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28 June 2023

Climate Change Authority
Consultation Hub
Email: consultation@climatechangeauthority.gov.au

Dear Sir/Madam

Re: Setting, tracking and achieving Australia's emissions reduction targets

Engineers Australia welcomes the opportunity to submit a response to the Climate Change Authority's open consultations on the following:

- Advice on emissions reduction targets for Australia's next Nationally Determined Contribution (NDC) under the Paris Agreement.
- Review of the Carbon Credits (Carbon Farming Initiative) Act 2011 (CFI Review).
- Review of the National Greenhouse and Energy Reporting Act 2007 (NGER Review).

Engineers Australia is the peak body for the engineering profession in Australia. We are a professional association with over 115,000 individual members, constituted by Royal Charter to advance the science and practice of engineering for the benefit of the community. Our members represent every discipline of engineering and work across all sectors of the economy impacting the lives of Australians every day.

Engineers Australia is also formally accredited as an observer to the business of the United Nations Framework Convention on Climate Change (UNFCCC), United Nations Environment Assembly (UNEA) and United Nations Environment Programme (UNEP).

Engineers Australia recognises the scale and urgency of the challenges presented by climate change, the disruptions it causes, and the pivotal role of engineering in enabling a socially just transition to a sustainable society.

Overall, Engineers Australia has the following recommendations regarding the current consultation:

1. Recommend reviewing Australia's NDC in the context of increasing the emissions reduction task to 2035 and beyond.
2. Recommend amending the CFI Act to address the permanency principle regarding carbon credits that are issued but subject to the effects of climate change itself, specifically the soil carbon methodology.
3. Recommend amending the NGER Act to include Scope 3 emissions as part of the required reporting requirements; as well as standardising criteria and methods for calculating emissions.

Please refer Appendix A for detailed responses to the *Setting, Tracking and Achieving Australia's Emissions Reduction Targets: Issues Paper*.

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Engineers Australia remains ready to engage in all future consultations on what is a vitally important socio-economic and environmental matte. The talents of applied scientists across all engineering disciplines need to be at the forefront of the Government's discussions, responses, and future decision-making.

Please do not hesitate to reach out if you would like clarification or to discuss anything further. You can contact Simon Koger, Senior Policy Adviser - Climate Change at skoger@engineersaustralia.org.au.

Sincerely yours

Damian Odgen

Group Executive, Policy and Public Affairs

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Appendix A: Responses to Setting, tracking and achieving Australia's emissions reduction targets Issues Paper

Frameworks (2.0)

STRATEGIC FRAMEWORK (2.1)

1. What actions and enablers beyond those identified in the Strategic Framework could help Australia progress towards a prosperous and resilient net zero future? What are your highest priorities?

Our members have suggested the strategic framework as presented, needs to be viewed in context of the economy and our society existing within the system bounds of the environment. Ultimately, the best way to support long-term social equity and economic prosperity is via environmental stewardship.

Actions (from strategic framework)

- Manage Climate Risk:
  - Contextually, it's not just about Australia's emissions but rather global concentrations of greenhouse gas emissions. Australia is one of the highest emitters per capita and so has a responsibility to address this accordingly.
  - The concept of 'net zero' is just the beginning. Atmospheric concentrations of greenhouse gases will need to be drawn down in order to stabilise the climate. Australia needs to plan for emissions removal, not just emissions reduction.
  - From a policy perspective, the implementation of effective, efficient, predictable, and enduring policy is a prerequisite to facilitate the appropriate investments needed to transition Australia to a net-zero emissions future. Having ratified the Paris Agreement, the Australian Government is obligated to not only align its ambitions (mitigation, climate finance and adaptation) in a manner consistent with global climate goals but to implement domestic policy settings that can ensure Australia mobilises and services the engineering needs (innovation, skills, education, standards) of the climate mitigation task at pace and scale.
- Produce efficiently: Adopting the principles of a circular economy in the transition to net zero gives effect to environmental and economic efficiencies.
- Switch Fuels: Biofuel alternatives are available and require significant upscaling to meet demand.
- Electrify: Electrification is only as good as the generative capacity that supports it. Engineers Australia notes there is already strong support from both States and Federal governments to reach high percentages of renewable energy prior to 2040.
- Deploy technology solutions: Requires engineering innovation from theory to project pilot to commercialisation. Funding opportunities to this effect should mandate commercial partnerships as a means of establishing stronger innovation / commercialisation connections.
- Sequester the residual:
  - The capacity for natural carbon sinks to increase their sequestering potential is limited given current rates of ecosystem decline. It is difficult to predict a transformational change in Land

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Use, Land Use Change and Forestry (LULUCF) significant enough to sequester carbon in the volumes required to mitigate climate change.
    - Deploying mechanical carbon capture and storage is the most realistic option in this regard. Point source capture will be particularly relevant for hard to abate sectors and facilities, along with direct air capture technologies in the context of achieving short to medium-term emissions reduction targets. This should in no way mean to provide a licence to pollute or condone the long-term use of fossil fuels.

