

ORIGINAL ARTICLE

On the way out: Government revenues from fossil fuels in Australia

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Abstract

Australia is moving from a fossil fuel-dominated energy mix to one that is increasingly powered by solar and wind. Fossil fuel exports are also likely to decline given their poor compatibility with the net zero emission targets of key trading partners. There is the potential for a variety of new exports of zero carbon energy and products to emerge. This paper reviews implications of the ongoing energy transition for government revenues from fossil fuel extraction and use and discusses policy options in response. It concludes that the transition heightens the need for efficient government revenue-raising mechanisms across the economy. Among the possible reforms, this paper reviews the potential for Australia's corporate income tax to be reoriented towards the taxation of above-normal profits via an allowance for corporate equity approach. Other revenue-raising options that are discussed include carbon pricing, electronic road user pricing, wider use of progressive royalties, the use of industry levies as applied in Australia's agricultural sector, and the generation of revenue from government co-investments.

KEYWORDS

energy, exports, fossil fuels, renewables, taxation, zero carbon

JEL CLASSIFICATION

H21, O13, Q48

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1 | INTRODUCTION

As of 2019, Australia was the world's sixth largest producer of fossil fuel energy and the fourth largest fossil fuel exporter, after Russia, the United States and Saudi Arabia (International Energy Agency [IEA], 2022a). The total value of Australia's energy exports in the 2019–2020 financial year was \$115.5 billion, mostly from exports of liquefied natural gas (LNG; \$47.5 billion), metallurgical coal (\$34.2 billion) and thermal coal (\$20.4 billion).¹ Fossil fuel extraction accounted for about 4.5% of Australia's gross value added (Department of Industry, Science, Energy and Resources, 2022a).

In the absence of low-cost carbon capture and storage, a large-scale move away from fossil fuels will be required in order to constrain global climate change. A transition is already underway, with sizeable investment going into the deployment of low-carbon energy technologies, especially solar and wind power generation (REN21, 2021). Efforts to speed the transition are important if the world is to retain the potential to limit global warming to 2°C in line with the Paris Agreement (Intergovernmental Panel on Climate Change, 2021).

For Australian governments, both state and federal, the ongoing energy transition is likely to lead to a reduction in fiscal revenues from both the extraction and use of fossil fuels over the long term.² New industries have the potential to emerge in the export of green electricity, green fuels such as ammonia and hydrogen, and zero carbon-processed ores and metals such as green iron, green steel, and green aluminium (Burke et al., 2022; Garnaut, 2019; Venkataraman et al., 2022). Other sectors of the economy such as agriculture will also increasingly be powered by renewable energy.

This paper reviews revenue implications of the ongoing transition from fossil fuels to renewable energy sources for Australian state and federal governments. While fossil fuel royalties and taxes are not currently a major source of government revenue, they do generate relatively sizeable revenue flows in some cases. The Queensland state government is the most dependent, mostly due to receipts of coal royalties. The Commonwealth Government also collects sizeable revenue flows from fuel excise and customs duty.

Production of alternative commodities such as green ammonia and hydrogen will not contribute to royalty or resource rent revenues given that these are not fossil fuels or minerals. Investor interest in these industries is growing (Burke et al., 2022). There is a need to ensure that appropriate government revenue-raising mechanisms are in place and that these are conducive to both encouraging large-scale investment flows and ensuring healthy benefit sharing from these future industries.

Lessons can be learned from Australia's experience with the LNG export sector, where benefit sharing has been lacking for reasons including weaknesses in the design of the federal petroleum resource rent tax (PRRT; Kraal, 2017). The east coast of Australia has been exposed to a large increase in natural gas prices as a result of the opening of the east coast LNG export sector, but the increment to government revenues has been relatively minor (D'Cruz & Holden, 2017).

Given the broad scope of Australia's future export opportunities, corporate income tax is the most relevant direct government revenue-generating instrument. This paper discusses a potential two-tiered corporate income tax arrangement involving a (1) reduced standard corporate income tax and (2) supplementary tax rate on above-normal profits after an allowance for corporate equity (ACE) has been deducted. The aim of the reform would be to make marginal projects more economically attractive and thus more likely to go ahead, while

¹Australian dollars are used throughout. The value of energy exports fell to \$81.2 billion in 2020–2021, a year of unusually low fossil fuel prices during the COVID-19 crisis. Values of 2019–2020 are used here so as to focus on a more representative year.

²'State and territory' is shortened to 'state' throughout.

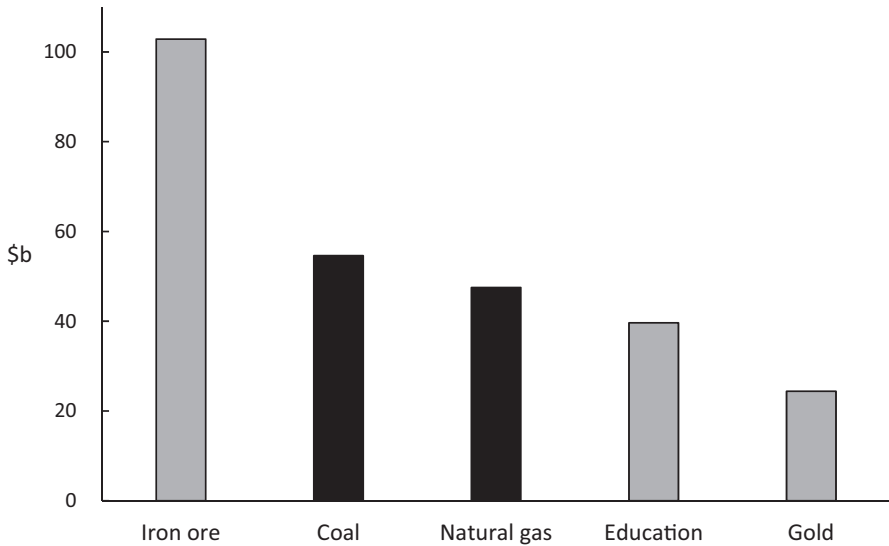


FIGURE 1 Australia's top five exports of goods and services by value, 2019–2020. Iron ore includes concentrates. Data are for the Australian financial year. Fossil fuels are in black. *Source:* DFAT (2021).

