Australian National University

Submission: Climate Change Authority Issues Paper

ANU Institute for Climate, Energy & Disaster Solutions

This submission is the collated perspective of independent researchers that work at The Australian National University. The views and opinions expressed in this submission reflect those of the authors and contributors.

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14 May 2024

Mr Brad Archer
Climate Change Authority
John Gorton Building
King Edward Terrace
Parkes ACT 2600

Re: Climate Change Authority Issues Paper

Dear Mr Brad Archer,

Please find enclosed a submission by the ANU Institute for Climate, Energy and Disaster Solutions (ICEDS) for the Climate Change Authority 2024 Issues Paper: Targets, Pathways and Progress.

Based in the ACT, ICEDS connects industry, governments and communities with climate, energy and disaster-risk research from the Australian National University. Our goal is to advance innovative solutions to address climate change, energy system transitions and disasters. We facilitate integrated research, teaching and policy engagement across disciplines.

The enclosed submission contains contributions from experts in electric transport, food and health systems, climate resilience, climate science and disaster solutions.

Our network of ANU researchers will gladly offer further consultation.

Sincerely,

Professor Mark Howden
Director, Institute for Climate, Energy and Disaster Solutions

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Executive Summary

The Australian National University (ANU) Institute for Climate, Energy and Disaster Solutions (ICEDS) welcomes the opportunity to comment on the Climate Change Authority (CCA) Issues Paper on Targets, Pathways and Progress (IP).

As a signatory to the Paris Agreement, Australia has committed to pursue efforts to limit the global average temperature increase to 1.5°C above pre-industrial levels. The window of time to achieve this limited warming is closing quickly. *ANU ICEDS recommends CCA aligns its ambition for reducing net greenhouse gas (GHG) emissions with Australia's commitment under the Paris Agreement.* Australia must rapidly reduce its GHG emissions (often loosely termed decarbonisation) or risk exacerbating the already escalating climate change impacts that are being felt nationally and globally.

Rapid decarbonisation should be a priority for Australia and is supported by the vast majority of Australians, with the CCA recommending ambitious targets that are aligned with the latest climate science. However, multiple climate hazards will unavoidably worsen under all reasonable trajectories of emission-reduction. *Hence, ANU ICEDS recommends that all decarbonisation pathways put forward by the CCA are developed with attention to the climate impacts that must be endured by any new infrastructure, technology, workforce or market.*

Achieving an economy with emissions consistent with our Paris Agreement commitments will require a concerted effort from government at all levels, corporations, research and academia, the non-profit sector and the general public. While the CCA has thus far focused on the pathways for actors within each sector, there is an overlooked avenue to effect meaningful emissions reductions. Targeting the evolving consumer market for each sector through government intervention is a potentially powerful tool. *Hence, ANU ICEDS recommends that CCA considers measures to reduce public appetite for emissions-intensive products, such as excessive consumption of foods with high embedded emissions and large petrol or diesel vehicles.*

ANU ICEDS members have also offered alternative modelling approaches that suggest the CCA has underestimated the impact of technological learning and improvement, which may indicate that the CCA can potentially increase the level of ambition surrounding the uptake of new technologies.

Ambition and Achievability

Recommendation 1: CCA aligns its ambition for decarbonisation with Australia's commitment under the Paris Agreement.

Immediate Decarbonisation Action is Required

The CCA IP calls into question the balance between ambitious and achievable decarbonisation targets. In all global modelled pathways that limit warming to 1.5 or 2°C assessed by the Intergovernmental Panel on Climate Change (IPCC), emissions peak between 2020-2025 and rapidly decline thereafter.[1] If Australian emissions remain high, emission cuts by 2035 will have to be even deeper than previously assessed.

The current climate science necessitates concerted efforts globally to ensure that emissions decline rapidly from 2025. Framing decarbonisation as a question of ambition or achievability is to suggest that ignoring the impacts of climate change until they become untenable is a rational option. Australia's ambition should reflect the urgency of the task at hand.

It should also arguably reflect the benefits and costs of different pathways. Economic analysis is becoming increasingly clear: rapid, concerted and substantial action on climate change is much less expensive than less-ambitious trajectories. An ambitious approach is also economically the best approach as well as having a range of other social and environmental benefits.

