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How I Learned to Stop Worrying and Love the RET

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How I learned to stop worrying and love the RET

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How I learned to stop worrying and love the RET

Introduction

The Renewable Energy Target (RET) is one of the most durable policy measures directed at mitigating climate change, dating back to 2001. It has survived changes of government and a series of policy reviews. Economists, however, have rarely found much of merit in the RET. It is seen as a high-cost way of achieving reductions in emissions that could better be pursued through a price-based mechanism such as either an emissions based trading scheme or a carbon tax.

Since the introduction of a carbon price in July 2012, criticism of the RET has intensified. The covering letter from The NSW Independent Pricing and Regulatory Tribunal (2012), in its submission to the Climate Change Authority inquiry into the RET articulates the wider concerns of economists, stating

> "In our view, the introduction of the carbon price and a move towards an emission trading scheme (ETS) removes the need for the RET (and ultimately electricity customers) to continue to subsidise investment in the renewables sector. The RET is not complementary to the carbon price and does not cost effectively address any other significant market failure."

In this chapter, it is argued on the contrary that the RET is not merely complementary to the carbon market, but is a welfare-improving policy, even after the introduction of the carbon price. The central argument is that, because of political resistance to carbon pricing, the price has been set at a level that is below that of the optimal path, and must increase more rapidly than would be consistent with a Hotelling rule (Hotelling 1931). The relevant criterion for assessing the RET is not the cost of mitigation relative to the current carbon price but the cost relative to the true shadow price of CO_2 emissions, which must be assessed in relation to abatement costs that must be incurred in the future if emissions are to be reduced in line with the government's stated targets.

The chapter is organised as follows. Section 1 presents background information on the development of the RET, and related policies, since 2001. In section 2, it is argued that, while energy policy should not be concerned with renewability *per se*, the fact that renewable energy sources are carbon-free means that the promotion of renewables is desirable. In Section 3, it is shown that the RET in its current form, is similar to an electricity-specific emissions trading scheme, except that it does not take into account differences in the emissions intensity of different fossil fuels sources.

1. Background

The RET was first established in 2001, as the Mandatory Renewable Energy Target (MRET) with the aim of ensuring the generation of at least 9500 GWh of renewable electricity, additional to existing hydro-electric generation, by 2010. This target was reached by 2007.

In 2009, the scheme was expanded, with the goal of ensuring that at least 20 per cent of Australia's electricity should be generated from renewable sources by 2020. Demand projections suggested that total electricity generation would be around 300 000 GWh/year by 2020, of which around 15 000 GWh would be generated from pre-1997 renewable sources, mostly hydro. Based on these estimates, the RET was set as a target of 45 000 GWh/year.

The operation of the RET was complicated by a variety of state and Commonwealth initiatives aimed at promoting renewable energy in general, and residential-scale solar energy in particular. These included feed-in tariffs introduced by state governments and the Solar Credits mechanism, which had a significant impact on the operations of the RET.

Under the mechanism, small-scale installations of solar photovoltaic systems were awarded a multiple of the number of credits to which they would normally be entitled. The multiple was intiially set at 5, and proposed to be reduced to 1 by 2015-16.

These schemes succeeded well beyond both expectations at the time they were introduced and the capacity of budgets to sustain them. By 2012 most had been wound up, and the remaining schemes were folded into the Small-Scale Renewable Energy Scheme. The final stage in this process was the announcement, in November 2012, that the Solar Credits multiplier would be set to 1 from the beginning of 2013, nearly three years ahead of the original schedule.

The main remaining effect of the subsidy schemes is the division of the RET into small-scale and large-scale schemes. This division was originally intended to protect large-scale renewable energy from being overwhelmed by credits generated from subsidised small-scale installations. This rationale is now obsolete, but, for a variety of practical reasons, the distinction has been maintained. The Small-Scale Renewable Energy Scheme is an uncapped scheme, but it is expected to support around 4000 GWh/year in generation. On this basis, the target for the primary component of the RET, the Large-Scale RET was set at 41 000 GWh.

