Low-emissions economy: Issues paper

Submission to the Productivity Commission

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Introduction

Thank you for the opportunity to make a submission on issues associated with your inquiry into New Zealand's transition into a low-emissions economy.

Despite having made a series of international commitments, New Zealand is currently on track to overshoot its Paris target by about 20 million tonnes of carbon dioxide.[1] Our greenhouse gas emissions have climbed steadily since 1990, and we have yet to begin making a real transition to a low-emissions economy.

In theory, a cap-and-trade emissions trading scheme should help us reach emissions targets at least cost. More useful tightening of New Zealand's ETS is envisaged, but by itself the ETS will not be enough.[2] Of course, New Zealand could theoretically purchase carbon credits offshore to help meet the Paris commitment. But there is no guarantee that this will be possible.

We must be realistic – making such a transition will not be easy, and will require effort and investment. To do this, we need a clear and stable way ahead so that investments in low-carbon technologies can be made with confidence.

How this can be done is the subject of the first section in this submission – the need for New Zealand to enact legislation along the lines of the UK's Climate Change Act.

The Productivity Commission is charged with identifying how New Zealand can maximise the opportunities and minimise the costs and risks of making a transition to a low-emissions economy.

The second section in this submission highlights one of the great opportunities New Zealand has – the scope for generating even more low-carbon electricity. Forestry is another major opportunity which I have previously looked at in some detail.[3]

The third section in this submission is focused on the great risk of locking in high emissions. A failure to act early enough would see assets become liabilities.

These two sections draw on work done by Concept Consulting on the carbon dioxide reduction opportunities in the energy sector.[4]

Finally, in a fourth section, I show how the mandate of the Energy Efficiency and Conservation Authority needs to be changed to align with the goal of a low-emissions economy.

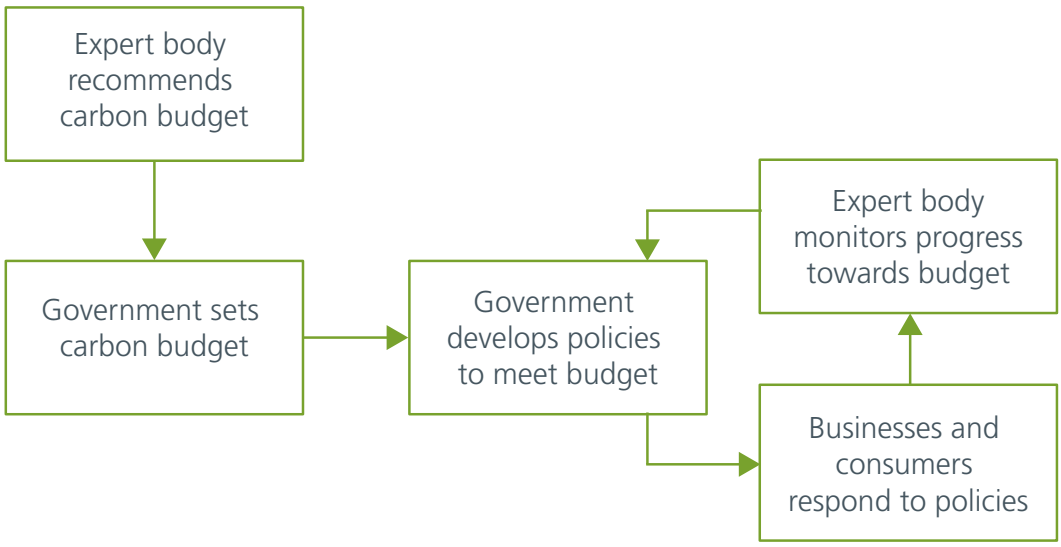
A UK-style Climate Act

I have become a strong advocate of establishing a new law that is modelled on the United Kingdom's 2008 Climate Change Act.[5] My last report, *Stepping stones to Paris and beyond: Climate change, progress, and predictability*, explains why.

