Towards Zero Carbon Scenarios: Application of an Australian TIMES model

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Outline

• Energy overview for Australia
• Energy policy landscape in Australia
• AUS-TIMES model structure
• B2DS results
• Future plans
Energy overview and policy landscape in Australia
Australian energy system
Australia vs Europe
High voltage grid, generation and population
Renewable share is rising ...

[Diagram showing renewable generation by technology type, annual electricity generation in 2017, and renewable energy penetration by state.]
Increased uptake of DER, especially solar PV
Policy uncertainty continues...

Federal ("stop-start" policy)
• End 2006 – Bipartisan support for emissions trading
• December 2007 – Kyoto Protocol ratified in Australia
• December 2009 – Liberal-National Coalition withdraws bipartisan support for emission trading or any type of carbon price
• July 2012 – Carbon tax policy comes into effect at $23/tCO2e as compromise policy under minority “hung” parliament. Designed to revert to emission trading scheme in 2015, linking to Europe where carbon permit prices are lower
• July 2014 – Carbon tax policy repeal comes into effect
• Early 2015 – Government implements abatement auction process without legislation for a cost of around $15/tCO2e (latest round $11.82/tCO2e)
• 2015 – LRET reduced
• Still uncertainty over long-term target (Australia’s NDC is 26-28% reduction on 2005 levels by 2030)

State/territory
• Many jurisdictions have renewable energy targets and net zero GHG emission targets for 2050
AUS-TIMES model
AUS-TIMES structure

- Base year 2015, model horizon 2050
- 16 time slices
- 8 region model – state/territory
- End-use sectors
  - Residential (heating, cooling, hot water, lighting, cooking, appliances/other)
  - Services (heating, cooling, hot water, lighting, cooking, appliances/other)
  - Industry and agriculture (no disaggregation yet)
  - Transport (10 road vehicle classes, aviation, rail, shipping)
- Electricity sector
  - NEM (16 zones), SWIS, NWIS, DKIS, MIIS
  - Existing generation fleet – unit level data
  - Renewable resource availability/potential
  - Many technologies
B2DS results
B2DS scenario result – electricity consumption

The image shows a bar chart representing the B2DS-Unc scenario for electricity consumption from 2020 to 2050. The chart distinguishes between different sectors: Battery, Commercial, Industrial, Residential, and Transport. Each bar for a given year is segmented to reflect the contribution of these sectors.

- **2020**: Approximately 300 TWh, with a significant portion from the Industrial sector.
- **2025**: Slightly above 400 TWh, with a notable increase in the Residential and Transport sectors.
- **2030**: Around 500 TWh, showing a marked rise in all sectors, especially Industrial.
- **2035**: Approaching 600 TWh, with substantial growth across all sectors.
- **2040**: Slightly above 700 TWh, reflecting significant increases in all divisions.
- **2045**: Approximately 800 TWh, with notable growth in all categories.
- **2050**: Close to 900 TWh, indicating a continuation of the trend with increases across all sectors.

The chart illustrates a steady increase in electricity consumption across the years, with each sector contributing to the overall rise.
B2DS scenario result - electricity
B2DS scenario result – road transport
AUS-TIMES – next stage

• Renewable resource availability
  o Pumped storage hydro (DONE)
  o Biomass (DONE)
  o Concentrated Solar thermal - CST (DONE)
  o Ocean (wave/tidal)
  o Geothermal

• Distributed generation (IN PROGRESS)

• Collaboration with ClimateWorks Australia (ONGOING)
  o Building types for residential and services
  o Industrial sub-sectors
  o Technology database

• Link with PLEXOS/PROPHET? (ON HOLD)

• Hydrogen pathways (UNDERWAY)

• Vehicle automation/TaaS (UNDERWAY)
Thank you

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