

Economic ideas and policy outcomes: applications to climate and energy

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This paper presents a revised version of the FH Gruen lecture by Professor Ross Garnaut at the Australian National University on 29 June 2022.

Fred Gruen signed up as Professor of Economics in the ANU's Research School of Social Sciences in 1972, at the same time that I joined the Research School of Pacific and Asian Studies as a Research Fellow. Fred spent the next few years as a Consultant to Prime Minister Gough Whitlam. My work was initially based at the ANU's New Guinea Research Unit in Port Moresby. Two years or so later, I was seconded from the ANU by Papua New Guinea's first National Secretary for Treasury and Finance, Mekere Morauta, to help him build the economic policies and institutions for independence.

From Port Moresby I kept close contact with the economists in the Institute at the ANU, presenting a number of seminars on issues I was thinking through in Port Moresby. I recall John Crawford chairing one public seminar adapting the Swan model of internal and external balance to an economy with a predominant subsistence or non-market sector, and another presenting Anthony Clunies Ross's and my paper on the resource rent tax. Fred was present and engaged on these occasions. So was Fred's wife, Ann Gruen. She had a strong interest in Papua New Guinea development.

I learned much later that Fred's first visit to Papua New Guinea provided his first scholarly contact with Austro-Hungarian economics and also with the top echelons of

wartime (and subsequently post-war) Australian social democratic economic thought. This was Fred's first point of contact with the two intellectual traditions that I discuss in this lecture.

Fred joined the Australian Army after his detention on the Hay Plains as a refugee from an enemy country. He was passing north through Brisbane to Papua New Guinea at the end of the war and sought a copy of Frederick Hayek's 'Road to Serfdom'. The helpful librarian said that she did not have it; but her cousin was reading it and she would see what she could arrange. So Fred was introduced to Ann and Austro-Hungarian economics at the same time. Travelling on to Lae in Papua New Guinea, now occupied by inactive Australian forces, Fred provided lectures to servicemen. Nugget Coombs, visiting as Secretary of the Department of Postwar Reconstruction, attended one.

The ANU was built from the work of the Curtin and Chifley governments' Department of Postwar Reconstruction. Stuart Macintyre's compelling history tells how a group of young men, believing that knowledge can guide economic policy to better outcomes for ordinary people, shaped Australian policies and institutions through the second half of the 20th century (Macintyre 2015). Curtin and Chifley, and Minister for Postwar Reconstruction John

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Dedman, were committed to building a different Australia after the war, free of high unemployment and poverty. Coombs led thought about post-war reconstruction, and had the administrative skills to make good new ideas work in practice. His Director of Research was John Crawford, who was recruited from the New South Wales (NSW) government's Agriculture Department and the Rural Bank of NSW.

The ANU was established to provide knowledge for building sound economic and independent foreign policy. The new University would have global standing in research, and reverse the brain drain to the UK and USA. The three most influential figures in shaping the early approach to policy-related economic analysis at the new ANU were deeply steeped in an Australian version of the established North Atlantic liberal social democratic tradition. Long after the work on foundation of the ANU, Coombs was chancellor with active interest in the University's work for eight years and an active visiting fellow in the Centre for Resource and Environmental Studies for 21 years. Crawford was inaugural director and professor of economics in the Research School of Pacific Studies and then vice chancellor, chancellor and visiting fellow in the Economics Department from 1960 until his death in 1984. The third, Trevor Swan, had been recruited into Coombs' Department of Postwar Reconstruction by John Crawford and joined the ANU as the foundation professor of economics in the Research School of Social Sciences in 1952.

Swan and the Department made brilliant contributions over the next half dozen years or so, but then lost dynamism and impact. Fred Gruen took over in late 1975, and Social Sciences Economics again became an important contributor to Australian economic policy discussion.

In a poignant coda to this story, Fred Gruen and Nugget Coombs died on the same day in 1998.

Ludwig von Mises was the father of Austro-Hungarian thought in the North Atlantic. Hayek, his student, was the most

influential of several emigres from Germanic Central Europe who reshaped UK and US ideas about economic policy in the second half of the 20th century. Von Mises, Hayek and Friedman were all major figures in the establishment and influence of the Mont Pelerin Society, which elevated the influence of the Austro-Hungarian model of untrammelled free markets, and minimal government intervention in the economy except to forcefully uphold private contracts and property rights. Friedman, born in the USA of migrant parents recently from Austro-Hungary, was intellectually close to but not altogether at one with the older professors.

