SUBMISSION

Submission to the Department of Climate Change, Energy, the Environment and Water

Submission to the Electricity and Energy Sector Plan

26 April 2024

The Australian Academy of Technological Sciences and Engineering (ATSE) is a Learned Academy of independent, non-political experts helping Australians understand and use technology to solve complex problems. Bringing together Australia's leading thinkers in applied science, technology and engineering, ATSE provides impartial, practical and evidence-based advice on how to achieve sustainable solutions and advance prosperity.

Electricity generation is the largest source of greenhouse gas emissions in Australia, accounting for around one-third of the nation's emissions, while energy extraction and use in the rest of the economy accounted for a further third[1] making energy the single largest source of Australian emissions (DCCEEW, 2023). Reducing emissions from energy use via renewable electricity and electrification is necessary for Australia to reach net zero. The Electricity and Energy Sector Plan will build on the strong start the electricity sector has made, with renewable generation in the National Electricity Market increasing from around 15% in 2017 to around 39% in 2023 (Clean Energy Regulator, 2024).

Achieving the emissions reductions will be no small task. It will require changes across the board, from energy generation and grid-level storage, to demand side management and reducing or capturing emissions from currently unavoidable uses of fossil fuels. All of this will need to be done while bringing communities on board with changes they may be unfamiliar with or directly benefit from.

ATSE welcomes the Australian Government's commitment to decarbonise high-emitting sectors guided by the development of sectoral plans. ATSE advocates that the Government should aim for net zero emissions by 2035[2] - which is technologically possible with the right investments. The Electricity and Energy Sector Plan will be a key pathway to reaching net zero, whether that be by 2035 or by 2050 under the Government's current legislated target.

ATSE recommends that the Electricity and Energy Sector Plan contains the following elements:

Recommendation 1: Accelerate the development of renewable energy zones and associated transmission, storage and grid stabilisation infrastructure by ensuring that the development of renewable energy infrastructure provides positive social benefits to local communities.

Recommendation 2: Develop additional funding or loan schemes to help low-to middle income households reduce the upfront cost of acquiring solar, battery systems and electric vehicles.

Recommendation 3: Fund upgrades for social housing to install energy efficient appliances, rooftop solar and battery systems.

Recommendation 4: Incentivise landlords to install energy efficient appliances, solar systems and storage capacity.

Recommendation 5: Invest in research and development for next generation negative emissions technologies to help make these a viable method of offsetting unavoidable emissions.

Recommendation 6: Adjust accounting methods for methane emissions to consider greenhouse impacts over a 20-year time horizon, rather than 100 years.

Recommendation 7: Require oil and gas companies to directly measure their methane emissions and adopt international best practice in minimising fugitive methane emissions.

Accelerating the transition to renewable electricity

Reducing reliance on fossil fuels will involve changes on two fronts – replacing fossil fuel generation with green alternatives and reducing grid energy demand from consumers (particularly from high emissions sources). Increasing the percentage of renewable generation in Australia will go a long way to decarbonise the energy sector. ATSE supports the continued rollout of renewable energy generation capacity as part of the Government's plan to reach 82% of energy in the National Energy Market being generated by renewables by 2030, and as planned for in the AEMO Integrated System Plan. The final step in the decarbonisation of the electricity sector recognises that Australia will need some level of dispatchable energy that is not reliant on weather systems and that can respond to peaks in demand. Short-term peaks in demand can be managed through battery systems – Hornsdale Power Reserve in South Australia, for example, helps the state manage peaks in demand and provides inertia support. For larger peaks or to fill longer-term lulls in renewable generation gas has often been floated as the major solution – but if we are to reach net zero this too will ultimately need to be phased out.

Deep storage solutions may help to manage this transition and replace reliance on gas. Solutions like pumped hydro can help to manage electricity during periods where the renewable generation is reduced.

[1] Stationary energy and fugitive emissions are counted in the figure for emissions from energy extraction and energy use in the rest of the economy. Emissions from transport or industrial processes are excluded as these are covered by separate sectoral plans. These account for a further 27%.
[2] See ATSE's Becoming a Net Zero Nation for more details.

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Australia has around 6500 possible sites for new pumped hydro storage (Blakers et al., 2022). Some of these sites can hold 500GWh – enough to supply Syndey for four days – and just three sites in the Snowy Mountains could support the storage capacity needed for a 100% renewable national energy system (Blakers et al., 2022). The Electricity and Energy Sectoral Plan will need to outline how Australia can move to a 100% renewable system by relying on clean storage systems, including pumped hydro and batteries.

Developing a social licence for change will be crucial to meeting Australia's renewable energy goals. Failing to bring communities along with the transition will result in delays at best and risk the future of projects at worst. Misinformation and perceptions of poor engagement has already led to community opposition to, and the politicisation of, renewable energy projects and related infrastructure (e.g. Kelly & Morton, 2023; Wilson, 2023). Ensuring that communities see economic benefits from projects, either through compensation or local investment in projects, will be essential to developing a social licence to make the necessary transition to net zero. Projects should align with community needs and be targeted in locations where they can engage with local industries and provide positive impacts on the local community.[3]

Part of this will include ensure projects create jobs within local communities and that workers displaced from high emissions industries are supported to reskill and retrain to find new, high-quality, employment opportunities, work that falls within the remit of the Net Zero Economy Authority. It will also involve the development of talent to grow local workforces. The energy workforce is currently more than 60% male (Clean Energy Council, 2021)[4] , so increasing the diversity of the workforce (through education support and best practice recruitment and retention practices) will help to address these skills gaps. School education initiatives (such as ATSE's STELR, which uses hands-on sustainable engineering kits connected with the science curriculum) will be crucial to building both skills and social licence. These should be prioritised for priority regions for renewable energy infrastructure.