achieving a healthy degree of benefit sharing from the most profitable firms in the economy. Menezes (2012), Ingles and Stewart (2018), and Sobeck et al. (2022) are among others to have set out the case for an ACE tax reform in Australia. Detailed modelling of the approach outlined in the current paper would be needed.

This paper also discusses other options for raising fiscal revenue, including land tax, road user pricing, carbon pricing, fossil fuel taxes during the phase-out period, industry levies (as currently used for agricultural commodities) for products such as hydrogen to fund activities such as research and development (R&D), and generating revenues from government co-investments. Maintaining adequate royalty rates on mineral extraction will also be important to ensure reliable payments are made in return for the depletion of assets. These could be designed to progressively step up as a function of the commodity price so as to seek to efficiently raise additional state government revenue during commodity booms.

This paper proceeds as follows. Section 2 discusses prospects for Australia's fossil fuel exports and presents data on the size of government revenues from fossil fuel extraction and use in Australia. Section 3 discusses prospects for the development of new zero carbon industries. Section 4 discusses options for efficient government revenue raising in a future low-carbon economy. The final section concludes.

2 | FOSSIL FUELS AND GOVERNMENT REVENUES

Australia's export revenue is dominated by primary commodities. Figure 1 shows Australia's five largest exports of goods and services by value in the 2019–2020 financial year according to the product classifications of the Department of Foreign Affairs and Trade (DFAT, 2021). Iron ore and concentrates were by far the largest, with coal (metallurgical plus thermal) and natural gas in second and third places. Fossil fuels accounted for more than one-fifth of the value of Australia's exports of goods and services.

Figure 2 shows the nominal values of Australia's fossil fuel exports over recent decades. Large increases have been experienced for coal and LNG. The onset of the COVID crisis saw a temporary decline, but a strong rebound was experienced in 2021–2022 as economies moved

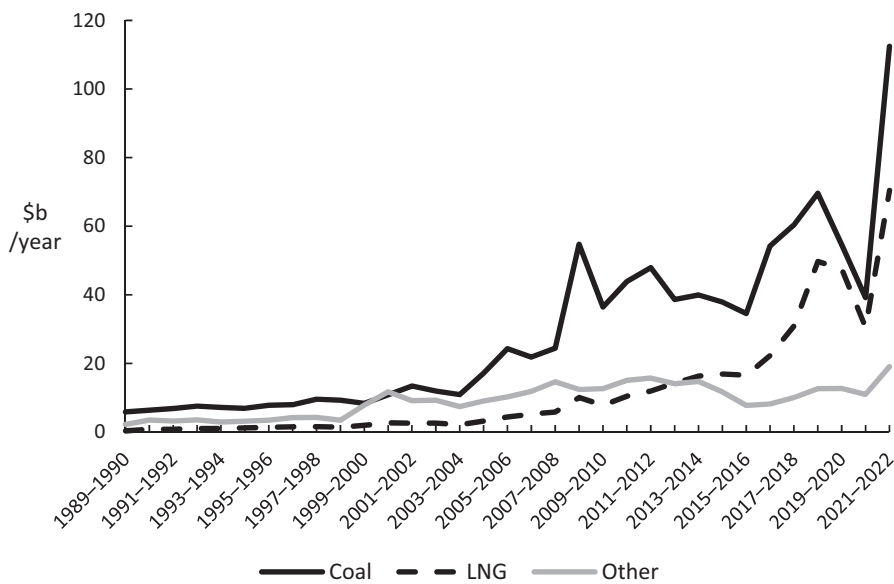


FIGURE 2 Australia's fossil fuel export revenues, 1989–1990 to 2021–2022. Values are in nominal terms. Source: Department of Industry, Science, Energy and Resources (2022a).

out of COVID restrictions and due to the increase in global fossil fuel prices resulting from the Russian invasion of Ukraine. In 2021, Australia emerged as the world's largest exporter of LNG on a calendar year basis for the first time (BP, 2022).

Table 1 presents data on government revenue from fossil fuel taxes, royalties and fees at both the state and federal levels in the financial year 2019–2020. Royalty revenues for the extraction of nonfossil fuel commodities such as iron ore are not considered. The contributions of fossil fuel companies to collections of other taxes such as corporate income tax, payroll tax, and goods and services tax are also not included given difficulties in measurement.³ General equilibrium modelling also suggests that these may be altogether relatively similar in a low-emission economy as resources are allocated to alternative activities (Adams, 2021).

The data in Table 1 reveal that total state and federal government revenue from royalties and taxes on fossil fuel extraction was in the order of \$8 billion in 2019–2020 and total net fuel excise plus customs duty collections equalled about \$12 billion. Together these accounted for about 3% of overall nongrant government revenue – a relatively modest share. Personal income tax generates much more revenue – about \$230 billion to the Commonwealth in 2019–2020.