Joseph Schumpeter shared some approaches to economic thought with his Austro-Hungarian confreres, and differed in others. He was at the University of Vienna with von Mises and Hayek after WWI. He spent a brief time as finance minister in the post-war socialist government, struggling with the legacy of debt from war and reparations. He spent more time close to owners of substantial financial businesses in Vienna. Schumpeter contributed profound insights into capitalist development. He favoured a capitalist market system with minimal intervention by government—to the point of opposing regulatory measures to increase competition and, after publication of Keynes' general theory (Keynes 1936), to opposing any countercyclical fiscal policy in response to depression. He was pessimistic about the survival of his preferred form of capitalism in a democracy.

Austro-Hungarian thought became immensely influential in Anglo-American thinking and policy in the 1980s. Its influence reached its zenith in the Reagan Presidency 1980–88, and has remained important. Martin Wolf from the Financial Times has noted that the brilliantly successful liberal social democratic approach to economic policy of 1946–70, with sustained strong growth in productivity, output and living standards, low unemployment and moderate inflation, was easily pushed aside in the 1970s when it ran into what now seem small problems. De Long's economic history of the long 20th century makes similar points (De Long 2022). On the other hand, its successor, the Austro-Hungarian

approach, has shown great tenacity through the stagnation of living standards of ordinary US and UK citizens and recurring financial crises. Wolf's explanation of the paradox is that the successful mid-century consensus in mainstream economics, while favourable for business in aggregate, challenged and damaged vested interests on important matters. The Austro-Hungarian approach in practice was unambiguously supportive of vested business interests.

Austro-Hungarian economic thought always contained doubts about democracy, back to its origins under Emperor Franz Joseph. Democratic pressures are likely to lead to interventions that affect the operations of a market economy. Hayek, in particular, saw value at times in suspension of democracy, and reset of institutions with new rules to constrain interventions in economic transactions. Such was Hayek's rationalisation of and Friedman's explanation of his association with the Pinochet military dictatorship in Chile. The concern about contradictions between capitalism and democracy and support for constraints on democratic interventions in the economy has appeared in critiques of contemporary US political economy close to former President Donald Trump. This was a theme of early 20th-century German political theorist Carl Schmitt (Schmitt 1922).

Alerted by a Newscorp columnist's sympathetic reference to Carl Schmitt's political philosophy, I took time over Christmas 2021 to re-read his 'The Crisis of Parliamentary Democracy' (Schmitt 1922). In Schmitt's view, representative democracy was useful in its place. But there were times when resetting power and constitutional arrangements by a strong leader was necessary for government to work effectively. Schmitt was appreciated by Nazi leaders and he reciprocated, but withdrew his appreciation when Nazi rule had led to national ruin.

Austro-Hungarian thought makes valid points. It reduces too much the role of market exchange and large problems of economic efficiency arise. Its big positive contribution to North Atlantic economic thought was as antidote to uncritical support for central planning in the Soviet style during and immediately after

the second world war. The Austro-Hungarians were not concerned that untrammelled market exchange leaves behind those who, out of bad luck, or low ambition or effort, or poor genetic or cultural or financial inheritance, do badly in market competition. When untrammelled competition leads to extreme inequality and generates pressures for policy intervention that challenge property rights and distort resource allocation, these pressures must be resisted, if necessary by illiberal means.

These Austro-Hungarian positions on inequality had parallels in 19th-century British thought. In the English-speaking countries, they had gradually been leavened by acceptance of the advantages of democracy, including in releasing pressure for revolutionary change.

Austro-Hungarian thought was blind to the observed reality that sustained strong economic growth is more likely with effective government provision of public goods and correction for market failure.

Mainstream Anglo-American thought was in a very different place to these Austro-Hungarian positions through the middle decades of the 20th century. It recognised the immense advantages of market exchange in goods and services in areas of economic activity in which competition could be effective. But where there were external positive or negative effects from private economic decisions, or where goods and services supply conditions suggested that they were 'public goods', or where sustained under-employment was caused by persistent tendencies for private savings to exceed private investment intentions, it supported fiscal, monetary or regulatory corrections. It also supported fiscal and regulatory interventions to correct undesirably large inequalities in income distribution or the presence of unacceptably high levels of poverty. It held that economic growth was strongest in practice in an optimality zone, with neither untrammelled free markets, nor indiscriminate state intervention. Knowledge and analysis could inform policy about the location of the optimality zone.

Fred was part of the generation of leaders in economic thought in ANU's Institute of Advanced Studies that succeeded the group

from post-war reconstruction. Over the decade or so before his retirement in 1986 he was one of three refugees from Germanic Central Europe who were influential in extending and strengthening the liberal social democratic tradition of economics at the ANU. Far from challenging and overthrowing the successful intellectual tradition into which they were welcomed, they refreshed it. The contrast with the Central European emigres to the North Atlantic is sharp.

Fred was from Vienna, the glittering artistic and intellectual capital of central and eastern Europe, and maybe of the world. Heinz Arndt and Max Corden both were children in the culturally German city of Breslau, now part of Poland. Different refugee experiences took them through England to Australia and the young ANU.