Recalibrating Ambition to Account for Exponential Change

The CCA IP references recent research on the power of technology learning effects in driving exponential change. The virtuous cycles of learning and improvement are indeed likely to lead to rapidly falling costs, as seen with renewable energy technologies. However, the CCA IP forecasts could underestimate the effects.

ANU ICEDS members have developed modelling that builds upon that referenced in the CCA IP (Way et al. 2022). New models describe the transition at a country level, as well as globally, and include policy targets. We would welcome the opportunity to work with the CCA to apply this model to the task of calibrating ambition in relation to both exponential learning effects and global industrial and policy momentum. The modelling suggests that the CCA IP underestimates the impact of global decarbonisation ambition on supporting an accelerated transition in Australia. Appendix A: Transition Modelling Outputs (EV Uptake in Response to Policy Ambition) includes an example of the model as applied the uptake of Electric Vehicles (EVs) in response to both the United States (US) Inflation Reduction Act and the European Union (EU) ban on sales of Combustion Engine (ICE) vehicles. This model forecasts all new car sales to be electric by 2030, at which point continued acceleration of the electrification transition requires early scrapping of ICE vehicles.

Adaptive Decarbonisation Pathways

Recommendation 2: All decarbonisation pathways put forward by the CCA are developed with attention to the climate impacts that must be endured by any new infrastructure, technology, workforce or market.

It is encouraging that the CCA IP makes passing mention of adapting to the impacts of climate change in the context of expanding renewable energy in farming regions.[2] However, ICEDS

[1] IPCC (2022b)
[2] CCA (2024) p31.

considers that the consideration of climate adaptation should be integrated throughout recommendations made by the CCA. This is consistent with both the IPCC and TCFD framing of climate risk and climate action.

The CCA IP has already flagged its barriers and enablers for each sector considered in the decarbonisation pathways advice. In general, the CCA suggests improved deployment of available technology at scale and pace, increasing specialised workforces, stabilisation of the energy grid, improvements in energy productivity and land management activities, focusing on the potential to reduce the GHG emissions of each sector. While this is consistent with the CCA's current remit, it overlooks the imperative to integrate adaptation action into emissions reduction efforts (for example building increased tolerance of extreme hot weather into new energy systems). The integration of adaptation and mitigation strategies is not a new idea and has been championed by the IPCC[3] and other literature[4] due to its potential to increase co-benefits and reduce the adverse side effects of engaging in isolated adaptation or mitigation action.

All sectors and systems carry various vulnerabilities to climate change hazards. Rapid, ambitious efforts in greenhouse gas emission reduction efforts may slow the pace of climate change. However, we are currently seeing unavoidable increases in multiple climate hazards that cannot be entirely eliminated through likely emission-reduction trajectories.[5] Without including climate adaptation in emission-reduction efforts, core components of Australia's transition may be at unnecessary risk or under-perform due to un-managed climate impacts.

The CCA IP suggests increasing energy efficiency and increasing the penetration of renewable energy across sectors given its high potential to reduce GHG emissions. The rollout of more solar and supporting infrastructure is a key example of the need to integrate adaptation action into sectoral pathways. For example, the productivity of solar photovoltaic (PV) arrays changes in response to environmental conditions. Heatwave conditions and exposure to storms that carry dust and debris or generate hail can reduce the efficiency or damage solar PV infrastructure.[6] Advice to government that focuses on accelerating solar uptake should therefore also include advice to increase research and investment in reducing the vulnerability of solar PV cells to future climate changes.

Similarly, the CCA IP speaks to the importance of carbon dioxide removal (CDR) as a means to eliminate residual emissions. Available CDR methods include technological options (for example, direct air capture [DAC], and bioenergy with carbon capture and storage [BECCS]), geological options (for example geological storage) and land-based options (for example, environmental planting and enhanced weathering) all of which carry physical climate risk. If CDR forms a key part of Australia's decarbonisation journey, then both the processes and facilities designed to capture carbon dioxide (for example, planting activities, or operating DAC facilities) and the methods used to store this (for example, trees and soils or products derived from captured carbon dioxide) must also be designed to withstand climate change impacts (for example land based sequestration in tree biomass may be increasingly susceptible to loss from fires and soil carbon is likely to be lost as the climate dries and warms regardless of management).

