NZ Climate Change Commission Model Review, Part 1

Dr. King

Thank you for the opportunity to provide comments on the modeling analysis undertaken by the New Zealand Climate Change Commission.

My review will be in two parts. The first part will focus on ENZ, the current policy reference case described in Chapter 7 "Where are we currently heading?", and the four scenario described in Chapter 8 "What our future could look like." The second part will focus on the C-PLAN and DIM modeling

The ENZ model is a bottom-up technology-based model of New Zealand's key sources of emissions. The model allows for supply chain links that introduce inter-sector linkages and factors in resource constraints (land, for example). The model is not a general equilibrium model, however, and cannot fully capture impacts of changing prices and requires the specification of the costs of current and future technologies over time. Full computable general equilibrium (CGE) models, on the other hand, are better able to capture the linkages across sectors and can project changes in inputs/outputs by sector without fully specifying which technologies are available to reduce emissions and what those technological costs are.

ENZ is built to investigate "which emission reductions might be technically and economically achievable in each sector of the economy" and I believe it serves it purpose rather well. I've seen nothing suspect that would suggest the Commission should not publish its work to date.

My following comments are organized around a question about power sector modeling in ENZ, the current policy reference case (CPR) discussed in Chapter 7 and the scenario structure discussed in Chapter 8.

Power Sector Modeling in ENZ

I found the statement in Chapter 8 in the "modelling electricity generation" textbox to be revealing, "This is not a market model with offers and bidders. The wholesale electricity price for the year is set by the long run marginal cost of the next renewable project to be built." I've gone through slide decks from model update meetings and this is the first time I've seen this mentioned. And while I do not recommend an update to the ENZ power sector at this time, I believe this assumption needs to be further evaluated and improvements to the ENZ power sector could be applied for future analysis.

It is not clear to me at all that the wholesale electricity price assumption matches key features of the NZ power market. In wholesale electricity markets, the wholesale electricity price is set by the marginal cost of highest bidder that clears the market. At times of low demand, this may be generators that are considered baseload providers of electricity; at times of high demand, this will be generators that are used to meet peak demand. Importantly, wholesale electricity

prices will vary widely across time blocks, depending on demand levels, hydro availability and wind/solar supplies. If and when renewables become baseload, gas generation is likely to set wholesale electricity prices to meet peaking requirements and to provide a source of generation when renewables are unavailable. At a minimum, a discussion of the key wholesale electricity price assumption is warranted and a comparison of ENZ power sector model results to a dispatch model of power supply in NZ would be very useful, especially because electricity prices are drivers of other key emissions reduction opportunities in the model (such as EV uptake). I'd also like to see a discussion on the use of battery storage in the power sector model. My reading is that it is not included but it is also possible I missed something.

Current Policy Reference Case

The current policy reference case (CPR) is an extremely useful projection of emissions through 2050 and paints a picture of where emissions could end up if the government makes no further policy changes and is a starting point for any analysis of pathways towards the midcentury net-zero goals. As Chapter 7 makes clear, there is significant uncertainty in the assumptions underpinning the CPR scenario. I understand there are time constraints, as noted in the Chapter, "With the time and resources available to produce this first set of advice, we are unable to model the entire spectrum of possible future scenarios." But I believe *some* quantitative analysis of key uncertainties is necessary to give policymakers a "confidence interval" for future emissions. With the exception of afforestation, the Chapter provides only a qualitative discussion of uncertainties. Alternative growth, commodity price (oil, milk, meat, log), exchange rate, and EV capital cost penalty scenarios would identify *which* assumptions are more important than others and give policymakers a range of potential outcomes that more effectively communicates the level of uncertainty than a single reference case.

Based on conversations during our Zoom meetings in November/December 2020, it is my understanding that land-use changes that drive significant negative emissions are largely exogenous. In the uncertainty section, alternative afforestation scenarios are derived through differences in ETS prices and afforestation appears to be particularly sensitive to ETS prices. Given the importance of afforestation to NZ's climate goals, I'd like to get a better understanding of a) how central case levels of exotic afforestation levels are initially set in the CPR scenario and b) the mechanism through which afforestation responds to ETS prices. I'd also like to see some further discussion on Land Use comparisons (the Land subsection in Comparison with Other Projections section doesn't actually provide any comparisons) and a discussion on sensitivity of afforestation to ETS prices.

Scenario Structure

The description of the scenario structure in Chapter 8 needs significant revisions. Without the context provided by the PowerPoint slides titled "Modelling Meeting – 3 September", it is impossible to understand the difference in results between the CPR scenario and the Headwinds, Behavior, Technology and Tailwind scenarios as described in Chapter 8. For example, there is no discussion of changes in ETS prices between the CPR and the other four

scenarios in Chapter 8 (see Slide 30 in slide deck). A summary of assumptions similar to slide 31 is also necessary. Without it, I don't know how we interpret statements such as "The uptake of EVs is considerably faster in the Headwinds scenario compared to the Current Policy Reference Scenario".

I would also like to see one additional scenario to help make the scenario comparison more meaningful (and these could or could not remain unpublished). The scenario I would like to see is base case with the alternative carbon price. This will allow me (and others) to see how much of the differences between the CPR and Headwinds scenario is being driven by changes in the ETS price and how much is driven by the technology cost/behavioral change assumptions listed on slide 31.

I'm happy to discuss my comments, particularly those that revealed a misunderstanding.

Dr. Marc Hafstead
Fellow and Director, Carbon Pricing Initiative
Resources for the Future
Washington, DC
hafstead@rff.org