Max saw Fred as having the poise and confidence of a citizen of Vienna. The three were sometimes of similar mind on particular issues and sometimes opposed. Heinz was an active supporter of Chifley and Coombs's proposals to nationalise the private commercial banks in 1949, and then the most prolific author explaining how the establishment of a central bank with Coombs as Governor served the same purpose well enough. He moved across the Australian political divide over his lifetime, without moving beyond the boundaries of liberal democracy. Max remained a committed liberal social democrat from a well-anchored centrist position, at sometimes supporting and at others opposing current fashions in political economic thought. Fred became more actively engaged in directly advising Labor governments, and a steady defender of centrist balance against challenge from the simplicity both of market fundamentalism and neo-Marxism. All three were defenders and valuable contributors to the successful Australian liberal social democratic tradition that began with the Chifley and Curtin governments, was maintained by Menzies, survived through Whitlam and Fraser and reached its apotheosis with the Hawke and Keating governments.

Fred attended lectures by Hayek and Friedman in his graduate coursework at Chicago. We know from Fred's life's work that he was

able to pick out the grain in Hayek and his Austro-Hungarian colleagues and leave the chaff. He argued the case for markets against neo-Marxist challenge at Monash University in the late 1960s and early 1970s. He was a participant in the correction of the Curtin-Chifley-Menzies underutilisation of international markets—most importantly in advocacy before and after the event of the Whitlam government's tariff cut in 1973. He wrote about aboriginal disadvantage in 1966, favouring equal pay as a right, and increased education and training as a means of making it work. He contributed to the Hawke government's enhancement of equity in social security in the mid-1980s. He promoted informed discussion of policy and a large role for knowledge and analysis in the policymaking process. He cautioned against over-simplification of complex issues which lends itself to extreme solutions. He helped to maintain liberal social democratic traditions in Australia when they were giving way to Austro-Hungarian simplicity in our great and powerful English-speaking friends.

Liberal social democratic traditions have come under stress in Australia in the 21st century. The recession of 1990–91, a mistake, provided opportunity for criticism of the Hawke reforms, as if they were echoes of developments in the USA and the UK. The Australian Labor Party in opposition chose not to own the reforms for a critical decade or so. This allowed other traditions to claim credit for the remarkable period of broadly based economic prosperity that followed, in the longest period of economic growth unbroken by recession in any developed country ever. Misunderstanding of the success supported neglect of judicious public investment in public goods, correction of market imperfections and measures to secure equitable distribution of incomes and services.

Australia has moved too far in an Austro-Hungarian direction so far in the 21st century. We sought to introduce market exchange into supply of public goods. We confused doing what business wants with supporting a large role for markets in the economy. We downgraded the role of knowledge and analysis in policymaking, and elevated that of vested

interests. Productivity growth collapsed, from the highest in the developed world in the 1990s to close to the lowest from 2013. We entered the Dog Days that I anticipated in 2013 (Garnaut 2013).

Nowhere was the change towards Austro-Hungarian approaches to policy more consequential than in climate and energy policy for nearly a decade from 2013. The remainder of this lecture focuses on challenges in the climate and energy transition to net zero carbon emissions.

Australia's climate and energy policy story intersects with Fred's early life in Australia. Fred had arrived in Australia with other refugees on the ship *Dunera* in 1940. Survivors and some descendants of refugees on the *Dunera* had a 70th anniversary reunion on the Hay Plains in 2010. Nick Stern, Professor at the London School of Economics and President of the Royal Society, and author of the Stern Review of Climate Change (Stern 2007), was passing through Canberra on his way to remembering his dad's experience as a refugee in our country. The two independent members of the House of Representatives, Tony Windsor and Rob Oakeshott, were in the process of deciding whether Tony Abbott or Julia Gillard should be the prime minister of Australia. They wanted the new government to move the country forward on climate change. I had spent some time with them, and Nick was able to join us on one important day. The independent members decided to support a Gillard Labor government. Nearly all of the institutions and policies that took Australia forward on the climate and energy transition from 2010 to 2022 were established in that Parliamentary term.

The Albanese government's energy crisis

The timing of the election of the Albanese government in May 2022 has haunting parallels with that of the Scullin Labor government in 1929. Scullin won an overwhelming majority in elections on 12 October. The Cabinet

was sworn in on 22 October. The 24th of October saw the Black Thursday sell-off on the New York Stock Exchange that heralded the start of the Great Depression.

The energy crisis that hit the new government in its first days and weeks has the potential severely to disrupt the economic welfare of most Australians. This comes on top of the stagnation in real wages and living standards through the Dog Days 2013–19 (Garnaut 2013) and subsequently. Poor understanding of and reaction to the crisis could knock Australian decarbonisation off course and undermine the new government.

