

# **A review for the NZ Productivity Commission of its report on Low-Emissions Economy (August 2018)**

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January 2019

# Introduction

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This is a review of the New Zealand Productivity Commission's report on the inquiry into a "Low-Emissions Economy" August 2018.

This review was undertaken in my private capacity under a contract with the Commission.

The Terms of Reference for this review are at Appendix A.

The Terms of Reference for the Commission's inquiry are at Appendix B.

# Summary Assessment

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## The Right Focus

“The relevance and materiality of the report”

The Terms of Reference for this inquiry were topical and relevant following the Paris agreement on climate change, and probably made even more so by the recent IPCC release of its report Global 1.5 degrees C. The Commission was asked to recommend how New Zealand can transform its economy into a low emissions economy while maximising its opportunities and minimising the risks. The importance of growing incomes and wellbeing while reducing its national emissions is emphasised. The Commission was asked to look across the economy, investigate the opportunities to reduce emissions and review how those would affect economic activity, over what time frame and what would be needed to make those changes successful. The Commission was specifically asked to look at the role of the ETS, other market solutions, regulation, innovation, barriers to investment, efficient land use decisions and maximising New Zealand’s comparative advantages in a carbon constrained world.

Specifically excluded were discussions of suitability of the emissions reduction targets and the veracity of anthropogenic change.

The Commission clearly outlined the task and the global background, took into account the current state of play and New Zealand’s distinctive emissions profile, commissioned quite extensive modelling of different scenarios and came up with recommended transformations of high emitting sectors which are significant in both scale and scope in the timeframes envisaged. Along with a reformed Emissions Trading Scheme (ETS) and pricing of biogenic methane, transforming both the light vehicle fleet and agriculture’s structure and management, along with numerous complementary policies, particularly encouragement of innovation, the Commission believes that New Zealand can achieve a low emissions economy by 2050, at a carbon price of between \$75 and \$250 per tonne CO<sub>2</sub>. Given the apparent general support for the approach, as evidenced by the submissions and post report evaluations these recommendations have the potential to guide one of the most significant changes to occur in New Zealand’s economy.

In such a broad enquiry I appreciate that not everything can be covered but a little more analysis of the political economy of the issue including behavioural and attitudinal change that will be required would have been helpful in considering the challenges of implementation. Identifying what the government might need to do to “sell” the story including the reasons for, explanations of, and benefits of, the policies over a sustained period ensuring the public that it will take care of those who will find the transition costly (both in financial and wellbeing terms).

It may have also been useful to have a little more analysis and discussion of relative GDP impacts, impacts on household incomes and employment over time etc but again the lengthy time frame under consideration might mean that the results stretch credibility.

The report will provide a seminal reference point for considerations of low emissions strategies for New Zealand for government, industry, business and households and individuals. As mentioned above, the subsequent evaluations from a representative focus group and a survey of a broad cross section of participants on the Commissions website reveal that most participants were generally very positive and made the point that the process and report had raised the level of debate about climate change in New Zealand which they clearly welcomed.

## Good Process Management

“The timeliness and quality of the inquiry process”

The Government issued the Terms of Reference for the Inquiry into the opportunities and challenges to a lower net emissions economy for New Zealand in April 2017 seeking a final report by 30 June 2018. Following a change of Government, on 22 December 2017, the new Government asked the Commission to take into consideration its intention to set a more ambitious target for 2050 – which may include setting a net-zero emissions target for 2050. The Commission included consideration of this request in its deliberations and produced an issues paper on 9 August 2017, its draft report on 27 April 2018 and its final report in August 2018. The passage of four months between receipt of the Terms of Reference and the issues paper seems rather long, given that maximising time for public response is usually desirable.

Given the scope of the initial Inquiry plus the additional work required, a two-month extension to the final report delivery date seems very reasonable. The Commission commissioned extensive modelling of different scenarios to evaluate their impact and the modelling reports are on the Commission’s website. The Terms of Reference also required the Commission to consult with a broad range of stakeholders including identified groups as well as the general public. The Commission appears to have consulted extensively and widely with 120 engagement meetings (including overseas), 15 conferences/seminars and 132 submissions responding to the issues paper and a further 269 submissions responding to the draft report. This level of interest was “unprecedented” for the Commission, however the post report survey of participants and focus group reports on the Commission’s website indicate a generally high degree of satisfaction with the process, with some expressing the view that the report had lifted the quality of debate about climate change in New Zealand. The Commission has also provided a summary report of the submissions on their website which indicates the broad range of those responding. The release of the final report was accompanied by a media release, the report “At a Glance” and a user-friendly graphic. Associated reports are also on the Commission website.

The Inquiry process appears to have been managed very effectively, including taking into account then additional work requested by the incoming government.

## High Quality Work

“The quality of analysis and recommendations”

The structure of the report generally leads to a logical flow of analysis with readable explanations of concepts at their introduction, prior to discussions of options and analysis, before leading to findings and recommendations. Given the breadth of the Terms of Reference, the report has excelled in its thoroughness. I would have preferred the discussion on the current state of climate policy in New Zealand to be in the earlier chapter setting the scene as there is an element of information being revealed progressively eg on the ETS when it would have been more helpful to the uninformed reader earlier.

Modelling work is presented in a remarkably readable manner with the arcane mathematics and assumptions available in separate reports on the Commission’s website.

The widely differing outputs of the two modelling exercises (one by the Commission and one commissioned by the Ministry for the Environment (MfE) suggest that there might be value in having modelling work of the Commission externally peer reviewed with the peer review report also placed on the Commission’s website. While modelling expertise is usually a bit limited in specialist topics peer review could reassure both the Commission and readers of the report that the conclusions are robust.

While there may have been an element of peer review in the fact that the Commission's modelling was undertaken by a consortium of three firms, partners in a consortium might struggle to be quite as independent as an independently commissioned reviewer.

Overall, the findings and recommendations are well supported by the preceding arguments.

