General Support

Except where noted below, I support the findings and recommendations of the report.

Significant Matters

P7 – The suggestion that hydrogen vehicle technology could be an alternative to EVs is stated. However, the hydrogen will generally be generated by hydrolysis from electricity with a lower overall efficiency that EVs, so the benefit is more likely to be range and size of vehicles rather than reduced emissions and the electricity demand could be higher than for EVs per se (F11.12).

P7 - There appears little consideration of the road user charge (RUC) regime and its influence on the balance between road and rail freight. I would contend that the current RUC regime has effectively provided a subsidy for road transport relative to the lower emitting rail transport or coast shipping (also relevant to p114 and Q11.2, R11.5).

P9 and Q13.1 – Milk processing is identified as a significant process heat emissions source but other processing industries also have significant process heat demands. Further, the obligation for Fonterra to accept milk supply is a significant constraint for Fonterra and I would support its removal. The impacts are multiple. A lot of capital goes into providing capacity to process the milk peak and this has low utilisation over a year so it is difficult to justify further investment in more energy efficient technology. Also the processes of choice for the peak processing generally have high process heat demand and results in products with low added value. Removal of the obligation to take milk would both help Fonterra move to greater added value processing and to justify investment in lower emission technology for the plants which would have greater utilisation over the year rather than just peak processing capacity.

P11 – I am surprised that changing process heating is not also identified as a 4th key driver to achieving emissions reductions (also F2.3, F3.3, F3.6).

P27-29 – The high per capita GHG emissions for NZ reflect our high dependence on export of primary products. It can be argued that these emissions should be “owned” by the ultimately consumers of these products and not the producers. In this case, the NZ consumers GHG profile would probably be better than most other OECD countries (as the emissions associated with our imports that we would inherit are probably lower than the emissions associated with our exports). The international community does not yet take this approach but because climate change is a global issue it can distort analysis. If NZ production of a good or service has lower net emissions than production from another country then, if the good or services is deemed essential, then it is best (from a global perspective) that NZ production occurs rather than it be reduced and replaced by production elsewhere. For example, NZ dairy products generally have lower GHG emissions than products from other countries due to our intensive grass-feed rather than grain-feed production system despite the longer transport supply chain (production emission are much greater than those due to international shipping). Hence while dairy production in NZ is a large GHG source it is lower than if the same global dairy product consumption was supplied from outside NZ. The same is true for meat and other animal based products while for plant-based products the NZ difference is less (our more intensive production advantages is offset by the transport disadvantage to a greater extent).

Chap 3 – It is surprising that the modelling does not appear to include technology advances in process heating. Process heating is probably the next largest energy demand after transport and there are a number of technological options that significantly change the emissions.

P32 and Chap 8 – The arguments on the short term nature of methane need to be carefully examined. Certainly because methane atmospheric life is lower, then a relatively late reduction in methane emissions can still contribute to a very rapid drop in the time-integrated GWP and still limit peak warming.

However, I disagree with F8.1 and to some extent F8.2 – all GHG impact must be stabilised by equal inflows and outflows – this is what net emissions equal to zero means and so is not different for long-term and short-lived GHGs. This discussion seems to avoid the fact that if a GHG contributes 20% of the equivalent emissions then it contributes 20% and so halving its net emissions reduces the impact by half of 20%. Stabilising to a positive net emissions of short-lived gas effectively locks in a long term impact.

Overall, I feel that the discussion on emission metrics risks confusion rather than clarity.

P60 – It is not clear whether the batteries in EVs have been considered as a storage element allowing solar PV and wind generation to be “firm” generation capacity. This is an important consideration. It is discussed in Chapter 12 but it is not clear if it is included in the modelling.

P61 – The increase in EV is clear but a shift of freight from road to rail or shipping might also be expected. Was this possibility incorporated into the modelling? If not, it is a major omission and opportunity.

Chap 5 – It is interesting to note that in the 2018 Endeavour Fund round a bid from collaborating established research groups focusing on GHG emission reductions did not even get to the second phase. This is possibly an example where the focus on the innovation on emissions is insufficient.

Chap 10 – While horticulture is less emissions intensive than animal based agriculture, the NZ emissions for export horticulture products are not significantly lower (and in some cases are higher) than the same horticultural products produced outside NZ (mainly due to the transport emissions). In contrast, the emissions for NZ animal-based products is generally significantly lower than for the same products produced outside NZ. Thus from a NZ perspective, a shift from pastoral agricultural to horticulture is justified from a global perspective the benefits are lower and potential negative if world-wide consumption mix of products does not also change! Put another way - from a global perspective, it is not worth converting land from pastoral to arable or horticultural if the pastoral emissions are lower than the global average and the arable/horticultural emissions are similar or higher than the global average.