With the important exception of the Solar Credits mechanism discussed above, the RET is designed to be neutral between renewables technologies. To the extent that diversity of renewable energy sources is considered desirable, the role of promoting such diversity is assigned primarily to the Clean Energy Finance Corporation.

2. Should we care about renewability ?

The possibility of exhausting the supply of non-renewable resources has been discussed by economists at least since Jevons (1865). However, for most of the 20th century, these concerns were allayed by a steady flow of new discoveries of oil, gas and coal resources. Modern concerns about the renewability of energy date back to the energy crisis of the 1970s, and in particular the 'oil shock' of 1973.

The sharp rise in the price of oil, combined with the fact that US oil production had been declining since the mid-1950s raised concerns that, on current trends, finite resources of 'fossil fuels' might be exhausted. These concerns, extended to encompass a wide variety of mineral resources, were explored by Meadows et al (1972) in *Limits to Growth*, which gave rise to a lively debate.

Meadows et al presented a variety of scenarios and there has been some dispute over which of these should be regarded as a central projection. In particular, Simmons (2000) argues that

> Nowhere in the book was there any mention about running out of *anything* by 2000. Instead the book's concern was entirely focused on what the world might look like 100 years later.

But Simmons' case is undermined by the dust jacket reproduced at the beginning of his article which sells the book as 'The headline-making report on the imminent global disaster facing humanity'. Whatever the intentions of the authors, the discussion generated by the Club of Rome focused on events in the near future, not those that might arise in the late 21st century.

Steady declines in the price of most mineral resources during the late 20th century led most observers to conclude that, at least as far as minerals were concerned, the *Limits to Growth* hypothesis was not valid. Although prices increased sharply in the early 21st century, primarily as a result of strong demand from China, it is now generally accepted that economic growth is unlikely to be constrained by limits on the availability of mineral resources.

However, the need to deal with the problem of climate change renders constraints on the supply of carbon-based fuels non-binding. In the absence of a low-cost method of capturing and sequestering carbon dioxide, we have more coal and oil than we can possibly use. Burning the coal and oil already available would raise global CO_2 concentrations well beyond 600 ppm, with damaging, and probably catastrophic consequences.

Since limits on the supply of fuel do not represent a relevant constraint, the question of whether energy sources are, or are not, renewable is unimportant. Even if coal and oil were renewable, we would still have to stop using them, or greatly reduce their use.

In one sense, this is a distinction without a difference. The only important non-renewable energy source other than carbon-based fossil fuels is nuclear power. Although the desirability or otherwise of nuclear power in Australia has been the subject of hot debate, the issue is purely symbolic, at least as regards the RET. In the absence of any supporting infrastructure, skilled workforce and legal and regulatory framework, there is no serious prospect of that nuclear power could be generated in Australia before 2030, even if there were a political consensus in its favour.

It follows, that, for all practical purposes, the terms ‘renewable’ and ‘zero-carbon’ are identical as applied to energy sources for the electricity industry in Australia. It is important to note, however, that all non-renewables are treated equally under the RET, regardless of their carbon intensity. The carbon-intensity of fossil fuels ranges from around 0.5 tonnes of CO_2 per MWh generated for gas-fired electricity to 1.3 tonnes of CO_2 per MWh generated using brown coal.

3. The RET, emissions trading and carbon pricing

The RET as a trading scheme

The mechanics of the RET are quite similar to those of an emissions trading scheme. Generators of non-renewable electricity are required to surrender renewable energy certificates (RECs) derived from the generation of renewable electricity. The liability is determined by the ratio of the renewables target to the total amount generated. Certificates are tradeable, as in a standard emissions trading scheme.

