Submission No 58

INQUIRY INTO CLIMATE CHANGE (NET ZERO FUTURE) BILL 2023

Name: Anna Nadolny

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Anna Nadolny

School of Engineering

ACTON, ACT, 2601

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NSW Climate Bill

Thank you for considering my submission.

Recommendations:

1. Strengthen the targets.
2. Ensure that real emission reductions are favoured over the inclusion of offsets etc.
3. Include a ratchet mechanism, similar to that used for National Determined Contributions in the Paris Agreement.
4. Ensure all Government decision-making includes climate mitigation and adaptation, e.g., throughout Transport for NSW, Sydney Water, etc.
5. Include methane reductions, as recommended in reports from the Intergovernmental Panel on Climate Change.
6. The global warming impact of methane over a twenty-year period should be used when deciding to approve new methane projects.
7. Methane leakage rates from mining, transmission, and distribution should also be considered.
8. Consider methods to limit conflicts of interest for Commissioners.

Please do not hesitate to contact me to discuss any of the information contained within this report.

With the right policies, residents and businesses in NSW will see huge benefits from reaching net zero emissions. Homes and workplaces can be made far more efficient and comfortable with lower energy bills and better air quality, transport can be cheaper, more accessible, and more enjoyable, and damaging air pollution figures will fall.

Paris Agreement

The Paris Agreement includes a ratchet mechanism for Nationally Determined Contributions, which every five years requires countries to present a "progression beyond" the previous target.[1]

[1] More details on the need for a ratchet here

Total carbon emissions will determine future warming, rather than the year in which net zero is reached.

"Current [global] policies will lead to around 2.7°C of global warming by 2100 relative to preindustrial levels (uncertainty range of 2.0°C–3.6°C). 2030 commitments reduce this to around 2.4°C (1.9°C–3.5°C). Although the recent wave of net-zero targets could lead to median warming of 1.8°C (uncertainty range 1.3°C–2.8°C) these pledges have not been accompanied by commensurate near-term ambition and thus have contested credibility."

The Paris Agreement states: "Each Party's successive nationally determined contribution will represent a progression beyond the Party's then current [NDC] and reflect its highest possible ambition".[2]

The Australian National Determined Contribution must be strengthened in the future. The Purpose of the NSW Climate Bill is to give effect to the 2015 Paris Agreement, and therefore the Bill must have the provision to strengthen targets to "hold the increase in the global average temperature to well below 2°C above pre-industrial levels, and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels". To meet this essential purpose, the targets in the Bill must be likewise strengthened.

Science-derived Targets

Targets for Australia have been calculated by many groups. Climate Action Tracker refers to Australia's net zero by 2050 target as "poor", the Climate Council recommends 75% reduction by 2030 and net zero by 2035, the Australian Academy of Technological Sciences and Engineering similarly calls for a 2035 net zero target.[3]

Whole of Government Mitigation

Ensuring that Government decision-making is inclusive of climate mitigation and adaptation will be instrumental in reducing emissions and protecting residents.

For example, the IPCC Climate Change 2022: Mitigation of Climate Change report includes the following text in Chapter 10:[4]

"Changes in urban form, behaviour programmes, the circular economy, the shared economy, and digitalisation trends can support systemic changes that lead to reductions in demand for transport services of expand the use of more efficiency transport modes (high confidence). Cities can reduce their transport-related fuel consumption by around 25% through combinations of more compact land use and the provision of less car-dependent transport infrastructure. Appropriate infrastructure, including protected pedestrian and bike pathways, can also support much greater localised active travel."

The Summary for Policymakers also states: "*Strategies for established cities to achieve large GHG emissions savings include efficiently improving, repurposing or retrofitting the building stock, targeted infilling, and supporting non-motorised (e.g., walking, bicycling) and public transport. Rapidly growing cities can avoid future emissions by co-locating jobs and housing to achieve compact urban form, and by leapfrogging or transitioning to low-emissions technologies*."[5]