Table 1 indicates that fossil fuel revenues are particularly important for the Queensland government, which received coal royalties of about \$3.5 billion in 2019–2020 – equal to 11.7% of nongrant revenue. While Queensland has ample opportunities for zero carbon energy production and exports, these would not deliver royalties (other than when minerals are extracted to produce commodities with embodied clean energy such as green aluminium). To some extent, Queensland thus faces a revenue disincentive to switching to alternative export industries such as green hydrogen, although delays in developing new low-carbon industries also come at the cost of new local economic activity and employment generation.

³ Among the challenges is that some companies extract and sell both fossil fuels and other commodities such as iron ore. Deloitte (2021) estimated that Australia's mining industry pays more in corporate income tax than in royalties, but an estimate for the fossil fuel extraction subsector is not available. Some fossil fuel extractors pay little corporate income tax. Chevron Australia Holdings, for example, paid zero corporate income tax in 2019–2020 (Australian Government, 2022a).

TABLE 1 Government revenues from taxes, royalties and fees on fossil fuel extraction and use, Australia, 2019–2020

	\$m	% of Government nongrant revenue
Commonwealth		
Petroleum resource rent tax (PRRT)	1052	0.2
Petroleum royalty	992	0.2
Fuel excise and customs duty, net of fuel tax credit payments	12,360	2.6
Total	14,404	3.1
Queensland		
Coal royalty	3517	11.7
Petroleum royalty	466	1.5
Land rents for petroleum leases ^a	<154	<0.5
Total	<4137	<13.7
New South Wales		
Coal royalty	1524	3.2
Petroleum royalty	1	0.0
Total	1525	3.2
South Australia		
Petroleum royalty	120	1.4
Victoria		
Royalties ^b	<111	<0.3
Western Australia ^c		
Petroleum royalty	7	0.0
Coal royalty	<122	<0.6
Total	<129	<0.6
Northern Territory		
Petroleum royalty	6	0.3
Tasmania		
Coal royalty and rents/fees ^d	<31	<1.0
Australian Capital Territory	0	0.0
Total excluding fuel excise and customs duty (rounded)	~8000	~1
Total (rounded)	~20,000	~3

Note: Excludes revenue from other taxes such as corporate income tax. Totals are approximate.

^aRents from pastoral holdings and mining.

^bMineral royalties.

^cNorth West Shelf grants are a secondary transfer from petroleum royalties collected by the federal government and so are not reported for Western Australia. Coal royalty revenue data are not available. Numbers are based on an 'Other' category and present an upper bound.

^dTasmania has only one operating coal mine (Blackwood), so coal royalty and other revenue data are not publicly disclosed. Total mineral royalties (including coal) equalled \$31 m. It is concluded that coal royalties and rents/fees are <1% of government nongrant revenue.

Source: Budget documents of federal, state and territory governments.

Fossil fuel usage taxes in the form of excise and customs duty on fuels (net of fuel tax credit) are the largest revenue item in Table 1. This revenue has been declining (Figure 3) as a result of factors including the removal of fuel excise rate indexation over 2001–2014, the improved fuel

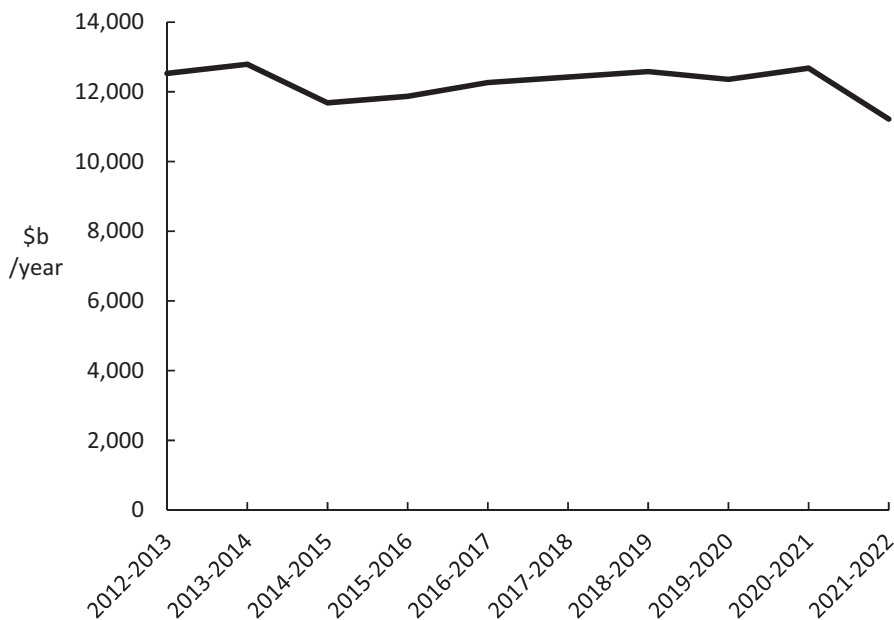


FIGURE 3 Commonwealth revenue from excise and customs duty on fuels, net of fuel tax credits, 2012–2013 to 2021–2022. Values are in nominal terms. *Source:* Commonwealth of Australia Budget Papers, various years.

efficiency of road transport vehicles, and the switch to electric vehicles. In March 2022, the federal government also halved the fuel excise rate for a period of 6 months in response to high world oil prices in the lead up to a federal election.⁴

Despite the large ramp-up in the value of Australia's LNG exports shown in Figure 2, annual Commonwealth revenue from the PRRT has generally been on a declining trajectory. As seen in Figure 4, annual liabilities to the Commonwealth under the PRRT indeed more than halved in nominal terms over the first two decades of this century. While higher natural gas prices brought additional PRRT revenue in 2022, relative to its potential the PRRT has not been a major overall contributor to government revenue collections.