Large increases in Australian electricity and gas prices are at the centre of the crisis. They have their immediate origins in the higher global gas and coal prices that followed the Russian invasion of Ukraine. Higher international prices found their ways into Australian domestic prices. If the high international prices persist and price-forming institutional and fiscal arrangements are left exactly as they were when the government was elected, several per cent of Australian household income would be transferred to producers of gas and coal over the three years 2022–25. The inflationary effects of the fossil energy price increases contribute to forces driving Reserve Bank increases in interest rates. Falling household real incomes and higher interest rates reduce real wages and household living standards and introduce risks of rising unemployment and under-employment.

The general election was on 21 May 2022. The minister for energy and climate change, Chris Bowen and most of the Cabinet were sworn in on 1 June. In succeeding weeks, wholesale gas prices were at times thousands of a per cent higher than on average in the preceding year. Together with high coal prices, these lifted wholesale electricity prices far higher than ever before.

On 30 May, the Queensland cumulated gas price threshold over 7 days (23–30 May) exceeded the extremely high levels that triggered a price cap of \$40 per gigajoule (GJ) under the market rules. On 7 June, the price cap on gas was extended throughout eastern Australia.

Wholesale electricity prices through the National Electricity Market (NEM) in mid-2022 were several hundred per cent higher than on average through any of the immediately preceding years. On 12 June, the cumulated electricity price threshold in Queensland over 7 days (5–12 June) exceeded the extremely high level that triggers a \$300 per megawatt hour (MWh) price cap under the NEM rules. Two days later, price caps were imposed throughout the NEM.

At the capped gas and high coal prices, many generators could not operate profitably at the regulated maximum electricity price. The rules provided for generators to be compensated for losses in these circumstances. There was uncertainty about how the compensation would work. Generators began withdrawing from the market. Anxieties developed about shortfalls leading to blackouts. The Australian Energy Market Operator (AEMO) began directing generators to supply the market. Direction attracted more certain compensation and was favoured. More generators withdrew from the market, awaiting direction from AEMO. On 15 June AEMO declared the market ‘impossible to operate’ and for the first time since the establishment of the NEM in 1998 suspended trade. Normal operation of the market was tentatively restored on 23 June without the wholesale electricity price cap and confirmed on 24 June. Average prices remained far above any previous experience.

Commentators referred to a ‘perfect storm’ driving the crisis of Autumn 2022. The perfect storm abated and the problems remained. The unusual weather gave way to the usual cold in late June. The rate of breakdowns returned to usual expectations from an ageing fleet. Mines ceased to be affected by floods. Extraordinarily high electricity prices remained.

The full pass-through of international into Australian power and gas prices will take at least two years, as households and businesses come off old and enter new contracts, and regulatory agencies take account of these lags in their pricing decisions. If electricity prices hold for the next two years at the forward

prices set by the market for the next year, then by July 2024 we can expect household electricity bills to double. Price increases for gas and electricity will pass through to business users more quickly.

Average household usage of grid-sourced electricity in NSW is about 5.5 MWh per annum, the increase in wholesale prices from \$60 to the June forward price of about \$250 alone would increase average NSW household electricity bills by about \$1000 per annum by 2025. The increase would be several hundred dollars more with normal mark-ups. Wholesale gas prices have gone up proportionately more than electricity. The average Australian household spends a bit more than a third as much on gas as on electricity. Wholesale prices represent a higher proportion of household costs for gas than for electricity. The increase in average household expenditure on gas and electricity would be around \$2000. The effects of higher electricity, coal and gas prices on business costs that are passed on to consumers are on top of that. The total increase in the average household’s costs might be around \$3000. That is 3 per cent of mean weekly household income of a bit over \$100,000 or 5 per cent of disposable income of around \$60,000. The proportions are higher for people on lower incomes. Direct and indirect increases in prices from higher petrol and diesel costs from the Ukraine war are on top of that. So are price increases for other goods in these inflationary times. We are Austro-Hungarian if we think that such changes do not warrant search for a low-cost policy response.

How electricity prices are set

What is happening is incomprehensible without knowledge of how electricity prices are determined in the NEM. There are five regions, corresponding to all states except Western Australia (WA) and with the Australian Capital Territory part of NSW. Interconnection allows movement of power in response to price differentials. But there is

insufficient transmission capacity to equalise prices across the regions, so large price disparities can persist.

Retailers and users of power in each state offer to purchase quantities of power at specified prices for each five-minute interval. The price is set so that the sum of offers to buy at or above that price equals the sum of offers to sell at or below that price. Where markets are competitive, generators offer power at the marginal cost of production.

I will now tell a stylised story of how prices are set through the interaction of supply of power from different technologies with total demand. I sacrifice some complexity for clarity.