The Issues paper contains one question about possible new legislation (Q28) and another question about an independent body (Q29). It is very important to note that in the UK, the independent body – the Committee on Climate Change – is one element of the comprehensive system set up in the Act. An independent advisory body set up on its own without the other elements would be far less effective.

The four elements of the UK 2008 Climate Change Act are:

- Emission targets in legislation
- Carbon budgets – the stepping stones to targets
- Policies set by Governments to ensure carbon budgets are met
- An expert body to provide objective analysis and advice



The flow diagram shows the process laid out in the UK's Climate Change Act.

As in the UK, an advisory expert body would only need a small number of staff forming a *"high-powered analytical machine"*.[6] But the ability to draw on the resources of other government agencies through a memorandum of understanding would be vital.

During the investigation into the UK Climate Change Act, members of my staff met with a number of private sector companies. They found a general frustration with the lack of stability in climate change policy.

Without a measure of predictability, companies cannot manage the risks of moving to a low-carbon economy. Nor can they invest with confidence in low carbon technologies.

Legislation that embodies the essential features of the UK Act cannot provide certainty, but it can provide a measure of the predictability that is sought by the private sector. That predictability comes primarily from the setting of carbon budgets that act as stepping stones towards targets. The technical and economic advice and the monitoring of progress by the UK Climate Committee on Climate Change is freely available unredacted to all, and helps provide stability through changes of Government.

The *Stepping stones* report continues to attract interest from the private sector. Following the launch of the report, Z Energy, Meridian, Dairy NZ, and Westpac all issued supportive press releases, and I have been busy giving presentations on the subject to a number of private sector audiences.

Investing in reducing greenhouse gases does not just add cost – it can also drive innovation.

With the best wind in the world, New Zealand could have positioned itself to be a world leader on wind energy – instead our own wind farms have relied on the expertise of Danish engineers. The setting of carbon budgets in the UK has led to the development of world-leading offshore wind generation, and to the redeployment of oil platform workers into this new industry.

Climate change is the ultimate intergenerational issue. Between now and the Paris target year of 2030, there will be five different Governments, so it is critical that different political parties work together on this great challenge. It is notable that the UK Climate Change Act passed in the House of Commons with only three MPs voting against it.

A great opportunity for New Zealand - low-carbon electricity

New Zealand has a great comparative advantage in moving toward a low-carbon economy – a wealth of opportunities to generate electricity without burning gas and coal. And this means that decarbonising transport would surely be easier for us than virtually any other country. However, in the Issues Paper, it is stated that New Zealand is disadvantaged by limited scope for further decarbonisation of the electricity sector. This misses the point. The point is how easily further gains can be made. While it is unlikely that more large hydro dams will be built, New Zealand has the best wind in the world and is rich in geothermal energy. Currently, resource consents have been granted for 14 wind farms, which collectively would generate more than three times as much electricity as the Benmore dam.[7]

The electricity grid is the friend of the climate. It is a key enabler of moving toward a low-carbon generation system for two main reasons.

- The grid enables large power plants to be built in optimal locations, so electricity can be generated at least cost.
- The grid enables the balancing of diverse renewable generation and demand variation across the country.

The grid is like public transport – something we all share in that can take us to where we need to go.

Compared with most other countries, relatively little fossil fuel is burned in thermal power plants in New Zealand. But this thermal generation is generally used at times when demand is high – early morning and early evening, especially in winter.[8]

Space heating and lighting are two important drivers of this winter peak. It follows that actions to reduce these uses of electricity – insulation, double-glazing, LED lights – will help reduce thermal generation and thus carbon dioxide. In contrast, increasing the efficiency of refrigerators is less helpful since they run continuously and use baseload power.