To better understand the climate hazards that decarbonisation efforts in Australia must be able to withstand, the CCA can look to the recently completed National Climate Risk Assessment (First Pass Assessment) [NCRA 1], the in-progress NCRA 2, and the in-progress National Adaptation Plan as well as the IPCC 6th Assessment.

[3] IPCC (2014)
[4] Howarth and Robinson (2024)
[5] IPCC (2022a)
[6] Gholami, A. et al. (2023)

National Climate Risk Assessment First Pass

According to the National Climate Risk Assessment (First Pass Assessment), projected trends in Australia's climate hazards include:

- More severe fire weather days,
- More frequent heatwaves and hot days over 35°C,
- More time spent in drought,
- Sea level rise and increase in coastal flooding,
- More coastal erosion and changes to shorelines,
- Fewer but more intense cyclones,
- Increase in heavy rainfall and flood risk,
- Likely increase in hailstorm days,
- Fewer extratropical storms but with heavier rainfall,
- And increase in ocean temperatures and acidity.[7]

Any recommendations made by the CCA should consider adaptation efforts to reduce the risk associated with the climate hazards identified in NCRA 1. Note also that the NCRA 1 found that "all systems have cascading, concurrent and compounding risks, with strong interdependencies across multiple systems."[8] Therefore, the CCA should consider adaptation efforts that account for the case of multiple hazards interacting simultaneously or serially across systems and sectors.

Interdependencies in Sectoral Pathways

It is encouraging that the CCA is currently considering the interdependencies between sectors.

Each of the six sectors identified in the CCA IP has interdependencies with one another. For example, electrification appears in all six sectors as an enabler to emissions reduction. Consequently, supply chain disruptions in this sector may have impacts on the decarbonisation process for all six sectors. It is possible for changes in any of these sectors to have flow-on effects to the others, so applying a systems thinking approach to sectoral pathways may support more effective decarbonisation pathways with in-built contingencies for potential sectoral shocks. Systems thinking for inter-related sectors requires the consideration of the internal components and dynamic relationships within each sector, but also how each sector interfaces with other sectors.[9] For example, in transitioning the workforce for a decarbonised Australia, there is a need to consult across the sectors at a regional scale and for an ongoing evaluation of community needs.[10] Allowing affected communities the opportunity to provide directional input establishes understanding and trust which can help identify where proposed policies may require further consultation. [11][12]

In particular, when modifying decarbonisation pathways to be more adaptive to changing climate hazards, it is worth noting the potential for these hazards to be compounding, cascading and protracted.[13] For example, droughts, extreme bushfires, severe flooding and other non-climate stressors (such as COVID-19) can occur one after the other in short order, with impacts across sectors that are difficult to predict. These complex disasters often consist of multiple interacting hazards that do not act independently but exacerbate each other, leading to unforeseen consequences and prolonged recovery periods. The interaction between natural and

[7] DCCEEW (2024)
[8] Department of Climate Change, Energy, the Environment and Water (2024b), p.11
[9] Monbiot (2022)
[10] Hughes, Jotzo & Colvin (2024)
[11] Hewett (2024)
[12] CCA (2024), p19.
[13] Lukasiewicz and O'Donnell (2022)

human-made vulnerabilities introduces additional layers of complexity where disasters reveal and compound known and unknown vulnerabilities.[14]

To address these challenges, the CCA should consider recommendations that focus on enhancing communication and collaboration across different sectors to assess risks to decarbonisation strategies comprehensively. Current disaster research suggests the need for a more integrated approach in disaster risk management, where the focus is not only on immediate responses but also on building long-term capacity and adaptability across all levels of governance and sectors of the economy.[15] Addressing the vulnerabilities of our renewable energy systems to complex acute climate hazards is especially crucial as failures across energy infrastructure affects not only power supply but also many interdependent sectors like water and healthcare. Proactive policies are essential to ensure that energy systems can withstand and recover from climate-induced disruptions efficiently and sustainably.[16]

Adjusting Consumer Behaviours for Decarbonisation

Recommendation 3: CCA recommends measures to reduce public appetite for emissions-intensive products.