There are three types of power generation. One is variable renewables—solar and wind. Most of the cost of these is borne at the beginning. Once the plant is in place, costs are no higher if the generator is delivering power to the network than if it is not. Indeed, total costs can be lower if power is delivered. So solar and wind generators bid into the market at a price near or below zero.

Coal power has substantial operating as well as capital costs. The main operating cost is buying or producing coal. If the coal is unsuitable for export, production costs determine the price. If exportable, the international price determines the cost to domestic generators.

Gas power under contemporary conditions in eastern Australia has lower capital and higher operating costs than coal generation. It has higher marginal costs than coal.

If there is enough solar and wind to meet demand, wholesale power prices are near or below zero. This now happens frequently in the regions with largest renewable energy capacity, especially South Australia (SA).

If there is not enough solar and wind generation to meet demand in a region in some period, price is set by the source of power with the next lowest marginal cost. This is usually coal. In Victoria, the lift in global coal prices has no effect on electricity costs because it is not exportable. NSW and Queensland coal is exportable. The marginal cost of coal power has lifted sharply since the Russian war, but remains below gas.

If supply of renewables and coal generation together is insufficient to meet demand, gas generation fills the gap. Prices are then higher again.

Increasing the renewables share of power supply expands the proportion of the time in which renewables meet the whole of demand and prices are very low. It expands the proportion of the time when renewables and coal together meet demand and prices are at intermediate levels. It reduces average prices.

A contraction of coal supply increases the proportion of time when some gas generation is required and reduces the proportion of time when renewables plus coal set the price. That increases average prices.

The withdrawal of large amounts of coal power generation increases the proportion of time when high-cost gas generation is required. This increases the average price of power. We saw that with the closure of the Northern power station in SA in 2016 and Hazelwood in Victoria in 2017. Since those closures, the supply of renewable energy has increased by large amounts in SA and Victoria. This increased the proportion of the time when renewables set the price near or below zero, and reduced the proportion of the time during which gas set the price at high levels. These developments have shifted average SA prices from well above to well below Queensland and NSW over recent years.

The result is a saw-tooth pattern of price changes over time. Expanding renewable supplies (including from rooftops) tends to reduce power prices. At some time, this leads to the closure of a coal generator. Prices then jump to higher levels, and then resume their downward slide. The profile is of a saw-tooth blade with a downward slope.

The dynamic is disrupted if international coal and gas prices increase. This raises the level of the saw while leaving in place the downward slope and the profile of the saw teeth.

Eastern Australian electricity prices are vulnerable to increases in international gas and coal prices for as long as internationally tradeable coal and gas are important. They are vulnerable to closure of coal-fired generators

until the last one is closed. When renewables supply almost all requirements, average power prices are relatively low and insulated from international energy market developments.

Three time horizons

There is a short-term crisis of high prices to users of power. There is a medium-term challenge of maintaining reliability of power with the lowest possible prices while we remove carbon from our electricity system. There is a long-term opportunity for Australia as an immense supplier of zero emissions goods and carbon credits in the emerging zero emissions world economy.

The challenge is to respond effectively to the short-term crisis without damaging our medium- and long-term prospects. We have to start work on all three horizons, making sure that steps taken towards one do not create problems for the others,

The first horizon: the Russian war price crisis

Two kinds of response are available: driving a wedge between international and domestic prices to hold the latter to pre-war levels; and taxing temporary profits from the coal and gas industries directly or indirectly to fund compensatory payments to users of power. Each type of response could be implemented at state or Commonwealth level.

Measures can be designed that automatically phase out as prices return to pre-war levels. How long will that be? We do not know how long military action will continue, nor how long restrictions on Russian exports will remain after military action ceases. Disruption and higher prices are likely to remain for several years.

There are at least two ways of driving a wedge between domestic and international prices: restricting quantities of exports so that the domestic market clears at a low price; or taxing exports to provide incentives to sell

into the domestic market below the international price.

Increasing domestic supply. Reservation of a proportion of supply for the domestic market along the lines used in WA could be introduced in eastern Australia. Commonwealth legislation enacted by the Turnbull government is a possible instrument. To be effective in returning domestic gas prices to pre-Russian war levels, the legislation would require amendment. Alternatively, companies may choose to expand supplies to the domestic market by enough to push prices back to pre-war levels, to avert regulatory action by government. The three liquefied natural gas (LNG) producers operating in Gladstone would be wise to offer to expand domestic sales to reduce prices. The exporters have referred to constraints associated with contractual commitments. Small proportions of output provided to domestic markets would have large leverage over domestic prices.

A similar domestic reservation measure could be designed for coal, although the larger number of mines would complicate administration.

Whether mandated or implemented voluntarily, expansion of supply to eastern Australian markets at pre-war prices would leave the LNG and coal producers with prodigiously high profits from the large majority of their production that would be sold at war-time prices.