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Reducing energy demand from fossil fuels

Beyond the national grid, one quarter of Australia's renewable energy is generated by consumer-owned rooftop solar systems (Adisa, 2023). Over 3 million (more than one third) of all homes generate their own power, a world-leading market penetration (Adisa, 2023), yet only around 180,000 homes have a battery storage system to get the most out of their solar systems (Mercer, 2023). Electric vehicles, which – due to their storage capacity this is several times that of typical home battery systems – could provide additional household energy storage, have also received low market penetration with only 180,000 estimated to be on Australian roads at the end of 2023 (Electric Vehicle Council, 2023).

Continuing to roll out not only household solar and battery systems (including those in electric vehicles) to support consumers to minimise their impact on the grid – while also saving money – would help ease pressure on the generation side of electricity management. Combining this with supporting consumers to electrify their homes – reducing reliance on gas for heating and cooking – will further reduce demand for high emissions power sources. Households and businesses will need assistance to overcome the high upfront cost of this, increased incentives and income contingent loan schemes (similar to HECS-HELP[5]) could be employed to support owner-occupied households do this, while social housing upgrades should be a priority for governments. Incentives will also be needed for landlords, who face the upfront costs of installation and maintenance, while tenants benefit from the resulting lower power costs. [6]

[3] For more information on this, please see ATSE's submission to the Australian Energy Market Operator's 2024-25 Integrated System Plan.

[4] With individual sectors having much lower representation of women (e.g. oil and gas is just 23% women)

[5] For more information on using income contingent loans to promote solar energy systems please see: *"Using Income Contingent Loans for the Financing of the Next Million Australian Solar Rooftops",* K.G.H. Baldwin, B. Chapman and U. Raya, *Social Science Research Network* http://ssrn.com/abstract=2738314

[6] For additional solutions to increase household electrification, please see ATSE's submission to the Senate Economics References Committee Inquiry into Residential Electrification and ATSE's submission to DCCEEW's consultation on the National Energy Performance Strategy.

Recommendation 2: Develop additional funding or loan schemes to help low- to middle-income households reduce the upfront cost of acquiring solar, battery systems and electric vehicles.

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Reducing emissions from oil and gas

While coal use for electricity generation in Australia will be phased out over the next decade or so, efforts to reduce reliance on oil and gas will also play a big part of Australia's net zero future. However, at least in the medium term, oil and gas are likely to continue to play an ongoing role in Australia's energy mix. Approximately three quarters of emissions from oil and gas globally were from consumption by end users, while one quarter occurred during extraction, refining and transportation processes (International Council of Academies of Engineering & Technological Sciences [CAETS], 2023). Both these sources provide opportunities to reduce net emissions.

While the release of emissions from this and other sectors is sometimes inevitable during the transition to net zero, negative emissions technologies have the potential to play a role in reducing overall atmospheric emissions. Many carbon capture and storage (CCS) technologies to reduce carbon emissions at source are still under development – with research showing efficiencies ranging from 6-56% (Farajzadeh et al., 2020) - and cannot yet be relied upon to neutralise all oil and gas sector emissions. Alternatively, direct air carbon capture, storage and use (DACCSU) technologies can be applied to reduce any emissions from any location but are currently at the prototype stage and are very expensive. Government support for this research will help to accelerate the discovery process and ensure Australia can be a world leader in negative emissions technologies.

On the production side, the single most cost-effective action oil and gas producers can take to reduce emissions is to focus on eliminating methane emissions. Methane emissions are the second largest cause of global warming (behind carbon dioxide) and have 80 times the warming effect of carbon dioxide over 20 years (CAETS, 2023) – and so can produce rapid emissions reductions on a decadal scale. While the impact of emissions if often measured over 100 years, methane should be measured over 20 years. This timing better reflects the much shorter atmospheric lifespan of methane compared to carbon dioxide (which can last for more than 100 years).

Fugitive emissions from coal and gas mining account for 10% of Australian emissions (DCCEEW, 2023). Though this figure relies mostly on modelling, rather than direct measurement, and could be much higher. Requiring fossil fuel companies to directly measure fugitive methane emissions would give us a better picture of true methane emissions and allow for better targeted action.

The United Nations has released best practice advice for managing methane emissions in the oil and gas sector that provides clear techniques for reducing methane emissions. The Australian Government should be compelling oil and gas companies to adopt best practice in line with the UN advice. This will need to include support for monitoring and measuring methane emissions to ensure we are making real progress towards emissions reductions.

Recommendation 5: Invest in research and development for next generation negative emissions technologies to help make these a viable method of offsetting unavoidable emissions.

Recommendation 6: Adjust accounting methods for methane emissions to consider greenhouse impacts over a 20-year time horizon, rather than 100 years.

Recommendation 7: Require oil and gas companies to directly measure their methane emissions and adopt international best practice in minimising fugitive methane emissions.

ATSE thanks the Department of Climate Change, Energy, the Environment and Water for the opportunity to respond to the Electricity and Energy Sector Plan. For further information, please contact academypolicyteam@atse.org.au.

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