## Effective Engagement

“How well the Commission engaged with interested parties”

As outlined above the Commission's Issues paper (released on 9 August 2017) called for submissions and asked 40 specific questions. The draft report (27 April 2018) contained 140 findings and 50 recommendations and asked 11 questions. Submitters had approximately two months to respond to the issues paper and six weeks to the draft report. The impressive level of interest expressed by submissions in response to both the issues paper and the draft report (totalling 401) resulted in the Commission preparing a report on the submissions (available on the Commission's web site) indicating that not all comments could be referenced in the report, that there is a lot of useful information in the submissions and that the report on submissions would provide a useful reference to those seeking further information or detail. In the final report there are frequent references to submitter's views, both positive and negative. The final report included a specific chapter on transitions absent in the draft and explicitly opens with commentary on the fact that submissions had requested a broader assessment of the impacts of transition and the Commission clearly responded.

The treatment of biogenic methane becomes more explicit in the final report, presumably a response to the feedback on the draft.

The Commission's website includes a very neutral analytical response to reports of a claim by Dairy NZ that the draft report's emissions pricing approach would cost an average dairy farmer in the vicinity of \$230,000 pa in 2050. The Commission says it was unsure of DairyNZ's assumptions, however it could only replicate the conclusion by assuming an emissions price of \$200 per tonne of CO<sub>2</sub> is in place and that no progress had been made to reduce on farm emissions up to 2050 plus a number of other somewhat unlikely assumptions. The Commission's analysis showed that to achieve net zero emissions by 2050, the emissions price would eventually need to be \$150 to \$250 per tonne of CO<sub>2</sub> by 2050.

While the time to respond to the draft report seems a little shorter than desirable, presumably the final deadline compressed the time period.

The Commission clearly made a significant effort to engage a diverse range of stakeholders and succeeded admirably in doing so,

## Clear Delivery of Messages

“How well the work is communicated and presented”

The report is clearly written although rather lengthy at 589 pages. As an author of such lengthy reports myself I am hesitant to suggest that there may be merit in a ruthless editing process because even though this is excellently written, the length is a bit daunting.

The use and style of graphics is excellent and I must single out Figure 15.8 on page 476 “Opportunities for reducing waste emissions”, having reached the end of that chapter trying to sort out the elements discussed, the figure is a model of clarity. The underpinning messages of the need for stable, credible, bipartisan policy are effectively drawn out repeatedly through the report so the reader is in no doubt about the prerequisites for even embarking on this transition. As well, to keep costs down, a focus on productivity and innovation is emphasised. Likewise, the main strategies of a reformed ETS, transformation of the light vehicle fleet into EVs, forest planting on a grand scale and substantial decarbonisation of agriculture are also clearly and often reinforced. The Commission also return frequently to the value of an early start to the transition to reduce costs and disruptions later.

As mentioned elsewhere, this will be a seminal study for emissions reduction in New Zealand of value to all stakeholders.

## Overall Quality

“The overall quality taking into account all factors”

As outlined above, the structure and writing in the report, the clarity, the presentation of complex modelling, the consultation process and use of external material, the thorough analysis of the economy and the impacts of decarbonising it, make this a document on which people can rely. This is critical given the gravity of the recommendations.

Low-Emissions Economy is a high-quality report of which the authors should be proud. It is an impressive analysis of transitioning an economy in a major way over a relatively short period and the unprecedented (for the Commission) interest in it and the post report feedback confirm this. It will obviously make a major contribution to the debate about New Zealand’s approach to emissions reduction and will likely be the benchmark against which other contributions on this topic are assessed.

## Having Intended Impacts

“What happens as a result of the Commission’s work”

The report is a comprehensive and pivotal statement on what needs to be done to transition the New Zealand economy to a low emission one while maximising the benefits and minimising the cost. The positive response of the report evaluations by the Commission following its release underline the value that developing the detailed approach to a low emissions economy is perceived to have had in elevating the quality of the national debate on climate change.

The Minister for Climate Change the Hon James Shaw put out a media release on 4 September 2018 saying that “the Government would consider the report alongside the more than 15,000 submissions received ...on the Zero Carbon Bill, together with other advice...” and that the “report highlights many areas we are working on, including establishing an independent Climate Change Commission and improving New Zealand’s Emissions Trading Scheme”. The Minister also referred to a number of other areas in which the Commission had made recommendations and in which the government is already working.

On 10 December 2018, in an interview with Carbon News the Minister emphasised his priority was “getting the legislation over the line, so that we can set up the commission. So that they can do the budgets. Do that and we can bend the curve...In fact it’s their report, more than anything, that I think alerted us to the significance of the next 10 years and the scale of what needs to happen at an industry level and a government policy level. The Productivity Commission report was what really took

us from a fairly academic conversation around temperature thresholds and targets and all that kind of stuff to the rubber hitting the road of what we will actually do about it. That's one of the reasons why I thought it was such a good report, was at quite a granular level... the Productivity Commission was getting to the point of going "we need something far more comprehensive than we've ever had before".

The Government's formal response is yet to be provided.

# Overview

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The report provides a compelling analysis of how New Zealand can transition to a low-emissions economy. As the Commission itself says the transition is “challenging but achievable”, with bipartisan support for both the change and general approach being critical to its success.

The Commission has undertaken a comprehensive analysis of New Zealand’s distinctive economy and recommended three central pillars of change as outlined in its media release: switch from burning fossil fuels to electricity and other low emissions fuels through large scale adoption of electric vehicles (EVs) in particular and alternative fuels by industry for process heat; replacing mostly more marginal sheep and beef farms with forests at an unprecedented scale and diversify agriculture with more horticulture and cropping and employment of more low emissions practices on farm.

The Commission points out that delay in starting the transition is likely to make the transition more costly and abrupt and reduce future options. The Commission also points out that the scale and speed of an adequate transition requires the Government to establish a comprehensive and durable climate change policy framework with legislated long-term targets for short and long-lived gases, a series of emissions budgets expressing these targets and establishing an independent Climate Change Commission to oversee the shift. The government should also reform the ETS (including applying it to agriculture) and price biogenic methane separately from the ETS.

Other policies are recommended to support the central arrangements and innovation and technological change is seen as critical to a transition which successfully keeps productivity and incomes high and fosters wellbeing. The Commission acknowledges that although New Zealand’s contribution to global emissions is tiny, it still has a responsibility to be part of the solution.

