on freshwater quality.

Some of the pressures created by the ETS will have negative environmental effects, of which the most significant and likely to occur are those on:

- landscape, from the increased number of renewable energy generation facilities (particularly hydro-electricity and wind farms) and increased afforestation
- freshwater biodiversity and flows, from increased hydroelectric generation
- indigenous terrestrial biodiversity from afforestation of high biodiversity value land and likely spread of wilding exotic trees
- human health from colder and damper households due to the increased cost of heating.

Most of the potential negative effects of the ETS can be addressed as part of existing or proposed processes and policies. Neither the scoping report, nor my review, have found that any of the potential negative effects of the ETS and its associated initiatives should delay the implementation of an ETS nor require major modifications of the bill.
It is also important to note that many environmental pressures identified in the Cawthron Report as a result of the ETS would arise from any coordinated policy response to climate change New Zealand chose to adopt.

[9] Sinner *et al.*, 2008.
[10] Office of the Parliamentary Commissioner for the Environment, 2008.
[11] Where afforestation of agricultural or marginal land, or regeneration of native forests occurs.

4.2 Indigenous biodiversity

The protection of high value indigenous biodiversity from exotic afforestation is the only environmental issue arising from the ETS that would benefit from additional legislative measures at this stage. This is because high biodiversity value indigenous ecosystems are variably and, in many instances, poorly protected through existing national instruments or local plans,[12] and could become prime candidates for exotic afforestation by 'carbon farmers'.

Our review of the Cawthron Report found that both minor changes to the bill and complementary measures should be considered to address the potential risk to indigenous biodiversity created by the ETS. Two recommendations regarding changes to the bill could create an incentive to protect high value indigenous biodiversity.

4.3 Recommendations

First, the ETS offers an opportunity to exclude or give preference to certain emission units. 'High biodiversity value units', for which the unit holder can show that the creation of the unit had positive effects on indigenous biodiversity, could have a number of advantages.

In an international carbon market that is likely to become stratified (with different prices for different types of emission units), New Zealand 'high biodiversity value units' are likely to have a high value and be widely accepted by participants in the domestic and the international carbon market. They would also contribute to the integrity of the ETS and help maintain the 'clean, green image' of New Zealand.

To attract high prices while mitigating the risk to indigenous biodiversity created by the ETS, discrimination between high biodiversity value units and other emission units must be possible, and that difference recorded in the unit register.

The bill as drafted could enable the development and recording of a 'high biodiversity value' unit in the future. Clause 11 of the bill gives power to allocate a unique serial number to a class or sub-class of New Zealand units (NZUs) that could include those certified as being of high biodiversity value. Clause 28 enacts the broad Regulation-making powers by which such a scheme could be achieved. It permits regulations to be made that prescribe procedures and requirements relating to the allocation of serial numbers. There is, however, no provision in cl 28 relating to the identification of the activity that has created a NZU.

Due to the potential risk to indigenous biodiversity created by the ETS, there is value in amending the bill specifically to allow regulations to enable discrimination between high biodiversity value units and other emission units.

Such an amendment could be drafted to apply both to high biodiversity value and other forms of units, which could also promote environmental benefits in the future.

[12] Ministry for the Environment, 2004.

I recommend that the committee consider adding a new sub-section to cl 28 of the bill to enable regulations to provide for discrimination between New Zealand units that produce significant environmental benefits beyond greenhouse gas reduction, and other New Zealand units.

This could be implemented in two steps.

Step one could amend cl 28 of the bill by inserting the new subsection "the identification, as part of the unique serial number, of the activity which created each New-Zealand unit" between subs 30G(1)(e)(v) and 30G(1)(e)(vi).

In a second step, the details of the 'activity identification' scheme would need to be considered at the regulation-making stage. In particular, the categories of activities would need to be carefully defined to ensure that they enable robust discrimination between activities with significant environmental benefits (such as the ones which contribute to 'high biodiversity value') and other activities that also create NZUs.

