AUSTRALIAN EXPERIENCE IN DECARBONISING THE ELECTRICITY SECTOR

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Australia’s role in the Indo-Pacific
Australia exports large quantities of:
- Coal (metallurgical and thermal), and
- Gas (LNG).

Climate policies may change:
- Demand for fossil fuels,
- Energy security (less reliance on imports), and
- Geopolitics.

The Global Change Analysis Model (GCAM)
- offers a useful tool for examining decarbonisation pathways pursued by governments, and
- examining the implications for Australia’s role as a supplier of energy security to the region.

Project info:
National Electricity Market (NEM)
Wholesale electricity prices have fallen over the last few years. 

AEMO Quarterly Dynamics

Real-time data is available via AEMO website →
Dynamics of prices is changing – negative prices are more common.
Solar and wind are displacing coal and gas, particularly during the daytime.
Combined wind and solar has set Victoria’s price more frequently than gas.

Brown coal generation is responding to negative prices. (wo carbon price)
The Australian Energy Market Operator (AEMO) has published the 2022 ISP, a 30-year roadmap for essential and efficient investment in the National Electricity Market (NEM).

The 2022 ISP supports Australia’s highly complex and rapid energy transformation, switching from higher-cost, high-emission energy to lower-cost renewable energy, doubling capacity to power transport and industry, and at all times providing consumers with reliable, secure and affordable power.

**Optimal development path (ODP)**

The ODP identifies five projects as immediately actionable which should progress as urgently as possible – HornsLink, VNI West, Mariner Link, Sydney Ring and New England REZ Transmission Link.

While delivery dates are as advised by project proponents, earlier delivery would provide valuable insurance for any faster transition or additional benefits to consumers. Supporting policies and mechanisms from the Commonwealth and jurisdictional governments may be required to assist in earlier delivery.

**Net benefits**

The transmission projects within the ODP are forecast to deliver scenario-weighted net market benefits of $28 billion, returning 2.2 times their cost of approximately $12.7 billion.

Although they represent just 7% of the total generation, storage and network investment in the NEM, they will provide investment certainty, optimise consumer benefits, and embed flexibility to reduce emissions faster if needed.
Rooftops - cities
<table>
<thead>
<tr>
<th>Details for solar panel average treatment effect</th>
<th>Could not pay electricity, natural gas, or telephone bill on time (1)</th>
<th>Could not pay electricity, natural gas, or telephone bill on time often or always (2)</th>
<th>Received disconnection warning from electricity or natural gas company (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar panels installed &gt; 2 years ago</td>
<td>−0.040**</td>
<td>−0.028***</td>
<td>−0.014</td>
</tr>
<tr>
<td></td>
<td>(0.020)</td>
<td>(0.009)</td>
<td>(0.017)</td>
</tr>
<tr>
<td>Solar panels installed &gt; 2 years ago, probit</td>
<td>−0.050**</td>
<td>−0.023**</td>
<td>−0.031*</td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
<td>(0.011)</td>
<td>(0.017)</td>
</tr>
<tr>
<td>Solar panels installed &gt; 2 years ago and</td>
<td>−0.060***</td>
<td>−0.029***</td>
<td>−0.027***</td>
</tr>
<tr>
<td>minimum of 2 matches</td>
<td>(0.013)</td>
<td>(0.006)</td>
<td>(0.009)</td>
</tr>
<tr>
<td>Solar panels installed any time</td>
<td>−0.042**</td>
<td>−0.021</td>
<td>−0.031***</td>
</tr>
<tr>
<td></td>
<td>(0.020)</td>
<td>(0.014)</td>
<td>(0.011)</td>
</tr>
</tbody>
</table>

Note: ***Significant at the 1%, **5%, *10% level. Average treatment effects are shown. Standard errors are in parentheses below the coefficients. The covariates include all of the explanatory variables from Table 1 plus a binary variable to identify households that are not concerned about energy conservation. The data are from the 2012 HEC survey.
Data are key to proving green-energy benefits

Scientists are working with poorer communities worldwide to improve access to clean and safe energy sources.