A 'Russian war price normalisation levy'. A levy could be applied to exports of coal and gas at a rate that reduced after-tax receipts from exports to average levels before the Russian war. The lower receipts from exports would hold domestic prices down to pre-war levels. Old contracts at pre-Russian war prices would not attract a levy, so would not affect the integrity of sales contracts. The structure of the levy would see it phasing out automatically as prices fell to pre-war levels. The revenue collected would be small at first, when most exports were being sold at prices contracted before the war. Spot sales and new contracts would attract the levy. Revenue

would rise over time while international prices remain high.

What would be done with the revenue from a Russian war price normalisation levy? There would not be a compelling case for compensatory payments to households, as prices for gas and electricity would return to levels before the Russian war. The revenue could be returned to producers, so long as amounts were not related to current export revenues—for example, in proportions equal to gas and coal companies' shares of export revenue in the year before the Russian war. It could be used to fund support for electricity infrastructure. Or it could be used to pay off Commonwealth debt.

The 11 per cent of Australians resident in WA do not have an energy crisis. Gas is available at about one tenth of the eastern Australian price and in adequate supply. Electricity prices have been increasing with or at a lower rate than the consumer price index. WA would be excluded from national arrangements.

Under the Australian Constitution, the States own mineral resources except in offshore areas and the territories. This makes it easier for the states to implement special supply, pricing or taxation arrangements. Requirements on domestic supply, or price-related levies with rebates for domestic sales, could be introduced as conditions of mining.

Queensland's new coal royalties announced in June 2022 collect 40 per cent of revenue from high prices, which is much more than would be required to compensate domestic users of coal for increases in prices from the Russian war. There is no rebate for domestic sales, so compensation to residents would have to be provided through mechanisms other than lower prices. The royalty automatically phases down as prices fall.

New South Wales has the power to do something similar to Queensland on coal.

Victoria is not an exporter of coal or gas. Its gas producers receive much higher domestic prices as a result of the Russian war. Its coal generators' costs are not affected by higher international prices. They are handsome beneficiaries, however, of higher electricity prices driven by high gas prices and

high electricity prices established by arbitrage through the NEM. Victorian users of power are heavily exposed to the Russian war prices through these mechanisms. It is open to the Victorian government to raise coal royalties to provide indirect compensation to residents paying extraordinarily high prices for gas and electricity.

Tasmania's renewable energy supply roughly matches local use. Domestic prices have risen largely through the Basslink submarine connection to Victoria and arbitrage through the NEM. This has increased profits of the state-owned electricity companies. Increased dividends to the state could support substantial direct or indirect compensatory payments.

The Commonwealth itself has powers in relation to export volumes and taxes, income-related taxes and royalties for offshore gas production. The Commonwealth Petroleum Resource Rent Tax (PRRT) operated successfully for many years for offshore projects, but its value was damaged by amendments to allow deductions for processing costs to denude resource rent revenue from later projects. Now is a good time to correct those anomalies. A Commonwealth role in onshore gas and coal taxation would be more difficult, as it would have to be worked out with Queensland and NSW and have value for them. Rationalisation with state royalties and other measures would be necessary for good outcomes.

The highly varied circumstances across the Federation argue for cooperation and close consultation among governments. The different histories of eastern states coal and gas may warrant different response.

Medium-term horizon: reliability and new investment

Increased investment in renewables is necessary for lower electricity prices and to reach Australian carbon emission reduction targets. That has to be supported by measures to secure reliability—balancing supply and demand for power at all times. The prime minister and energy minister correctly frame

the reliability challenge as one of buying insurance. What is the cheapest and best insurance?

The Energy Security Board (ESB) in its paper 'Consultation paper on the high-level design of a capacity system' in June 2022 suggested a reliability mechanism that would significantly affect the operations of the energy market. The energy market is the one success story in the introduction of the NEM and associated privatisations and corporatisations of generation, transmission, distribution and retail businesses over the past quarter century. The competitive energy market has facilitated large investments in new and old technologies while adjusting to huge variations in economic and policy circumstances. Until the current crisis, it delivered reasonably low wholesale power prices.

The ESB's capacity market would change radically the one part of the NEM that was working well before the current crisis. The following is my suggestion for a mechanism to ensure reliability in matching supply and demand for power as the proportion of variable renewable energy generation increases, without disrupting the energy market.

The government would specify the range within which unrestricted market exchange would determine prices. It would be wide enough for large interventions by the reserve mechanism to be infrequent. The price limits would emerge from analysis.

The mechanism would be managed by a Commonwealth-owned Energy Reserve Authority (the Energy Reserve). The Energy Reserve would have access to enough storage capacity or flexible demand for power to hold the price at the lower limit whenever the market fell to that level. The Energy Reserve would hold enough storage and flexible generation capacity to stop the price rising above the upper limit. It would not sell power below the upper limit.