The requirement to surrender RECs amounts to an implicit price surcharge for non-renewable electricity generation, given by

$$p_n = p_r \, q_r / q_n \qquad (1)$$

where

p_n is the price surcharge (in \$/MWh)

p_r is the renewables certificate price (in \$/MWh)

q_r is the required output of renewable electricity (in MWh)

q_n is the output of non-renewable electricity (in MWh)

In the case where the target is specified as a renewable share of total

$$p_n = p_r \, s_r/(1-s_r)$$

where s_r is the required share for renewable electricity.

Interaction between the RET and carbon prices

The primary policy instrument used to reduce emissions of carbon dioxide in Australia is the carbon price. Under current policy, the price has been fixed at $23/tonne until 2015, at which time Australia will join the European Union emissions trading scheme. The market price of EU emissions is currently

The combined effect of the RET and the carbon price is to impose a surcharge on the generation of electricity from carbon-based fuels given by

$$p_i = p_n + c_i p_c \qquad (2)$$

where

p_i is the surcharge for electricity source i (in $/MWh);

p_c is the carbon price (in $/tonne); and

c_i is the carbon intensity of source i (in tonnes/MWh).

Alternatively, we may derive the total effective carbon price for source i as

$$p^*_{ci} = p_c + p_n/c_i \, . \qquad (3)$$

From (3), the total effective carbon price is higher, the lower is the carbon-intensity of any non-renewable source. On the other hand, (2) shows that the total surcharge per MWh increases with carbon intensity.

4. The optimal time-path of emissions and emission price

The problem of planning a time path for emissions may be considered as one of optimally depleting a finite resource, namely the capacity of the global carbon cycle to absorb additional CO_2 while avoiding dangerous warming. The standard analysis for this problem is based on the work of Hotelling, who first analysed the problem of optimal extraction of a fixed resource stock.

Central to Hotelling's analysis is the observation that, on an optimal timepath a resource owner must be indifferent between a small change in extraction now and a small change in the future. Assuming that extraction is costless, this can only be true if the present value of a unit of the resource is constant over time; that is if the price rises at a rate equal to the rate of interest.

There is general agreement that the carbon price required to achievable stabilisation of global atmospheric CO_2 concentrations at levels of 450 ppm is well above the $23/tonne currently in force in Australia, let alone the lower prices currently prevailing in EU and US markets for tradeable permits. Quiggin (2012), on the basis of assumptions that are more optimistic than those adopted in much of the literature, suggests that a price somewhere between $50/tonne and $100/tonne will be required.

A crucial assumption here is that we are only concerned about the aggregate volume of emissions. However, the warming effect of CO_2 begins immediately, while the rate at which emissions are reabsorbed depends on aggregate concentrations. It follows that, assuming emissions are eventually controlled, the concentration of CO_2 will stabilize at some maximum level over the next few decades before gradually declining over a significantly longer period. This implies that a molecule of CO_2 emitted now will exert a warming effect over a longer period than one emitted in the future. Hence, on an optimal path, the initial price of carbon should be higher, and the rate of increase lower, than would be suggested by the Hotelling rule.

5. The second-best case for the RET

Under current Australian policy, CO_2 emissions from different sources are treated differently. Emissions from light passenger motor vehicle use and from agriculture are not subject to a carbon price. However, reductions in agricultural emissions are eligible to create offsets under the carbon farming initiative, with a price equal to the carbon price. Most industrial emissions are subject to the carbon price, although emissions-intensive trade exposed industries receive special treatment.

Thus, the effective price of CO_2 emissions from electricity generation is higher than from other sources. It follows that our existing emissions trajectory could be achieved at lower cost if the carbon price was increased, and the RET abolished or relaxed to the point where it no longer represented a binding constraint.

It does not follow, however, that abolishing or relaxing the RET would generate a welfare improvement. The analysis above suggests that the current price for CO_2 emissions is below the price that would prevail under an optimal Hotelling rule consistent with meeting a target of global stabilization at 450 ppm. The effect of the RET is to raise the implicit carbon price for non-renewable electricity generation.

To analyse the question properly it is necessary to consider the theory of the second-best. As discussed above, the effect of the RET is to increase the implicit carbon price for non-renewable generation. The implicit price per tonne of carbon emitted is higher, the lower is the carbon-intensity of the non-renewable source.