Fossil fuels contribute a much lower share of government revenues in Australia than in some other large fossil fuel exporting countries. In Qatar and Saudi Arabia, for instance, oil and gas extraction contributes the majority of government revenues (International Monetary Fund [IMF], 2019a, 2019b). In Qatar's case, the government routinely receives in excess of \$40 billion per year in fiscal revenue from hydrocarbons (IMF, 2019a). In Norway, about a quarter of general government revenue is oil-related (IMF, 2021).

Iron ore and other minerals are, however, more important contributor fiscal revenues in Australia than in many other large fossil fuel exporters. Indeed, Western Australia's iron ore royalties alone equalled \$7.6 billion in 2019–2020 (Government of Western Australia, 2020), exceeding the value of coal royalty revenues for the whole of Australia.

3 | LOW-CARBON OPPORTUNITIES

The global energy system is set for substantial change over the coming years. Solar and wind are together already contributing the majority of new net electricity generation capacity

⁴By encouraging fuel use, the halving of the fuel excise would have been expected to have led to a less-than-halving of fuel excise revenue from road transport over the 6-month period (Burke & Nishitaten, 2013).

globally and are benefiting from sizeable ongoing cost reductions (International Renewable Energy Agency [IRENA], 2021a). The contribution of renewables to global electricity production has been steadily rising, passing one-quarter in 2018 (Figure 5). An accompanying trend is the gradual electrification of the global energy system, with electricity supplying 20% of final energy in 2019, up from 16% at the turn of the century (IEA, 2022a). The improving cost competitiveness of low-carbon generation options and the attractiveness of electricity as a high-quality, emission-free energy vector means that these trends are highly likely to continue (Burke & Do, 2021; Helm & Hepburn, 2019).

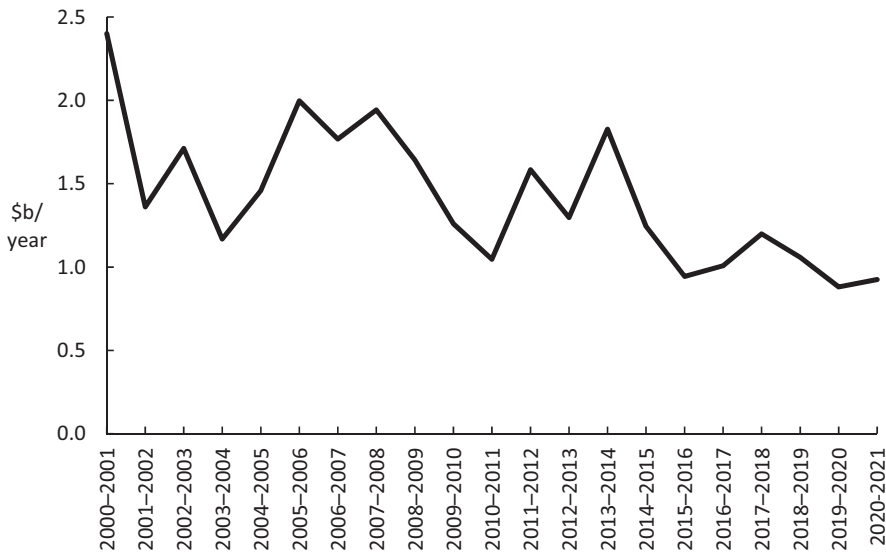


FIGURE 4 Annual liabilities to the Commonwealth under the petroleum resource rent tax (PRRT), 2000–2001 to 2020–2021. Values are in nominal terms. *Source:* Australian Taxation Office (2022).

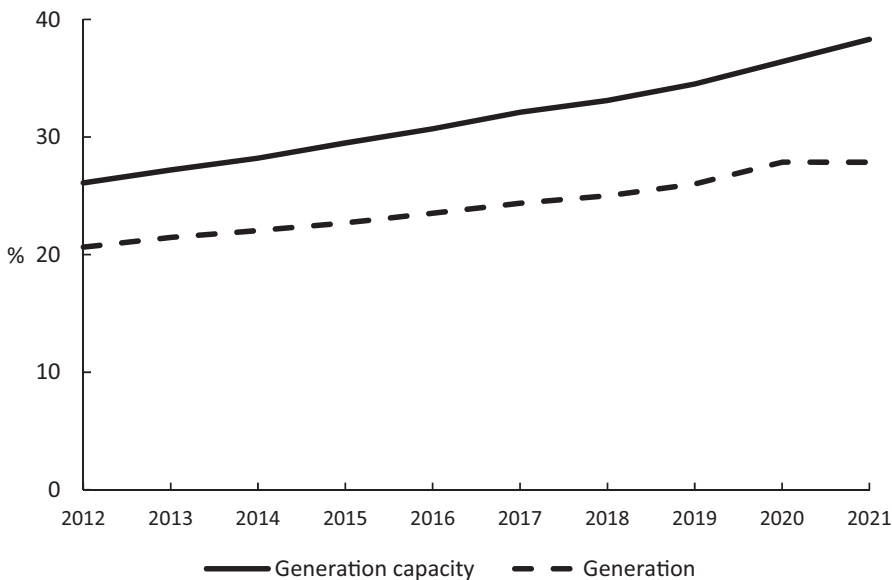


FIGURE 5 Global shares of electricity generation capacity and production from renewables, 2012–2021. *Source:* BP (2022), IRENA (2021b).