The report has 173 findings and 78 recommendations.

These matters are dealt with in more detail below.

# The report

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## Setting the scene

The TOR required the Commission to “identify options for how New Zealand could reduce its domestic greenhouse gas emissions through a transition to a low emissions future, while at the same time continuing to grow incomes and wellbeing”. In considering the transition, the inquiry was guided by two broad questions – opportunities to maximise benefits and minimise costs while continuing to grow incomes and wellbeing and how New Zealand’s regulatory, technological, financial and institutional systems, processes and practices could help realise those benefits and minimise the costs. The Commission recognised that the transition requires both a reduction in high emissions sources and increased emissions efficiency in production and consumption.

The Commission appropriately sets the scene with a brief overview of the global climate change problem – its uniqueness and “wicked” nature – it’s a one shot, a tragedy of the commons issue, everyday activities are involved, decision makers can’t control all the levers, delay is costly and future uncertainty complicates today’s decisions. The importance of a stable and credible approach is emphasised as is the need to engage the totality of a nation’s institutional arrangements in any approach. The science of climate change is taken as a given and New Zealand has committed to an emissions reduction of 30% by 2030 on 2005 levels under the Paris agreement, notwithstanding its likely more ambitious 2050 target which is considered in this report. The role of international units in meeting domestic commitments is briefly raised but the report’s emphasis is on domestic emissions reduction and the report also clarifies that it is not covering the area of climate change adaptation.

Chapter 2 very neatly and briefly sets out the basics of climate change science, the Paris agreement and the criticality of acting swiftly to reduce CO<sub>2</sub> emissions to net-zero in the second half of the century to keep temperature rise to less than 2 degrees. (This report predated the latest IPCC report (IPCC, 2018) which puts the case for limiting warming to 1.5 degrees – requiring net-zero CO<sub>2</sub> by 2050.) New Zealand’s unique emissions profile is explained, with agriculture and forestry contributing 50% of emissions along with an abundance of low carbon energy, its relatively high emissions per capita but it’s very low contribution to global emissions, its relatively high production of methane and nitrous oxide, the post 1990 increase in (transport) emissions and the role of population and economic growth in that increase. Progress towards current commitments and possible options for a long-term reduction target are raised. Current institutional arrangements and CO<sub>2</sub> reduction policies – especially the principal policy, the Emissions Trading Scheme complete the background picture.

## Low-emissions pathways

This section of the report provides the basis for the discussion in the rest of the report. It contains a thorough analysis of extensive modelling exercises undertaken to determine the feasibility of different levels of ambition, and where the opportunities and challenges might lie. This is followed by a detailed discussion on the issue of transitions with illustrations of previous transitions, their drivers and impacts to give an indication of the magnitude and impact of what might be involved.

The first phase of modelling looked at two emissions reduction targets (net emissions of 25 Mt CO<sub>2</sub>e in 2050 and net-zero emissions of CO<sub>2</sub>e by 2050), each under three scenarios (policy driven – eg high initial emissions prices, disruptive decarbonisation – fast technological change and stabilising decarbonisation – also fast technological change but reducing emissions in existing industries). The second phase of modelling included the same scenarios but with a variety of assumptions and uncertainties and the possibility of future changes of strategy. The modelling provides information on

the impacts of different choices on sectoral investment, economic activity, scale of land use and emissions. While acknowledging the imperfections and limitations of modelling particularly given the enormous uncertainties and long-time frames involved, it is useful particularly to compare the impact of different strategies under the same conditions. In brief the modelling was valuable in identifying that: New Zealand could move to a low emissions economy by 2050 at a price of between \$75 and \$250/tonne CO<sub>2</sub>e, depending on the target; that forestry expansion is critical to reaching the targets but will create challenges post 2050; expanding clean energy (renewables) and reducing fossil fuel use could assist in supporting a big move to electric vehicles (EVs); depending on the scale of forestry expansion, agriculture will likely continue changing from sheep and beef to tree planting and/or horticulture, though dairy might expand with technological innovations; early actions, increasing and broadening the application of, emissions pricing without delay and rapid technological change will reduce long term costs. However while the results (see p 15 of the modelling report – uncertainty analysis) indicate the emissions prices and implied costs (using net outlays on emissions units as a cost measure) in 2050 are lower under scenarios with higher prices in 2030, there is no cumulative measure of total economy-wide costs over time to show that the long run cost savings are greater than the short run higher costs.

There is some discussion of Stage 1 of alternative modelling commissioned by the Ministry for Environment (MfE) using the same targets and similar assumptions on new technologies in a CGE model which produced significantly higher emissions pricing than the Commission's modelling. Although the report suggests that the alternative GCE model focusses on a granular approach to the economy and the Commission's modelling focusses on greenhouse gas emissions at a fine level and the behaviours that influence them, it might have been useful to acknowledge in the report that the Commission's chosen framework does actually not allow for the analysis of economy-wide economic costs of different pathways. This was noted in the modelling report - interim results (p.14). Additional analysis might have been valuable to better understand the basis for the price differential. The report also notes that only stage 1 (preliminary results) of the MfE modelling was complete at the time the Commission's report was written, so it might be useful if Stage 2 of the MfE modelling sheds more light on the differential in emissions prices to publish an addendum to the report. As well, peer review of modelling, with the peer review placed on the Commission's website can assist in confirming the rigour of the work.

In the final report there is a standalone chapter on transitions to make clear that both increased emissions efficiency and a significant structural shift away from fossil fuels in New Zealand's economy - affecting jobs, businesses, investment activity etc - is essential to achieve the emissions reduction targets at reasonable cost. Examples of previous significant shifts over decades in the economy eg market reforms, major shifts in transport and land use are provided to indicate the scale and magnitude of what might be expected in decarbonising the economy and how a transition differs from gradual economic change. This discussion leads nicely to the final section which outlines the key policy and institutional factors necessary for an effective transition.

## Policies and Institutions

A significant part of the report is then dedicated to a discussion of the factors, policies and institutions relevant to a transition to a low emission economy and to ensure the benefits of the transition are maximised. The importance of policies, strategies and institutions being stable, bipartisan and credible for a successful transition is repeatedly emphasised.