Enablers (from the strategic framework)

- Information: This is a key consideration and should include opportunities for standardisation in measurement, collection, analysis and reporting of carbon related data including scope 1, 2 and 3 emissions via a central data hub.
- Markets: Current market structures and value chains support a business-as-usual (BAU) approach. Comprehensive regulatory reform is required to enable decarbonisation, reductions in material use and decommissioning for material reuse, recycling or repurposing across the economy.
- Rules: Standards, specifications, and codes of practice are the decision-making vehicles used to provide surety and risk mitigation across a range of manufacturing and construction sectors. Engineers Australia supports reviews of all relevant documentation aimed at improving materials circularity and reducing embedded and active carbon across supply chains. This being the basis for capacity change and skills development in a number of key disciplines.
- Planning: Planning and assessment processes will be required to factor greater material providence and emissions intensity. Lifecycle analysis (LCA) and Environmental Product Declarations (EPD) will need to be undertaken as a key element of future planning activities.
- Investment: Surety in policy for emissions reduction fosters both innovation and commercial investment in a range of carbon abatement technologies, alternative fuels, renewable energy generation and storage, and so on. Key is low sovereign risk and stable policy as a leading indicator of investment potential.
- International Engagement: Two main focus areas:
    - International standards: Are essential in providing benchmarks and learnings for Australian circumstances. Global alignment on standards makes Australia a noteworthy player on the global stage and demonstrates leadership.
    - International investment opportunities: Capital investment from international entities is a key component in maximising Australia's comparative and competitive advantages.

PROGRESS FRAMEWORK (2.2)

3. What should the Authority measure or assess to determine progress towards a just transition and improved wellbeing?

- Ensure the transition to a net zero (and beyond) economy is occurring as planned.
- Monitor and verify emissions reductions per sector within the context of Australia's emissions reduction goals.

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4. What more could the Government do to help you reduce your carbon footprint?

- Australia has one of the highest carbon footprints per capita of any nation.
- Adopting circular economy principles will be key to changing the current business as usual approach:
  - Improve recyclability, serviceability and repairability of products for reuse.
  - Incentivise recycling and expand number and capacity of recycling centres.
  - Eliminate single use plastics from the economy where practicable.
  - Develop standards for plastics generation to enable recyclability, particularly as a means of addressing single use plastics.
  - Electrify everything.
  - Mandate solar/battery installations on all new buildings, with greater incentives for retrofitting.
  - Further incentivise emissions reduction in the transport sector:
    - Electric vehicles.
    - Biodiesel.
    - Registration reforms including time of use fee structures.

5. What are the other challenges and opportunities the global context presents Australia with in responding to climate change?

Opportunities

- Catalyst to modernising Australia's economy.
- Value adding supply chains for especially for minerals export (critical minerals, rare earths) as a means of building local manufacturing capacity and literally fuelling the transformation to 100 per cent renewable energy both here and overseas
- Export of indigenous & domestic intellectual property and know-how
- Reduced vulnerability in our supply chains for our trading partners
- Opening up of new technology and commodity markets
- Diversification of trading partners especially in developing countries (Pacific, Africa, South America) through technology transfer and climate financing
- Australia could become a lead financial centre as an emissions trading exchange, etc.

Challenges

- Carbon leakage if domestic climate policies render economic sectors uncompetitive relative to global trading partners – leading to a worse environment al outcome
- Geopolitics threatening achieving Paris climate goals; (1) vulnerability of US abatement depending on 2024 US election (Trump's withdraw from Paris Agreement), (2) Russian conflict disengaging from UNFCCC Paris Agreement as one of world's largest polluters etc
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6. What role is there for corporate action to 2030 and beyond?

- Funding Australia's emission mitigation requirements will be too great for the Federal public balance sheet alone with the private sector needing to facilitate a significant portion. This will

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include Clean energy investments and modernising of Australia's economy, adopting the pollution pays principle rather than defaulting to direct action funded by taxpayers.

- Govt's CERT initiative needs to transition from voluntary to mandated climate-related financial disclosures to avoid greenwashing & greenhushing (similar to EU, UK, NZ, Japan, Canada etc).
- The Australian government can support corporate action through:
  - Ensuring corporates adopt responsible procurement practices.
  - Mandating both climate and nature related financial disclosures.
  - Ensuring methods of measuring, calculating and reporting Environmental, Social, Governance metrics are standardised and consistent.

7. When is it appropriate for the Government to regulate something?

- Government regulation is necessary when markets fail, or where the market response inadequately addresses externalities. This is especially relevant when measuring and valuing environmental utility.
- Further, a regulatory response may be required where market systems, value and supply chains are entrenched in a Business-as-usual practice and require reforms to effect largely unpriced socially or environmentally desirable changes.

TARGET SETTING FRAMEWORK (2.3)

8. How could the Authority best strike a balance between ambition, domestic considerations and the international context in its 2023 NDC advice?