Australia has substantial potential to benefit from the use of zero carbon energy given its rich endowments in land and in solar and wind resources, together with proximity to Asia-Pacific markets (Garnaut, 2019). Australia has a particular advantage relative to more densely populated and land-poor neighbours such as Singapore and Indonesia, where opportunities for low-cost solar and wind power generation are less favourable than at the best Australian sites. The IEA (2019) identified Australia as among the potential lowest cost producers of green hydrogen in the East Asia and the Pacific region.

The share of renewables in Australia's electricity mix is on a sharp incline, reaching 27% in 2020–2021, up from only 10% a decade earlier. On a state basis, the highest shares are in hydro-rich Tasmania (98%) and also in South Australia (61%), where wind and solar generation have expanded quickly (Department of Industry, Science, Energy and Resources, 2022b). Over time, the great majority of economic activities in Australia – from mining to manufacturing to services – are likely to be powered by zero carbon energy (Blakers et al., 2017; Lu et al., 2021).

Opportunities for new zero carbon exports include:

- direct electricity exports via subsea cables,
- exports of green hydrogen and derivatives such as green ammonia and
- exports of goods and services produced in Australia using zero carbon energy, including processed ores and metals.

There is currently private sector interest in each of these potentials. For example, Sun Cable proposes to build an Australia-Asia PowerLink connection from the Northern Territory to Singapore.⁵ There are also proposals to build large-scale solar and wind farms in Western Australia and Queensland for the production of green hydrogen products for export.⁶ These projects remain at the design and financing stages.

By contrast, the medium- to long-term prospects for Australia's fossil fuel exports are relatively bleak. This is particularly the case for thermal coal, already under intense competition from renewables and natural gas and facing increasing regulatory and other pressures due to its high emission intensity (Jotzo et al., 2018).⁷ Australia's largest export markets – China, Japan, South Korea, the United States and India – have announced net zero emission targets for 2050, 2060 (China) or 2070 (India). There is thus expected to be a reorientation of demand towards lower emission commodities.

Making the switch from fossil fuel extraction will involve challenges. The revenues listed in Table 1, plus corporate and other tax collections from the fossil fuel industry, are set to decline. Other challenges arise from the fact that some communities are currently highly dependent on the jobs and incomes that come from the extraction and use of coal, for example in the Bowen Basin in Queensland. There is evidence of adverse unemployment consequences at the community level following the closures of some coal-fired power stations (Burke et al., 2019).

While Australia is well placed to commence exports of zero carbon energy products over the coming years, there is likely to be stiff competition from both local energy generation options in overseas markets (such as offshore wind in Japan; Cheng et al., 2022) and from exports from other regions, including the Middle East, Africa, and North America (IRENA, 2022). Nevertheless, there may be attractive profits available for some projects, especially given the sizeable demand-side plans of some countries in the region such as Japan for commodities such as hydrogen. For tradable commodities such as green hydrogen,

⁵See <https://suncable.energy>.

⁶See for example <https://intercontinentalenergy.com/western-green-energy-hub>.

⁷Under an IEA (2022b) 'net-zero emissions by 2050' scenario, annual world coal use would need to fall by about 90% by 2050. Only about 1% of electricity would be generated by coal.

commodity price cycles should continue to be expected, as have been seen throughout history (Bhattacharyya, 2021).

In addition to clean energy opportunities, Australia is also richly endowed in lithium, cobalt, copper, and many of the other minerals used in the modern energy sector and for other technologies. Strong demand for minerals is expected during the transition to a low-carbon economy (IEA, 2021; World Bank, 2017).

4 | OPTIONS FOR REVENUE RAISING

4.1 | The importance of efficient government revenue raising

The likely decline in revenues related to fossil fuel extraction and use underscores the importance of efficient overall tax collection mechanisms at the state and federal levels. It is not the case that the lost government revenue from fossil fuels needs to be directly replaced by new government revenue from the energy sector; France and Sweden, for example, achieve strong government revenue raising without sizeable fossil fuel production revenues. Efficient taxation seeks to raise revenue with minimum adverse distortive impacts on production, consumption, investment, and other decisions.

The transition also heightens the importance of generating adequate tax revenue from corporate activities. Some zero carbon production activities (e.g. green ammonia production) are likely to be carried out in remote regions, be financed predominantly by foreign capital, have a local environmental impact, be relatively disconnected from the national economy as a whole, and not deliver royalty or resource rent tax revenue. Adequate tax collection from these projects will be important to help ensure national benefit sharing and a return on the public R&D and infrastructure provision that helped pave the way for the emergence of such new industries.

4.2 | Taxes on renewable energy

Renewable energy production from solar and wind sources does not involve the depletion of assets, so a royalty is not a relevant concept. A tax on solar and wind power generation would also be distortive, slowing the transition to renewable energy. The same is true for a tax on the production of energy-intensive secondary commodities such as green ammonia. Other than the degree of energy intensity, there will be little to distinguish this commodity from others, as over time the production of all goods and services is likely to be powered by zero emission energy. I therefore conclude that there is thus no compelling case for new direct taxes on renewable energy or secondary commodities such as green ammonia. Nevertheless, there are other highly relevant revenue-generation options, as will be discussed.

