RESEARCH NOTE

When the facts change: How the ICCC saved New Zealand from a policy disaster

THE NEW ZEALAND INITIATIVE

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Executive Summary

When the facts change, I change my mind. What do you do, sir?[1]

The government's decision to put the 100% renewables policy on ice and prioritise other more effective emissions policies was because an expert committee dared to rewrite its terms of reference and do something the government had not asked for: test the policy.

And it was not just any policy but the flagship environmental policy of a newly elected government. Enshrined in the coalition agreement between Labour and the Greens, the policy committed the country to generating all of its electricity from renewable sources by 2035 in "normal hydrological years".[2]

Analysis by the Interim Climate Change Committee (ICCC) showed that although 100% renewables would lower electricity sector emissions, it would also raise the cost of electricity – this jeopardises far greater emissions reductions elsewhere in the economy. Effectively, 100% renewables would make New Zealand's overall emissions targets even harder to achieve.

The interim committee found the 100% renewables policy will:

- increase the average cost of electricity for households by 14% or nearly $270 each year
- increase the cost of electricity by 20% for commercial users and by 39% for industrial users
- reduce electricity sector emissions at a cost of up to $1,280 per tonne of carbon, far higher than the alternatives
- affect low income households the most, making the policy regressive, and
- make blackouts up to 100 times more likely.

The committee concluded in its report in April the government should prioritise accelerated electrification over the 100% renewables policy.

Results of the interim committee's analysis were consistent with those of *Switched On!* a report released by The New Zealand Initiative in March.[3] We found the 100% renewables policy could add $800 million to the annual cost of electricity, avoid emissions at a cost of over $1,000 per tonne, and, as the interim committee found, effectively raise emissions by delaying a transition from fossil fuels to cleaner electricity in transport and industry.

The interim committee's findings were not what the government was probably hoping for from its independent experts. The government had a difficult decision to make. On 16 July, Energy and Resources Minister Megan Woods announced the government had accepted

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the interim committee's recommendations.[4] The 100% renewables policy would remain aspirational until technology meant it could be achieved while keeping electricity affordable. The policy would be reconsidered every five years. In the meantime, the government would shift its focus to accelerated electrification.

It is hard to overstate the significance of the interim committee's findings and the government's response to the committee. A flagship environmental policy has been put on hold on its environmental merits. The interim committee's immediate contribution is to allow New Zealand to avoid a counterproductive policy that would have effectively harmed the environment and at considerable expense to households and businesses. That alone makes the findings of the interim committee consequential.

But the committee's greater contribution may be to show that emissions policies can be tested for their effects on emissions, and that the results of testing can change a government's policy. Emissions policies vary enormously in their performance. Overseas research, as well as the interim committee's findings, shows with disturbing regularity how emissions policies can reduce emissions at huge expense, or even raise emissions in some cases. The single most important factor that will decide New Zealand's success in reducing emissions will be the ability to find and scale policies and approaches that are effective, and avoid policies like 100% renewables. Just by not doing ineffective or counterproductive policies and redirecting resources into more effective measures, the government could double the performance of its emissions policies. That is why the government's decision to shift priorities based on the effectiveness of a policy is so significant. The interim committee has revealed a political market for environmental policy that is effective. And this is a process that can be repeated.

However, New Zealand has avoided a policy disaster by only the narrowest margin. If political parties are going to adopt policies that propose to intervene in complicated chains of production to lower overall emissions – something that parties have every right to do – mistakes like 100% renewables are going to happen again. Testing is an essential filter that will make emissions policies safe for the environment and for living standards.

Without the assertive actions of the interim committee, New Zealand would have almost certainly been stuck with the sort of counterproductive policy that will continue to plague countries like Germany, Britain and Australia for the foreseeable future. The interim committee is directly responsible for avoiding an environmental and economic disaster. That makes the committee's report on electricity among the most valuable ever produced in this country.

Background

In October 2017, a month after New Zealand's general election, the Labour and Green parties signed a confidence-and-supply agreement, one of two that brought the coalition government to power. That agreement contained a number of policies, including 100% renewables,[5] and a commitment to establish a permanent new entity, the Climate Change Commission, as an independent monitor and advisor to the government on climate change. The legislation that would establish the Commission was more than a year away, so the government decided to establish a committee to prepare advice for the incoming Commission. In April 2018, the Minister for Climate Change announced the seven well-credentialled and respected members of its Interim Climate Change Committee (ICCC).[6]

But there was a problem. The committee suspected that the 100% renewables policy might not work as advertised. New Zealand's electricity system was already among the cleanest in the world. Renewables were generating up to 85% of the country's electricity, a share that is expected to increase to over 90% in the 2030s. There was only so much more the 100% renewables policy could do to reduce emissions. Larger emissions reductions might be possible in other sectors such as transport and parts of industry through a transition off fossil fuels on to electricity. Transport and industrial heating processes produce over five times more emissions than electricity.[7]

But electrification could be slowed or halted entirely if a policy like 100% renewables increased the cost of electricity. Even if 100% renewables reduced emissions from the electricity sector, it could effectively raise overall emissions by preventing far greater emissions reductions in transport and industrial heating.