Transport and Personal Vehicles

The CCA IP identified road transport as contributing 87% of Australia's transport emissions. Passenger cars and light commercial vehicles contribute 60% of Australia's transport emissions.[17] The CCA IP highlights the shift to battery electric light vehicles as the most immediate and significant opportunity to reduce emissions for the transport sector. However, it fails to mention a key driver of increased uptake of large, emissions-intensive ICE vehicles including utes and SUVs, which make up five of the top ten most popular new vehicles in Australia (despite most vehicle journeys occurring within cities).[18] The Australian tax system allows consumers to write off non-passenger vehicles (with a payload of at least one tonne) as an annual expense, as it is classed as a new business asset through the Temporary Full Expensing policy. This incentive works alongside the Loss Carry Back Tax Offset, where the purchase of a new vehicle results in a net loss for a business, the loss can be applied to previous years' profits which allows claimants to receive a refund, reduced tax liability or debt reduction from the Australian Taxation Office.[19] These tax structures encourage the purchase of large, inefficient, non-passenger vehicles (that can also be used as passenger vehicles). Given the lifespan of a new light commercial ICE vehicle is 10-15 years, and that (as identified in the CCA IP) achieving net zero transport emissions by 2050 requires no new ICE vehicles by 2035, urgent reform is required.[20]

The Australian tax system has other mechanisms under which vehicle emissions are incentivised. Exemptions to Fringe Benefits Tax (FBT) apply to utes, vans, or other road vehicles designed to carry a load of one tonne or more, encouraging the use of such vehicles for travel between home and work, incidental travel or non-work-related use.[21] Businesses also receive tax credits for fuel used in heavy vehicles.[22]

[14] Ibid.
[15] Dovers et al. (2022)
[16] UNSW (2023)
[17] DCCEEW (2024a)
[18] The Australia Institute (2023)
[19] The Australia Institute (2023) p12.
[20] CCA (2024) p25.
[21] ATO (2023)
[22] ATO (2021)

Consumers are currently incentivised to purchase and use new, heavy duty ICE vehicles that will increase Australia's transport emissions. The CCA should focus its recommendations on removing the tax structures that encourage the purchase and unnecessary use of commercial ICE vehicles as passenger vehicles, or following the EU example of banning the sale of new ICE vehicles.

Alternative Approaches in Agricultural Pathways

The CCA IP sectoral pathway described for agriculture and land has a focus on technological solutions to reduce the emissions associated with business-as-usual. For example, rather than suggesting reductions in headcount of ruminant animals, or consumer behaviour changes that may encourage a natural reduction in the methane and nitrogen production associated with keeping cattle, sheep and goats, the CCA IP looks to presently unreliable feed supplements.[23] While the feed supplement Asparagopsis has, in laboratory cases been shown to reduce up to 98% of methane emissions from cattle, it has also been shown to cause ulceration, haemorrhaging an inflammation in cows' stomachs. The most recent and largest animal trial showed that feeding cattle this supplement resulted in no reduction in GHG emissions per unit liveweight gain - but at significantly increased cost. This makes it an economic non-starter for farmers. It is also not viable for use on extensively grazed livestock as intake needs to be constant. Further, it is unclear what the impacts of *Asparagopsis* are on the consumers of milk and meat from supplemented livestock.[24] It is notable that there are alternative products available such as Bovaer (3-NOP) which are equally effective for intensively farmed animals, have none of these drawbacks, and which are registered for animal use in a large number of countries.[25]

The CCA has an opportunity to reduce the sector's reliance on unproven or early-stage technologies in efforts to reduce emissions while offering a co-benefit in addressing the public health implications of high consumption of animal source foods[26],[27],[28] through offering alternatives to high intensity livestock farming. Research shows that ruminant meat has the highest greenhouse gas emissions (gCO_2-eq) and land use (m^2) per serving of all food sources, with vegan and vegetarian diets associated with the greatest reduction in greenhouse gas emissions and land use.[29] There are also many health and environment co-benefits. Suggesting to government a campaign to reduce the consumption of ruminant meat in Australia and reducing the export of ruminant livestock would be a more reliable measure to reduce greenhouse gas emissions from agriculture and would carry fewer health risks or uncertainties for both livestock and the humans consuming derived products.