4.3 | Land tax

Land is immobile, and some land is required for most economic activities. Land tax is thus often argued to be a relatively efficient revenue-raising measure (Henry et al., 2010). Land use is not nonsubstitutable, however; it can be economised on. As a result, land tax is not non-distortive. As an example, a land tax may cause some investors to switch to more expensive offshore wind projects so as to reduce land use.

Australian states and the Australian Capital Territory have annual taxes on the unimproved value of land. These do in general apply to utility-scale solar and wind farms, which do not benefit from the exemption given for land used predominantly for primary production (Freebairn et al., 2015).⁸ In future, it is possible that high demand for the best solar and wind sites will place upward pressure on unimproved values and hence lead to higher land tax liabilities, capturing some of the Ricardian rents for these sites. The Henry Review recommended reducing land tax exemptions so as to broaden its base, although with a marginal land tax rate of zero for land with low unimproved value (Henry et al., 2010).

Whether land use should be subject to a differentiated rate of tax depending on ecosystem impact is of interest. In principle, pricing the local environmental impact would be desirable. However, this can be done in other ways, for example via tight restrictions on projects in ecologically sensitive areas or a requirement to purchase biodiversity offsets. Prohibitions on development in ecologically sensitive areas have the same effect as a very high Pigouvian externality price.

Australian states and territories currently have relatively heavy dependence on revenue from stamp duty on property transactions. Gradually reorienting away from stamp duty and towards land tax is seen as being economically efficient given that it reduces disincentives to move (Freebairn, 2020; Henry et al., 2010). Reforms with this aim are currently being implemented in the Australian Capital Territory and New South Wales.

4.4 | Road user charges

The ongoing decline of fuel excise and customs duty as a sizeable revenue-raising measure contributes to a strong case for the introduction of a comprehensive new electronic road user pricing system, with higher per-kilometre road use charges applied when driving in congested locations and for heavier and more polluting vehicles (Cramton et al., 2018; Henry et al., 2010). From an efficiency viewpoint, such a reform makes sense given the negative externalities associated with congestion, road damage, road accidents, and vehicle emissions. Road user pricing also ensures that road users directly contribute to revenue raising to cover road infrastructure. By helping to avoid traffic jams, congestion surge pricing could help to make better use of our road resources and boost national productivity (Henry et al., 2010; Productivity Commission, 2020).⁹

The introduction of comprehensive road user charges could be designed as part of an overall package that achieves desirable distributional effects, for example via directing revenue to transport projects and other interventions targeted at low-income areas and households. Currently, total road-related revenue in Australia (including fuel excise) exceeds road-related expenditure (Bureau of Infrastructure and Transport Research Economics, 2021), meaning there is an implicit subsidy from people who do not place heavy demands on the road system, including those without a car. This imbalance could be sought to be overcome.

4.5 | Carbon pricing and fossil fuel taxes

Another desirable reform would be the reintroduction of a revenue-raising form of carbon pricing. For example, a methane tax, as recently announced by the United States under the Inflation Reduction Act, would be a useful way to seek to make progress towards Australia's recent commitment to reduce emissions by at least 30% below 2020 levels by 2030 under the

⁸See <https://www.revenue.nsw.gov.au/taxes-duties-levies-royalties/land-tax/exemptions-and-concessions> for the case of New South Wales. The Northern Territory does not have land tax.

⁹Reduced density of vehicles on the road can facilitate greater flows of vehicles along a road during peak hours; see Zhang and Burke (2020).

Global Methane Pledge. While there has been significant political angst over broad use of carbon pricing in Australia (Burke, 2014), it remains an available option to both help to achieve the country's net zero emissions by 2050 target and raise government revenue during the fossil fuel phase-out period.

The simplest approach would be a carbon tax that rises over time, as used by countries such as Singapore and South Africa. This could deliver interim revenue flows, although it would not be a source of sizeable revenues in the long run given that the tax base is one that is intended to shrink over time. Research suggests that carbon pricing has been effective in spurring low-emission energy transitions and emission reductions (Best et al., 2020; Best & Burke, 2020). Australia earlier had an emissions trading scheme with a fixed initial price that commenced on 1 July 2012, but this was removed as of 30 June 2014.

There is also the potential for fossil fuel royalties and taxes to be used to generate government revenue in an increasingly efficient way in the fossil fuel phase-out period. In 2022, the Queensland government indeed reformed its coal royalty regime to boost the marginal rate at times of high coal prices. A maximum marginal royalty rate of 40% of value was introduced, up from 15%.¹⁰ It would be possible for New South Wales (the other coal exporting state) to do similar. Other options include the federal government seeking to reform the PRRT to boost its revenue collections, for example via further reducing the available uplift rate and increasing the tax rate (Kraal, 2017).

4.6 | Corporate income tax reform

Australia's corporate income tax rate is currently 25% for firms with less than \$50 million per year of aggregate turnover and 30% for larger firms.¹¹ Corporate income tax has the potential to distort investment and production decisions given that doing so would impede the ability of firms to earn a normal profit. Modelling suggests that a reduction in Australia's corporate income tax rate would be likely to boost gross domestic product, although with ambiguous implications for welfare for reasons including that it would eat into government revenue collections (Dixon & Nassios, 2018; Murphy, 2016).

One reform option would be to seek to reorient Australia's corporate income tax towards the taxation of above-normal profits (Schwerhoff et al., 2020; Sobeck et al., 2022). Instead of commodity-specific rent taxes such as a hydrogen super profit tax, an economy-wide mechanism could be introduced to seek to collect a higher rate of tax from super profits – whether they exist in the commodities sector, the banking sector or elsewhere.

