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### **Submission to Inquiry into Australia's Transition to a Green Energy Superpower**

To the selection committee,

We are grateful to the Joint Standing Committee on Trade and Investment Growth for the opportunity to submit to the inquiry on Australia's transition to a green energy superpower.

This submission responds specifically to emerging and possible future trends.

We provide detail and modelling results for the potential change in demand for imports of thermal coal and gas depending on the decarbonisation pathways of Australia's major trading partners China, Japan, India, and South Korea. We used different decarbonisation pathways to reflect the overall level of climate change ambition, and technology availability and choices, and discuss the future implications for Australia. We recommend the Australian government increases investment in Asia-Pacific capabilities, including in expertise and analytic capabilities, in support of benefitting from the decarbonisation pathways of current and future trading partners.

Sincerely

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Llewelyn Hughes

A handwritten signature in black ink, appearing to be 'Thomas Longden', with a long horizontal line extending to the right.

Thomas Longden

## **EMERGING AND POSSIBLE FUTURE TRENDS**

For decades Australia has played an important role as an exporter of traditional fuels to major trading partners in the Indo-Pacific region. Australia has been a trading partner of choice for countries seeking to increase energy security in traditional fuels by diversifying suppliers.

Research conducted at the Australian National University (ANU) using the Global Change Analysis Model (GCAM) offers insights into how different decarbonisation pathways will affect the demand for imports of thermal coal and gas to mid-century. We focus on our major trading partners China, Japan, India, and South Korea (Longden and Hughes 2022).

GCAM is an Integrated Assessment Model that incorporates the interaction of socio-economic factors with energy, climate, water, and land use based factors. There are important uncertainties in all models that need to be recognised in order to ensure users do not assume an unwarranted degree of certainty about model results. Nevertheless, IAMs are one strategy for examining possible future regional trends in energy trade and use under different decarbonisation trajectories. A key additional benefit of IAMs, including GCAM, is their attention to incremental processes of change, providing a view of rates of change, in addition to potential end-states.

## **COAL AND NATURAL GAS**

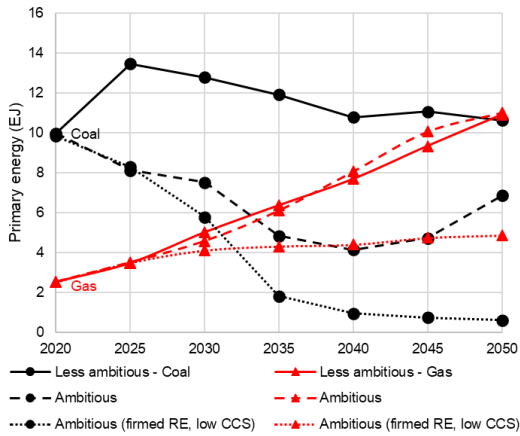
GCAM results suggest changes in imports of coal and gas in major trade partners in the Indo-Pacific – China, Japan, India, and South Korea - is dependent on three factors:

- The overall global level of climate policy ambition;
- The available technology options supporting decarbonisation, such as carbon capture and storage (CCS), and options for firming renewables such as batteries and pumped hydro;
- Available resources in each country, including land, solar irradiance, wind, and carbon storage sites.

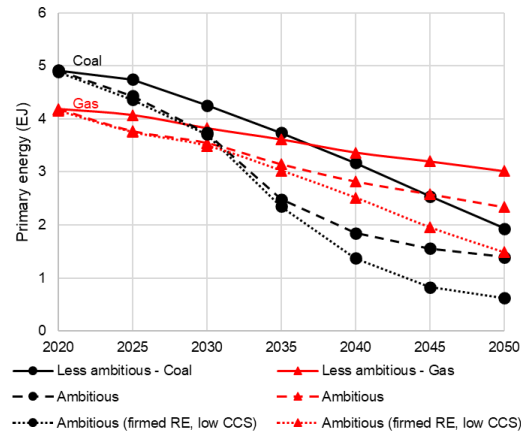
Analysis using GCAM suggests thermal coal imports in China, Japan, South Korea, and India will decrease markedly in the near-term under more ambitious climate scenarios, but the pace of this fall also depends on the availability of firmed renewable energy and/or CCS deployment. Trends in gas imports also vary by country, and similarly are affected by the availability of firmed renewable energy and/or CCS at scale (see Figure 1).