Pricing emissions across the economy is seen as a fundamental element of incentivising "polluters" to minimise the costs of their actions and respond to the global "tragedy of the commons nature" of climate change. It can also decentralise decisions to the level with most relevant information on cost effective emissions reduction. A wide range of issues to do with trading and pricing schemes is canvassed - eg taxes vs subsidies vs trading, price floors, caps and levels, quantity caps vs price

caps, shadow pricing, auctioning vs free permits, use of international units, international competitiveness, carbon sequestration etc. There follows a detailed discussion drawing on a range of sources about New Zealand's current domestic Emissions Trading Scheme (ETS), and while acknowledging that a carbon tax can deliver many of the same outcomes as an ETS, the Commission concludes that building on and reforming what is in place already is less disruptive and more efficient than starting again. Thus there is considerable discussion about how the ETS might be improved to become an economy wide scheme that is both credible and effective, with the ability if required to link to international schemes. Given the export orientation of some sectors and agriculture in particular, free issue of emissions units for emissions intensive trade exposed (EITE) sectors with gradual withdrawal of permits in concert with the degree of implementation and escalation of emissions pricing on comparable products in competitor nations is a rational approach. Finally, the chapter provides recommendations on principles and issues to be considered in reforming both the structure of the ETS and the institutional framework necessary to deliver it effectively.

As highlighted by the modelling exercises, innovation, especially technological innovation, and especially if it comes early in the transition period, can significantly reduce the costs and speed up the pace of decarbonisation of the economy. As the report acknowledges, "it is the closest thing to a "silver bullet" to enable humanity to meet the challenge of avoiding damaging climate change" (p 148). New Zealand's uneven efforts at innovation, productivity improvement and commercialisation are noted and the chapter provides a range of institutional and policy suggestions for improving and stimulating the research and development environment. Some very interesting research on the impact of public policy support for clean technology demonstrates the relatively greater success of supporting focus in those organisations which already excel in that area, and the positive relationship found in OECD countries from 1990 to 2012 between the number of low carbon inventions and the stringency of national climate policy. Policies to incentivise low carbon innovation are effective and support for low carbon technologies can help swing the tide of the economy faster to a lower carbon future. Current research support for low carbon innovation is reviewed and perceived as patchy and poor and the Commission has a number of recommendations towards taking a more strategic approach, building on New Zealand's natural strengths (eg agriculture) in research and development.

Unsurprisingly the issue of investment receives detailed analysis. The challenge of redirecting capital to low carbon activities will be assisted by the stable, credible, bipartisan policies and institutions to which the Commission consistently returns. Much is also made of the importance of transparency of structured comparable climate change relevant information from both the public and private sectors and the need for government to ensure that barriers to redirecting capital or transparent disclosure are minimised. Targeted government support to low emissions activities and investments is seen as an essential element of a successful transition.

Laws and institutions is a critical chapter as it provides recommendations on the appropriate basis of an emissions reduction approach for New Zealand. It initially reflects on the fact that while New Zealand has a regulatory framework for reducing emissions, its effectiveness is questionable in the absence of..." political consensus, ...a plan for reducing emissions, ...central government leadership and ...policy coherence" p 207. Many and varied submitters were clearly exercised about this perceived failure of public policy. While these reflections make a cogent case for clear, strong appropriate laws and institutions, introducing this material in the introductory chapters as part of scene setting might have led to greater resonance of the oft repeated need for stable, credible, bipartisan policies, laws and institutions as critical to an effective approach to emissions reduction. The Commission, supported by submissions, then recommends the development and introduction of a "New Zealand tailored" Climate Change Act, using the broad principles and frameworks of the United Kingdom Climate Change Act and bearing in mind the regulatory framework underpinning another long-term policy issue - fiscal and monetary policy. Pros and cons of various potential elements of such an Act are canvassed as it fits into a long term economy wide emissions reduction strategy – eg target setting, emissions budgets, compliance, institutional style and responsibility, monitoring and reporting concluding relevant discussions with principle based findings and

recommendations. Recognition of the Treaty of Waitangi with a Treaty clause in the proposed Act is strongly supported along with mechanisms for Maori to advise Government on elements of the Act and to support a strong partnership. The role of leadership in delivering both this partnership and the partnership between a Climate Change Commission and Government Ministers is not underestimated.

From a wide ranging but detailed discussion on regulatory frameworks for emissions reduction policy more generally, the report then canvasses at some length a specific issue of particular New Zealand relevance – that of short and long lived gases. New Zealand’s distinctive emissions profile of a high proportion of short-lived gases (mainly biogenic methane CH<sub>4</sub>) relative to the high proportion of CO<sub>2</sub> in most other countries emissions profiles, has implications its regulatory frameworks, mitigation targets and trajectories. A detailed technical discussion of the properties of relevant gases, emission metrics and budgets follows and recognising that even though methane is a much more potent gas than CO<sub>2</sub>, the latter is a longer lived gas. This leads the Commission to recommend separate emission reduction targets and budgets for short and long lived gases, the inclusion of all long lived gases in New Zealand’s ETS and the introduction of a separate pricing scheme (either a separate ETS or quota system) for biogenic methane from agriculture and waste scheme.

The final chapter in this section of the report pulls a range of matters together such as dealing with the impacts of the transition on opportunity and equity, government support of information and training, coordination and coalitions of activities and investments, co-benefits and co-harms of mitigation measures, planning for “shocks” – eg the sudden closure of a large employer, and appropriate support for low income households disadvantaged disproportionately. The Commission acknowledges that submissions on the draft report suggested that it had been rather too narrow in focussing primarily on employment and impacts on low income households in its discussion of an inclusive transition. Among other things, this chapter covers the importance of information and support for opportunities that in some cases might otherwise be seen as negatives eg promoting premium and niche agricultural products if synthetic protein products with lower emissions and landscape impacts are successfully developed, marketed and widely adopted. The issue of government assistance to households, firms and regions is measured. Although the quantitative analysis of impacts on households of transport, energy and food expenditure with the implication of increases resulting from emissions pricing is brief, it is probably sufficiently indicative for a principle-based report such as this. The Commission concludes that a well designed and properly functioning social safety network along with complementary policies should be able to assist vulnerable households and regional and firm scale “shocks” should focus on tailored skills and labour market needs.