A specific way to seek to do this would be to both (1) reduce the standard corporate income tax rate and (2) introduce a supplementary 'allowance for corporate equity' (ACE) tax on above-normal profits. The ACE tax approach allows a deduction to be made for a rate of return on corporate equity before a tax rate is applied. To achieve an increase in the intensity of taxation of above-normal profits under this approach, the total tax rate would need to exceed the pre-reform corporate income tax rate.

The above reform would seek to both strengthen investment signals (via the lower standard corporate income tax rate) and ensure that the most profitable activities deliver healthy revenue flows to the federal government (via the standard plus supplementary ACE tax). By allowing a deduction for a rate of return on corporate equity, the approach would help to reduce the current preferential treatment of debt over equity finance provided by Australia's corporate income tax system (Cooper, 2012; Freebairn, 2016; Murphy, 2018; Sobeck et al., 2022).

¹⁰See <https://www.business.qld.gov.au/industries/mining-energy-water/resources/minerals-coal/authorities-permits/payments/royalties/calculating/rates>.

¹¹See <https://www.ato.gov.au/Rates/Changes-to-company-tax-rates>.

Nevertheless, the ACE tax component would continue to involve the taxation of some quasi-rents. For this and other reasons, it would not have a fully neutral effect on investment decisions.

The concept of an ACE tax was initially introduced by Devereux and Freeman (1991), building on the earlier work on rent taxes of Boadway and Bruce (1984). Sobeck et al. (2022) reviewed research on the experiences of other countries with ACE taxes, including Belgium and Brazil. Ingles and Stewart (2018) concluded that the concurrent use of separate corporate income and ACE taxes, as in the above, is worthy of consideration. The Henry Review also countenanced a move to an ACE tax, although it expressed concern that it would be risky to make a complete switch too quickly (Henry et al., 2010). The use of a two-tiered approach and an ongoing process of review would address this concern.

An alternative is the proposal of Garnaut et al. (2020) and Garnaut (2021) to implement a two-sided corporate cash flow tax and abolish the corporate income tax. Their proposal is styled as a Brown tax (Brown, 1948), with positive cash flows taxed and negative cash flows compensated at the same rate. Investments would be immediately deductible, encouraging new investment. The proposal would involve a more substantial change in Australia's system of company taxation, especially given its two-sided nature. The above-outlined ACE tax reform avoids the need for the government to compensate for cash flow losses.

A key design choice would be the rate of return to corporate equity that is allowed to be used as a deduction. One approach would be to use the 10-year Australian government bond rate (3.4% per annum as of December 2022) plus an addition to cover a return to risk-taking. Other design choices include whether the deduction should cover all or only new equity and the uplift rate to be applied for the carry-forward of losses. Sobeck et al. (2022), for example, recommended that losses be allowed to be uplifted at the 10-year government bond rate and offset against future liabilities, which is less generous than the provisions for the PRRT. Such decisions are crucial for the final amount of tax collected – especially for capital-intensive industries such as clean energy, where costs are front-loaded. Detailed modelling work by Treasury and others on design options would be useful.

An ongoing challenge to corporate income tax collection arises from profit shifting and transfer pricing practices (Freebairn, 2019). Australia's government is currently seeking to reduce opportunities for such practices, including by tightened rules for paying for intangibles from low-tax jurisdictions, boosted compliance efforts, and requiring multinational enterprises to report their income and tax payments being made in other jurisdictions (Commonwealth of Australia, 2022). Nevertheless, Australia's history of relatively low PRRT and corporate income tax collections from the LNG sector in particular calls for a degree of caution when it comes to the revenues that could be expected from an ACE tax. Tight design rules and vigilant implementation will be required.

In 2022, high commodity prices saw Amaglobeli et al. (2022) from the IMF call for increased use of permanent excess profit taxes so as to efficiently generate revenue that can be used for social and other purposes. The above ACE tax reform idea is consistent with this call. The mechanism could also help to reduce calls for more distortive interventions such as price ceilings for commodities such as natural gas (today) and hydrogen (in future). In December 2022, the federal government indeed announced the introduction of price caps for natural gas and coal in response to high fossil fuel prices due to the Russian invasion of Ukraine.

4.7 | Industry levies

A commonly used approach in Australia's agricultural sector is the application of industry levies to fund industry-specific activities such as R&D, marketing, and quality assurance. These are currently applied to more than 75 agricultural, forestry, and fisheries commodities (Department of Agriculture, Water and the Environment, 2022). Agricultural levies are currently imposed on the request of each industry and, once established, are payable by all

producers, with revenue directed to industry-specific purposes. The federal government also typically matches the R&D component of these levies. R&D expenditure by corporations also benefits from a tax offset scheme, the Research and Development Tax Incentive (R&DTI).

Federal revenue from agricultural revenues was \$626m in 2021–2022 (Australian Government, 2022b) – a relatively modest sum. Examples of individual levy measures include a:

- *Wheat levy*, first introduced in 1957 and currently equal to 1.02% of the sale value.
- *Rice levy*, currently at \$6.00 per tonne.
- *Livestock transactions levy*, applied on either an *ad valorem* or specific basis depending on the animal. For example, a \$5 per head levy is applied on sales of cattle.

There are also levies outside the agricultural sector. Australia's black coal industry, for example, self-administers a \$0.05 per tonne levy to fund the Australian Coal Association Research Program (Australian Coal Research Limited, 2022). Offshore oil and gas operations also pay mandatory levies to fund the regulation of safety, well integrity, and environmental management (National Offshore Petroleum Safety and Environmental Management Authority, 2022).