The theory needed testing. After the committee was established, its chair, David Prentice, wrote to the Minister of Energy and Resources, Megan Woods, seeking amendments to its terms of reference to allow the committee to test the policy's overall effect on emissions, taking into account the downstream consequences for electrification. The government agreed to the changes, and the committee began its work.

The Committee's two-part analysis

In the first part of its analysis, the interim committee wanted to understand the impact of 100% renewables on emissions and on the cost and price of electricity. To do this, it developed three scenarios, taking as given the existing mix of electricity market settings and regulation, and tested them using existing models of the New Zealand electricity system developed by the academics and consultants to the interim committee (see Box 1).[8] The committee's three scenarios were:

Scenario 1 – Baseline: Under this "business as usual" scenario, energy and other policies would continue unchanged until 2035, the year the 100% renewables policy would come into effect and the reference year for all results of the committee's analysis. Modelling would track investment in new generation until 2035, and show the resulting cost, prices and emissions paths. Investment occurs when electricity demand is sufficient to recover costs, and each investment is in the lowest-cost type of generation available at that time.[9] Scenario 1 is the "no policy" yardstick against which the effects of the 100% renewables policy are detected.

Scenario 2 – 100% renewables: In this scenario, investment choices are constrained to exclude thermal generation (coal, diesel and gas), and existing thermal capacity is exited ahead of 2035. Other model settings, such as assumed growth in electricity demand and technology changes, were left unchanged from the baseline scenario.

Box 1: Modelling New Zealand's electricity system

The interim committee used computer models of the New Zealand electricity system to predict how the 100% renewables policy could affect electricity sector investment, prices and emissions each year from 2018 through to 2035.

The committee used two models. The *I-Gen* model covered investment in generating assets. Investment occurs when justified by the demand for electricity, taking into account supply of competing generators. Investment is always in the next cheapest technology to build and operate, consistent with electricity market operations.

The second model, called *E-Market,* took the power plants built by *I-Gen* and calculated how generating assets are used over time. In each calculation period, the model matched electricity supply with demand. This required working out the combination of available generating assets, demand response, and short-term battery storage that would be used to meet electricity demand on a least-cost basis, and also consistent with electricity market operations.

The models required many inputs, including projected paths for electricity demand, existing generation assets, and costs of technology, fossil fuels and emissions. The committee developed forecasts on a "middle of the road" basis using a combination of extrapolation from recent trends, official forecasts, and overseas projections of technology costs. The committee used weather data to model generation from weather-sensitive technologies like solar and wind. To model the 100% renewables policy, the committee also had to come up with a definition of "normal hydrological year", which it did using 87 years worth of rainfall data.

The models produced the following outputs: total electricity supply, installed capacity of different types of generation, greenhouse gas emissions, modelled wholesale electricity price,[10] retail electricity prices, demand response and battery use, and the marginal emissions abatement cost.

The committee revealed how costs and emissions change as the share of renewables approaches 100% by breaking the transition from the baseline share of renewables into a sequence of steps, where each step cumulatively adds to the number of thermal generation assets forced to exit by 2035. Starting from no early exits (93% renewables), the committee retired a single gas plant at Huntly (96% renewables), retired or converted to biomass all co-generation (98%), retired a second gas peaking plant (99%), and finally retired all remaining thermal generation (100%). At each step, the committee re-calculated costs and the overall effects on emissions to reveal the change in the marginal cost of abatement as the share of renewables approached 100%.

Scenario 3 – Accelerated electrification: The committee developed a third scenario to test the potential of electrification of transport and industrial heating to reduce overall emissions. In this scenario, the allowable generation mix included gas but excluded diesel or coal. Electrification of transport and heating increases the demand for electricity by about 8 terawatt-hours in 2035, a 16% increase over business as usual.

Results of the interim committee's modelling are summarised in ***Table 1***.