## Emission sources and opportunities

Six chapters are then devoted to major sectors of the New Zealand economy which will be required to play significant roles in emissions reduction and which, because of their particular characteristics, will, in the Commission’s view, require additional regulation and/or policies.

Currently, almost 50% of New Zealand’s emissions arise from agriculture and forests offset 29% of total emissions. To achieve a low emission economy, the Commission has recommended that by 2050 land planted to forests will need to increase by between 1.3 million and 2.8 million hectares. This puts land use change front and centre in any transition to a low emissions economy. Beef and sheep farming land will need to be converted to forestry (at an increased rate) and (along with some dairying land) could be converted to more profitable and less emissions intensive horticulture and cropping at a comparable rate to the last three decades. The Commission believes that the primary driver of this very significant change should be through the pricing of emissions from land use (agriculture and forestry) through the economy wide ETS (for nitrous oxide only) as well as an emissions price on biogenic methane, as this will drive change more quickly and systemically than relying on management practices, genetic and feed changes for instance. However, barriers to land

use change – including policy uncertainty, skills and training, sunk investments and risk of stranded assets, agrarian conservatism, understanding of markets and opportunities, uptake of technological developments etc. will require both government and industry leadership – with funding, advice, training, research and development into emissions reduction technologies eg a methane vaccine.

While most submitters who raised the issue supported a price on agricultural emissions – equity and efficiency were often cited; not surprisingly some farm groups were opposed. The issue of international competitiveness (as New Zealand exports more than 90% of its agricultural production) could be dealt with by free issue of emissions permits and subsequent gradual withdrawal, related to emissions pricing of competing products from other nations.

The Commission envisages a major transformation of transport, particularly light vehicles, to dramatically reduce emissions from their current level of 19% of total national emissions. New Zealand's dominant road transport system is characterised by a rapidly growing fuel inefficient, old light vehicle fleet. The current ETS emissions price is no deterrent to road use and the Commission believes that policies complementary to an increased emissions price will be absolutely essential to generate the change to low emissions vehicles, particularly Electric Vehicles (EVs), greater availability and use of public transport and other mobility alternatives that are required. The Commission recommends that to achieve a low emissions economy by 2050 the ambitious target of “nearly all vehicles entering the fleet would need to be EVs by the 2030s” (p 339). Given the current fleet is four million road vehicles, this is a massive task, especially considering that under business as usual a vehicle purchased now is likely to be replaced in 2031 and be scrapped in 2038. The Commission recommends a “feebate” on vehicles entering the fleet as the major policy to achieve this – potentially revenue neutral (depending on its parameters) a fee is charged relative to vehicle emissions higher than a benchmark and a rebate is provide for a vehicle with emissions below a benchmark. Adjustments could be made for low income households. Complementary policies to encourage EV uptake canvassed include assistance with charging infrastructure particularly in commercially unattractive areas, government procurement of EVs, phasing out tariffs and the critical need for regulatory and supply changes in the electricity sector. To expedite the overall transformation of transport, pros and cons of vehicle emissions standards, a “cash for clunkers’ scheme (unsurprisingly, not enthusiastically supported), and phasing out fossil fuels are covered.

New Zealand's electricity sector, with 85% generated from renewable sources (especially hydro) is a low emissions sector (approximately 5%), in contrast with Australia where electricity generates 30% of the nation's emissions because of its high reliance on coal. However New Zealand does have some fossil fuel electricity sources – for daily peak demand and dry years. Having a low emissions electricity sector is an advantage in decarbonising an economy, especially for example in switching from fossil fuel transport to EVs or in generation of industrial heat. However significant structural changes, like that proposed, leading to greater reliance on electricity, mean the closure of fossil fuel power sources and population growth will generate not only an increased demand for electricity but a challenge in ensuring that power is constantly available on demand at reasonable cost. While New Zealand's significant wind resources provide a potentially abundant source of low emissions energy, given wind power's capacity of about 30%, the Commission cautions there will need to be careful consideration of the transition path. The sector is covered by the ETS but the Commission recommends caution in setting emissions targets in the sector prior to a clear understanding of the transition path, it cautions against picking winners in technology eg by subsidising renewable energy, it recommends that the governance and regulatory arrangements be carefully reviewed for the inclusion of demand response and increase in distributed energy and generally suggests that careful and considered progress is necessary to avoid a costly and disruptive transition. It makes the point that “an effective emissions price will help weigh the efficiency of reducing emissions in electricity against possibly lower-cost options to do so in other sectors” (p 400).

As well as this overriding message the Commission suggest review of a number of policy statements and planning instruments to remove impediments to the development of the renewable sector and reviewing the sectors statutory framework to ensure it has contemporary relevance.

Emissions from industrial sources generate 15% of New Zealand's gross emissions: about half from fossil fuels to produce process heat in manufacturing and the balance from industrial processes and product (IPPU) eg production of iron, steel, aluminium and cement and hydrofluorocarbons replacing ozone depleting substances in refrigeration and airconditioning. Decarbonising this sector will be a significant challenge for New Zealand given the relatively constrained alternative low emissions options currently available. The Commission suggests that there are options to increase efficiency of production thereby reducing emissions to some extent, but that a major reduction in emissions will require fuel switching. The Commission's modelling suggests that a carbon price between \$40 and \$120 per tonne depending on the current fuel source will generate switching to a lower emissions fuel. Electricity and biomass offer some possibilities but iron, cement, steel and aluminium production will require technological breakthroughs for substantial emissions reduction. Carbon capture and storage (CCS) is regarded as a long-term possibility but certainly not an option in the foreseeable future. This does not appear to bode too well for the long-term future of those industries.