- The concept of balance needs to be weighed against the current costs of climate change on our economy, society and environment versus the future cost of climate change given the worst-case scenario. A key understanding will be whether the current policies enable effective mitigation and avoidance of potential impacts. By means of example, risks associated with the worst case scenario range from severe to catastrophic and will be measured in billions/trillions of dollars and loss of life:
  - Widespread damage from extreme events (fires, floods, cyclone).
  - Declining agricultural productivity.
  - Declining sustainable fishing yields.
  - Adaptation, resilience and emergency preparedness costs.
  - Abandonment costs.
  - Escalating insurance costs.
  - Declining population security (sea level rise displacement, conflict resulting from geopolitical issues relating to deteriorating global environmental and economic conditions).
- In context, it becomes a question of undertaking required mitigative action rather than 'ambition' to ensure a safe, healthy world for future generations.
- Further, Australia's emissions reduction targets should be considered floors not ceilings; scope to at least signal much more ambition.

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9. What do you think Australia's 2035 target should be and why?

- Engineering disciplines are grounded in science and concerned with the management of risk. Limiting warming to 1.5°C, with an 83 per cent likelihood of success, is the best case described by the Intergovernmental Panel on Climate Change (IPCC).
- Accordingly, this requires net zero emissions to be achieved by 2033 assuming a linear reduction in emissions. Such a low probability of success is unacceptable in any engineering code. The window for acting within engineering risk parameters has already closed. From a risk perspective, this means that when the projected consequence is unacceptable, what can be done should be done, unless proved that it is impracticable.
- It follows that Australia's current emissions reduction targets of 43% of 2005 levels by 2030 and net zero by 2050 require a far more ambitious lens to limit global warming to 1.5°C. Immediate action at pace and scale must occur to minimise climate disruption. This includes rapid reductions in emissions and improvements in the resilience of communities, infrastructure and biodiversity.
- In 2014, the Climate Change Authority (CCA) recommended Australia's fair share of global emissions based on a contraction (reducing emissions) & convergence (emissions per capita to a level which is equal for all countries) approach.
    - Engineers Australia considers this is a sound approach and recommends it should at minimum be hypothetically updated as a means of guiding a new 2035 target (see p117 of link).
    - At the time the Australian carbon budget was suggested to be about 0.5% of the remaining global budget.
    - Contextually, historical emissions reductions between 1990 and 2005 yielded a 3 percent reduction at an annual average mitigation rate of 0.2%. This compares to historical emissions reductions between 2005 (Aust baseline) and 2022 of 22 percent at an annual avg mitigation rate of 1.2 per cent.
        - Both of these actual historical mitigation rates (over 32 years) give little to no confidence that Australia can or will achieve the projected annual average mitigation rate of 2.7 percent (with additional measures) between 2023 & 2035
    - If Australia had adopted the CCA's 2014 carbon budget for 2014 to 2050 (10.1Gt) then our carbon budget based on the latest projected estimates would have already been expended by 2035. This suggests Australia was expected to have achieved substantially more mitigation by now than it actually has.
- Today's challenges include:
    - A doubling of Australia's current mitigation rate out to 2035 to achieve current agreed targets.
    - Ensuring higher mitigation rates post 2035 that are arguably more closely aligned with what might be considered international 'fairer' emissions reduction targets (as per the contraction/convergence approach).
    - The more important consideration is Australia not adding to the cumulative stock of global atmospheric emissions at present so as to avoid heavy lifting beyond 2040. This scenario can only be avoided with higher abatement ambitions and sufficient policy settings in the short term.

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LEADING INDICATORS (3.1)

10. What are some leading indicators of progress towards net zero emissions?

- Rate of change in the emissions intensity of generative capacity from mitigated fossil fuels to renewables and energy storage.
- Rate of change of embedded emissions in products by sector.
- Rate of change of sector emissions averages for scope 1 & 2 emissions.
- Rate of change of sector emissions averages for scope 3 emissions
- Amount of investment in innovation aimed at decarbonising materials, products, processes by sector.
- Technical readiness and scalability of appropriate mitigation technologies
- Uptake of innovation by sector.
- Volumes recycled, reused, repurposed.

11. What are some leading indicators of progress towards preparing for and adapting to climate change?

- Amount of funding provided to emergency response entities including level of governance, quantum of emergency response by risk (region) and mobilisation timeframes.
- Review and implementation of Standards, specifications and codes of practice that cater for resilience to climatic variability.

SECTORAL PATHWAYS (3.2)

12. What factors should the Authority consider when developing sectoral decarbonisation pathways?

- Improved understanding of material provenance through mandatory Lifecyle Analysis (LCA) for major projects - planning and assessment processes.
- Greater access to materials and emissions data with mandatory Environmental Product Declarations for manufactures.
- Review all relevant Standards, specifications, and codes of practice for products and services particularly for the built environment and food supply sectors.
- Update all certification systems to include circular economy principles.
- Further increase the Safeguard Mechanism's (SGM) abatement task.
    - Amend the aggregate 2030 emissions reduction target from 100Mt CO_2-e, as per the January 2023 Position Paper to 90Mt CO_2-e.
    - Include additional high emitting sectors such as agriculture and energy generation/transmission.
    - The energy sector alone generates 190MtCO_2-e annually, representing an additional 125% of total aggregate emissions over and above all SGM facilities.
- Align NGER reporting thresholds with the SGM scheme.
    - Any facility that generates over 25Kt CO_2-e per annum and 50Kt CO2-e for controlling corporations (groups) should automatically qualify for the SGM and be subject to declining emissions baselines.
    - Would offer reduced administrative burden for both Government and industry.