The Energy Reserve would be required meet its objectives at the lowest possible cost. Costs would be net of profits from arbitrage—buying at low and selling for high prices. Suppliers of power with carbon emissions would be required to surrender credible carbon offsets. With this recognition of the cost of

carbon emissions, the Energy Reserve could draw power supplies from their lowest cost sources.

Authoritative assessment of future demand and supply would be required. AEMO now provides those market perspectives and is well placed to guide the Energy Reserve.

The Energy Reserve would control a portfolio of storage and peaking assets. Batteries could efficiently cover shortfalls up to four hours, perhaps more with emerging technologies. They could be backed up by flexible thermal generation and pumped hydro storage. Thermal generation can be from biomass, bio-gas, bio-oil, gas and hydrogen. Through the transition period when coal generation is closing, there may be a place for holding some mothballed coal generation capacity in reserve for rare long-lasting events.

For the electricity system as a whole, stability within the Energy Reserve's price range would come from more flexible use of established hydroelectric capacity, thermal peaking generators, geographic diversification of solar and wind supply through stronger interconnection, and managing demand.

Who would own the storage and peaking assets? That would be a matter for the Energy Reserve. It would have access to the Commonwealth's balance sheet, so it would be a low-cost owner of capital assets. Its participation would facilitate rapid development of some storage and peaking opportunities. However, leasing provides more flexibility and requires less management capacity. The Energy Reserve could lease part of a privately owned peaker or storage asset, and leave the private owner to participate in market exchange with the balance. Or the Energy Reserve could own that proportion of the asset that it seeks to bring within its operational portfolio. Sharing the use of an asset could also be over time. For example, the Energy Reserve could lease the use of an asset for a number of years, with use rights reverting to a private owner after that time. This might be valuable, as demands on firming are likely to fall after the completion of the transition to zero emissions.

Would purchase of demand management potential be part of the Energy Reserve's brief? Industrial and other processes which can reduce demand at little cost when prices are high and expand use of power when low will become much more important in the energy system. Production of hydrogen by electrolysis will eventually absorb a high proportion of electricity output. Electrolysers will be fully engaged in their own arbitrage within the price range protected by the Energy Reserve. The private market in demand management will expand. This development alone will greatly reduce the requirements of intervention by the Energy Reserve. Demand management is better left to private markets.

I have suggested elsewhere (Garnaut 2019, 2021, 2022) that one way of beginning the building of a reliability reserve would be to separate the peaking and storage assets from the conventional hydroelectric and retail businesses of Snowy Hydro. The Energy Reserve could be responsible for managing established gas generation and pumped hydro storage and also for completion and operation of Snowy 2.0 and the Kurri Kurri gas and hydrogen generator. The knowledge that these assets in the hands of a sovereign entity will enter the market under rules that are not known to other participants has been a substantial deterrent to private investment in peaking and storage assets. Operation by the Energy Reserve under transparent rules would remove uncertainty.

Prices will be lower sooner if there is more rapid transition to zero net emissions from electricity generation. How short can the transition period be? In my assessment, a zero carbon electricity sector could be achieved economically by 2035. Demands on the Energy Reserve would be heavy during the period of retirement of coal generators, and ease after that. Private markets for arbitrage will become more sophisticated and absorb more of the balancing load. Decentralised storage in home batteries and especially in electric motor vehicles will add immense depth to private storage. The growth of the Superpower economy (Garnaut 2019, 2021) with large-scale electrolysis to produce

hydrogen for industry and export will greatly expand the size of the system and the proportion of demand absorbed into flexible uses. The Superpower economy will expand inter-regional interconnection, allowing diversification of solar and wind resources and the absorption of regional shocks over a larger market.

Third horizon: reliable low-cost supply of energy in a zero carbon economy

A generally applied carbon price would greatly assist and probably be essential to completion of transition to zero carbon emissions in some sectors and activities. That will be crucial in the later stages, after 2035. Carbon prices will be much higher than any previously contemplated in Australia, and provide powerful incentives for Australians to capture and store carbon in plants and soils. A carbon price at that time would not affect the cost of electricity, or have much effect on transport, which will be close to zero emissions by 2035.

Introduction of broadly based carbon pricing for the time being is ruled out politically in Australia by the legacy of disputation over policy since 2009 (Garnaut 2022). The Australian Secretary-General of the OECD, former Finance Minister Matthias Cormann, is leading OECD efforts to establish a carbon pricing system across developed countries. The G-7 on 28 June 2022 agreed to form a club of countries committed to strong action on climate change and imposing restrictions on imports from countries thought to be doing less than their fair shares. We should join that work and participate in a scheme that emerges. I suggest that we anchor our work now with an expectation that Australia will have a new Australian emissions trading scheme with deep international links by about 2035.