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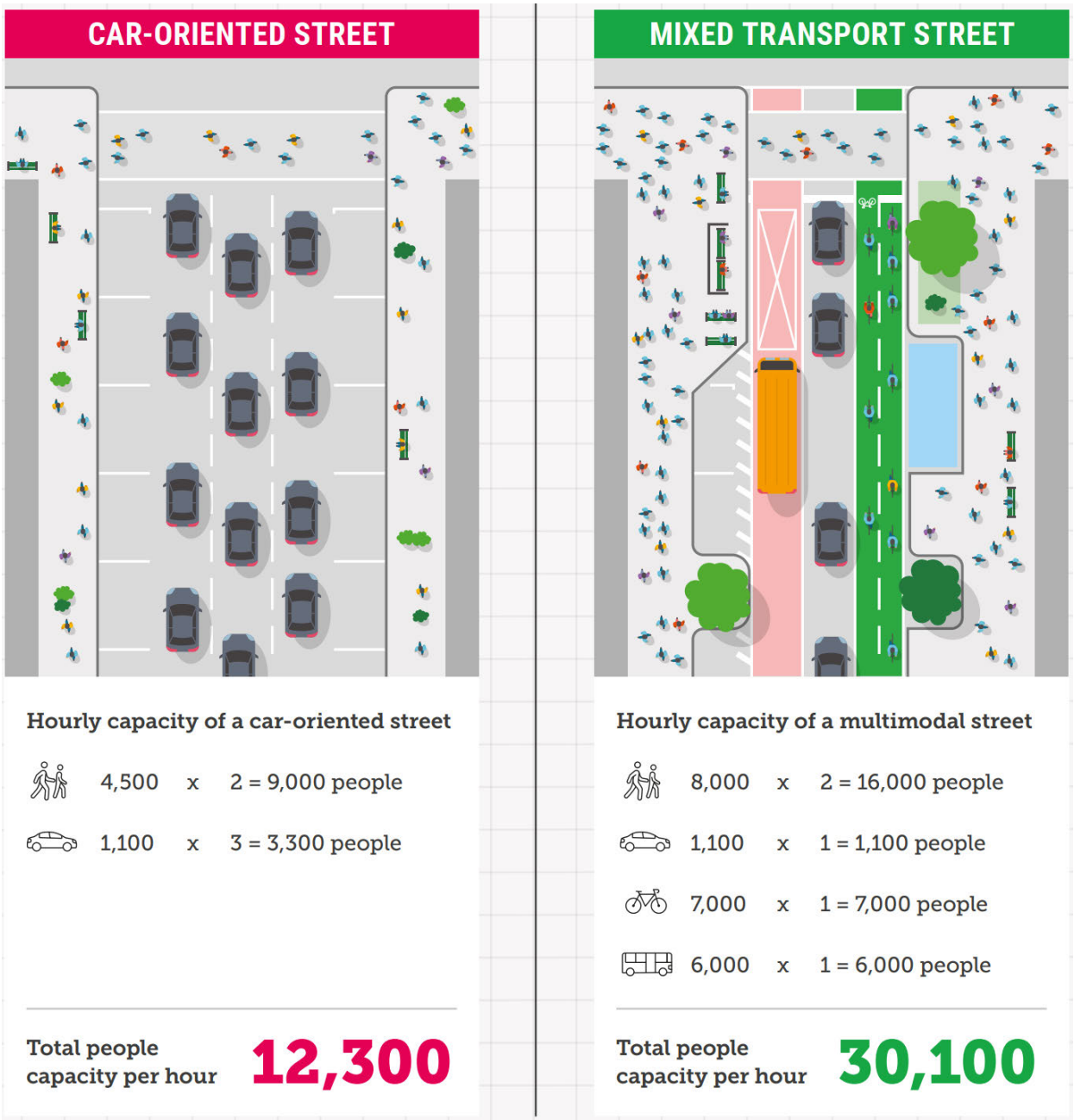
[2] Paris Agreement
[3] Climate Action Tracker, Climate Council, ATSE
[4] IPCC Mitigation Report
[5] ibid

Decisions from the Department of Planning and from Transport for NSW can either lock-in or avoid substantial emissions. Long-term goals such as those in *Future Transport* are commendable, but must be supported by climate-conscious decision-making in the immediate term.

