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Policy – the drug of choice for renewable energy

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INTRODUCTION

Renewable energy has been gaining an increasing foothold in the global energy mix, to the extent that non-hydro renewable energy as a share of global power generation is forecast[1] to rise from three per cent in 2009 to 15 per cent by 2035, with much of the increase coming with explicit government support.

Proponents will use a range of data to justify support for their preferred options including anticipated rapid cost reductions, cleanliness and job creation.

Detractors will equally point out the ongoing cost gap, intermittency, job exports and the dependency on government subsidies.

It seems that each time a particular renewable energy achieves a material share in any market, the government or consumers react to the cost imposed on energy bills or government budgets. This results in the support that created the gains being just as rapidly withdrawn or greatly reduced, with both sides lamenting the outcome.

This paper explores the role of renewable energy in the global energy mix with a particular focus on Australia. It identifies the rationale for government support, reviews the policies applied to date and assesses the results of these policies. Finally it addresses the question of how a sustainable role for renewable energy could be achieved in Australia.

WHY BOTHER?

Climate change mitigation demands electricity decarbonisation inside 40 years

Renewable energy could logically be defined as energy with a fuel source that never runs out, and that is an obvious advantage against any form of energy that, in its production, consumes a finite resource. The long-term benefit that this implies, and the fact that some forms of renewable energy supply already have a significant role in some countries, however, pale by comparison with the characteristic that drives today's global focus on renewable energy sources: they produce zero, or near-zero greenhouse gas emissions (GHG).

International agreement to contain average global temperature increases to less than two degrees Celsius has resulted in commitments such as that by the Australian Government to reduce GHG emissions by 80 per cent of 2000 levels by 2050. A large part of achieving this goal is likely to come from reductions in Australia's physical emissions, and from changes in the mix of electricity technologies, since it is the major source of these emissions[2]. Based on modelling for the Australian Treasury, it is estimated that Australia must achieve a carbon intensity of 0.2 tonnes of CO_2 per megawatt-hour or lower to meet its target[3]. The sustain-

[1] IEA (2011)
[2] DCCEE (2010)
[3] The Australian (2011)

ability of these political commitments will be determined by the social acceptance of the policy responses adopted.

A shift of this magnitude will require large-scale changes in Australia's electricity generation sector. Gas could play an important bridging role, but in the long-term, there will need to be a shift to coal and gas plants with carbon capture and storage or replacement of fossil fuel plants with low- or near-zero emission technologies[4].

The modelling for Treasury referenced above[5] foresees a major ramp-up of renewable energy from under 10 per cent market share to becoming the largest source of electricity by 2050. It is challenging and possibly stretching credibility to be confident that the current momentum will cause this transformation to be achieved. The time span available, compared with other historical energy sector transitions, provides part of this challenge. A second major factor is the need for renewable energy generation capacity to be integrated into a system designed around an existing structure that might be very different from one with a high renewable energy market share[6].

Why should government intervene?

With some exceptions, it is generally accepted that pricing the environmental damage of GHG emissions is likely to be the first most effective step towards a lowest cost approach to mitigation. This is reflected in the adoption of emissions trading systems (ETS) in the EU, New Zealand, Australia and several other countries. In addition, China is trialling an ETS approach with a view to implementing a national system by 2015.

However, government intervention beyond pricing carbon is required for a number of reasons. These include[7] early mover technology development spill-over risks, market barriers associated with regulatory structures and existing subsidies for fossil fuels, finance barriers and carbon price discounting. These market failures are also the basis for the OECD to conclude that there are economic efficiency arguments for policy instruments on top of a cap-and-trade system[8].

This is not a policy-free space into which a carefully crafted set of complementary policies could be introduced to address market failures and barriers and lead to a necessary and sufficient policy framework to meet the objective of lowest cost mitigation over the long term. A number of policy instruments have been introduced to support renewable energy, or low-emission technologies. Some of these are technology-neutral and some are very technology-specific. Their nature and performance is worthy of assessment.

A HISTORY OF BOOM AND BUST

In its assessment of the role that renewable energy could play in contributing to climate change mitigation, The International Energy Association (IEA) has observed[9] that its projections for market share growth for non-hydro renewable energy in power generation is underpinned by annual subsidies that rise almost five times to $180 billion. China and the European Union drive this expansion, providing nearly half of the growth. The IEA states:

> *"Even though the subsidy cost per unit of output is expected to decline, most renewable energy sources need continued support throughout the projection period in order to*

[4] Wood et al (2012)
[5] The Australian Treasury (2011)
[6] Mitchell et al
[7] Wood et al (2012)
[8] OECD (2011)
[9] IEA (2011)

compete in electricity markets. While this will be costly, it is expected to bring lasting benefits in terms of energy security and environmental protection."

Well-intended initiatives deliver results best viewed through favourable eyes

A Grattan Institute analysis of a wide range of Australian policies with emissions reduction as one of the objectives[10] concluded that: "Market mechanisms, such as a carbon trading scheme, have delivered the greatest emissions reduction and have met targets ahead of time." While some of the policies in the area of grant-tendering and rebate programs have other objectives, including building industry capacity, it is difficult to conclude that these have been successful. Generally, the design of such programs has led to short-term cycles of boom and bust, rather than sustainable activity. The following sections assess the three generic policies adopted to date, namely tradable green certificate (TGC) schemes, feed-in tariffs (FiTs) and grant/rebate programs.