That electricity demand in New Zealand is at its highest in winter also means that rooftop solar panels are not very effective at reducing emissions. They contribute least when fossil fuel plants are most likely to be running.[9]

Electric vehicles would integrate well into our electricity system, especially if their charging was staged through the night when demand is low. Most houses have garages making night time charging straightforward. Well-timed charging would flatten peaks, reducing the need for thermal generation. The extra electricity needed to charge electric vehicles could be supplied by new wind farms and geothermal power plants.

A great risk for New Zealand - acting too late and locking in high emissions

It is critically important that we do not delay taking some significant actions to lower our emissions in the near term because we fear they may not be 'optimal'. Many high-carbon assets are long-lived major investments – the sooner we stop investing in such high-carbon assets, the better.

Three examples – internal combustion vehicles, poorly insulated buildings, and coal-fired industrial boilers – are used as illustrations below.

Internal combustion vehicles

Emissions from road transport have grown by nearly 80% over the last 25 years. Electric vehicles are a 'no-brainer' for New Zealand. Not only can we readily generate more low-carbon baseload electricity, most households have garages allowing for overnight charging.

If we could wave a wand and magically replace the light vehicle fleet (private and commercial) with electric vehicles, annual emissions would fall by about 11 million tonnes of carbon dioxide. Recall that New Zealand is on track to exceed its 2030 Paris target by 20 million tonnes of carbon dioxide.

But no such magic wand exists. Even though electric vehicle technology costs are projected to fall, the transition to electric vehicles will take several decades because New Zealand cars are typically not scrapped until they are 20 years old. A high but realistic electric vehicle uptake would reduce emissions by about 4 million tonnes by 2030.[10]

New vehicles are substantial investments. Every new light vehicle running on petrol or diesel will lock in emissions for about 20 years. It is encouraging that a group of major companies have committed to purchasing electric vehicles for their corporate car fleets.[11]

Poorly insulated buildings

Buildings are major investments built to last at least 50 years. Compared with other developed countries, New Zealand was very late to require insulation in new buildings. (Even current insulation standards are low by international standards.) This delay led to the construction of thousands of buildings that are expensive to heat.

While insulation is being retrofitted to many existing buildings, it is both more expensive and less effective than insulation incorporated during construction. The delay in mandatory insulation has locked in emissions and left us with an unnecessarily large legacy of cold damp homes.

Double-glazing was not made mandatory until 2009, and is still not required for new buildings in the north of the country. Why does New Zealand lag so far behind other countries when it comes to such regulations? I have begun to wonder if we take an overly simplistic approach to benefit-cost analysis when assessing potential regulations and other initiatives.

Some years ago, double-glazing was much more expensive than single-glazing. This would not have been because of the small difference in the cost of materials, but because demand was low and the market was small. Mandatory double-glazing in new buildings then would have increased demand. Increased demand leads to economies of scale in production and greater competition between producers, driving down cost.[12]

Coal-fired boilers

Industrial process heat emissions are dominated by a relatively small number of very long-lived super-large boilers. It is estimated that over 90% of these emissions are produced by less than 5% of the boilers, mainly in food-processing and methanol production. These super-large boilers cost many millions of dollars and last indefinitely provided they are maintained.

A boiler installed today may still be operational in the middle of the century. How then can we avoid these emissions being locked in?

There are two main considerations for the choice of boiler fuel – availability and fuel cost.

Five fuels can be used in boilers – coal, gas, geothermal energy, biofuel, and electricity. Of these coal has by far the biggest carbon footprint, and many boilers in the South Island are fuelled with lignite – the most emissions-intensive type of coal.

Although gas is a fossil fuel, its carbon footprint is about half that of coal. But gas is not available in the South Island. Neither is geothermal energy. Wood residues can only be used if there is enough available close enough to the plant, otherwise transport emissions become significant.

Boilers can be fuelled with electricity and electric boilers have a low capital cost, but are expensive to run. Moreover, in some cases new transmission lines may be needed if the very large food processing plants were to run on electricity.