Energy Security

There are many concrete benefits to emission mitigation, improved energy security being a key example. Energy security can be improved through greater uptake of walking, bike riding, and public transport use (while also improving public health outcomes, independence for children and those who are not able to drive, allowing for improved public spaces, reducing congestion, and more benefits).[6]



[6] See for example: Barcelona super blocks academic paper and Conversation article, Climate and Health Alliance Healthy Transport Campaign, physical activity for children, Wheels for Wellbeing UK, Climate Council Transport Report (image source).

Electrifying vehicles is another avenue. Bloomberg New Energy Finance report that for every day a fleet of 1,000 electric buses is used, 500 barrels of diesel are avoided [1]. Australia currently imports 90% of its total liquid fuel needs, compared to 60% in 2000. As more local refineries are closed this figure will reach 100%. Purchasing oil from the international market means prices can be volatile, and are tied to events outside of domestic control [2]. In December 2018, Australia only had the equivalent of 18 days of consumption cover for petrol and 22 days for diesel. In the event of a supply-chain disruption, emergency rationing would take three weeks to implement, by which time reserves could be exhausted [3].

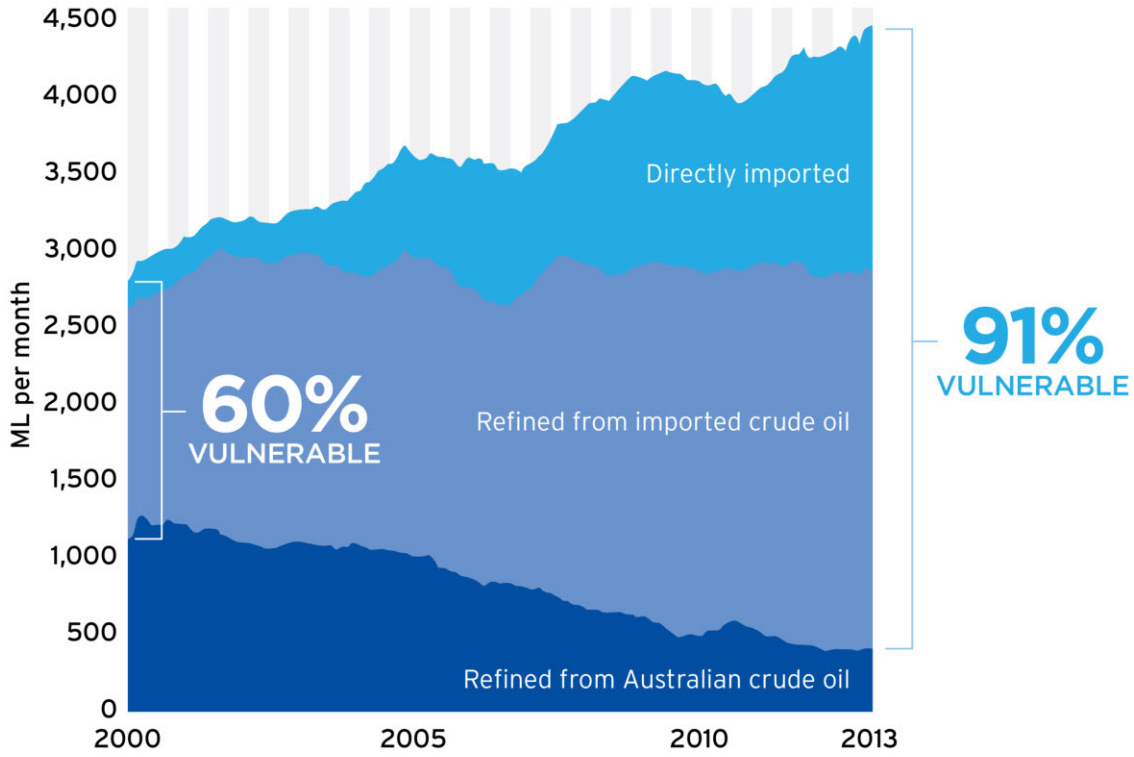


Figure 1: Australia has been relying more and more on imported liquid fuel. Image from [2]

Mode shift and transitioning to an electric vehicle fleet would improve transport fuel security. Electric vehicles can be powered with electricity which is domestically generated.