Since the current explicit price is below the socially optimal price, the effect of the RET is to move carbon prices closer to the first-best level, but in a way that creates differences between the prices for different emissions sources. This is a classic example of the 'second-best' problem. The key issue is whether the beneficial effect of raising prices outweighs the distortion associated with price differentials between sources.

There are two distortions that must be considered. First there is the fact that the implicit carbon price for electricity is higher than for other emissions sources. This is important to the extent that there are opportunities for substitution. As an example, the effect of the RET, by raising electricity prices, is to disadvantage electric vehicles and plug-in hybrids, relative to petrol driven vehicles (including pure hybrids). However, given the very limited market penetration of electric vehicles, it seems unlikely that this is a major problem. The most important area for substitution is between electricity and gas, in uses such as home heating and cooking.

The second distortion arises from the fact that, since the requirement for renewable energy certificates is fixed in $/MWh, the implicit carbon price differs between fuel sources, varying inversely with carbon intensity. This creates perverse incentives, favouring brown coal over black coal, and favouring both over gas. This could have been addressed if plans to buy out and shut down brown coal power stations had gone ahead, but under current conditions it remains problematic.

A quantity-based test

The discussion so far has focused on the price of CO_2 emissions from different sources. Since the RET is a quantity-based policy, it makes sense to consider its implications for the quantities of electricity generated from each source, and the resulting volume of emissions, from each source and in aggregate.

Under current policy, Australia is committed to achieving an 80 per cent reduction in emissions, relative to a 2000 baseline, by 2050. This is an ambitious target, compared to the interim goal of a 5 per cent reduction by 2020. Moreover, the expectation is that the interim goal will be achieved largely through the purchase of permits on the international market. It seems unlikely that this will be a cost-effective strategy in 2050, when the price of permits on the Hotelling path will be much higher than today.

Consider a least-cost path of adjustment to the 2050 target. Such an adjustment requires, among other things the replacement of carbon-based electricity generation with renewables, and the replacement of most uses of oil with electricity, also derived from renewables. In addition, population growth and growing demand for final energy services will, partly at least, offset improvements in energy. It follows that the required supply of renewable electricity is likely to exceed current total generation of electricity from all sources.

Prior to the adoption of the first version RET, renewable energy, derived almost entirely from hydro-electricity, accounted for around 10 per cent of total generation. Thus, the RET target requires an increase of around 10 percentage points in the renewable share, to be achieved over 20 years. The 2050 target implies replacement of all remaining carbon-based electricity generation, and the addition of additional electricity to replace oil, over the 30 years from 2020 to 2050. It is obvious that the implied path of adjustment will be costly than one in which a large-scale switch to renewables is commenced earlier.

A quantity-based analysis therefore yields the same conclusion as the price-based analysis presented in the previous section. Far from requiring excessive investment in renewable energy, at the expense of lower-cost sources of emissions reductions, the expansion of renewable energy required under the RET is less than would be consistent with an efficient adjustment to our 2050 target. It follows that the RET improves welfare, relative to the alternative of relying solely on a carbon price initially set at current low levels, with the implicit requirement for a rapid increase in the decades after 2020.

Concluding comments

In an idealised version of the public policy process, as seen by economists formulation of a response to the problem of climate change would begin with a scientific assessment of the physical processes involved, proceed to an assessment of benefits and costs, and then determine the adjustments to the market equilibrium price vector needed to generate a socially optimal outcome. In such a world, there would be no place for renewable energy targets.

Sometimes, as with the formulation of the Montreal Protocol to control ozone-depleting chlorofluorocarbons, the policy process is reasonably close to this ideal. Unfortunately, the debate over climate change is nothing like this. The combination of ideologically-based denial of the science and rent-seeking by existing emitters ensures that the price of carbon will be set well below the socially optimal level. In these circumstances, which are likely to persist for some years to come, a renewable energy target is a beneficial policy.

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