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- NGER reporting metrics could be reviewed to include a range of engineering-led practices aimed at decarbonising major projects, in particular metrics aimed at:
  - Product design: material choice; use, re-use & recycling potential; waste avoidance/generation.
  - Project design: feasibility assessments, supply chains including Scope 3 emissions, end of life facility utilisation, etc.

13. What is the role for Government in reducing these risks and assisting households, business, workers and communities to realise the opportunities?

- Review current regulatory environment to understand gaps and opportunities.
- Amend definitions of waste to enable reuse and repurposing at least cost.
- Harmonise funding scope across the various agencies and define a complimentary set of economically efficient abatement goals.
  - Presently, there are many funding agencies with emissions reduction mandates (Powering Australia, Powering the Regions Fund, Regional Infrastructure Fund, National Reconstruction Fund, Emissions Reduction Fund, Clean Energy Finance Corporation, ARENA).
- Continue to increase funding opportunities and government spending on renewable energy projects in context of international benchmarks with a view to ceasing funding for fossil fuel projects.
- Prioritise engineering skills development and the availability of the engineering workforce as a key enabler of innovation and capacity building:
  - Review workforce to understand where gaps in skills exist.
  - Foster targeted retraining opportunities for workers needing skills transference, especially in regional communities.
  - Review Visa conditions for skilled engineers with relevant experience.
  - Incentivise higher education aimed at renewable energies and emissions reduction.
  - Provide leadership in establishing links between academia and industry in aiding research pilots reach commercialisation.
  - Provide training and project pilot opportunities to improve the uptake of low carbon products via material trials.
- Undertake public awareness campaigns for circular economy and decarbonisation strategies.
- Work with State and Territory Governments including municipalities to align circular economy goals and targets and coordinate action across all levels of government.

CONTRIBUTING BEYOND AUSTRALIA'S BORDERS (3.3)

14. What are the most important things to consider when assessing the adequacy of a country's NDC?

- Whether the NDC will deliver an adequate portion of emissions reduction as part of the global stocktake in relation to emissions per capita and our global propensity to limit global warming to 1.5°C.
- What domestic economic opportunities will arise in new global decarbonised markets.
- The environmental and biodiversity benefits of decarbonising the economy.

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15. How could Australia partner with other nations to accelerate global progress towards meeting the Paris Agreement goals?

- Trade and manufacturing agreements aimed at developing and deploying low carbon technologies including critical minerals, value added resources, energy storage, etc.

16. What do you see as the challenges and opportunities from a phase out of fossil fuel production? What should the Government consider when determining a plan for the phase out of fossil fuels?

- The phase out needs to ensure reliability and affordability of the domestic energy grid.
- In developing renewable alternatives, a key focus will be manufacturing capacity and the available skills required to build/install that capacity (both generation and transmission).
- Opportunities for efficiency across the grid will enable cost reductions to help offset the transition. Consider deploying Artificial Intelligence (AI) to aid this process.
- Phase out timeframes and processes need to be equitably managed within communities and opportunities for skills transference need to be provided.
- Ensure effective guidance is provided to communities to offset misinformation.

17. Should the Authority consider international maritime and aviation emissions in its advice?

- Yes. Decarbonisation of the aviation industry (domestic and international) will primarily come from the following areas:
  - A move to green aviation biofuel for conventional aircraft (that is replacing or supplementing jet fuel).
  - The evolution of conventional aircraft to more energy efficient designs being brought into service.
  - More energy efficient operations being implemented by airports, carriers, and air traffic managers.
  - Transition of fleets to incorporate revolutionary new technology that may change how aircraft are designed, certified, maintained and disposed.
- Green aviation biofuel will initially come from the refinement of existing used oils (such as waste cooking oils), which will then expand to incorporate plant-based oils feedstock (such as wood pulp and agricultural residue) and eventually through to capture of carbon directly into e-fuel that will pull CO_2 from the air and convert to fuels. This is commonly referred to as Sustainable Aviation Fuel (SAF)[1], which will offer a ~40% reduction in carbon footprint alone. Green aviation biofuels are predicted to reduce carbon contribution in the range of 40 to 75% in the 2050-2070 timeframe when combined with other technological changes, i.e., depending on future scenarios.[2, 3]

[1] The term "SAF" has not been used throughout this summary as it is considered too vague, and Biofuels is considered more appropriate to allow the various feedstock options to be incorporated. Feedstock inputs include (but are not limited to) cooking oil, straw waste, forest waste, sawmill waster and municipal waste.
[2] Air Transport Action Group, "*WAYPOINT 2050: Balancing Growth in Connectivity with a Comprehensive Global Air Transport Response to the Climate Emergency: A Vision of Net-Zero Aviation by Mid-Century*", 2nd Ed, September 2021, p23-27, < https://aviationbenefits.org/downloads/waypoint-2050/>.
[3] International Civil Aviation Organization, "*Report on the Feasibility of a Long-Term Aspiration Goal (LTAG) for International Civil Aviation CO_2 Emission Reductions*", ICAO Committee on Aviation Environmental Protection, March 2022.