Emissions from organic solid waste to landfill (largely methane) CH<sub>4</sub> and wastewater treatment and discharge (methane and some nitrous oxide N<sub>2</sub>O) make up about 5% of New Zealand's emissions. Beefing up the two-pronged approach currently in place is supported by the Commission. This involves reducing waste volumes via a waste disposal levy and better waste management (as methane emissions can be reduced by landfill gas recovery or anaerobic digestion) via the ETS emissions price. Increasing the price of both instruments and applying them to all solid waste and waste water sites along with some planning reforms is regarded as the most efficient way to achieve reduced emissions. The main barrier to implementing all this is the poor data on waste and treatment sites. The Commission supports a program to gather this data and to progressively apply waste disposal levies and management arrangements as more sites are brought into the system.

The final chapter in this section on the opportunities and challenges from the main emissions sources in the New Zealand economy is on the built environment. This includes emissions from buildings and infrastructure and the production of their materials, their construction and operation and destruction and disposal. The chapter also considers how the configuration of urban environments can affect emissions. The speed of change in this area is likely to be relatively slow as the majority of building stock that will exist in 2050 is currently in place and major change in the configuration of urban environments is generally, though not always, gradual. Interestingly in the construction and operation of buildings, the majority of emissions across its lifecycle are generated in the operation of a building – mainly from energy use. However, tools are available to assess life cycle emissions prior to construction. Along with a higher carbon price, the Commission recommends that the Energy Efficiency and Conservation Authority be given a new mandate to promote the use of low emissions energy sources and materials – which would apply to building materials (and also to industrial processes and product use). Improving energy (especially electricity) efficiency in building use will assist with meeting the increased demands for electricity from other sectors. The Commission is cautious about recommending a raft of new programs or amend existing programs related to building and construction to focus on emissions and suggests that program reviews assess the costs and benefits of including low emissions in a program's mandate prior to acting. A discussion of urban environments including higher density accommodation, public transport and accessibility suggests that these issues need to be considered together and that an emissions price (or shadow price in the interim particularly for government) will drive lower emissions decisions.

## Achieving a low-emissions economy

The final chapter of the report brings together the Commission's main findings and outlines what is required in the short term to launch a productive transition. The Commission reiterates the global nature of the challenge, the fact that the transition will be significant for New Zealand and its population and that it is recommending three big transformations: away from fossil fuels to low emissions energy including a wholesale move to EVs and changes to process heat for industry, an unprecedented scale and pace of forest planting and changes to the nature and operation of agriculture such as decreases in sheep and beef and possibly dairy farming and increases in horticulture and cropping.

Such a transformation will have benefits (that will be more obvious to New Zealanders) beyond reducing emissions – environmental and health in particular – but there are clearly costs and risks – for livestock producers, for industrial production like steel aluminium and cement and heavy transport. Achieving a transformation is heavily reliant on technological innovation and if it is successful it will be disruptive for industries, businesses and individuals. Appropriate targeted support is likely to be needed but the challenge will be to provide support while maintaining the incentive to change.

To achieve this scale of change the Commission recommends over the next two years reforming the ETS especially raising the emissions price and broadening its coverage, introducing a separate price on methane, including in the Zero Carbon Bill being developed the emissions reduction targets and the concomitant emissions reduction budgets, and the establishment of a Climate Change Commission to oversee this transformation. Investment in the innovation system and the development of complementary policies should be initiated. Critically, the Commission views bipartisan agreement to the approach as an essential prerequisite to success.

## Discussion

This Inquiry has been a significant undertaking – with broad terms of reference – “to recommend how New Zealand can maximise the opportunities and minimise the risks of transitioning to a low emissions economy”. The Commission has covered a range of issues, looked broadly at the economy and its sectors, commissioned extensive modelling of scenarios, consulted widely with stakeholders and taken into account the history and current domestic settings including New Zealand's contribution to global emissions. This analysis is counterbalanced with the global imperative to reduce emissions, New Zealand's Paris commitment and the ambition of a new Government to make very substantial reductions in emissions by 2050.

The report has covered the major sectors of the economy well and clearly taken into account the unique nature of New Zealand's emissions profile. The Commission's report should provide reassurance that a low emissions target can be achieved by 2050 at an emissions price between \$75 and \$250 per tonne CO<sub>2</sub>. If adopted the Commission's recommendations mean the task ahead is extremely ambitious – which they acknowledge. There is always a tension between ambition and achievement and the Commission has handled this well reviewing changes to date in the relevant sectors and assessing benefits and costs. The Commission also acknowledges the challenge of looking ahead some thirty years. It is hard to imagine that in 1989 anyone foresaw the digital transformation, the scale of development of renewable energy and the changes in agricultural production and practice, let alone the growth in carbon emissions that has occurred. So the Commission has had a particularly challenging job.

However, the speed and scale of change on which the emissions reduction is predicated may need to be closely monitored to determine if additional policies are required to expedite things. Considering the scale of increase in forestry, potentially up to an additional 10% of New Zealand (on my calculation) would be projected to be planted with forests in in the next 30 years. Changing from beef,

sheep and dairy to more horticulture, cropping, and possibly dairy and potentially niche beef and sheep is likely to be challenging in the extreme given sunk investment, skills and understanding of markets. The Commission points out that 30% of pastoral farmland, 3 million ha, has changed to other uses including nonfarm use between 1990 and 2015 and before 1990 sheep and cattle made up some 95% of New Zealand's livestock. Since then, beef has fallen 20%, dairy cattle numbers doubled and sheep numbers halved. So large scale transformation in the sort of time frames required is possible but as the Commission points out while the move to dairying has caused some negative impacts for rural communities, increased incomes for those remaining in the industry has been positive. The move to dairying was no doubt driven by increased profitability and whether the same will be true for an emissions price driven change in farming is unclear. The report does not seem to spend a lot of time on the political economy of the proposed transition such as the government explaining and publicising its policies and the reasons for their use. This includes how complementary policies help support transitions especially for low income households even though this may be needed for public support of emissions reduction policies, particularly given the fluxes in the ETS price and the history of discussions about including agriculture in the ETS..