**FIGURE 1: COAL AND GAS IMPORTS IN SELECTED INDO-PACIFIC COUNTRIES**

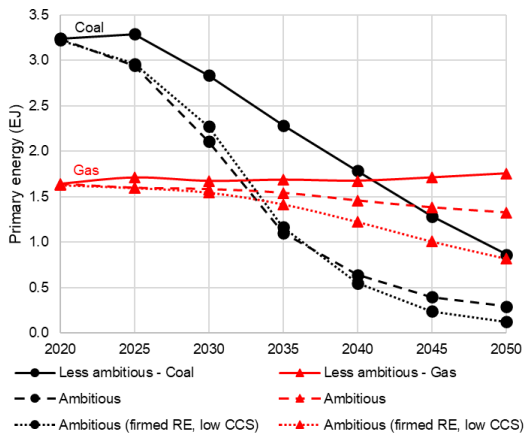
**a) China**



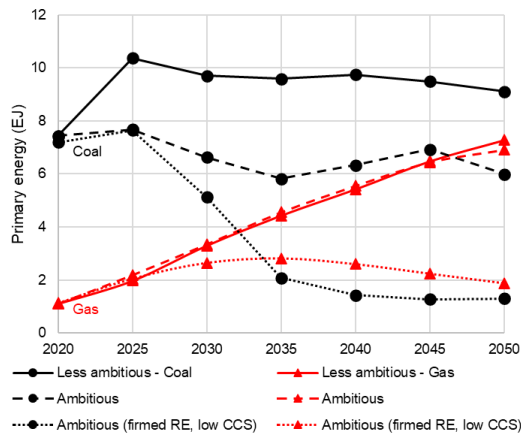
**b) Japan**



**c) South Korea**



**d) India**



**CHANGE IN ELECTRICITY GENERATION**

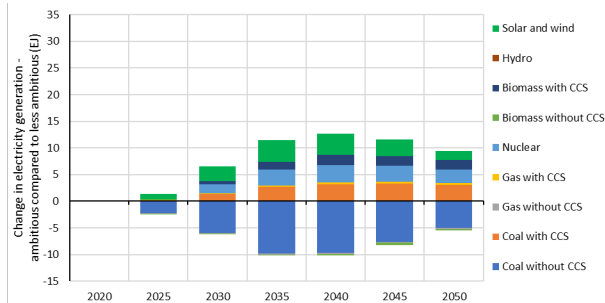
If we consider the domestic electricity sector in each country, results from GCAM suggest the shift away from coal and gas use in China, Japan, South Korea, and India depends on whether CCS becomes a viable option at scale (see Figure 2).

Using GCAM we examined an ‘Ambitious Climate Scenario’, which allows for large-scale CCS deployment, and compared this with an ‘Ambitious (Firmed RE, Low CCS)’ scenario, in which there are limited available storage sites for captured carbon, and firmed solar photovoltaics (PV) and wind power are available at scale.

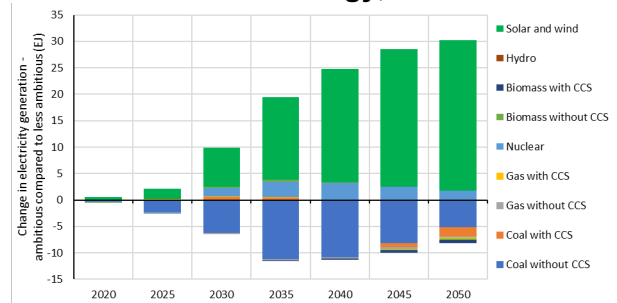
In Figure 2 below, the panels on the left show changes in energy use to meet electricity demand in the case that CCS is available at scale. The panels on the right show changes in energy use in the electricity sector if CCS is not available at scale. In both cases, as global climate ambition increases, the use of unabated coal and gas fall, however the replacement technology varies depending on the availability of CCS and/or firmed renewable energy at scale. An additional key difference across countries is an increase in nuclear power, which is part of the fuel mix in all countries except India.

**FIGURE 2: CHANGE IN ELECTRICITY GENERATION SOURCES - DIFFERENCE BETWEEN LESS AMBITIOUS AND AMBITIOUS SCENARIOS**

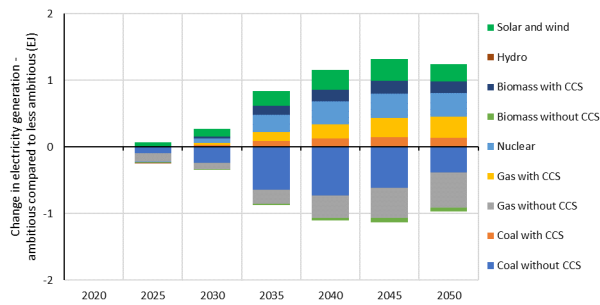
**a) China: Ambitious Climate Scenario**



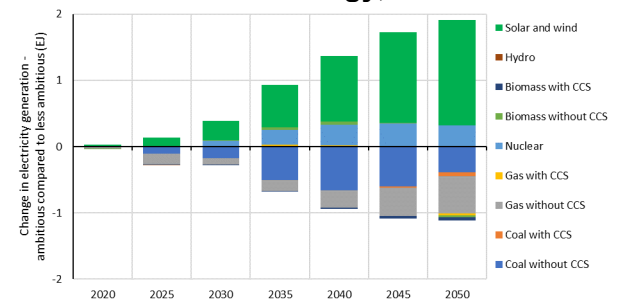
**b) China: Ambitious Climate Scenario Firmed Renewable Energy, Low CCS**