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- More energy efficient aircraft designs will see the evolution of existing designs and will range from lighter weight/stronger aircraft material (such as composites); more efficient engines; all the way through to overall aircraft designs that minimise aircraft drag (such as blended wing bodies). Aircraft technologies are collectively predicted to reduce carbon contribution in the range of 20 to 25% in the 2050-2070 timeframe.[4]
- Aircraft operations will become more energy efficient through a combination of ground operations (such as electrifying ground vehicles); digitally optimised flight paths; more efficient take off/landing phases (such as minimising holding patterns and optimising ascent and descent); through to more efficient route designs (such as avoiding storms and changing altitude mid-flight to minimise contrails). Aircraft operations are predicted to reduce carbon contribution in the range of 4 to 11% in the 2050-2070 timeframe.[5]
- Transition to new technology aircraft will include technologies such as electric, hydrogen and ammonia powered aircraft.[6] These technologies will not only change the design of the aircraft but may also impact the design of airport and logistical infrastructure to support them.
- International Actions for Decarbonising the Aviation Industry:
    - Whilst ICAO has a target of net zero by 2050, there are predictions that due to the continued increase in international flights (both passenger and cargo) and the unknown appetite to incorporate the various new technologies, that net zero will more likely be achieved in the 2070 timeframe.[7] The increase in international flights comes primarily from developing nations who will want to travel more (private and business travel) with increased import and export opportunities for cargo transport.[8] The 5.3% annual growth in international aviation will outweigh the current 2% compounding energy efficiency dividend the aviation industry generates each year.[9] Moreover, whilst international aviation represent 2.1-2.8% of the current global carbon emissions,[10] this percentage is expected to increase unless more drastic action is taken as other industries become more efficient leaving aviation in its wake. The EU predicts the total emissions will double if no other actions is taken beyond the efficiency dividend from design evolution of the conventional aircraft.[11]
    - Out to 2030 (and potentially beyond) electrification of aircraft will be limited to commuter aircraft (9-19 seats with <60minute flights) and regional aircraft (50-100 seats with 30-90

[4] See n**Error! Bookmark not defined.**, p4-5.
[5] See n**Error! Bookmark not defined.**, p4-5.
[6] Suborbital flight has not been considered as part of this initial review.
[7] See n**Error! Bookmark not defined.**.
[8] The EU's Clean Aviation initiative predicts the demand for flights will increase threefold by 2030. See https://www.clean-aviation.eu/infographic
[9] Royal Aeronautical Society Lecture, "*Net Zero Fuels for Aviation: The Royal Society Report and Beyond*", Presented by Dr Guy Gratton – Associate Professor of Aviation and the Environment, Cranfield University, 19 Apr 2023
[10] Intergovernmental Panel on Climate Change (IPCC), "*Sixth Assessment Report*", Figure 6.16, 2021. Compare with n**Error! Bookmark not defined.**.
[11] n**Error! Bookmark not defined.**.

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minute flights) due to the power limitation of batteries. [12] Whilst these smaller aircraft will continue to be biofuel capable, this will likely be where electrification will meet its limits.[13]

- It is predicted that by 2035 short haul flights (100-150 seats with 45-120 minute flights) will start converting to hydrogen power technology, with medium haul flights (100-250 seats with 60-150 minutes) starting to convert in the 2040 timeframe and long haul (250+ seats with 150+minute flights) converting to hydrogen technology sometimes beyond the 2050 timeframe.[14] The effect of this late conversion of medium to long haul aircraft is compounded by these larger aircraft having a higher carbon footprint (even if the carbon per passenger km is less). These large aircraft require a high energy density that electrification currently cannot provide. As such it is expected that the short, medium, and long-haul aircraft will (in the short to medium term) prioritise the use of green aviation biofuel which can be "dropped in" to existing infrastructure and used by conventical aircraft; whereas hydrogen will likely require redesign and extensive certification of aircraft and airports to handle the product.
- Whilst biofuels/SAF is already feasible, biofuels are not currently available in the volumes required for existing fleets let alone a growing fleet. The drive for decarbonisation will increase demand on biofuels that are already (and likely continue to be for the short-medium term) more expensive to produce than fossil fuel-based aviation fuels.[15] This increased cost in fuel will continue to drive the need for more efficient conventional aircraft designs and operations. These efficient designs will assist in the decarbonisation of both international and domestic aviation operations.