Tradable green certificates

TGC schemes have the common characteristic that they impose an obligation on energy suppliers to purchase a defined quantum of renewable energy. This liability is generally acquitted via certificates or credits that can be created and sold/bought across the industry. The price is determined by demand and supply in the certificate market. The intent, and usually the result, is to generate that nominated quantum of renewable energy at lowest cost. The well-known versions of such schemes include the Renewable Obligation (RO) in the UK, Renewable Portfolio Standards (RPS) in a number of states in the USA and the Renewable Energy Target (RET) in Australia.

The UK's RO has undergone a number of reforms and improvements since it was introduced in 2002 with an original target for a renewable energy market share of 15 per cent by 2015.This was the UK's principal mechanism to meet its obligation under the Renewable Energy Directive which established renewable energy targets across the EU for 2020.

The most significant change to the UK's RO was to introduce banding in April 2009, which arose from concerns that the RO was not delivering the optimal mix of renewable energy technologies, specifically not enough offshore wind. With this change, the RO moved from being technology-neutral to becoming technology-specific. This moved the RO from a mechanism which offered a single level of support for all renewable technologies, to one where support levels vary by technology, according to a number of factors including their costs, relative maturity and potential for future deployment. As described by Wood and Emmett[11], through this change, the RO became closer to a quasi-feed-in tariff (FiT). In mid-2011, the UK Government released a White Paper on Electricity Market Reform, one element of which is a proposal to replace the RO with FiTs. Part of the reason for this change is a view that the impact on consumer electricity prices will be lower through lower investor risk exposure and lower potential for further political intervention. It remains to be seen whether this prospect can be realised.

RPS policies in the USA cover more than 20 states and around half of nationwide retail electricity sales[12]. The design of these policies varies widely and they have often been coupled with investment tax credits and/or government loan guarantees to achieve their desired outcomes.

Australia's RET has delivered emissions reductions in line with the scheme's design (almost nine million tonnes in 2010) and is projected to continue to do so at a cost of $30–$70 per

[10] Daley et al (2011)
[11] Wood and Emmett (2011)
[12] Wiser and Barbose (2008)

tonne CO_2-e[13]. This policy has been a success in terms of delivering a targeted level of renewable energy at a relatively modest cost. As with the RO in the UK, there has been criticism that such schemes deliver the lowest cost technology deployable today and may not facilitate investment in a mix of technologies that might have lower costs in the long term. Further, the RET's limited life and the adverse effect of other concurrent Federal and State renewable policies have meant that the price of certificates has recently been very low and there is much debate about whether the 2020 target can be achieved without a cost blowout.

In addition to the criticism that TGC schemes support the cheapest near-market technologies (usually onshore wind)[14], the other major criticism is that they expose investors to market price risk (both electricity price and certificate value), thereby increasing costs[15].

Feed-in tariffs and power purchase agreements (PPAs)

FiTs and PPAs with governments have the common characteristic that the price is set by government and the market determines the volume, although most schemes also have some form of cap to limit total budget exposure and/or consumer price increases. This means that market price risk is effectively borne by government, and the success of the policy, perceived or real, is determined by the setting of the tariff level. There are many variations in the design of FiTs and by 2010 more than 45 countries had FiTs, including most of Europe[16].

The challenge in getting the FiT parameters right is reflected in the problems encountered in Australian states, notably NSW, and the current German and Spanish claw-back. The German Federal Environment Minister commented:

> *"Our proposal on assistance for photovoltaics aims to effectively limit the quantity of new capacity and the costs. With regard to the sharp rise in new capacity seen in the last two years, the renewed adjustment of assistance primarily aims to keep the renewable energies surcharge stable for the electricity consumer and to maintain public acceptance of photovoltaics and renewable energy in general. The aim is for photovoltaics to achieve market maturity in a few years so that the technology can be used without any subsidies at all."*

Recent countries to adopt FiTs have sought to avoid past mistakes and implemented systems with the following characteristics:

• Tariffs differentiated by technology type and project size; and

• Tariff step-down scenarios with clear criteria for triggering such steps.

An innovative approach to introducing a level of market competition to reduce prices is to run a reverse auction in which project proponents bid a contract price for access to a capped total capacity.

Grants and rebates

Grant tendering schemes involve government directly funding projects that produce low-emission energy. The history of such schemes has been poor. Grants are generally slow to deliver results, have failed to build substantial domestic industry capacity (few projects have proceeded to completion[17]) and are limited in their ability to contribute materially to significant reductions in greenhouse gas emissions[18]. Despite $7.1 billion being allocated to grant tendering schemes over the past decade in Australia, only a small fraction of this

[13] DCCEE (2010)
[14] Watson (2008)
[15] Wood and Emmett (2011)
[16] Mitchell et al
[17] ANAO (2010)
[18] Daley et al (2011)

amount has ever been allocated to viable projects. The most recent example of such schemes and their challenges is the Solar Flagship Program where the selected projects have failed to achieve key milestones and the process has been revisited. This and other grant tendering schemes struggle due to a mixture of ill-defined success criteria and the complexities of new technologies or projects.

