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Energy-only markets and renewable energy targets: Complementary policy or policy collision?

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ABSTRACT

Australia's 20% Renewable Energy Target (RET) was designed and implemented against a backdrop of several decades of continuous growth in electricity demand. Since the introduction of the policy in 2009 electricity demand has declined continuously. In this article, we analyse how Australia's National Electricity Market (NEM) has responded to falling demand and significant additional installed capacity as a result of climate change-related policies. We conclude that an energy-only market design, barriers to exit for incumbent plants, and time inconsistency of policy has resulted in investment in new renewable energy projects becoming largely intractable. In our opinion, changing the RET fixed GWh target will not alter this fact. To overcome barriers to exit, we examine three options for complementary public policy in the short-term: direct government intervention; a market-based solution; or regulation. In the long-term, a redesign of the energy-only NEM market seems inevitable.

1. Introduction

Australia's electricity industry is heavily influenced by government policy. Since the commencement of the National Electricity Market (NEM) in 1998, Commonwealth and State Governments have introduced at least six material government policies designed to reduce greenhouse gas emissions or increase investment in renewable energy. These policies have profoundly altered investment decisions in an environment where electricity demand has contracted significantly, both in absolute terms and relative to historic expectation. In 2009, policy makers establishing a 20% Renewable Energy Target (RET) expected electricity generation to increase by ca.2.5% per annum, from 230 terawatt-hours (TWh) to about 300 TWh in 2020. Yet, electricity generation in 2012 was just 221 TWh, 4% lower than in 2009 (esaa, 2013). Despite this, over the past decade more than 6000 megawatts (MW) of new renewable generation has been added to the NEM.

These policies have been successful in adding substantial volumes of new plant capacity. As far as we are aware, little thought was given as to how the operation of policies designed to stimulate investment in new generation capacity would operate within one of the world's most competitive energy-only gross pool electricity markets if a sustained contraction in electricity demand occurred. Policy makers and practitioners alike, ourselves included, assumed that new supply would

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1 All views, errors and omissions are entirely the responsibility of the authors.

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be absorbed by increased electricity demand, while the opposite has in fact occurred. The result of declining electricity demand, along with what we describe as a newly emerging thematic of 'barriers to exit for incumbent aged thermal plants' has evidently produced intractable investment conditions. Renewable generation under current policy settings, even though it is mandated through legislation by the Commonwealth Government, is no longer financially viable.

Very low wholesale electricity prices and declining effective real prices from Large Scale Renewable Generation Certificates (LGCs) has resulted in total revenues falling materially below the long-run marginal cost of renewable plant entry, in spite of targets that rise sharply and require imminent commitment. Policy uncertainty almost certainly originated these effects. As Simshauser (2014) has argued, a dynamic inconsistency of the RET has induced a vicious circle. Firms expect the target to be altered, and so LGC prices have softened and investment has hence been delayed. Now such little time is left to meet the target that policy makers will almost certainly as a minimum vary the target to avoid manifest policy failure or abandon the existing policy altogether, producing a second wave of dynamic inconsistency.

Incumbent plant 'barriers to exit' are material and have in our view amplified the trends arising from dynamic inconsistency and policy uncertainty. We classify barriers to exit into four groups: 'sweating' ageing thermal plants; avoiding non-trivial site remediation costs; first-mover disadvantage; and policy uncertainty. The mean age of brown and black coal power stations is 34.2 and 27.4 years respectively and so a number of the older coal plants are well beyond design life (Simshauser and Nelson, 2012, p. 108). There are substantial costs associated with closing down a power station permanently — a cursory review of Annual Reports tends to indicate remediation costs of \$100–\$300 million. First-mover disadvantage costs are also material — economic theory (and game theory in particular) tells us that actions taken by any one supplier to reduce capacity will make competitors better off. However, it is the final identified barrier to exit which is most likely to be present within the Australian context: policy uncertainty.[2]

If power stations are not decommissioned due to perceived or genuine 'barriers to exit' and are instead mothballed, the capacity remains available for dispatch albeit with advanced notice. The presence of mothballed capacity depresses expected future prices despite not physically generating electricity *because* the broader markets know that capacity can, and will, be recalled above a certain price threshold. Generators may remain commissioned despite their continued availability depressing future expectations of wholesale pricing outcomes. In the short to medium term, this poses no real problem from a system security perspective. However, in the long-run reliability may ultimately be tested. Continued low wholesale electricity prices will discourage necessary maintenance expenditure on a rapidly ageing thermal generation fleet. On extremely hot days, unexpected plant outages may increase in frequency and mothballed plants will be unable to respond within the necessary timeframes. Over the long-run, this could combine to produce unintended security of supply events. In our view, policy makers need not be immediately concerned by such a scenario occurring because of the extent of oversupply. This is a long-run problem. However, we believe policy makers should begin to consider how to facilitate an 'orderly' rather than 'disorderly' exit and replacement of the ageing capital stock.

The purpose of this article is not to articulate public policy reasons for, or against, mandated renewable energy policies, nor to discuss how or at what level such targets might be set. As a means of reducing greenhouse gas emissions over the long-term, there may be sound reasons for supporting the deployment of renewable energy, such as reducing long-run average technology costs over time, system portfolio and fuel mix diversification or recognising that deployment of new 'low-emission' capacity may create a capital stock that becomes redundant under a 'deep-cuts' emission reduction scenario, thereby necessitating the deployment of renewable capacity as an alternative. What we can say with confidence is that it is important for policy makers to clearly articulate why such policy is being implemented.

In this article we examine how climate change policies, especially mandated renewable energy targets, can co-exist with an energy-only gross pool market design in the presence of barriers to exit. This article is structured as follows: Section 2 documents a brief literature review of power generation economics against a background of declining electricity demand and mandated renewable energy supply; Section 3 outlines the results of partial equilibrium analysis of the NEM with and without new generation incentivised by government subsidies (explicit and implicit); barriers to exit are discussed in Section 4; the intractability of new investment in renewable generation is assessed in Section 5; and policy recommendations and concluding remarks are presented in Sections 6 and 7.

2. Power generation economics: on mandated supply and declining demand

The NEM is an energy-only gross pool electricity market in which prices are formed under a uniform first-price auction clearing mechanism. The operation of the market is well documented in Simshauser (2006, 2008, 2010) but at its simplest, for such a market to be sustainable, it should facilitate generators recovering efficient fixed (capacity) and variable (fuel and operating) costs over the long run. Due to the highly variable nature of intra-day and seasonal electricity demand, resulting spot prices fluctuate significantly. In other industries, inventory management is used to smooth production schedules and meet variable demand. However, there are currently limited economic options for large-scale electricity storage, thus necessitating the need to match supply and demand continuously. In the Australian market, prices can (and do) increase from

2 There is considerable existing literature on climate change policy uncertainty in Australia (Nelson et al., 2010, 2011; Simshauser and Nelson, 2012; Nelson et al., 2013).