This would also result in lower emissions. A study from the United States shows that electric buses already result in fewer emissions than conventional ones, even for areas that are highly dependent on coal for electricity generation [4].

Global warming impact of gas

Methane has 34 times the global warming impact of carbon dioxide over a century. If the time frame is shortened to just 20 years, it has more than **80 times the impact of carbon dioxide** [5]. This is because methane is converted to carbon dioxide via oxidation, generally within 12 years [6].

However, the figure used by the National Greenhouse and Energy Reporting Regulations for the Global Warming Potential (GWP) in Australia for methane is 28, based on the findings of the Intergovernmental Panel on Climate Change's Fifth Assessment report [7], shown in Table 1 below [8]. These are for a 100-year period (denoted below by GWP_{100}).

Table 1: Global Warming Potentials for 100 years from the National Greenhouse Accounts Factors [8].

Gas	Chemical formula	Global Warming Potential
Carbon dioxide	CO_2	1
Methane	CH_4	28
Nitrous oxide	N_2O	265

Australia, along with 188 other countries, has ratified the Paris Agreement [9]. We are bound to mitigate "the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius" [10]. A widely recognised goal is to reach zero net emissions in 2050, if not before. If we are to limit warming to these levels, the **shorter-term impacts of pollutants should be given more weight** [11].

Fugitive emissions

Estimated fugitive emissions account for 10% of Australia's total greenhouse gas emissions. They "occur during the production, processing, transport, storage, transmission and distribution of fossil fuels. These include coal, crude oil and natural gas". For the reasons explained below, fugitive emissions are likely underestimated.

Research published in the journal Nature showed that anthropogenic emissions of methane are 25-40% higher than previously assumed [12]. Methane leaks from oil and gas operations can be difficult to control and monitor [13]. Satellite monitoring of methane is a relatively new tool that has already come to some startling conclusions: for examples, an accident at a fracking site in Ohio "released more methane than the reported emissions of the oil and gas industries of countries like Norway and France", and substantially more than was estimated by the site's owner [14].

Rather than require the measurement of fugitive emissions from mining projects, our system simply estimates them using a leakage rate factor:

> *Current greenhouse gas inventory estimates for fugitive emissions in Australia assume a much lower leakage rate of 0.48% (without venting or flaring) and 0.59% (with venting and flaring) than current international estimates. The Northern Territory Scientific Inquiry into Hydraulic Fracturing has expressed concern that present inventory estimates appear too low, stating "These values underestimate field based measurements, which range from 1.6 - 1.9%. Further research is required to better understand the differences between these inventory and field based estimates". The International Energy Agency estimate a global average methane leakage rate of 1.7%* [15]

Regulation of methane leakage in the gas sector must be well managed to ensure the industry has a low global warming impact. Methane can only be considered a low emissions technology if leakage rates are low. Above a certain threshold, there is no climate benefit in replacing a coal-fired power station with gas. Researchers in the US and Australia have pegged this figure at 3% leakage [5] [16] [17].

To the best of our knowledge, thus far ***there has been no "comprehensive, rigorous, independently-verifiable audit of gas emissions"*** [5]. There has also been no requirement for

baseline testing for Australian gas mining sites. Methane can migrate from a coal seam gas without human intervention, but also due to the seam being dewatered. Without baseline monitoring we cannot attribute the emissions to the mining activity [5].

Methane also leaks during transmission – the factors used to determine emissions from transmission pipelines in Australia can be seen in the Table below:

Table 2: Natural gas transmission emission factors from the National Greenhouse Accounts Factors – August 2019 [18]

Operation or process source	Emission factor (tonnes CO_2-e/km pipeline length)	
	CO_2	CH_4
Natural gas transmission	0.02	10.4

Source: National Greenhouse and Energy Reporting (Measurement) Determination 2008 (Section 3.76).

Methane leakage is also a problem for distributional infrastructure. For example, a study investigating major cities in the United States (in total comprising 12% of the country's population) found that human activities resulted in the release of more than double the mass expected by the US EPA [19]. The factors used for each State in Australia are shown below.