Table 1: Results from testing the 100% renewables policy by the ICCC

		2035		
	Current	**Business as usual**	**100% renewable electricity**	**Accelerated electrification**
Electricity demand	43 TWh	49 TWh	49 TWh	57 TWh
Renewable %	82%	93%	100%	92%
Additional capacity		+3,400MW	+5,100MW	+5,500MW
Cost of generation		$79/MWh	$113/MWh	$85/MWh
Retail price –residential		-2%	+14%	+1%
Retail price – commercial		+4%	+29%	+9%
Retail price – industrial		+6%	+39%	+13%
Electricity emissions pa		2.8 Mt/year	1.7 Mt/year	3.6 Mt/year
Transport + process heat emissions pa		-3.6 Mt/year	-3.6 Mt/year	-9.0 Mt/year
Net change emissions pa		-0.8 Mt/year	-1.9 Mt/year	-5.4 Mt/year
Cost per tonne CO2 abated			$200–$1,280	
Blackouts		0.04 GWh/year	4.00 GWh/year	0.60 GWh/year

Source: Interim Climate Change Committee, "Accelerated Electrification: Evidence, Analysis and Recommendations" (Wellington: 2019).

The committee's testing of the 100% renewables policy yielded interesting results. First, even at 100% renewables, electricity produces 1.7 million tonnes of emissions, entirely from geothermal generation. That is 1.1 million tonnes less than business as usual emissions in 2035, so the 100% renewables policy succeeds in reducing electricity sector emissions. However, overall emissions fall far more in the accelerated electrification scenario. Although accelerated electrification raises emissions from the electricity sector, this is more than offset by cuts in emissions from transport and industrial heating. Accelerated electrification produces an overall emissions reduction of 4.6 million tonnes per year. The committee also concluded that accelerated electrification of transport and heating could not occur under a 100% renewables policy – it is possible to do one of those two policies, but not both.

The committee's results reveal why the 100% renewables policy is so costly. The committee found that although electricity demand under both business as usual and 100% renewables scenarios is about the same, 49 terawatt-hours, it takes 1,700MW more generating capacity to meet this demand with 100% renewables. This is the "overbuild penalty". At higher shares of generation from intermittent solar and wind, and partly intermittent hydrogeneration, overbuild becomes necessary to maintain the security of electricity supply. Despite overbuild, the interim committee found the rate of "non-supply", or blackouts, under 100% renewables higher relative to business as usual by a factor of 100.

At a renewables share of 82%, New Zealand electricity is already the third-most green among OECD countries. The interim committee's baseline scenario suggests New Zealand's electricity system is on track to become even more green without any change in policy. Renewables will generate 93% of New Zealand's electricity in 2035.[11] Furthermore, this green energy comes at almost no cost to households and businesses – the inflation-adjusted cost of electricity is nearly unchanged under business as unusual. In fact, business as usual electricity prices for households fall slightly. Price increases under accelerated electrification are also modest. However, electricity prices are expected to rise substantially under 100% renewables, by 14% for households and 39% for industrial consumers.

Overall, these results confirm the interim committee's initial concerns about the 100% renewables policy. The committee's analysis shows the policy has a major effect on the cost of electricity and will make it harder for New Zealand to achieve its emissions targets, a lose-lose policy for the economy and the environment. The interim committee recommended the government prioritise electrification of transport and industrial heating as a more effective way to reduce emissions.

Analysis of dry year alternatives

In the second part of its analysis, the interim committee looked at low-emissions alternatives to solving the "dry year" problem. Hydrogeneration produces around 60% of New Zealand's electricity on average, but this share varies with the weather over a wide range, between 50% and 70%. The dry year problem is how to replace the energy lost from the electricity system in years of low rainfall. Currently, generation by gas and coal fills the energy shortfall.

The committee tested six dry year alternatives to fossil fuels. The results are shown in ***Table 2***.

Table 2: Estimated performance of dry year alternatives to natural gas generation

Alternative	Cost per tonne of CO2e avoided[12]	Tonnes CO2e avoided per $1,000,000
Pumped hydro	$250/t CO2e	4,000t
Demand interruption	$680/t CO2e	1,471t
Biomass generation	$790/t CO2e	1,266t
Overbuilding renewables	$1,270/t CO2e	787t
Hydrogen via ammonia	$1,520/t CO2e	658t
Long-term battery storage	$88,740/t CO2e	11t

Source: Interim Climate Change Committee, "Accelerated Electrification: Evidence, Analysis and Recommendations" (Wellington: 2019).