Secondly, there is a possibility that a post-1989 Kyoto forest owner could earn carbon credits despite not being a 'fit and proper person' from an environmental perspective. For example a participant in the ETS could establish a post-1989 Kyoto forest in contravention of a local plan or provision of the Resource Management Act 1991 and claim NZUs.

I recommend adding a clause to the bill that makes the ability of participants to gain carbon credits under the ETS contingent on their compliance with all relevant environmental legislation while undertaking the registered Schedule 4 activity.

5 References

European Commission. 2008a. *Proposal for a directive of the European Parliament and of the Council amending directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading system of the Community.* http://ec.europa.eu/environment/climat/emission/pdf/com_2008_16_en.pdf [accessed 20 May 2008]

European Commission. 2008b. *20 20 by 2020 - Europe's climate change opportunity*. Communication from the Commission to the European Parliament, the Council the European economic and social committee and the committee of the regions. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0030:FIN:EN:PDF [accessed 20 May 2008]

Harrington, W., Morgenstern, R.D., and Nelson, P. 1999. *On the accuracy of regulatory cost estimates*. Resources for the Future discussion paper 99-18. Resources for the Future: Washington, DC. http://www.rff.org/Documents/RFF-DP-99-18.pdf [Accessed 1 May 2008]

Ledgard, S. F., Basset-Mens, C., McLaren, S., and Boyes, M. 2007. *Energy use, "food miles" and greenhouse gas emissions from New Zealand dairying – how efficient are we?* Proceedings of the New Zealand Grassland Association 69: 223-228.

Ministry for the Environment (MFE). 2004. *A snapshot of councils' efforts to address biodiversity on private land*. Wellington: MFE. http://www.mfe.govt.nz/publications/biodiversity/indigenous-biodiversity-private-land-jun04/indigenous-biodiversity-private-land-jun04.pdf [Accessed 21 May 2008]

Office of the Parliamentary Commissioner for the Environment (PCE). 2008. *Review of the scoping report for an environmental assessment of the New Zealand emissions trading scheme and closely related measures*. Wellington: PCE. http://www.pce.govt.nz/news/speeches/Cawthron_Report_PCE_review_May08.pdf [Accessed 15 May 2008]

Saunders, C., Barber, A., and Taylor, G. 2006. *Food miles – comparative energy/emissions performance of New Zealand's agriculture industry.* AERU Research Report No. 285. Christchurch: Lincoln University. http://www.lincoln.ac.nz/story_images/2328_RR285_s13389.pdf [Accessed 21 May 2008]

Saunders, C., and Barber, A. 2007. *Comparative Energy and Greenhouse Gas Emissions of New Zealand's and the UK's Dairy Industry.* AERU Research Report No. 297. Christchurch: Lincoln University. http://www.lincoln.ac.nz/story_images/3270_RR297_s10091.pdf [Accessed 21 May 2008]

Senate of the United States. 2007. *A bill to direct the administrator of the Environment protection Agency to establish a program to decrease emissions of greenhouse gases and for other purposes*. http://epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=85a349e8-0579-4b3b-a642-70219ab09f41 [Accessed 20 May 2008]

Sinner, J., Lawrence, J., Sapsford, R. and Blaschke, P. 2008. *Scoping report for an environmental assessment of the NZ emissions trading scheme and closely related measures*. Cawthron Report No. 1436. http://www.mfe.govt.nz/publications/climate/scoping-report-environmental-assessment-ets-apr08/scoping-report-environmental-assessment-ets-apr08.pdf [Accessed 15 May 2008]

World Business Council for Sustainable Development. 2008. *Green barricade*. Financial Times, 24 January 2008. http://www.wbcsd.org/plugins/DocSearch/details.asp?type=DocDet&ObjectId=MjgyNDY [Accessed 29 April 2008]

6 Appendices

Appendix A: Baseload, mid-range and peaking electricity generation

There are three different modes of operation for electricity generation plants: baseload, mid-range and peaking.