In the meantime, we get on with what is possible. Measures within the new government's election policies can support reasonable progress over the next few years.

The building of Australia's opportunity economically to export large quantities of zero

emissions goods in the low carbon world economy (Garnaut 2019, 2021), requires international acceptance of Australia as a full participant as a developed country in the global effort to defeat climate change. Intense diplomatic activity in the first month of the Albanese government demonstrated that Australia had moved on from its destructive role in the Glasgow United Nations Framework Convention on Climate Change (UNFCCC) conference in November 2021. That early progress was consolidated at the conference in Egypt in November by confirmation of the 43 per cent commitment for 2030 and acceptance of the global methane pledge.

Minister for Energy and Climate Change Chris Bowen said on 24 June that the best way to reduce electricity prices is to accelerate the growth of renewable energy supply. He is right. The government's stated objective of 82 per cent of electricity from renewables by 2030 would make a decisive difference in reducing prices. Achieving that goal is much easier said than done. Investment in renewables has been declining in recent years, as the incentives provided by the renewable energy target (RET) wind out and increased supplies of wind and especially solar electricity depress prices at the times when their output is highest.

Removing bottlenecks from renewable energy zones to major load centres through the government's Rewiring the Nation program is a necessary condition for success. It will add momentum to important state initiatives. It is not a sufficient condition.

High electricity prices themselves provide stronger incentives for investment in renewable energy. But only if they are expected to persist for long enough to support the recovery of capital with an acceptable return. Investors anticipate return to old patterns of pricing at some time after the end of dislocation from the Russian war.

Wholesale power prices before the war—and from time to time since—have been negative for extensive periods in SA and lesser but significant periods in Victoria, when the sun is shining and the wind blowing. Negative prices lower the average cost of power. That

is good. They reduce returns for generators that sell at those times. That removes the incentive to continue investment in the renewable energy that is necessary to keep average prices on a downward path. In the absence of changes in the incentive structure, renewable energy investment will not deliver anything like the government's 82 per cent renewables by 2030.

A general carbon price would have provided the required incentive. In its absence, achievement of the government's renewable objective and putting average power prices on a downward path requires other incentives. One effective approach, and the simplest, would be extension of the life of the current RET out from 2030 to 2035, and its strengthening to ensure that the objective of 82 per cent of renewables by 2030 is achieved.

Liberal social democratic and Austro-Hungarian approaches to the energy crisis

Let us return to the Fred Gruen story, and to liberal social democratic and Austro-Hungarian economic thought.

It would be Austro-Hungarian and consistent with dominant approaches to economic policy in the early 21st century to let high gas and coal prices from the Russian invasion of Ukraine pass through without policy modification to record-breaking profits for companies mining and exporting Australian gas and coal resources, and record-breaking declines in real wages and living standards of ordinary Australians.

That would, however, contradict the liberal social democratic approaches to policy applied in post-war reconstruction, extended and expanded by Fred Gruen and colleagues at The Australian National University, and reaching their apogee in the Australian reform era of the late 20th century.

Within the Australian liberal social democratic policy tradition, achieving the right balance between raw market exchange and

interventions to secure greater equity in distribution of incomes is centrally important. Among other things, it is essential to the health of democracy itself.

Knowledge and analysis are required to define that judicious balance. That was the foundation of policymaking in earlier times when economic policy has worked for our community, in the immediate post-war period and the reform era late last century. Knowledge and analysis can define Interventions that secure greater equity while avoiding major damage to growth in total incomes—and often in the longer term to enhancing greater total output as well as distributional equity.

Judicious interventions in the interests of equity may disappoint the expectations of business vested interests at a time when they have become accustomed to disappointment being something endured only by others in society. But wise business leaders will recognise their interests in Australian democracy working for its citizens.

Finding policies that strike the right balance between continuity in established arrangements, enhanced equity and economic efficiency is

intellectually demanding. Implementing policies that deliver that right balance demands political leadership of high quality. The Australian liberal social democratic traditions provide a sound foundation from which to face the challenge.

Those traditions require knowledge and analysis to define conditions in which free operation of markets works effectively, and others in which government intervention is necessary for more equitable distribution or correction of market failures. Introducing enough renewable electricity soon enough to provide low electricity prices and climate change imperatives has to draw on the power of the competitive market, modified by fiscal or regulatory intervention to align private and public goals. That is a market with a carbon price.

Fred Gruen would agree on this approach. Actually, on a carbon price to internalise the external damage from greenhouse gas emissions, so would Milton Friedman. The Morrison and Abbott governments' slogans 'technology not taxes' and 'technological neutrality' are lonely in economic thought. Fortunately, they are now also lonely in the Australian Parliament.

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