20 June 2020

Department of Industry, Science, Energy and Resources
Consultation Hub
Canberra ACT 2600

Dear Minister and interested parties

Submission from the Australian-German Energy Transition Hub (Energy Transition Hub) on Australia's Technology Investment Roadmap Discussion Paper of May 2020

Thank you for the opportunity to provide our input to help inform Australia's first Low Emissions Technology Statement and Technology Investment Roadmap.

The Energy Transition Hub was established by the Australian and German Governments as a bilateral initiative to identify and harness opportunities for both countries in the transition to a net-zero emissions world economy. The Hub is led in Australia by the University of Melbourne and the Australian National University. It involves 13 research partner organisations involving over 100 world leading researchers in energy transition. A variety of research outputs from the Hub, relevant to the development of the Roadmap, are available at https://www.energy-transition-hub.org/.

It is critical that deep consultation and engagement is maintained with industry, research institutions and other key stakeholders to ensure Australia continues to thrive in the transition to net-zero emissions.

The conclusion from the work undertaken by researchers affiliated with the Hub, and many others, is clear: If planned well and we act quickly, Australia can deploy existing and new technologies to become a renewable exporting superpower, and bring sustained benefits to the Australian economy.

We have provided some comments below on the specific questions in the discussion paper. We are happy to expand on this submission or provide clarification as needed.

This submission draws on a range of Hub supported research outputs. The text was prepared by Scott Hamilton, strategic advisor to the Hub.

Yours sincerely

Malte Meinshausen, Frank Jotzo & Rebecca Burdon
(on behalf of the Energy Transition Hub)

Response to specific questions:

a) The challenges, global trends and competitive advantages that should be considered in setting Australia's technology priorities

A clearly evident global trend is the rapidly increasing demand for renewable energy generation and storage technologies, and technologies for low- and zero-emissions synthetic gas production, storage and use. Demand is projected to rise for metals and other energy intensive goods from low-carbon production processes (Lord et al. 2019)[1].

Globally, low-carbon electricity has recently overtaken electricity produced from coal but still needs to expand dramatically. In the context of Covid19, renewables in global electricity supply reached nearly 28% in the first quarter of 2020, up from 26% during the same period in 2019 – but growth in renewables is expected to slow down in 2020 (Turk et al. IEA 2020)[2]. This is due to a combination of factors including supply chain disruptions, lockdown measures, financing challenges, delay in utility-scale projects and depressed markets for rooftop solar PV.

Australia will have a comparative advantage as the world transitions to renewable energy because of its exceptional and complementary wind and solar resources. Australia's vast wind and solar resources are assets with increasing value as global trade and energy flows shift. Australia could be an important source of supply in global markets for:

- Renewable energy powered fuels such as hydrogen, and hydrogen-based synthetic fuels such as ammonia, methane or methanol, which are widely projected to play an increasing role in meeting global demand for energy by the middle of this century

- High-voltage direct current (HVDC) transmission lines to directly export renewable energy to South East Asian neighbours, and

- Energy intensive goods, including metals, produced using renewable electricity, or synthetic fuels created using renewable energy. If well managed, these export focused industries could deliver significant benefits to the domestic economy, in addition to the export revenues generated.

Hub research studied possible synergies and co-benefits of hydrogen export and a domestic energy transition towards very high shares of renewables (Ueckerdt et al 2019). This research indicates that an ambitious approach to the development of hydrogen and energy intensive exports sectors is better than a cautious one. Aggressively pursuing hydrogen exports can reduce costs of domestic energy supply if electrolysers are integrated into a renewable-heavy NEM, reducing curtailment and the need for electricity storage and network investment.

It could be beneficial for the hydrogen industry in providing cost-competitive hydrogen and also could provide a basis for new export industries, such as green steel, in a carbon-constrained world. Scenarios examining how a major hydrogen industry might roll out in Australia were explored in a collaboration of five Energy Transition Hub partner institutes (two in Germany and three in Australia) using four optimisation models (REMIND, REMix, OpenCEM and MUREIL).

The modelling shows that if Australia produced 200% of our electricity needs by 2050, exporting the surplus as hydrogen or other energy intensive products, it would lower the cost of electricity from the NEM relative to a baseline scenario. Costs are lower both relative to average electricity system costs today and relative to the projected optimal 2050 system with less hydrogen and energy intensive goods produced for export. This can benefit the broader economy. (Hamilton et al. 2019)[3]

There are challenges to realising these opportunities and a clear role for policy. Proven policy approaches to support the development of these opportunities include mechanisms to reduce risks to investors and ensure low-cost financing. Another important component is regulatory and energy market reforms to ensure timely exit of aging generation and efficient investment in new generation, networks, storage and flexibility of demand. (Ueckerdt et al. 2019)[4]

Energy Transition Hub recent work on these and related issues is summarised in a series of papers that cover:

- Australia's power advantage: Energy transition and hydrogen export scenarios
- Innovation and export opportunities of the energy transition
- Towards net zero - Carbon dioxide removal and utilisation
- Markets, regulation, policies and institutions for transition in the electricity sector

b) The shortlist of technologies that Australia could prioritise for achieving scale in deployment through its technology investments (see Figure 7).