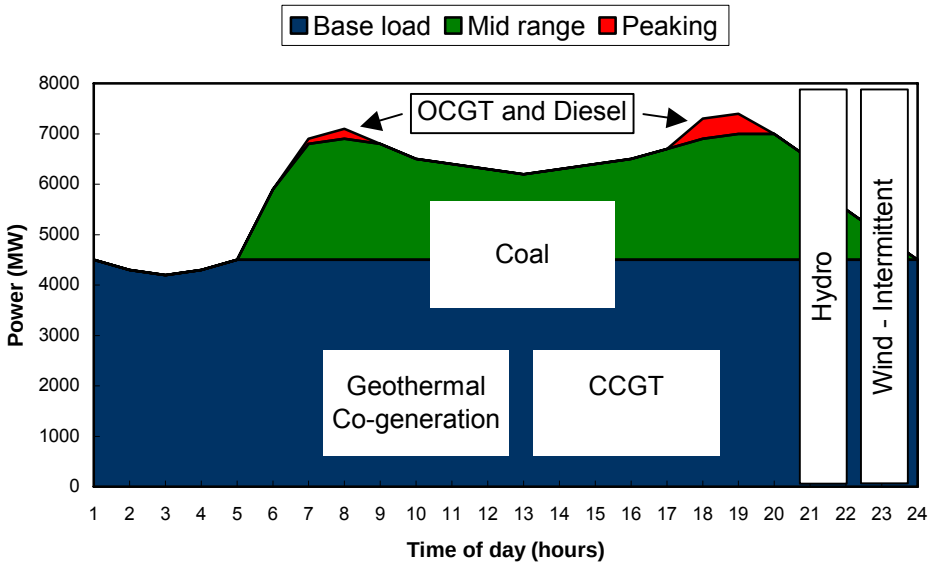
A baseload plant is commonly run most of the time that it is available. These types of plants include geothermal, wind, co-generation and combined-cycle gas turbines (CCGTs).

Peaking plants are used to meet peak demand and must be able to start up and shut down very quickly. Open-cycle gas turbines (OCGTs) and diesel generators are examples of peaking plants.

The coal-fired generators at Huntly have been used to help meet both baseload and mid-range demand. Hydroelectric generation can be used to supply baseload, mid-range or peaking electricity.

Figure 1 shows how load varies throughout the day, the modes of generation and the different types of power plants used to meet the load requirements.

Figure 1: Daily load variations and types of power plants used to meet the load requirements.



Appendix B: Comments on the proposed exemptions to the moratorium

Below are comments on the three of the five exemptions listed in proposed subs 62G of the Electricity Act, to be inserted under cl 67 of the bill. No comments have been provided on subs 62G(b)(iii), 62G(b)(iv), 62G(c), and 62G(d).

62G(a) Non-baseload exemption
Non-baseload plant that has a load factor or greenhouse gas emissions level below or less than prescribed limits.

This exemption is intended to allow the connection and operation of non-baseload fossil fuel plants. Two options for setting this exemption are given – having a load factor or an emissions level below prescribed limits.

The first option involves setting an upper limit on load factor. Baseload plants typically have load factors between 70 percent and 90 percent; a non-baseload plant would have a load factor below 70 percent.

According to Cabinet Paper CAB(07)607 the Minister of Energy has suggested setting the load factor limit below 40 percent.[13] Allowing an upper load factor limit of 40 percent should be more effective than 70 percent, but the choice of the limit is to be done through regulation.

As shown in Table 1, setting an upper limit on load factor alone does little to reduce CO_2 emissions. Fossil fuel plants with the same load factor can produce very different CO_2 emissions, not only in total, but also per MWh of electricity produced.

Three power plants – two existing and one proposed – all running with the same load factor of 40 percent are considered in Table 1:

- The Huntly power plant has four 250MW coal-fired steam generators.
- The Whirinaki power plant has three diesel turbines with an installed capacity of 155MW.
- Contact Energy has purchased two 100MW gas-fired peaking units to install at its disused Stratford power station site.

Table 1: Total annual emissions and emissions intensity for three different power plants – all running at a load factor of 40%.