The transformation proposed for light vehicle transport is perhaps a more heroic challenge. The behavioural changes required will be significant and given the current cost of EVs relative to the current fleet, the level of the feebate is likely to be critical in encouraging purchasing an electric vehicle. The Commission points out that to meet the 2050 target nearly all vehicles entering the light vehicle fleet need to be EVs by the early 2030s. With an average vehicle age of 14.2 years (having grown from 11.8 years in 2000) and another five years on the average life of a vehicle prior to being scrapped, there might be a need for very active encouragement to get people to bring forward their car purchases and to be prepared at least for the immediate future to buy a more expensive vehicle. It is interesting that the Commission has focussed on a particular technology for the transition in motor vehicles but stresses the importance of technology neutrality for energy.

The challenges that increased demand for (low emissions) electricity as a result of population growth, emissions pricing, the transport revolution and the changes brought to industrial processes and products are well identified and articulated. Predictability in the electricity system for the smooth functioning of the economy is vital and the Commission's recommendations appear to provide an appropriate direction for moderated change while keeping the lights on and costs reasonable.

The extensive modelling that was undertaken for this report has assisted the Commission in evaluating different strategies and understanding likely benefits and impacts. Emissions prices from the Commission's modelling are comparable with prices from other models, but are very different from the emissions prices from the modelling commissioned by the MfE, as outlined earlier. The MfE modelling of scenarios leads to emissions prices which translate to lower GDP, lower gross national disposable income (GNDI) per household and lower wages. Although the MfE scenarios are based on very limited sectoral innovation eg energy only and the results are preliminary (Stage 1) compared with the Commission's modelling involving multiple sectoral changes, the differences seem worthy of further investigation. An initial carbon price of \$75 per tonne is high and the economy-wide lifetime impact of the carbon price under different scenarios on households and sectors would be useful for policy makers to understand. Given the importance of understanding the impact of scenarios on emissions prices and their translation into the health of the economy the importance of reassuring industry, business and the public about the wisdom of particular policy choices is paramount.

The Commission has also proposed a number of complementary policies to strengthen the impact n emissions price. While in some cases it suggests an analysis of costs and benefits of these policies prior to proceeding, some more comprehensive work to assess their costs and benefits would also seem prudent.

## Conclusion

The Commission has undertaken a rigorous piece of investigation which has produced an ambitious but credible strategy to transform the New Zealand economy into a low emissions economy. The proposed approach which submissions indicate is generally supported, builds on existing ETS arrangements with additional policy interventions where more encouragement is seen as required. The pace and scale of change proposed is challenging and if achieved will lead to a rapid transformation of the economy. The support of the individuals, households, businesses and industries of New Zealand will be required for the transformation to be successful. But as the Commission points out, this transformation will not even start unless bipartisan agreement can be achieved.

# Reference

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IPCC, 2018. Global Warming of 1.5oC.

## Appendix A: Terms of Reference for this review

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### Review of Low Emissions Economy inquiry (final) report

#### Background

An independent review of the Low emissions economy inquiry report is a valuable opportunity for the Commission to learn from a recognised expert in the field about what we done well and what we could have done better. The deliverable would be a relatively short report (20-30 pages) summarising the evaluation that we could publish on our website, quote in reporting our performance (e.g. in the Annual Report) and use in improving our performance. You should feel free to speak with a few stakeholders, as you see useful.

#### Deliverables

The deliverable is a short report of your review of the Commission's inquiry final report: 'Low emissions economy' (**August, 2018**)

The review should evaluate (based mainly on the final report) the quality of the 'Low emissions economy' inquiry against the following performance measures:

- **The right focus** – the relevance and materiality of the final report inquiry report in meeting the TOR.;
- **good process management** – the timeliness and quality of the inquiry process;
- **high quality work** – the quality of the analysis, findings and recommendations;
- **effective engagement** – how well the Commission engaged with interested parties;
- **clear delivery of messages** – how well the work is communicated and presented in the final report; and
- **overall quality** – the overall quality of the inquiry taking into account all factors

Note that the Commission's performance framework also contains another dimension:

- **Having intended impacts** – what happens as the result of the Commission's work

While it is mainly too early to judge this aspect, you should make any observations that you feel you can make.

We are particularly interested in whether you think the inquiry has increased understanding of climate change policy and transitioning to a low emissions economy, and helped lift the standard for high quality policy advice in this area.

The review should note any lessons that can be taken and make recommendations for any future improvements.

Finally, the report should contain a 'summary assessment' (or alternate name) that summarises your perspective on each of the performance dimensions (a short paragraph on each) – this is useful for the Commission's Annual Report.

## Appendix B: Terms of Reference for the inquiry Low-Emissions Economy

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26 APR 2017

Mr Murray Sherwin  
Chair  
Productivity Commission  
PO Box 8036  
The Terrace  
WELLINGTON 6143

Dear Murray

### **TERMS OF REFERENCE FOR INQUIRIES INTO THE OPPORTUNITIES AND CHALLENGES OF A TRANSITION TO A LOWER NET EMISSIONS ECONOMY FOR NEW ZEALAND**

I am pleased to refer to you the Terms of Reference for a Productivity Commission inquiry into the *Opportunities and Challenges of a Transition to a Lower Net Emissions Economy for New Zealand*.

This inquiry into *Opportunities and Challenges of a Transition to a Lower Net Emissions Economy for New Zealand* will seek to identify options for how New Zealand could reduce its domestic greenhouse gas emissions through a transition towards a lower net emissions future, while at the same time continuing to grow incomes and wellbeing.

I wish you all the best as you commence this inquiry and look forward to your results.

Yours sincerely,

Steven Joyce  
**Minister of Finance**

## Minister of Finance

### **Terms of Reference - New Zealand Productivity Commission Inquiry into the Opportunities and Challenges of a Transition to a Lower Net Emissions Economy for New Zealand**

Issued by the Minister for Climate Change Issues, the Minister of Finance, and the Minister for Economic Development (the “referring Ministers”). Pursuant to sections 9 and 11 of the New Zealand Productivity Commission Act 2010, we hereby request that the New Zealand Productivity Commission (“the Commission”) undertake an inquiry into how New Zealand can maximise the opportunities and minimise the risks of transitioning to a lower net-emissions economy.