- Australia and International Aviation:
  - Australia relies upon international designers and manufacturers for most of the aircraft flown by Australian operators. Qantas and Virgin have both identified that they plan to use overseas supplies for their biofuel needs in order to reduce their carbon footprints (London, Los Angeles and San Francisco).[16] Whilst this is an honourable plan, it needs to be considered that the UK is already questioning whether they will have enough supplies across their industries to support everyone and achieve their own targets.[17] So Australian operators will likely have to compete internationally for biofuels produced overseas.
  - Australia is already a net exporter of fuel/energy. As such producing green biofuels to be sold/used locally could well be an economic opportunity for Australia as there will likely be minimal international competition to supply biofuel at Australian airports.[18] Unless Australia

[12] n**Error! Bookmark not defined.**, p54.
[13] It is expected that this would be an equivalent range limit in the region of 500km by 2030, which would likely extend to 1000km range by 2035.
[14] n**Error! Bookmark not defined.**, p54.
[15] Current estimates are that SAF will be 3-6 times more expensive than current Jet fuel due to increasing demand on fuel into the future and new refinement technologies and facilities requiring investments.
[16] Australian Government, Department of Infrastructure, Transport, Regional Development, Communications and the Arts, "*Australia's State Action Plan – International Civil Aviation Organization (ICAO) Assembly Resolution A37-19 on Climate Change*", October 2022, p9-10.
[17] The Royal Society, "*Net Zero Aviation Fuels: Resource Requirements and Environmental Impacts Policy Briefing*", February 2023. <https://tinyurl.com/RS-NZF>.
[18] It is expected that at least initially international biofuel producers will favour larger/closer hubs over Australia.

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becomes a net importer, a local production/supply will be required to meet the increasing demand of refuelling aircraft for long international routes by carriers (not just Australian). These carriers will be incentivised to lower their own carbon footprints with increasing use of biofuels. This demand will be further emphasised as more energy efficient aircraft operations will likely drive operators to have minimal fuels levels upon landing.[19] If this is the case, this will see most international aircraft in Australia refuelling locally due to the vast distance to any other country. This represents an economic opportunity for biofuel refiners like BP (who are commissioning oil refineries in Perth, WA)[20] and Caltex (who are testing supply chain readiness in Queensland with Virgin).[21] However, it will also have the effect of driving up the price/demand for the feedstock required as input into the refining process, feedstock such as used cooking oils and crops.

- Australia and Domestic Aviation:
  - Australia cannot simply disconnect domestic aviation activities from what happens internationally, as both will impact the other.
  - Whilst it is hard to compare Australia to Europe[22], the EU is investing €4.1B (~$6.6B AUD) into their clean aviation initiatives. This amount doesn't account for the renewal of aging aircraft fleet to new more energy efficient designs; however, it highlights the need for analysis and research into the complexities involved and the symbiotic relationships between domestic and international aviation.
- There are significant complexities requiring analysis of interdependent matters. For example:
  - A Market Assessment on the effect of Competition for Green Aviation Biofuel is undertaken - Unless there is government intervention, domestic suppliers of green aviation biofuel may well sell to the highest buyer. Due to many factors, including the scale/demand of international compared to domestic operators, it is easily envisioned that letting the fuel market be shaped by competitive forces alone could well reduce green biofuel supplies for the domestic aviation market. This could then have a negative effect to Australia achieving any emission target.
  - A review is undertaken to determine Australian priorities for Green Aviation Biofuel Feedstock. Whilst increasing aviation demand (domestically and internationally) for green biofuel may seem attractive at first instance, it needs to be considered in context of the wider Australian economy and the feedstock required. For example, preliminary studies in the UK have already been undertaken, which show that to satisfy the UK's aviation needs alone would take up a significant proportion of all crop production for biofuels and water availability for hydrogen production.[23] A review needs to be undertaken about where Australia's priorities lie for its natural resources to ensure that they aren't diverted just to aviation but spread out to other sectors such as human consumption, maritime fuel and other areas. All of which will be competing for biofuels. Noting that it is expected that maritime will have similar

[19] Minimal fuel levels above those fuel reserves required under existing regulations.
[20] Sonali Paul, "*BP Aims to Strat Producing Green Jet Fuel in Australia by 2025*", Dated 14 July 2022, accessed 19 June 23. <https://www.reuters.com/business/sustainable-business/bp-aims-start-producing-green-jet-fuel-australia-by-2025-2022-07-14/>
[21] n**Error! Bookmark not defined.**, p10.
[22] Europe is a bigger economy with more flights, more operators, a larger population, and several aircraft designers/manufacturers.
[23] See n**Error! Bookmark not defined.**.