While a consumer shift away from animal source foods would reduce demand for ruminant products, reducing methane emissions, the Australian livestock industry is unlikely to support such a change. In fact, in 2023, according to Meat & Livestock Australia (the industry peak body), Australia recorded significant increases in slaughter and production of sheep, lambs and cattle with plans to increase production into the future.[3031] Australia has the unique opportunity to capitalise on a relatively abundant low-carbon source of red meat by improving integration of kangaroos into the pastoral sector. Modelling from AgriFutures suggests that displacing the ruminant population, in part, with kangaroo grazing and using kangaroo stock to meet increased meat production goals has the potential to reduce greenhouse gas emissions by 12 times per

[23] CCA (2024) p26.
[24] Camer-Pesci, B (2024)
[25] EFSA Panel on Additives and Products or Substances used in Animal Feed (2021)
[26] Walker et al. (2005)
[27] Bodirsky et al. (2020)
[28] Gonzalez et al. (2020)
[29] Willett et al. (2019)
[30] MLA (2024)
[31] AgriFutures (2023)

kilogram of meat.[32] Utilising the ability of kangaroos to successfully forage from Australia's nutrient-poor soils decreases demand for nutritional supplements,[33] which are typically needed for ruminant populations and rely on extraction of limited minerals, such as phosphorus.

Other benefits include managing the kangaroo pest population without waste products, and the potential to implement adaptive grazing strategies that attract carbon credits for soil carbon sequestration.[34]

[32]AgriFutures (2023)
[33] Ritchie & Munn (2016)
[34]AgriFutures (2023)

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Appendix A: Transition Modelling Outputs (EV Uptake in Response to Policy Ambition)

Figures 1 and 2 show how continued global learning effects, combined with policy ambitions including the US Inflation Reduction Act and EU ban on sales of Internal Combustion Engine (ICE) vehicles, drive the exponential uptake of electric vehicles (EVs). This uptake is faster than current forecasts from CSIRO and AEMO, which have not incorporated the effects of increasingly ambitious policies internationally. Our model forecasts all new car sales to be electric by 2030, at which point continued acceleration of the electrification transition requires early scrapping of ICE vehicles.