Liquid biofuels are currently limited to the relatively small amounts that can be produced from food processing waste such as tallow. Rather than using this fuel to power heavy vehicles, it might be preferable to use it instead of coal in food processing plants.

The emissions from industrial process heat have grown rapidly over recent years. Coal-fired boilers are a particular challenge, particularly in the South Island because they are so long-lived and so emissions-intensive. This is an area urgently in need of research and innovation such as greater use of microwave technologies.

The Energy Efficiency and Conservation Authority

New Zealand's laws, regulations and policies have been developed over many decades, but the conviction that, along with the rest of the world, we must reduce carbon emissions is relatively recent. It is inevitable that there will be long-standing inadvertent barriers to reducing emissions.

One example is the mandate of the Energy Efficiency and Conservation Authority (EECA).

EECA is the government agency charged with working to improve the energy efficiency of New Zealand's homes and businesses, and encourage the uptake of renewable energy.

The focus on the distinction between renewable energy and non-renewable energy began with the oil price shocks of the 1970s. For many the primary aim for energy policy was to move from using up finite stocks of fossil fuels to capturing energy from sunlight, wind, and other sources that could not be depleted.

In recent years, it has become clear that the finiteness of fossil fuels is not the problem; rather the problem is the carbon dioxide emitted when fossil fuels are burned. The real scarcity is the limited ability of the atmosphere to absorb greenhouse gases without substantially changing the climate.

EECA's mandate should now be changed to that of working to reduce carbon dioxide emissions. Often renewable energy is low carbon, but this is not always the case.

For instance, geothermal energy is classed as 'renewable' under the Resource Management Act, the carbon dioxide that accompanies the generation of geothermal electricity varies widely. For instance, each kWh of electricity generated at the Ngawha power plant is accompanied by the release of nearly twenty times as much carbon dioxide as electricity generated at the Wairakei plant.[13]

Notes

1. See http://www.mfe.govt.nz/climate-change/reducing-greenhouse-gas-emissions/emissions-reduction-targets.
2. Very radical changes to the ETS would be needed if it is to be the sole mechanism for reaching targets. Reasons why the current form of the ETS is not enough include the following.
    - It is a cap-and-trade system without a cap. There is no direct connection between the ETS and greenhouse gas targets.
    - Allocations are made on an intensity basis, so while companies are incentivised to become more greenhouse gas efficient, emissions can still rise.
    - The carbon price is invisible to most residential electricity consumers because it is concealed in flat tariffs. Enforcing universal time-of-use tariffs would have major social impacts.
    - Including the biological emissions from agriculture in the ETS is fraught with challenges. So is not including them.
3. Parliamentary Commissioner for the Environment, 2016, *Climate change and agriculture: Understanding the biological greenhouse gases.*
4. See Concept Consulting, Summary insights into energy-related carbon-abatement opportunities. This report is available at www.pce.parliament.nz.
5. At least nine other countries have since passed similar legislation. These include Denmark, Finland, France, Ireland, Mexico, Norway, Scotland, Sweden, and Switzerland.
6. The first Chair of the UK Committee on Climate Change uses this phrase to describe the secretariat.
7. New Zealand Wind Energy Association (http://www.windenergy.org.nz/consented-wind-farms).
8. The amount of electricity generated by burning gas and coal also varies from year to year – thermal plants run more in dry years.
9. Moreover, widespread uptake of roof top solar panels would largely displace wind generation that would otherwise be built. Solar generation would likely make most sense at grid-scale where collectors can be located optimally and economies of scale would lower cost.
10. Based on a scenario where the proportion of new light vehicles that are electric increases every year until it reaches 100% in 2030.
11. In contrast with electric vehicles, electric bicycles are not major investments and their growing popularity may have a significant impact on emissions.
12. Costs are dynamic. Standard benefit-cost analysis used to assess potential regulations uses *ex ante* costs.
13. New Zealand Geothermal Association (https://nzgeothermal.org.nz/emissions/).