There are a number of interesting consequences from the committee's approach and analysis. The first is simply its decision to evaluate alternatives on the basis of cost per tonne of avoided emissions. Cost per tonne of avoided emissions measures the

effectiveness of a policy or technology, directly relevant to achieving the goal of reducing emissions. The measure can be inverted into avoided tonnes per dollar, shown in the right-hand column of ***Table 2***. Cost per tonne, or tonnes per dollar, reveals which policies can deliver the greatest environmental impact, and how an emissions target can be achieved at the lowest cost. Technologies and policies can also be evaluated on other dimensions such as distributional effects.

The committee's analysis also reveals the important fact that expected cost per tonne performance of policies and technologies are readily calculated, and that these calculations can take into account the spillover effects of a technology or policy in other sectors. The results of analysis are usually not obvious.

It is worth noting just how unusual is the committee's decision to evaluate alternatives using cost per tonne. Emissions policies are rarely evaluated for their actual effectiveness in reducing emissions. This is illustrated by a recent Official Information Act request we sent to the Ministry for the Environment. We asked for all estimates of the cost per tonne emissions performance of any government policy, regardless of whether it targeted emissions, produced in the last five years. The Ministry reported no estimates had been conducted.[13]

Another significant finding from the committee's analysis is the enormous variation in how effective different technologies and policies are in reducing emissions. The committee tested just six technologies and found the best-performing technology to be over 300 times more effective than the worst-performing. This degree of variation is consistent with findings in academic literature,[14] and it has two important consequences.

First, when emissions policies vary widely in their effectiveness, governments sacrifice a lot by using second-best emissions policies. If objectives other than emissions effectiveness, such as inequality, are used in decision-making and lead to governments using second-best emissions policies, most of the environmental benefits of emissions policies may be lost. It is not that objectives like inequality are unimportant – far from it – but using emissions policy to pursue other goals such as equity is environmentally expensive.[15] Wide variation in the performance of emissions policies is why cost effectiveness is the most important measure for choosing emissions policies.

Considered as a whole, these findings should be of interest to anyone thinking about how New Zealand will achieve its emissions targets. The committee's results suggest potentially large environmental benefits from testing all emissions policies, a matter we will return to.

Other findings from the interim committee

The interim committee's report contains other valuable insights.

The 100% renewables policy is almost certainly regressive. The committee found higher retail electricity prices disproportionately affect low-income households. According to the committee, Māori households spend more each week on electricity on average than other households both as a share of income and in absolute terms (about $41.20 compared to $36.80), meaning Māori households would disproportionately bear the higher cost of electricity under a 100% renewables policy.[16]

The Resource Management Act is a barrier to emissions reduction. The interim committee points to an increasingly narrow interpretation by courts of a key section of the RMA. Section 5(2)(c) defines sustainable management in part as "avoiding, remedying, or mitigating any adverse effects of activities on the environment". Courts have increasingly

focused on “avoid” at the expense of remedies or mitigations. Wind generation and transmission are especially caught by this narrow interpretation since avoiding the effects of these technologies on visual amenity largely means avoiding those technologies altogether. Wind is likely to dominate investment in generation over the next 16 years if the constraints of the RMA are resolved.[17] Surprisingly, the committee did not recommend a legislative amendment to clarify section 5, instead preferring changes to a National Policy Statement and introducing new National Environmental Standards.

There is no framework for trading off competing, often conflicting, objectives within the RMA and the host of National Policy Statements. There are five NPS, including one on renewable energy. Sections 5, 6 and 7 of the RMA contain 21 objectives. Without a system for choosing between objectives, the result is legal uncertainty, which is detrimental to investment in renewable generation, among other things.

Electricity sector emissions halved between 2007 and 2016. Over that period, annual emissions fell from 9 million tonnes to 4 million tonnes, and renewables’ share increased from 67% to 85%, mainly in wind and geothermal.[18] The interim committee’s analysis reminds us how well New Zealand’s electricity system is performing.

Recommendations for achieving accelerated electrification

The interim committee concluded its report by considering what steps the government could take to accelerate electrifying transport and industrial heating.

Here the report runs into some difficulty. The committee’s analysis of options for electrification discarded the bottom-up approach it used to analyse the 100% renewables policy, in which costs informed where emissions could be reduced most effectively. Instead, the committee adopted a top-down approach that sees policy as a way to achieve its preferred solutions in spite of costs.