Table 3: Natural gas distribution infrastructure leakage factors from the National Greenhouse Accounts Factors – August 2019 [18]

State	Unaccounted for gas *(%UAG)*	Natural gas composition factor (tonnes CO_2-e/TJ) *(C)*	
	UAG	CO_2	CH_4
NSW and ACT	2.2	0.8	390
VIC	3.0	0.9	388
QLD	1.7	0.8	377
WA	2.9	1.1	364
SA	4.9	0.8	390
TAS	0.2	0.9	388
NT	2.2	0.0	314

Source: National Greenhouse and Energy Reporting (Measurement) Determination 2008 (Section 3.80).

Methane leaks from transmission and distributional equipment should be carefully considered before deciding to continue to use this fuel and infrastructure. As will be shown in the section below, new all-electric appliances and resilient local electricity networks can outcompete methane on cost for consumers, on resilience, and on global warming potential.

We don't need gas

Cities around the world are beginning to switch off the gas. More than 70 cities in the United States have passed legislation that impacts new gas connections,[7] including the entire state of

[7] Natural Gas Bans US

New York,[8] in response to the Netherlands Government phase out of gas connections,[9] Ikea in the Netherlands will reportedly also stop selling gas appliances.[10] The United Kingdom Committee on Climate Change recommended that by 2025, no new homes should be connected to the gas grid [20].

Electricity is cheaper for heating water and air and for cooking in residential buildings and even with a higher purchase price, electric appliances have a lower total cost of ownership than gas [21] [22]. If a new home is all-electric instead of connected to the gas network, the owners save between $9-16,000 over the first decade [23]. (Energy security in areas with higher rates of black outs does need to managed, for example with community microgrids.)

In response to the AEMO 2019 Gas Statement of Opportunities, which suggested that a severe shortfall in the supply of gas to Victoria would occur from 2024, the consultancy Northmore Gordon was commissioned by Environment Victoria to determine whether gas demand could be reduced. The forecast shortfall is expected to be 26 to 85 PJ annually – demand-side savings of 98 to 113 PJ annually were found. Reverse cycle air conditioners can be used to effectively warm houses. Hot water heat pump technology has progressed to the point that previous issues with low temperatures are no longer a problem. Induction cooktops are now just as responsive as gas, and twice as efficient. Households are now far better off in an all-electric house. The modelling was quite conservative, in that only the ducted gas systems that are older than 20 years were replaced with air conditioners [24]. With the right policies, Australia could have a more comfortable, and also decarbonised, housing fleet by 2050.

