



Mini-Symposium / Thematic Session 1

The role of the energy sector in Australia's net zero emissions target

With the federal government's commitment to net zero carbon emissions by 2050, the energy sector has gained much of the focus as transition to renewable sources of energy could contribute to a significant reduction in emissions. Lowering emissions in the energy sector could reduce the emissions not just from the sector itself, but also in other energy intensive sectors. A rapid rollout of renewable energy could have many opportunities and challenges for the energy sector. Many Australian states and territories have already started investing on new renewable energy generation and storage options, such as solar and wind to enhance this transition smoothly and efficiently. The symposium will provide scholarly discussion about this issue and contribute to the ongoing debate of energy transition.

Paper 1: Who is buying electric vehicles in Australia? A study of early adopters

Anna Mortimore, Shyama Ratnasiri, Md Sayed Iftekhar

To design relevant policy measures and incentives to accelerate the uptake of electric vehicles (EVs) in Australia, it is important to understand who the early adopters of EVs are, their reasons for choosing an EV, and their level of satisfaction in driving, charging locations, home charging, and other experiences. This paper presents the results of the first survey of early adopters in Queensland, Australia. The data has been analysed to understand the socio-demographic profiles of early adopters and to explore variations between two groups of adopters, identified as Tesla owners, having the highest uptake of Battery Electric Vehicles (BEV) in Australia and non-Tesla owners of BEVs and plug-in hybrid electric vehicles. The analysis suggests that both groups of early adopters are predominantly male, university educated and have substantially higher incomes. However, higher income households and younger people are more likely to own a Tesla. In terms of the major motivating factors, soc

Paper 2: Technology Adoption, emissions, and inequality

Shyama Ratnasiri

This study develops an overlapping generations model of technology adoption and wealth inequality. The model attempts to explain the inequality dynamics when agents are adopting cleaner technologies by giving up 'dirty' technologies which are typically associated with emission cost. The model suggested that adoption of cleaner technologies slows down economic growth and

reduces the income and wealth inequality in the very short run but tend increase in the long run. The model's predictions were tested using empirical estimation of inequality and clean technology adoption measured in terms of the clean technology patents. The findings confirm a negative relationship between the two variables.

Paper 3: Sensitivity of carbon emission outcomes to deep decarbonisation of electricity generation in the NEM involving high penetration of variable renewables and network balancing utilising firming technologies.

Paul Simshauser, Tim Nelson, Nancy Spenser , Phillip Wild

For the year ending September 2020, actual emissions from the electricity industry was 170.4 Mt CO₂-e, representing 33.4% of total emissions. Deep cuts in emissions from electricity generation will be needed to achieve Australian decarbonisation goals. Emission results from simulations of decarbonisation pathways applied to the NEM based around high penetration of renewables will be presented. Firming technologies utilised in the modelling include battery storage, pump hydro and gas plant. Coal generation is assumed to be shut down. The time frame of the modelling is 2040 and utilises aspects of the 2020 Integrated System Plan. The ANEM model of the NEM is used to perform the simulations. This model is an agent-based wholesale market nodal model of the NEM and incorporates 59 nodes, 415 generators and 84 transmission pathways.

Paper 4: Firming merchant renewable generators in Australia's National Electricity Market

Jonty H. Flottmann, Alexandr Akimov, Paul Simshauser

Global decarbonisation is driving investments in intermittent renewable generation, with most plant entering the market by way of a Power Purchase Agreement. In Australia's NEM, a surprising number of renewable generators have entered on a merchant basis. To maintain tractable revenues some minimum level of hedging is required, but in an energy-only electricity market with a very high market price cap, merchant intermittent generators require some level of associated firming capacity to ensure spot price exposures can be adequately managed. This article uses unit commitment, battery arbitrage and stochastic discount cashflow valuation models to compare an Open Cycle Gas Turbine and a battery as firming options for a hypothetical wind farm in the South Australian region of the Australian NEM.

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