The flip in the committee’s approach is most clearly illustrated when it discusses carbon pricing. The committee doubts carbon pricing will be enough on its own to convince businesses to switch heating from coal and gas to electricity. Businesses might not switch, the interim committee says, because “assets can be capital-intensive and long-lived” and because “[n]eeded investments in energy or emissions intensity improvements… compete for capital”. This, the committee concluded, means “[p]olicy change is needed”.[19]

But why is policy change needed? The committee is correct, of course, to point out the large costs of stranding sunk assets and how it could impede electrification. But so what? The goal is lower emissions, not electrification per se. The implication seems to be that the committee wants to use policy to override costs that get in the way of electrification, rather than allow costs to inform where emissions can be reduced most effectively, whether through electrification or something else. That is precisely the logic that led to the committee recommending electrification over the 100% renewables policy. Yet for some unknown reason, the committee recommended across-the-board electrification (“phase out fossil fuels in existing process heat”) rather than an approach that finds and gives effect to electrification where it is cost effective.

The interim committee’s analysis of the 100% renewables policy should have alerted it to the potential for bans on certain technologies to run into exponential costs. Is it not possible, if not certain, that the committee’s recommended policies, including bans on the use of coal in heating and the import of conventional vehicles, could run into the same skyrocketing costs

as the 100% renewables policy? It is not that electrification will not work – it will – but at some unknown point below a 100% share, electrification, like renewables, will almost certainly cease to be competitive with other channels for reducing emissions. Without proposing conditions or checks for cost effectiveness, the committee's recommended bans on fossil fuels and on importing conventional vehicles invites a government response that repeats the mistakes of the 100% renewables policy.[20]

The committee's analysis of electrification is further eroded by its decision to introduce a host of other objectives other than emissions effectiveness. These objectives include reducing social inequality, minimising emissions per kilowatt-hour of energy output, maximising consumer participation in demand response, and, bizarrely, electric vehicles equality:[21]

> *Proactive, targeted support to low-income and rural households in relation to electric mobility will be needed to ensure they are able to participate in the low-emissions transition.*

We have already noted that second-best policies are environmentally expensive relative to first-best when policies vary widely in their emissions performance.

So how should the interim committee have approached electrification? By restating the principle behind its analysis of the 100% renewables policy, that emissions should be seen in a wider context, meaning emissions policies are desirable only up to the point they are cost competitive with alternatives. Like 100% renewables, electrifying transport and heating almost certainly has a cost of abatement[22] that starts low but increases as the share of electrification approaches 100%. Exactly where costs take off in transport and industrial heating is unknown. However, effective policy will require systems for detecting, or encouraging the detection of, the point at which further electrification ceases to be competitive with other ways to reduce emissions. Policies like deterring and ultimately banning fossil fuels in heating, supporting charging infrastructure, banning the import of conventional vehicles, and setting sector-specific emissions targets – all recommended by the interim committee – are as vulnerable to exponential costs as the 100% renewables policy.

The interim committee's treatment of carbon pricing is also baffling. Carbon pricing is "vital"[23] and a "key mechanism"[24] to achieve lower emissions, says the committee, and we agree. However, the committee believes carbon pricing might not be sufficient due to the uncertainty of future carbon prices, and concerns about whether asset prices incorporate the carbon price.[25] The committee is right to raise these concerns about a vital and key mechanism for reducing emissions. Yet the committee recommended no further investigation. That is a thin basis for the committee's proposals for far-reaching interventions. As we argued in *Switched On!* the distributed nature of emissions makes pricing a far more promising way to reduce emissions than top-down command and control. The question is whether pricing can be made to work. The committee's decision to focus exclusively on command over price as a way to support emissions reduction, including through electrification, is difficult to understand.

These issues do not detract from the interim committee's main contribution, which is to convince the government to put the 100% renewables policy on hold. However, the committee's recommendations regarding electrification risk repeating the serious problems of the 100% renewables policy, which were so convincingly revealed by the committee's analysis of that policy.

Box 2: How electric vehicles can raise emissions

Transport produces 20% of New Zealand's emissions. If New Zealand is to achieve its emissions targets, EVs will almost certainly play an important role. However, using EV technology to reduce emissions is about more than just putting EVs in garages.

When an EV is manufactured, it produces about double the emissions of a conventional vehicle, mostly in the production of the battery.[26] If an EV is to produce an overall cut in emissions, it must therefore be driven. Specifically, an EV must displace enough miles that would otherwise have been driven by a conventional vehicle to more than offset its higher manufacturing emissions.