Gemma Conroy

Employees of Ben Hill Electrical and Original Power work on rooftop solar installation at Norman Frank Jupurrula’s home in Tennant Creek. Credit: Original Power

https://www.nature.com/articles/d41586-022-02831-4
Energy insecurity during temperature extremes in remote Australia

Thomas Longden1, Simon Quilty2, Brad Riley3, Lee V. White3, Michael Klier4,5, Vanessa Napaljarri Davis1 and Norman Frank Jupurrula1

Indigenous communities in remote Australia face dangerous temperature extremes. These extremes are associated with increased risk of mortality and ill health. For many households, temperature extremes increase both their reliance on these energy services, and the risk of these services becoming broken. This means that, in the face of climate change, the risk of energy insecurity and energy associated with prepayment all exacerbate the risk of temperature-related harm. Here we use daily smart meter data for three remote Indigenous communities to assess the relationship between high temperature and energy consumption, and to explore how this relationship is moderated by prepayment in 26 remote communities. We find that nearly all households (91%) experienced a disconnect from electricity during the majority of 2019-2020 financial year. Almost three quarters of households (76%) were disconnected at least once. Households with high electricity use located in the central climate zones had a one in three chance of a same-day disconnect, on very hot or very cold days. A broad suite of interrelated policy responses is required to reduce the frequency, duration and negative effects of disconnection from remote electricity for remote-living Indigenous residents.

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The climate of the Northern Territory (NT) ranges from equatorial and tropical regions in the north to hot dry grassland regions in Central Australia (Fig. 1A). Remote Indigenous communities in the NT are mostly off grid and unconnected by the guidelines of the Australian Energy Regulator. In such situations in Australia, remote living residents prefer access to electricity and regularly experience disconnection on non payment. Distant from Australia’s urban centres and major electricity grids, these communities have long relied on diesel and gas-fired generators. In recent years, there has been incremental integration of renewable energy into these isolated, high-cost systems. Australian remote Indigenous communities face some of the highest temperatures on earth and are vulnerable to the effect of warming climate (Fig. 1B). Exposure to extreme temperatures has been associated with a range of adverse health outcomes and death (Fig. 1C). In the hottest climate zones in Australia, between 45° and 50° of latitude, there are higher levels of health issues, which can be highly regionalized and locally specific (Fig. 1D). Socio-economic, demographic and structural characteristics include the size, type and quality of housing stock and exposure to extreme conditions. The lack of energy consumption, while the prevailing temperature can affect the security of electricity supply and cooling (Fig. 1E).

Temperature extremes are likely to act as a risk multiplier, worsening energy insecurity for those at greatest risk as ‘vulnerable households’ typically live in poor housing quality, have little resources or opportunity to invest in improvements to its efficiency and heating technology. The increased access to energy has also been facilitated by the implementation of policies mitigating this access, many with special attention to reducing the health effects of heat and cold.

Policy Brief: https://rdcu.be/cFDaF
Blog: http://go.nature.com/31WxDNn
Energy insecurity during temperature extremes in remote Australia. *Nature Energy*

**Key findings:**

• We find that nearly all households (91%) experienced a disconnection from electricity during the 2018–2019 financial year.

• Almost three quarters of households (74%) were disconnected more than ten times.

• Households with high electricity use located in the central climate zones had a one in three chance of a same-day disconnection on very hot or very cold days.

• Disconnections differed by climate zone and size of house/household.
Percent of disconnections by climate zones

Most disconnections occurring in central Australia – during both heat and cold

https://rdcu.be/cVe5d
Issues for the discussion

- Importance of competition and allowing new entrants.
- Replacing coal and reducing gas is key to decarbonising electricity. Health co-benefits and better energy security.
- Long-term planning is needed to link renewable energy zones with large demand centres. Plus speedy grid connections for better investor certainty.
- Roof-top PV is important as it leads to direct savings for business or residents. Also crucial for remote areas via micro-grids.
- Equity and policy is important for a just transition.

Next time we’ll discuss the same national and local issues – with a focus on policy.