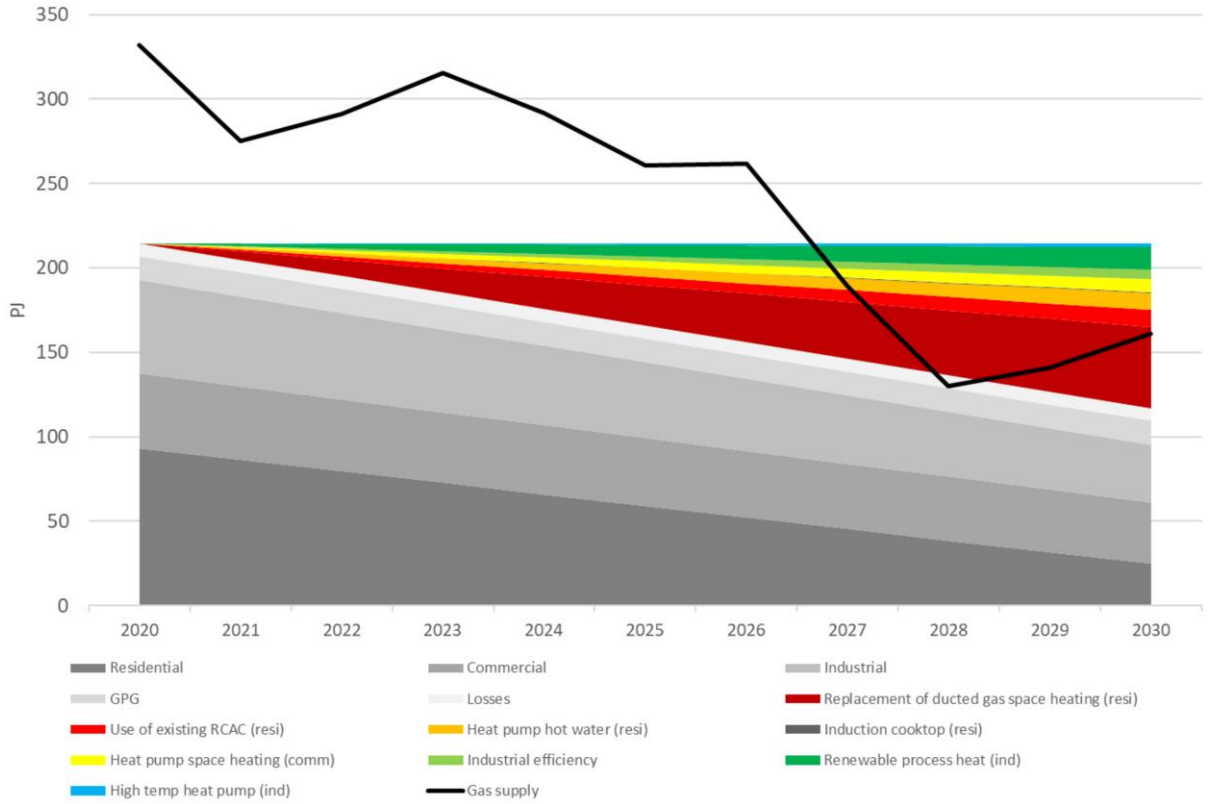


Figure 2: Gas demand reduction by sector and reduction means [24]

[8] New York becomes the first state to ban natural gas stoves
[9] Netherlands gas phase out 2026
[10] Ikea Netherlands to cease selling gas cooktops

The Beyond Zero Emissions *Electrifying Industry* report [25], the WWF and EY reports *Delivery economic stimulus through renewables* [26] and *Australian renewable export COVID-19 recovery package* [27], the ClimateWorks *Decarbonisation Futures* [28], and many more provide roadmaps on rapidly reducing our dependence upon methane and other fossil fuels.

Gas appliances also impact indoor air quality. According to Asthma Australia, "Scientists have found that around 12 per cent of childhood asthma in Australia can be attributed to the use of gas stoves for cooking" [29].

Flexible demand

In order to ensure stability, the electricity grid needs new, flexible load. The chart below shows the new normal in South Australia during Spring and Autumn, when demand is low. Rooftop solar generation is plentiful and has reduced total midday demand [31]. Without management, this could create problems. New load that can be deployed flexibly could soak up this generation. Demand management through electric vehicle charging is an ideal candidate. Where possible, charging should be performed during the hours around midday, but at any time it can be controlled and interrupted in order to support grid stability. This is important as more wind and solar PV come online.