This is why an EV that spends its life sitting idle in a garage could worsen emissions. This helps explain why overseas research suggests the emissions benefits of pro-EV policies are frequently small. Norway, for example, spends an astronomical US$6,000 for each tonne of carbon emissions avoided by EV subsidies.[27]

Two additional factors work against EVs. They are driven only about half as far per year as conventional vehicles, often acting as a secondary vehicle; EV batteries have a relatively short working life of 10 years on average. Together, these factors leave EVs with fewer kilometres with which to make up their emissions deficit from manufacturing. The end result: EVs can be an expensive way to reduce emissions.

The problem is not the technology, but the policy. EVs can be cost effective as a source of emissions reduction where policies put them into the hands of households and businesses that will use them. That means policy has to be concerned with the *match* between technology and user. Unfortunately, the interim committee's report does not indicate any awareness of these issues, nor does it include any proposals to protect against the risk of raising emissions by misallocating EVs. The committee treats EVs as if they are a free lunch in which more is better. But if policy is to make a difference, then cost effectiveness matters. Policy has to be concerned with matching and not just quantities.

The committee's approach tends to reinforce the risks of top-down policy in reducing emissions and the value of testing policies. Carbon pricing can automate the discovery and handling of matching.

Why the interim committee's report matters

The interim committee's decision to test the 100% renewables policy, and the government's decision to step away from the policy on the advice of the interim committee, makes the interim committee's report one of the most valuable ever produced in this country. As a direct result of the interim committee's actions, New Zealand has avoided an environmental and economic disaster, making the interim committee's report historically important. The government's decision to drop the policy is entirely consistent with its commitment to lower

emissions and higher living standards. Furthermore, the interim committee has revealed a powerful way to improve emissions policies.

So what were the essential elements that led to success? The interim committee's report is significant for all the following reasons:

The committee has demonstrated that emissions policies can be tested for their environmental benefits. This simple fact may not be widely appreciated given the nearly total absence of cost per tonne evaluations of emissions policies in the public sector.

The committee's analysis shows emissions policies vary enormously in their effectiveness. The cheapest dry year alternative to fossil fuels, pumped hydro, avoided carbon at an estimated $250 per tonne – 10 times more than the New Zealand price of carbon and five times more than in Europe, the world's largest system for emissions trading. The most expensive cost an estimated $88,740 per tonne – 3,500 times higher than the New Zealand carbon price.

The appropriate unit of analysis for testing and prioritising emissions policies is marginal cost per tonne abated. Given the wide variation in policy performance, New Zealand's aggressive emissions targets, and finite political and financial capital that is available for emissions policies, emissions reduction will mainly depend on the ability to prioritise the most effective channels for abatement. Selecting emissions policies on effectiveness does not mean other issues like inequality have to be ignored (see below). Implicit in the decision to compare policies on a cost per tonne basis is a commitment to technology- and sector-neutrality – in other words, a commitment to reducing emissions wherever it is most effective. The simplicity and clarity of the committee's approach is a model for the organised evaluation of all emissions policies.

A policy's emissions performance is only revealed by testing. It took an expert evaluation to reveal the serious shortcomings of the superficially attractive 100% renewables policy.

Testing can incorporate downstream and cross-sector effects to reveal overall (nationwide) emissions effects of a policy. The counterproductive result of the 100% renewables policy was revealed by estimating its emissions effects in two downstream sectors.

Cross-sector effects can more than undo within-sector emissions benefits, which should be recognised as an inherent danger of all sector-specific and technology-specific policies.

Policies can also be evaluated for their distributional effects.

Top-down emissions policies can be regressive. Departures from the ETS are sometimes justified as necessary to protect fairness, but it is not clear top-down policies are more progressive on average than carbon pricing. The 100% renewables policy is an example of a policy that appears to be regressive.

Distributional effects should not justify a shift from first-best to second-best emissions policies. The wide variation in the performance of emissions policies implies a large environmental penalty for using second-best policies. Fairness is important, and can be protected by estimating the distributional effects of first-best policies and bundling emissions policies with compensating adjustments in welfare and tax systems, which

specialise in redistribution. Using emissions policies to manage inequality is expensive in environmental and financial terms, and unlikely to deliver results for either distribution or the environment.

Testing all emissions policies almost certainly has very high environmental and economic returns, the product of all the following factors: the performance of emissions policies varies widely; only testing can reveal performance in most cases; testing is cheap relative to the cost of the evaluated policy; evidence suggests policy mistakes are common; and governments are usually reluctant to drop policies after they are announced or implemented. Testing policies before they are announced is especially valuable because at that point, exercising the option to change or drop a policy is politically costless.