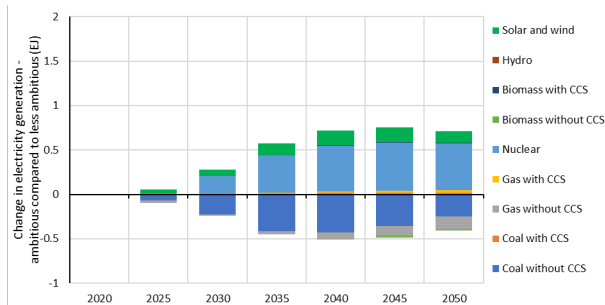
**c) Japan: Ambitious Climate Scenario**



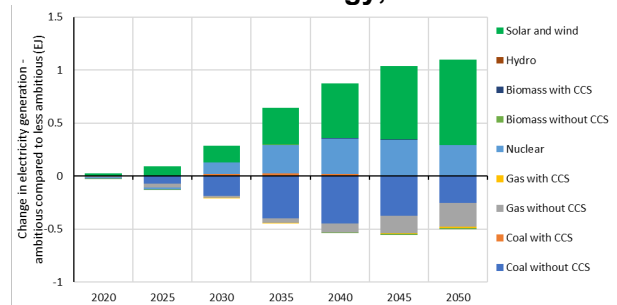
**d) Japan: Ambitious Climate Scenario Firmed Renewable Energy, Low CCS**



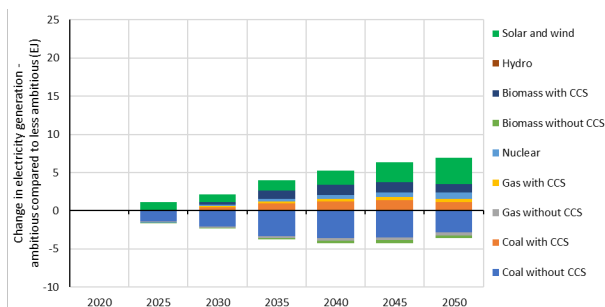
**e) South Korea: Ambitious Climate Scenario**



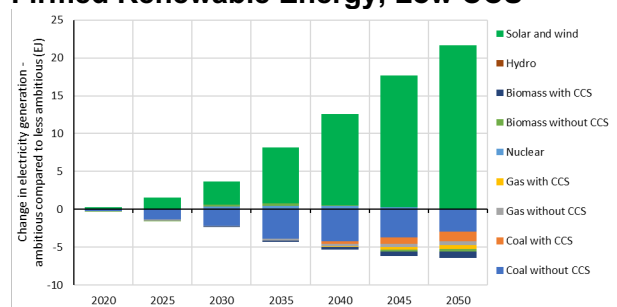
**f) South Korea: Ambitious Climate Scenario Firmed Renewable Energy, Low CCS**



**g) India: Ambitious Climate Scenario**



**h) India: Ambitious Climate Scenario Firmed Renewable Energy, Low CCS**



## **IMPLICATIONS FOR AUSTRALIA**

For Australia, a core issue of national interest is identifying what new opportunities emerge from the decarbonisation pathways chosen by trading partners in the Indo-Pacific, as well as the implications for demand for imports of fossil fuels. As global climate ambition increases, GCAM modelling suggests we should expect a near-term drop in thermal coal imports by traditional trading partners if CCS is not deployed at scale.

GCAM modelling also suggests gas will remain in the energy mix, but imports by key trading partners is strongly affected by the availability of CCS, coupled with the overall level of global climate ambition.

The countries we examined all increased the use of solar and wind in the electricity mix. Regional decarbonisation also has important geopolitical implications (Downie 2022), and these countries will increase their exposure to supply chain risks associated with solar, wind, and firming technologies as they decarbonise.

There are large uncertainties in the technology pathways selected by Australia's key trading partners as they decarbonise. A recent announcement by the government of Japan, for example, has overturned the stated policy of using nuclear power to the minimum extent possible, and may lead operators to extend the operating life of nuclear power units, with implications for its future energy mix (ABC News 2022).

Understanding the timing of decreased demand for thermal coal and gas is important in preparing for alternative futures. At the moment, there is a lot of speculation about potential trends, but a lack of detailed modelling of how our trading partners may change in the coming decade. There is also great uncertainty about the pace of deployment and the potential for renewable energy in countries in the Asia-Pacific.

Information gathering and analysis on regional trading partners' decarbonisation pathways are crucial for Australia's existing energy trade, and the new market opportunities emerging in as the region decarbonises.

The Asian Studies Association of Australia identifies important challenges in Asia-related literacy, including support for Asian languages and research (Aspinall and Crouch 2023). In addition to collaborating with current and potential energy trading partners, as discussed in the submission by our colleagues (Aisbett et.al. 2022), the Australian government should increase investment in Asia-related expertise and analytic capabilities in support of understanding the decarbonisation pathways being chosen by current and future trading partners.

### **Recommendation:**

The Australian government should increase investment in Asia-Pacific capabilities, including in expertise and analytic capabilities, in support of understanding and benefitting from the decarbonisation pathways of current and future trading partners.

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## **Acknowledgement**

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