#### **Context**

New Zealand is part of the international response to address the impacts of climate change and to limit the rise in global temperature, requiring a transition of the global economy to one consistent with a low carbon and climate resilient development pathway.

New Zealand has recently formalised its first Nationally Determined Contribution under the Paris Agreement to reduce its emissions by 30 percent below 2005 levels by 2030. The Paris Agreement envisages all countries taking progressively ambitious emissions reduction targets beyond 2030. Countries are invited to formulate and communicate long-term low emission development strategies before 2020. The Government has previously notified a target for a 50 per cent reduction in New Zealand greenhouse gas emissions from 1990 levels by 2050

New Zealand’s domestic response to climate change is, and will be in the future, fundamentally shaped by its position as a small, globally connected and trade-dependent country. New Zealand’s response also needs to reflect such features as its high level of emissions from agriculture, its abundant forestry resources, and its largely decarbonised electricity sector, as well as any future demographic changes (including immigration).

The government is already taking action to support meeting the 2030 target. This includes reviewing the New Zealand Emissions Trading Scheme (NZ ETS), encouraging the up-take of electric vehicles and other energy efficiency technologies, and developing links with emerging international carbon markets. It has also founded the Global Research Alliance to fund research into emissions mitigation in pasture-based livestock systems.

However in the long-term - 2030 and beyond - New Zealand will likely need to further reduce its domestic emissions in addition to the use of forestry offsets and international emissions reduction units, although these will continue to remain an

important part of the country's climate change response for meeting targets at least cost.

This has the potential to influence the direction and shape of the New Zealand economy as the country seeks to balance the need to reduce domestic greenhouse gas emissions with preserving and enhancing economic wellbeing.

Taking action to transition to a low net emissions economy would involve a gradual change to the country's pattern of economic activity in order avoid a potentially costly and disruptive economic shift in the future. How such a change occurs, however, will not necessarily be linear.

### **Scope and Aims**

The purpose of this inquiry is identify options for how New Zealand could reduce its domestic greenhouse gas emissions through a transition towards a lower emissions future, while at the same time continuing to grow incomes and wellbeing.

Two broad questions should guide the inquiry:

*What opportunities exist for the New Zealand economy to maximise the benefits and minimise the cost that a transition to a lower net-emissions economy offers, while continuing to grow incomes and wellbeing?*

To answer this, the inquiry will need to examine New Zealand's current patterns of economic activity and the ways in which these are contributing to the country's greenhouse gas emissions.

It will then need to consider the different pathways along which the New Zealand economy could grow and develop so as to achieve New Zealand's emissions targets, as well as respond to the physical effects of a changing climate.

The inquiry will then need to analyse the respective opportunities and risks offered by these pathways, and identify which pathways offer the best outcomes in terms of both growing incomes and wellbeing and reducing domestic net-emissions

This will require the Commission to consider how patterns of economy activity may need to change, including over what timeframe and at what cost, to achieve the potential benefits of these future pathways, and what strategies the government could use to maximise these benefits through regulatory systems, behavioural change, and economic incentives.

As part of analysing these pathways, the inquiry should also examine how they could affect broader economic objectives for increasing wellbeing and achieving higher

living standards, including sustainability, economic growth (including productivity growth), increasing equity, social cohesion, and resilience to risk.

*How could New Zealand's regulatory, technological, financial and institutional systems, processes and practices help realise the benefits and minimise the costs and risks of a transition to a lower net emissions economy?*

The inquiry should examine the range of current and potential government interventions that could both support a transition to a lower net emissions economy and support growth of incomes and wellbeing.

In particular the inquiry should include the following:

- a. the role of the NZ ETS in supporting New Zealand to transition to a lower net emissions economy, building on the Ministry for the Environment's Stage II review
- b. the role of other market-led solutions, direct regulation (such as minimum fuel efficiency standards) and non-regulatory interventions (including aspirational targets) in a low net emissions transition
- c. how the science and innovation systems (including research and design) could better support the development of low emissions technologies, and whether there are any barriers (regulatory or otherwise) to the deployment and uptake of these technologies
- d. whether there are any barriers in New Zealand to undertaking domestic investment to reduce net emissions, and what the government could do to reduce or remove these barriers ((e.g. green bonds, public private partnerships, risk-sharing finance, climate-related disclosure requirements)
- e. how to encourage efficient land-use decisions that take into account the costs and benefits of greenhouse gas emissions and abatement (including how costs and benefits may be affected by applying carbon prices or other interventions to different activities) and concerns about international competitiveness
- f. how to maximise New Zealand's comparative advantages in a carbon constrained world, including the timeframes for any relative advantages from market premiums or market access risks.

## **Report and Recommendations**

The inquiry should explore New Zealand and international research and experience related to both the questions above. However, the focus should be on practical applications relevant to New Zealand's circumstances.

The inquiry should have a long-term focus, while being cognisant of New Zealand's 2030 and 2050 emissions reduction targets.

The final report should provide credible recommendations for how New Zealand should manage a transition to a lower net emissions economy, while still maintaining or improving incomes and wellbeing.

### **Exclusions**

This inquiry should not focus on the suitability of New Zealand's current, or any future emissions reduction target. In addition, the inquiry should not focus on the veracity of anthropogenic climate change, and should only consider the implications of a changing climate to inform consideration of different economic pathways along which the New Zealand economy could grow and develop.

### **Consultation**

Given that climate change is an economy wide-issue, the Commission should consult with a broad range of stakeholders including: central and local government, the Climate Change Iwi Leadership Group, relevant industry and NGO groups, scientific and academic bodies and the general public.

This inquiry is intended to complement and take account of existing policy work (particularly the Stage II review of the NZ ETS) and other current evidence gathering groups exploring issues related to climate change, including the Biological Emissions Reference Group, the Forestry Reference Group, and the GLOBE-NZ commissioned work by Vivid Economics.

### **Timeframes**

The Commission should present a final report to referring Ministers by 30 June 2018.

HON PAULA BENNETT, MINISTER FOR CLIMATE CHANGE ISSUES

HON STEVEN JOYCE, MINISTER OF FINANCE

HON SIMON BRIDGES, MINISTER FOR ECONOMIC DEVELOPMENT