The interim committee's contribution is not just in its analysis, but in revealing the circumstances in which the results of testing can cause a government to change its policy position. The interim committee's demonstration is especially powerful given the 100% renewables policy was a commitment enshrined in the confidence-and-supply agreement of two governing political parties. The government presumably anticipated greater political fallout from disregarding its committee's advice than by following it. So what are the elements of the process by which the committee was established and run that added so much clout to the committee's advice?

Box 3: Where did the interim committee's clout come from?

Eight factors added clout to the interim committee's advice:

1. **Independence** – the committee's terms of reference carefully regulated interactions with ministers
2. **Government-appointed** – it is harder for the government to disregard a committee it appointed
3. **Credible** – the committee was composed of qualified, recognised experts in their relevant fields
4. **Rigorous analysis** – findings on the 100% renewables policy were the product of skilful application of appropriate methods
5. **Conclusions within scope of authority** – the committee secured express approval from the government for testing by renegotiating its terms of reference. By clearly acting within its authority, the committee added legitimacy to its findings
6. **Sufficient resourcing** – the committee had the resources necessary to execute its function
7. **Transparency and public profile** – the committee's existence, composition and terms of reference were in the public domain and known. This prevented the government from burying the committee's findings
8. **Strong public reputations of committee members** added to the incentives for the committee's independence and for high quality analysis

The case for permanent testing of emissions policies

It has been said you cannot fix what you do not measure. There may be no area of policy where that is more true than in emissions. The interim committee has effectively made a case for testing all emissions policies. For anyone who believes New Zealand should take its emissions targets seriously, or who is concerned about protecting living standards in view of

the expected costs[28] of reducing emissions, organised efforts to check whether emissions policies are working are a no-brainer.

The government recently introduced its Zero Carbon amendment bill into Parliament, delivering on another commitment in the Labour-Greens coalition agreement.[29] The bill makes good on the promise to establish the Climate Change Commission, a permanent new entity that will advise current and future governments on climate change policies and monitor progress towards emissions targets. Here is the opportunity to embed a testing regimen that permanently mirrors the interim committee process. Testing must carry the weight necessary to get the attention of governments. That weight comes from independence, credibility, rigour and transparency – all characteristics of the government's proposed Climate Change Commission.

What better home for the independent testing of all emissions policies?

Conclusion

New Zealand cannot achieve its emissions targets or be a good international citizen in practice by implementing policies that do not work. Emissions policies should be effective, fixed or cancelled. The scale of the government's commitments to lower emissions, large enough to be measured in percentages of GDP, and the wide differences in the performance of different emissions policies, justifies organised and permanent efforts to test emissions policies. Testing is the only way to know whether proposed policies will deliver, and implemented policies are delivering, for the environment. There are currently few, if any, checks on whether emissions policies work. There is quite simply no justification for sinking public and private resources into ineffective policies.

The interim committee has demonstrated the essential elements of a workable and effective process for testing emissions policies that will help achieve New Zealand's emissions targets. Any process for testing must be rigorous, and carry the clout necessary to shift the positions of elected governments. This means any testing regime must have independence, credibility and transparency. To the functions of the proposed Climate Change Commission should be added responsibility for the independent testing of every emissions policy of current and future governments. No other policy is likely to have higher environmental returns than a commitment to testing all emissions policies.

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Endnotes

[1] Versions Versions of the quote have been attributed to John Maynard Keynes. See https://quoteinvestigator.com/2011/07/22/keynes-change-mind/.

[2] House of Representatives, "Confidence and supply agreement: New Zealand Labour Party & Green Party of Aotearoa New Zealand," 52nd Parliament (Wellington: 24 October 2017), 3.

[3] Matt Burgess, "Switched On! Achieving a Green, Affordable and Reliable Energy Future" (Wellington: The New Zealand Initiative, 2019).

[4] Megan Woods, "NZ embracing renewable electricity future," Press release (Wellington: New Zealand Government, 16 July 2019).

[5] The "normal hydrological years" in the 100% renewables policy effectively excludes dry years. This is a sensible exemption that was presumably aimed at protecting energy security in New Zealand's hydro-dominated system and which prevented the 100% renewables from being even more expensive.

[6] The interim committee comprised Dr David Prentice (Chair), Ms Lisa Tumahai (Deputy Chair), Dr Harry Clark, Dr Jan Wright, Dr Keith Turner and Dr Suzi Kerr.

[7] The interim committee describes process heating as follows: "Process heat is heat energy (often in the form of steam, hot water or hot gases) which is used by the industrial, commercial and public sectors for industrial processes, manufacturing and space heating. For example, coal is burnt in large industrial boilers to create heat that dries liquid milk into milk powder and schools use fossil fuels in boilers for space heating." Interim Climate Change Committee, "Accelerated Electrification: Evidence, Analysis and Recommendations" (Wellington: 2019), 13.