Plant	Size	Type	Total emissions (1000 t CO_2 / yr)	Emission intensity (kg CO_2 / MWh)
Huntly	1000 MW	Coal fired	3,357	958
Whirinaki	155 MW	Diesel peaker	436	803
Stratford	200 MW	Gas peaker	370	528

These three different power plants produce very different amounts of total CO_2 per year. They also differ in emissions intensity, that is, how much CO_2 they emit per

[13] It actually says **above** 40 percent, but this is wrong.

MWh of electricity generated. But all three are envisaged as running at the same load factor of 40 percent.

The second option for allowing exemption 62G(a) is through setting a cap on CO_2 emissions. Such a cap could be set as a maximum number of tonnes of CO_2 per year or as a maximum emission intensity measured in kg CO_2 per MWh.

In the Cabinet paper, the former is envisaged with a suggested cap of 436,000 tonnes of CO_2 per year. Although this is the amount emitted by running Whirinaki at a 40-percent load factor, it is an arbitrary choice.

Still considering the three plants of Table 1 – Huntly, Whirinaki and Stratford – Table 2 shows the load factor at which each of the three plants could run and remain below the emissions cap proposed in Cabinet Paper CAB(07)607.

Table 2: Maximum load factor for three different plants given an emissions cap of 436,000 tonnes per year.

Plant	Size	Type	Maximum load factor (%)	Emission intensity (kg CO_2 / MWh)
Huntly	1000 MW	Coal fired	5	958
Whirinaki	155 MW	Diesel peaker	40	803
Stratford	200 MW	Gas peaker	47	528

CO_2 emissions from a fossil fuel plant depend on four main factors:

- the capacity of the plant measured in MW
- the annual running time. This is closely related to the load factor.
- the type of fuel. Gas is much more carbon-intensive than coal.
- type of plant. An open-cycle gas turbine (OCGT) is less efficient than a combined-cycle gas turbine (CCGT), and consequently emits more CO_2 per MWh.

A total emissions cap set at, for example, the 436,000 tonnes CO_2 per year suggested in the Cabinet paper, could be 'gamed' by building small plants instead of big plants.

For exemption 62G(a) to provide for some discrimination between proposed fossil fuel power plants, two limits would be required:

- a load factor limit. To avoid baseload plants being exempted it should be set at about 40 percent.
- an emissions intensity limit measured in kg CO_2 per MWh. If this limit were set at 600 kg per MWh, it would prevent the construction of new coal and diesel power plants.

62G(b) (i) (ii) Emergency / Reserve exemption
Is necessary or desirable for the purpose of mitigating the effects of an emergency.
Is necessary or desirable for the purpose of providing reserve energy.

Security of electricity supply is a major issue in New Zealand. As well as the transmission vulnerability of a single, long, direct current (DC) link, we cannot import electricity from other countries; there is relatively little storage capacity in our hydro lakes; and we cannot always rely on rain to fill those lakes.

It is difficult to define “emergency” or “reserve energy”. This is because the level of security built into our electricity supply is a choice about tolerable risk and stakeholders do not currently agree on the same level of risk.

62G(e) ‘Swap’ exemption

Will be connected and operated in circumstances where an existing thermal electricity generation plant will be retired in whole or in part and the specified generation plant together with any part of the existing thermal electricity generation plant that is not retired

(i) will significantly decrease greenhouse gas emissions (based on projected emissions assessed by the Commission rather than nominal output capacity); and

(ii) will not reduce security of supply margins.

This exemption has reportedly been added to achieve significant decreases in emissions by allowing replacement of the high emissions coal-burning units at Huntly with low emission gas turbines. However, the two sub-clauses to this exemption need to be defined more clearly.

Sub-clause (i) states that any replacement power plant will be required to significantly reduce greenhouse gas emissions. The bill does not explain what “significant” means. It also does not specify any time frames for comparing emissions. These details will be set in regulations.

Sub-clause (ii) states that the replacement plant will not reduce security of supply. Security of supply margins cannot be predicted very far into the future. Moreover, the envisaged replacement of Huntly coal generation with gas generation could be judged to decrease security of supply, given that future gas supplies are less certain than coal supplies.