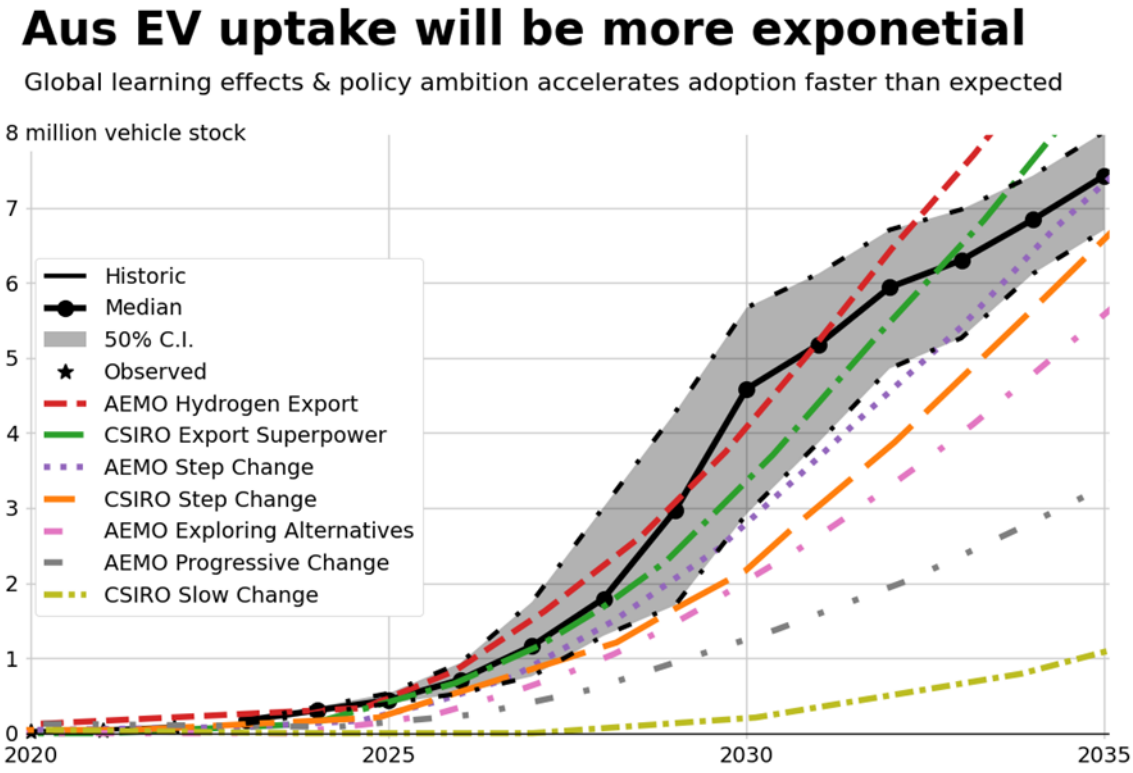

Figure 1

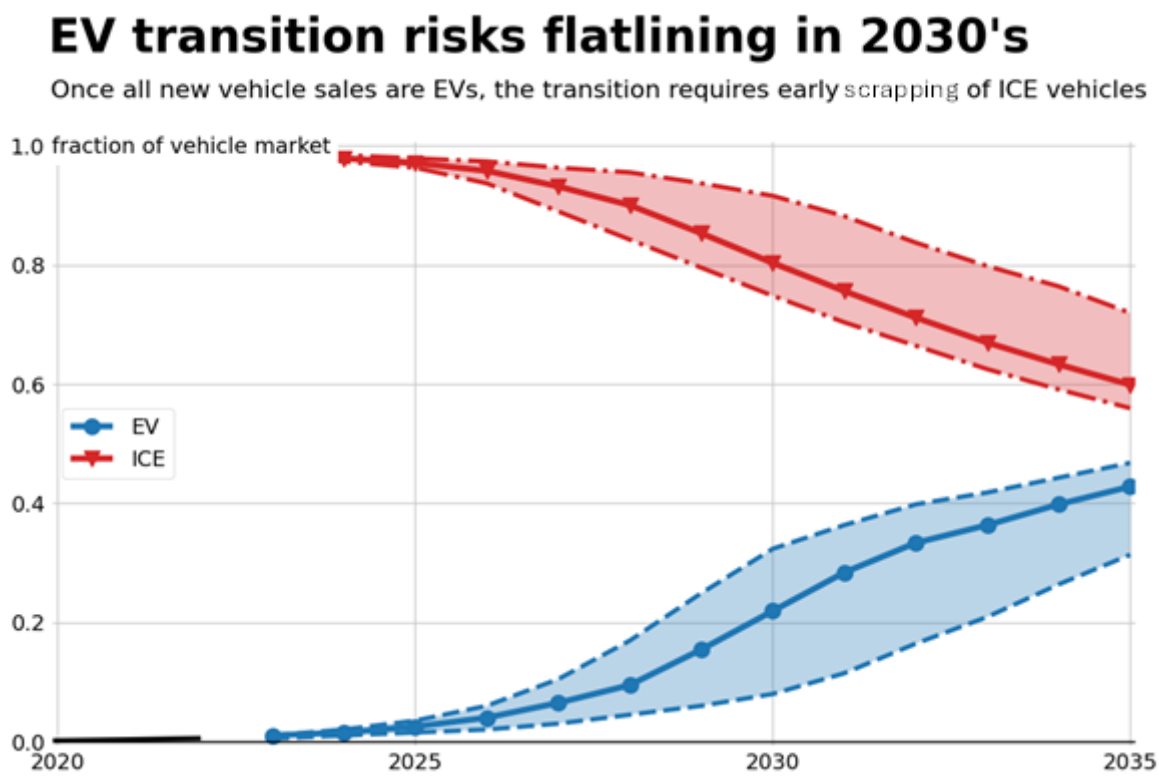

Figure 2

This example highlights the risk of underestimating the momentum and ambition of other jurisdictions and how these will support an accelerated transition in Australia.

Please contact Dr Bjorn Sturmberg (bjorn.sturmberg@anu.edu.au) for further information about the modelling approaches used, or to engage in collaboration to explore the capabilities of the model.

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