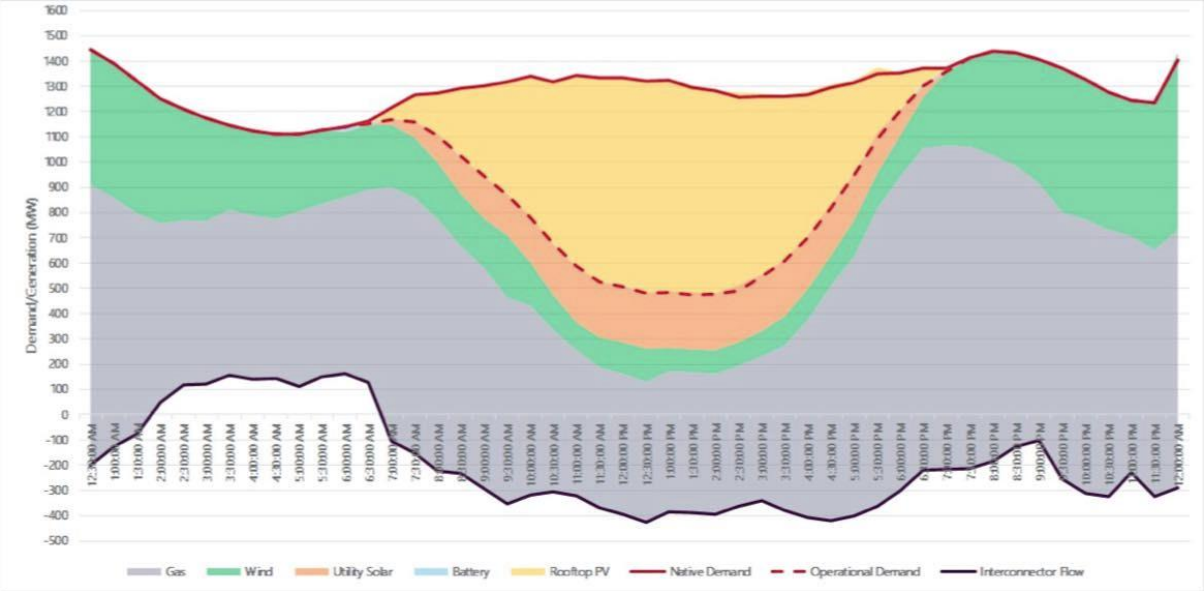


Figure 3: South Australian grid generation for Sunday 20th October 2019 – showing the operational demand (red dotted line) which represents a new low on the system [31]

As an example, consider that 66 066 GWh was generated in NSW in 2014 [32]. In order to use batteries to electrify all of the buses in the State, just 900 GWh would be needed each year – which represents 1.4% of current electricity consumption. (This calculation was performed using data from the Australian Bureau of Statistics [33], which includes those buses which travel longer distances. These would may need to be electrified using hydrogen fuel cells rather than battery technology). Electrifying transport would remove local air pollution, and provide the grid with more flexible demand.

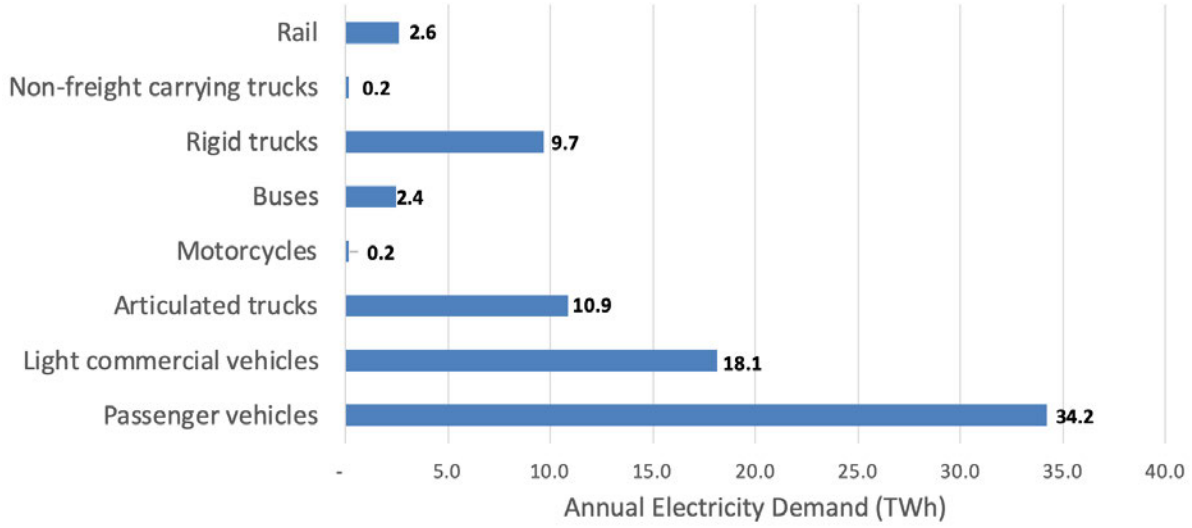


Figure 4: Additional electric load added by each mode of transport within the National Electricity Market

Net zero emissions versus near zero

Achieving zero emissions with and without offsets are very different prospects. Many forms of offsets are not permanent, and could in actual fact lead to greater emissions than simply avoiding climate pollution in the first instance.[11] Offsets with only 25 years of permanence are allowed by the Federal Clean Energy Regulator.[12]

In most instances, electrifying loads and using solar and wind are more cost effective now, when maintenance and fuel costs are included. Offsets must be used for only hard to abate industries, and to further drawdown emissions.

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