Australian State and Federal Governments have allocated more than $5 billion over recent years to support rebates for a range of products that have claims of energy efficiency and/or renewable energy.

Rebates have suffered from two inherent problems: the challenge of setting the rebate at the right level to deliver a sustainable outcome and the almost inevitable disruption when the budget is exhausted, even if the scheme's end is communicated well in advance. The experience has commonly been characterised by cycles of boom and bust (the solar photovoltaic rebate program) or just bust (the recently terminated solar hot water rebate program) as schemes become victims of their own success[19].

The above criticisms are based on the practical experience of these schemes in Australia and have little to do with the potential value or cost of the renewable energy being supported.

Loans, loan guarantees, tax credits and other financial instruments

In various countries, notably the USA, additional financial instruments have been adopted to support the primary policy such as the TGC. For example, loan guarantees have been effective in lowering financial risk premia for projects already underpinned with power purchase agreements triggered by an RPS. In a similar vein, the UK is establishing the Green Investment Bank and the Australian Government has announced a Clean Energy Finance Corporation. Both institutions intend to target financial market failures and barriers to the deployment of clean or renewable energy technologies.

The results to date have been at best mixed – it depends on the perspective

Most comparisons of the above policies to support renewable energy deployment concentrate on TGCs and FiTs and compare them on the basis of effectiveness and efficiency[20]. As described above, both approaches can demonstrate a capacity to deliver on policy objectives, including meeting some form of quantity target. However, there is some evidence that FiTs generate greater investor support through the transfer of market risk to the public sector. This may also lead to lower costs. A more pragmatic conclusion might be that either approach, if well designed, can produce both effective and efficient outcomes.

The detailed policy design is important because different policies and different detailed elements within a policy produce quite different risk mitigation outcomes, even when the level of financial support is identical[21]. Compared with a TGC, FiTs transfer an element of risk from investors to consumers, rather than reduce risk.

If the objective is lowest cost achievement of carbon abatement targets over decades, and when technology risks are also significant, the relevant question might more appropriately be when might such a risk transfer be socially justified?

[19] Ibid.
[20] Wood et al (2012)
[21] Gross et al (2007)

WHAT'S WRONG WITH WHAT WE'VE GOT?

The core proposition of this paper is that the primary objective in supporting renewable energy is to facilitate a transformation of the energy sector to near-zero emissions over 40 years.

A carbon price, introduced via an ETS is the necessary first step. If the emissions cap is binding, additional policy instruments will not lead to any extra reduction in emissions[22]. However, like TGCs, an ETS will facilitate near-term low cost emissions abatement, not necessarily long-term, lower cost technologies. Early movers face higher costs in areas of finance, regulatory frameworks and resource mapping. They can also face higher barriers to transmission connection and may not share the implicit subsidies provided to existing energy sources through existing distribution and transmission infrastructure. The rewards to early movers are low. Innovators will struggle to defend intellectual property in an undifferentiated product market, and because government policy on climate change is inherently unreliable, they cannot bank the full value of projected higher long-term revenues for low emission electricity. The end result is that markets will under-price carbon and therefore will under-invest in low emission technologies, including renewable energy[23].

A WAY FORWARD

As implied above, the first and fundamental issue is to define the objective. The premise of this paper is that the right approach to support renewable energy is for it to achieve a market share consistent with an optimal inter-temporal allocation of emissions reduction. This approach begins with implementation of the proposed ETS as the central plank in the policy platform. To ensure investor confidence in the government's policy, the forward emissions caps must be structured to build credibility, and there must be predictability in the way that the ETS rules and mechanisms respond to future developments. Over time, this could allow the private sector to rely increasingly on the ETS framework to form a view of the future carbon price and investment opportunities, in the way of other industrial markets.

In the short-to-medium term, additional policy instruments must then address market failures and barriers to deployment of renewable energy, such as transmission connection hurdles and subsidies to incumbent technologies. Finally, financing and early mover barriers mean that governments should support research and development in areas of national interest[24] and early-stage deployment of a suite of low-emission technology options[25]. Technology development at the demonstration and early deployment stages involves more local issues and requires more overall funds than at the R&D stage, although risks may be lower. Criteria to target this support should be based on addressing the relevant early mover risks. Uncertainty about future costs of all technologies means that government should also support a variety of options.

CONCLUSION

[22] OECD (2011)
[23] Wood et al (2012)
[24] Garnaut (2011)
[25] Wood et al (2012)

Renewable energy will make its optimal contribution to the global and Australian energy mix only when it is deployed via a credible, flexible and predictable policy framework that creates an emissions-constrained energy market and addresses the political risks. This is unlikely to be achieved via policies based on narrowly focused self-interest, including most of the approaches used to date. It will categorically fail if governments do not resist the temptation to make continued and unexpected changes to the policy framework.

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