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considerations to aviation in scale and distances, minimising the reliance on electrification alone.
    - A review needs to be conducted of the entire Australian fleet to assess when transition to more energy efficient aircraft will likely occur. Australia is a large country and has routes analogous to some international routes. As such, while some commuter and regional aircraft routes may be electrified in the next 5-10 years, it is likely short, medium, and long-haul aircraft will require considerable volumes of biofuels for the foreseeable future and have a direct impact on what emission targets are achievable.[24]
- The above three recommendations are not to be viewed in isolation as they interact with one another.
- The Australian aviation industry has just survived the impact of COVID-19 over the past three years. Over this time, the aviation industry has been shown to be vital to Australia both economically and socially. As such, it is highly necessary that we consider the complexities involved in both the domestic and international aviation markets if we are to continue to have a thriving aviation industry over the coming decades.

PREPARING FOR CHANGE (3.4)

18. What risks and opportunities do you (including your household, business, workers and communities) face as the world decarbonises and as Australia responds to the impacts of climate change?

- A risk is not being guided by science and sound analysis of data. A rational approach to developing Government strategies and plans is to include analysis (e.g. estimates of emissions and potential emissions reductions) to identify where increased effort or changes in approach are required to ensure that the emissions reduction goals are achieved.
- Fire hazard - A risk is fire as a result of thermal runaway of some types of lithium ion batteries. An opportunity is to ensure appropriate building standards for battery installations (depending on vulnerability of that type of battery to cause fires) to minimise risk of fire spreading to the rest of the building from a fire in an electric vehicle or from a stationary energy storage system. A further opportunity is to undertake research and development into battery technologies that provide both high charge density and are not susceptible to thermal runaway.
- Sustainability - poor or costly recyclability of batteries and solar panels. An associated opportunity is to lead development of standards and sponsor research and development into designs of battery and solar panel installation that facilitates easy and inexpensive disassembly and recycling, including repair and repurposing opportunities.

19. What could governments do to help?

- Mitigate lithium battery related fire hazards through building standards and through funding research and development into fire-safe battery technologies.
- Improve battery and solar panel sustainability through funding research and development into improving recyclability of batteries as well as minimum standards for installation.

[24] See n**Error! Bookmark not defined.**. Comparing Australia to the size of Europe – Whilst Australia does n ot have the same level of passenger kms, Europe is predicting that 67% of Aviation CO_2 emissions in 2050 will come from Long Range (>250 pax) and Medium-range (166-250pax) aircraft flights with significant contributions with flight ranges of 1,000-2,000 kms.

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- Introducing regulations that achieve decarbonisation across all sectors of the economy, like an economy wide carbon pricing mechanism.
- Planning and implementing economic stimulus packages so that they yield economic, social, and environmental dividends and assist with decarbonisation (e.g., electrification of appliances; energy efficiency, solar/battery rebates, etc.) of residential and commercial entities.

TARGETS (3.5)

20. What types of targets do you see as important and/or problematic, and why?

- Minimum recycled content for products (percentage targets) are problematic as they don't provide for the provision or availability of recycled material itself. Targets defined in the establishment and provision of a secondary materials market would complement minimum recycled content targets ensuring greater circularity.
- Renewable energy targets are important and are currently achievable due to a combination of supportive policy platforms and government funding initiatives leading to an attractive domestic and international capital investment economic environment.

ARE KYOTO-ERA SCHEMES FIT FOR THE PARIS AGREEMENT ERA? (3.6)

21. What do you see as the strengths and weaknesses of the NGER scheme? How could it be improved?

- Currently NGERs does not account for Scope 3 emissions and is therefore omitting a potentially significant source of emissions. This undermines the accuracy of Australia's total emissions stocktake and jeopardises the potential to limit global warming to desirable levels.
- Recommend amending Part 1, Division 2, Section 11 to include:
    - (1) (aaa) Scope 3 emissions
- Further, Part 1, Division 2, Section 11 (3) currently allows for Ministerial determination of methods and criteria for methods for calculating emissions. This allows varying calculation methods to exist simultaneously.
    - Engineers Australia recommends establishing standard government emissions calculation methods as a basis for data comparability and standardisation of approach across the economy.

22. What aspects of methane measurement, reporting and verification should the Authority focus on as part of the NGER review?

- Greater scrutiny of fugitive emissions from gas extraction activities needs to occur to establish a clearer understanding of total emissions from this sector. This includes reviewing construction methods and emergency response mechanisms to limit uncontrolled emissions.

23. Following the Government's acceptance of recommendations of the Chubb Review, what do you see as the strengths and weaknesses of the CFI and ERF?

- Addressed in next section.

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24. How could the CFI, ERF and NGERs be improved in the context of the Paris Agreement era?

- Addressed in response to Q 21 and in next section.