F10.6 - Emissions of methane from animals represent an inherent loss of energy that has not been converted into a useful product (e.g. meat or milk). Therefore reducing methane emissions has the theoretical potential to also increase production efficiency (productivity) i.e. greater conversion of animal feed to useful products.

R10.2 - While there is analysis of historical rates of changes in land use, there is little analysis of the available areas of land of different types/quality to check that the proposed magnitude of transitions are feasible and sensible. This recommendation should be expanded to include availability of other land types for transition and not just those for afforestation.

Q10.1 – The mixed model for point of obligation is supported. Some farm-level obligation is critical to incentivise change particularly for the high emission forms of farming and large farms.

Q11.1 – Yes, a phase out date should be signalled to provide certainty.

Q11.2 and R11.5 – Carbon-based increases in fuel price and review of the RUC regime should be sufficient to incentivise change for the heavy vehicle fleet so a feebate scheme should not be needed. For the heavy vehicle fleet transition from road transport to other modes is probably as important than slightly improved efficiency.

F11.11 and R11.3 – As well as charging infrastructure there should be consideration of battery-swap options. Battery-swapping could avoid range anxiety and means that the charging infrastructure can be much lower cost and higher efficiency – slow rather than fast charging can dominate.

Q12.1 – Yes, a more consistent approach nationally to application of the RMA to renewable generation projects is required.

Chap 13, p350-351 – The discussion of fuel switching to electricity does not consider the potential use of heat pump (HP) technology as part of this switch. HPs can provide COPs greater than 3 for relatively low temperature process heating (less than about 120oC) that can more than compensate for the difference in fuel costs. However, HPs have significant capital costs so until carbon emission charges are sufficient to significantly change the relative costs of fossil-fuels and electricity then the investment case for HPs will be hard to justify in many cases. HPs are feasible for many low temperature processes (less than 90oC) at current emission pricing but high emission pricing would improve the economics and uptake.

For higher temperature process heat (120oC to 200oC), HPs also have potential but the technology for this temperature range (from ambient heat sources) is immature world-wide and the capital investment case is more margin than for HP at lower temperatures. The large scale and capital cost of an industrial HP for process heating plus the technology risk, mean that many industrial businesses will be loath to be the first mover. Therefore some support for early demonstration projects will be critical to encourage development and uptake of HP for industrial process heating.

While a lot of process heat is provided by high temperature sources (e.g. steam from fossil-fuel boilers), in reality a lot of the heating demand is at much lower temperatures that could be supplied in more emission efficient ways. The extent of this heat supply quality “conservatism” is not well known so there is a need to better understand the match or mismatch between supply and demand quality (temperature levels). For example, the recent elimination of rendering from most meat processing sites (consolidated to a smaller number of large sites) means that there is little heat demand above 90oC and use of steam boilers is an overkill on many meat processing sites.

F14.1 – While the technology exists to lower emissions from the waste sector, lack of economy of scale remains a very significant factor for its implementation. New technologies could offer the opportunity to be easier to implement at the scale required for many NZ sites. Also new technologies may be required to address Maori specific perspectives related to waste management.

R15.1 and R15.2 – Any review of the building code (particularly energy efficiency provisions) should consider life-cycle emissions as well as life-cycle costs. In many cases, especially with high emissions pricing, these will result in similar outcomes, but the duality is a worthwhile addition.

Minor Matters

P26 – Nitrogenous fertilisers are also a contributor to N_2O emissions and not just animal urine.

P26 – Refrigeration and air-conditioners do not "use" HFCs and HFCs are not the only high GWP refrigerants – a better description is "leakage of high GWP refrigerants from refrigeration and air-conditioning systems"

P40 (F9.5) – While better insulation has the potential to reduce energy use for heating, often the net result is improved comfort and health rather than reduced energy use (energy spend/use remains similar but higher average temperatures in the heating season). However, insulation plus more efficient or lower emission heating technologies such as heat pumps or biomass can give both benefits.

P209 – HFCs are in fact mainly used for commercial and domestic applications (including transport air-conditioning) and industrial use is not completely dominant as stated (a large fraction of industrial application in NZ use ammonia as the refrigerant).

P389 – Heat Pumps for building space heating and water heating and solar thermal technologies are the building technologies with the greater potentials to reduce building emissions than those listed.