An industry levy may one day be suitable for the green ammonia industry, for example, with funds used for activities such as R&D and safety initiatives. However, quantity- or revenue-based industry levies add to project costs and thus would have a distortive effect. Given the nascent state of the industry, the optimal timing for the introduction of such a levy appears to be further into the future. An industry levy could also be considered for other zero carbon industries such as green steel.

4.8 | Revenues from government co-investments

An additional approach to both accelerate the energy transition and generate future returns to government is direct government co-investments in zero carbon projects. This approach is already being employed via the Commonwealth Government's Clean Energy Finance Corporation (CEFC), which provides both debt and equity finance for selected projects and has a mandate to target a return exceeding the 5-year Australian government bond rate over the medium to long term (CEFC, 2021). There are opportunities to increase the use of this approach at both the federal and state levels.

Aside from the potential government revenue benefits, various market failures – from unpriced pollution to undervalued positive externalities from knowledge generation and first-mover projects – create an ongoing justification for a proactive government co-investment stance. Ideally, government co-investment would also continue to focus on highly innovative or early-mover projects that create positive externalities.

4.9 | Mineral royalties

Mineral extraction involves the depletion of a physical asset and causes environmental damage. Given the strong expected demand for Australian minerals, in part fuelled by the energy transition itself (World Bank, 2017), mineral royalties offer a potentially growing revenue stream.

In many instances, royalty rates are currently low and are not yet progressive functions of the price level. For example, Western Australia's royalty for lithium is currently set at a fixed *ad valorem* rate of 5%. South Australia's royalties for mineral ores and concentrates are a fixed

5% of the mineral value. Queensland's royalty for base and precious metals including copper and cobalt varies in the range 2.5%–5% of value, depending on the metal price. There are ongoing reform opportunities for these royalty regimes. One simple approach is to progressively step up the marginal *ad valorem* royalty rate as a function of the commodity price, as currently done for Queensland coal. This can be a relatively manageable way of seeking to efficiently and directly capture some of the super profits that can exist at such times. It is simpler than a super profits approach.

5 | CONCLUSION

Australian state and federal governments are set for a decline in revenue collections from fossil fuel extraction and use over the coming years as both the economy and national exports decarbonise. Direct revenues across the state and federal governments from fossil fuel extraction and use equalled about \$20 billion in 2019–2020 – quite modest relative to other key government revenue sources.¹² Nevertheless, a decline in these revenue streams would contribute to a fairly sizeable impact for the Queensland and Commonwealth Governments in the form of lower revenue from coal royalties and fuel excise/customs duty, respectively.

The expected reduction in government revenues from fossil fuels heightens the importance of efficient government revenue-raising instruments in general. Some of the most important efficiency-enhancing tax reform ideas, such as reorienting from stamp duties to land taxes and the introduction of road user charges, are at the state level (Freebairn, 2020). There are also efficient revenue-raising options federally, including a return to carbon pricing as a transitional revenue source and a means to speed the energy transition. Road user charging is also a highly promising reform area.

The key tax for collecting revenue from large-scale clean energy export projects is corporate income tax. This paper has discussed a potential tax reform that would involve a reduction in the standard corporate income tax rate and the introduction of a new supplementary ACE tax component. This would be an economy-wide reform aimed at increasing the intensity of taxation of above-normal profits. Design choices are crucial in determining how much revenue would be collected, especially for capital-intensive projects for which cash flow losses are to be expected in the early years. Detailed work is needed on the precise design elements.

Given the history of underwhelming revenue collections from the PRRT, a degree of circumspection is needed regarding corporate income tax proposals aimed at collecting revenues from super-normal profits. A supplementary ACE tax would also be unlikely to collect sizeable revenue from new investments in the early years given that time would be needed for capital expenditure to be covered by revenue. Design settings will need to strike a balance between seeking to ensure adequate future revenue streams from profitable enterprises while also not overly distorting investment decisions. Ongoing efforts will be needed to ensure corporate income tax (including any ACE supplement) is adequately enforced and paid.

Tax reform proposals can face political challenges in Australia, as seen in the case of the proposed Resource Super Profits Tax in 2010, which contributed to the political downfall of Prime Minister Kevin Rudd (Gilding et al., 2016). Nevertheless, the introduction of a bank levy in 2017 (Chronopoulos et al., 2019) demonstrated that tax changes do remain politically viable if well motivated and communicated. Clear communication and a well-developed narrative would be needed.

¹²This includes only revenue from the direct measures included in Table 1, although as noted some fossil fuel companies pay only limited corporate income tax.

An additional approach discussed in this paper is for governments to expand the use of co-investments in clean energy projects with the aim of both boosting project viability and generating future revenue. However, it would be important to impose strict investment criteria. The focus of co-investments should also ideally be projects that provide dynamic benefits for clean industry development.

A priority for the energy transition is ensuring sizeable benefit sharing from renewable energy projects for local communities, especially Indigenous communities. O'Neill et al. (2022) highlighted the importance of well-designed agreements for land access and benefit sharing. Research on the approaches best suited to various contexts would be useful.

There is substantial scope for detailed modelling work of the various reform ideas reviewed in this paper, including the specific design details for an ACE tax and various land tax designs. Such modelling could also seek to estimate the effects of the energy transition and of various reform options on indirect revenue collections via instruments such as personal income tax. Such modelling would ideally consider a variety of global development scenarios given the substantial uncertainty surrounding levels of future demand for individual Australian commodities. Timely work in this area may be directly useful for informing policy design.

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