Demand for the technologies required to produce renewable energy and synthetic fuels is projected to increase rapidly, even in the short-term. The value of the global market for technologies to support renewable power generation, energy storage and hydrogen production is projected almost double between 2016 and 2025, and then continue to expand at an increasing pace to 2050. (Burdon et al. 2019)[5]

This global change is occurring in the context of rapidly changing technology costs and as countries move to implement policies, such as net-zero emissions by 2050, in line with Paris Agreement goals. For example, Germany has recently released its National Hydrogen Strategy and allocated €9 billion as part of its stimulus package to end the countries reliance on coal.

On 17 June 2020, Minister Taylor told the Australian Parliament: “It's not just Asian countries that are interested in this but European countries. Only today we've seen Germany signaling their interest in importing hydrogen, announcing 2 billion euros to develop international partnerships. We will certainly be talking to them about that.”

It is critical that Australia moves quickly to take advantage of this transition and keeps an eye on the decades 2030 to 2050 as it develops and deploys technologies in the 2020s.

Figure 7 in the Discussion Paper provides a useful shortlist list of priority technologies. In order to maximise the effectiveness of Australia's Long-Term Emissions Reduction Strategy, Energy Transition Hub recommends further focus and prioritisation. In particular we propose immediately accelerating deployment of mature and demonstrated zero-emissions technologies, and investing in R&D and the acceleration of the deployment of emerging technologies. This is consistent with other work in this field (eg Butler et al. 2020)[6]

Investment in zero-emissions technologies should be prioritised. Investment in long-lived fossil-fuel assets risk being higher cost given the high risk of stranded assets, the lower cost of renewable generation, and options for supporting the grid using demand response and storage.

The existing gas infrastructure will however continue to play an important role in the energy system in a transition period as Australia closes ageing coal fired power stations and the proportion of renewables in the system increases.

Technologies that Australia is likely to benefit from prioritising for deployment include:

- green hydrogen production – as supported by the Energy Transition Hub work, global analysis and a number of reports commissioned by Australian state and Federal governments in the past two years
- electrification of industrial processes – which will require a range of technologies depending on the application, many of which are available and being deployed in other countries (Maddedu et al. 2019)[7]
- electrification of industrial commercial and residential heating and cooling
- electrification of transport including via battery electric or fuel cell electric vehicles.

In all cases, these are being supported in many other countries via a combination of investment and supportive regulatory and policy environments (Jotzo et al. 2019)[8].

c) Goals for leveraging private investment.

[no specific Energy Transition Hub response]

d) What broader issues, including infrastructure, skills, regulation or, planning, need to be worked through to enable priority technologies to be adopted at scale in Australia.

As discussed, it is critical to plan Australia's energy transition from a system perspective as the co-benefit of sector coupling should not be underestimated.

Australia needs to move quickly to take advantage of growing global markets in new energy technologies. There are long lead times from research, development, demonstration, commercialisation and deployment.

The lead times are particularly pertinent when is come to Carbon Dioxide Removal (CDR) technologies. There is an innovation gap for CDR: Key technologies are still in the early stage of development, but modelling shows substantial deployment is already needed between 2030 and 2050. The urgency of the need for R&D and commercialisation of CDR is not widely appreciated.

Continued and further investment in research institutions and public bodies such as ARENA, CEFC and CSIRO will be required to support the achievement of Australia's Long-Term Emission Reduction Strategy.

The transition of energy systems can bring large economic benefits. However, the adjustment can also place pressure on communities and businesses. Effective settings for regulations, markets and policy are needed to support the transition. In many instances, reform is needed to adapt to changed circumstances and new objectives. Getting regulation, market frameworks and policy settings right underpins the progess towards electricity supply with low- and ultimately zero-carbon emissions while maintaining reliability of supply and limiting energy costs. Zero-emissions electricity supply is at the heart of a shift to a clean energy system.

In Germany, the evolution of market design and regulation is driven by the need to expand and integrate renewable energy sources into the grid, and most recently by the need to decarbonise other sectors through electrification. A focus of research and analysis has been on large-scale

renewable integration by improved market, dispatch and grid operations. For future large-scale renewable integration, large-scale energy storage and sector coupling are discussed (Zerrahn et al. 2018)9. Large investments by the German government in research capability for energy transition, including for electricity, have enabled the development of advanced modelling tools that allow technology and policy ideas to be tested for their whole-of-system impacts. Many of these tools are available to Energy Transition Hub partners and can be adapted to the Australian context.
Energy Transition Hub supports the development of a roadmap including the setting and reviewing of 5-year investment goals. Notwithstanding, the roadmap needs more connection and collaboration with international research institutions and businesses.

e) Where Australia is well-placed to take advantage of future demand for low emissions technologies, and support global emissions reductions by helping to deepen trade, markets and global supply chains.

See response to (a) above.

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Attachments & reference documents

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