CARBON CREDIT INTEGRITY (3.7)

25. Following adoption of the Chubb Review recommendations, what concerns about ACCU integrity remain?

- In general, Engineers Australia supports the implementation of the 16 Chubb review recommendations. Of particular importance is 'Recommendation 4. Offsets Integrity Standards', which needs to be more clearly defined and supplemented.
- The Integrity Council for the Voluntary Carbon Market (ICVCM) have developed a range of core principles for carbon offsets. These supply-side principles include:
    - Governance:
        - Effective governance: The carbon-crediting program shall have effective program governance to ensure transparency, accountability, continuous improvement and the overall quality of carbon credits.
        - Tracking: The carbon-crediting program shall operate or make use of a registry to uniquely identify, record and track mitigation activities and carbon credits issued to ensure credits can be identified securely and unambiguously.
        - Transparency: The carbon-crediting program shall provide comprehensive and transparent information on all credited mitigation activities. The information shall be publicly available in electronic format and shall be accessible to non-specialised audiences, to enable scrutiny of mitigation activities.
        - Robust independent third-party validation and verification: The carbon-crediting program shall have program-level requirements for robust independent third-party validation and verification of mitigation activities.
    - Emissions Impact:
        - Additionality: The greenhouse gas (GHG) emission reductions or removals from the mitigation activity shall be additional, i.e., they would not have occurred in the absence of the incentive created by carbon credit revenues.
        - Permanence: The GHG emission reductions or removals from the mitigation activity shall be permanent or, where there is a risk of reversal, there shall be measures in place to address those risks and compensate reversals.
        - Robust quantification of emission reductions and removals: The GHG emission reductions or removals from the mitigation activity shall be robustly quantified, based on conservative approaches, completeness and scientific methods.
        - No double counting: The GHG emission reductions or removals from the mitigation activity shall not be double counted, i.e., they shall only be counted once towards achieving mitigation targets or goals. Double counting covers double issuance, double claiming, and double use.
    - Sustainable Development:
        - Sustainable development benefits and safeguards: The carbon-crediting program shall have clear guidance, tools and compliance procedures to ensure mitigation

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activities conform with or go beyond widely established industry best practices on social and environmental safeguards while delivering positive sustainable development impacts.
    - Contribution toward net zero transition: The mitigation activity shall avoid locking-in levels of GHG emissions, technologies or carbon-intensive practices that are incompatible with the objective of achieving net zero GHG emissions by mid-century.
- Engineers Australia strongly supports adopting the above principles as part of the CFI Review.
- Further, it is acknowledged that the principle of 'Additionality' has been addressed with the Chubb review in claiming the current Avoided Deforestation method has reached its used by date.
    - Avoided impacts are an unsuitable metric for claiming improvements in carbon sequestration.

26. What are the risks to integrity that should be buffered against?

- From the principles outlined above, the principle of 'Permanence' comes into question when Australian Carbon Credit Units (ACCU) are generated via soil carbon methodologies.
- Soil carbon improvements in agricultural or pastural lands requires consistent and active land management over many years and is likely to involve a significant change in agricultural or pastural practice. In context of the typically slow yielding timeframes of any soil carbon project, any improvement is precariously subject to not only any change in agricultural management, but the effects of climate change itself. Both extreme drought and floods impact soil constitution and the potential for erosion. Methods to improve soil health through regenerative agricultural practices are wholly supported and at a minimum, such should be business as usual in the agricultural sector.
- The practice of claiming carbon offsets, however, from a sector prone to weather events and floods invites uncertainty and questions the long-term viability of those soil carbon projects.

27. How should a buffer be applied (e.g., government purchase, supply-side reserve, demand-side correction, other)?

- Engineers Australia recommends reviewing and potentially limiting the volume of ACCUs generated via soil carbon projects as a means of ensuring the integrity of the Australian carbon offset market.
- Consider reviewing the soil carbon methodology by making the criteria for improvements in soil carbon more robust to as to enable resilience against erosion and climate change.

28. What role should governments and users of offsets have in ensuring demand-side integrity?

- Continued consultation between government and organisations such as the Science Based Targets initiative (SBTi), Voluntary Carbon Markets Initiative (VCMI), and Integrity Council for Voluntary Carbon Markets (IC-VCM) will help ensure ongoing integrity.
- As the Safeguard Mechanism reforms are implemented, demand side integrity will be critical to ensuring carbon credits support genuine emissions reduction in line with emissions reduction targets.

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- The government has already introduced a 30% of total abatement limit on the purchase of carbon offsets for SGM facilities as a means of contributing towards demand-side integrity for SGM facilities.
- For voluntary climate commitments, the government should introduce an industry standard outlining expectations in demand side integrity and climate action plans. Mitigation should commence at emissions avoidance, reduction, energy substitution and conclude with innovation & technological advancements. Only unavoidable or unmitigable emissions should be considered for verified emissions offsetting.
- Mechanisms to address carbon leakage will also need to be introduced, like the proposed Carbon Border Adjustment Method (CBAM) to enable a level playing field for abatement effectiveness.

29. What protections are needed to ensure the integrity of carbon trading markets and exchange platforms?

- Providence of carbon credits and verification mechanisms need to be independent and trustworthy.

INTERNATIONAL UNITS (3.8)

30. What role should international carbon markets have in Australia?

- An assessment should be made on the availability of local carbon markets to deliver ACCUs in response to potential demand. Depending on the extent of constraints to availability of domestic offsets, there may be benefit in allowing a proportion of any emitters offsets to be international carbon offsets (such as Amazon reforestation), with a caveat that the offsets provide net positive social and economic impacts in the countries where those offsets are located.

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