[8] The interim committee has published technical appendices. See Interim Climate Change Committee, "Electricity inquiry – Final report," Website.

[9] Each investment is in whatever technology is the most competitive (least-cost) at the time. Modelling took into account factors like geographic constraints on hydrogeneration and the changing costs of technologies over time.

[10] We understand the wholesale electricity price is based on long-run incremental cost of marginal generators, rather than as the product of a simulated market process.

[11] The interim committee's analysis suggests renewables share could reach 97% under business as usual if the Tiwai Point smelter exits or the per-gigajoule price of natural gas doubles. The New Zealand Initiative's "Switched On!" reported findings showing renewables share is also increasing in the price of carbon. Matt Burgess, "Switched On!" op. cit.

[12] CO_2e is carbon dioxide equivalent.

[13] The Ministry for the Environment transferred responsibility for a response on transport-related matters to the Ministry of Transport. We are yet to receive a response from the Ministry of Transport.

[14] See Matt Burgess, "Switched On!" op. cit. 30 and Appendix 1.

[15] As we note in the conclusion to this research note, the better approach to managing the distributional effects of emissions policies is to bundle first-best emissions policies with adjustments to dedicated and highly effective redistributive tools like tax and welfare systems. This approach will deliver far more for the environment and for distribution than the alternative approach of using second-best emissions policies on grounds of their preferred distributional effects.

[16] Interim Climate Change Committee, "Accelerated Electrification," op. cit. 57.

[17] The committee's findings do not take these RMA constraints into account. In effect, the committee assumes that RMA constraints on investment will be resolved before 2035, a reasonable assumption for modelling. If the RMA does continue to constrain investment in the electricity system, then this added supply constraint will push electricity prices higher than the committee's findings.

[18] Renewables share of generation is weather-dependent. In the year to December 2016, renewables generated 84.9% of electricity. In the year to June 2018, renewables share was 82.2%. This lower figure is used in this report to align with the ICCC value. Ministry of Business, Innovation & Employment, "Electricity Statistics," Website.

[19] Interim Climate Change Committee, "Accelerated Electrification," op. cit. 90.

[20] In its estimates of the emissions effects of electrification, the committee assumed less than 100% electrification of transport or industrial heating. The committee assumed that by 2035 50% of transport is electrified, and industrial heating equal to one third of that used for food processing is

electrified. Interim Climate Change Committee, "Accelerated Electrification," op. cit. 41. However, the committee recommends total removal of fossil fuels from industrial heating and a ban on the import of conventional motor vehicles at some point in the future, effectively recommending 100% electrification of each sector. The committee's recommendations are not conditioned on cost effectiveness. See Interim Climate Change Committee, "Accelerated Electrification," op. cit. 99–100.

[21] Interim Climate Change Committee, "Accelerated Electrification," op. cit. 89.

[22] This refers to Marginal Abatement Cost, a policy or technology's marginal cost of avoiding or offsetting one tonne of carbon and carbon-equivalent emissions.

[23] Interim Climate Change Committee, "Accelerated Electrification," op. cit. 86, 95.

[24] Ibid. 80.

[25] These reasons are listed on Interim Climate Change Committee, "Accelerated Electrification," Ibid. 67–68. The interim committee also says sunk costs and the cost of capital (i.e. competition for capital) and regulatory hurdles could dampen the response of businesses to a carbon price. It will, but that dampening is the product of discovery of least-cost abatement opportunities. The presence of sunk costs and red tape will lead to abatement shifting elsewhere in the short run. If the interim committee is concerned about the political feasibility of a sufficiently high ETS (i.e. carbon) price, it does not say this. The fact that the cost of stranding assets informs prioritisation of abatement is an important feature of the ETS. Policy that forces abatement regardless of or in spite of costs is risks raising emissions.

[26] Matt Burgess, "Switched On!" op. cit. 42.

[27] Ibid.

[28] See the Regulatory Impact Statement attached to the Climate Change Response (Zero Carbon) Amendment Bill.

[29] New Zealand Parliament, "Climate Change Response (Zero Carbon) Amendment Bill," first reading.

ABOUT THE INITIATIVE

The New Zealand Initiative is an independent public policy think tank supported by chief executives of major New Zealand businesses. We believe in evidence-based policy and are committed to developing policies that work for all New Zealanders.

THE NEW ZEALAND INITIATIVE

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