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Abstract

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NATIONAL ENERGY SECURITY IN A WORLD WHERE USE OF FOSSIL FUELS IS CONSTRAINED

Hugh Saddler

Introduction

This paper focuses on the domestic energy policies of industrialised states and, in particular, those states which have been at the forefront in applying neo-liberal policies to the reform and restructuring of their energy supply industries. It examines the interactions between the neo-liberal and climate change mitigation agendas, as they have been applied to energy policy, and the consequences these interactions are having for energy security, which is a core objective of energy policy for all states.

A case study approach is taken, using two states, the United Kingdom and Australia, as examples. These countries, while markedly different in many respects, are alike in currently being largely, though not completely, self-sufficient in fossil fuel energy resources, having a high proportion of fossil fuels (including coal) in their primary energy supply and in having pursued liberalisation of their electricity and gas industries earlier and further than most other countries. The examination of the policies of the United Kingdom and Australia is framed by an initial discussion of the evolution of energy policy prescriptions recommended by the International Energy Agency (IEA), of which both the United Kingdom and Australia are longstanding members, together with the great majority of other industrialised states.

For the purpose of this paper, the term energy security is used in what may be called its broadest sense. There is a variety of different broad definitions of energy security; the following, used by the Australian government in a 2009 publication, is a representative example: '[...] energy security is defined as the adequate, reliable and affordable supply of energy to support the functioning of the economy and social development, where:

- *adequacy* is the provision of sufficient energy to support economic and social activity;
- *reliability* is the provision of energy with minimal disruptions to supply; and

- *affordability* is the provision of energy at a price which does not adversely impact on the competitiveness of the economy and which supports continued investment in the energy sector.’ (Department of Resources, Energy and Tourism, 2009, p. 5)

These words amount to a specification of the objectives of energy policy as a whole, that is, for the objectives of government actions relating to the provision of energy, both today, and historically for as far back as governments, either national or sub-national, have taken such actions. The argument advanced in this paper is that it is energy security in this broad sense which affects and is affected by policies directed towards mitigating the effects of climate change by reducing greenhouse gas emissions, which requires the use of fossil fuels to be constrained. It is further argued that this is the case largely as a consequence of other energy policies implemented over the past twenty years or so, specifically the economic liberalisation of the supply of electricity and gas within the domestic markets.

At the outset it is worth defining the overall context, well known as this is. Firstly, industrial manufacturing processes, and the high levels of material consumption which they allow, require the high intensity use of large quantities of energy. Until the last few decades, and with the limited exception of hydro-electricity, this could only be achieved by the use of fossil fuels. Economic activity today is still overwhelmingly dependent on the combustion of fossil fuels. Secondly, for all developed countries, and for the world as a whole, the combustion of fossil fuels to supply energy is by far the most important source of greenhouse gas emissions. Any effective action to achieve substantial reductions in emissions must involve large reductions in the combustion of fossil fuels.

The International Energy Agency (IEA)

The IEA was established in late 1974 as an autonomous body within the framework of the OECD, and most OECD countries became members, either immediately, or within a few years. Formation of the IEA was a direct response to the First Oil Shock one year earlier, which saw governments of the major oil exporting countries seize control of their national oil production, the imposition of selective supply boycotts by some of these governments, and a fourfold increase in the price of crude oil. This brought to the end a period of nearly three decades during which rapid developments in the technologies of finding, extracting, refining

and transporting crude oil and petroleum products led to a steady reduction in the real price of petroleum and to the use of petroleum products, mostly replacing coal, in a far wider range of energy applications.

Nevertheless, and despite many new discoveries of crude oil, significant production remained confined to relatively few countries, and most countries, both developed and developing, remained heavily dependent on imports to meet their requirements for petroleum. The First Oil Shock exposed the resultant economic and social vulnerabilities in importing countries when petroleum supply was disrupted. The IEA's initial stated aims (1982) were:

- i) Co-operation among IEA Participating Countries to reduce excessive dependence on oil through energy conservation, development of alternative energy sources and energy research and development;
- ii) An information system on the international oil market as well as consultation with oil companies;
- iii) Co-operation with oil producing and other oil consuming countries with a view to developing a stable international energy trade as well as the rational management and use of world energy resources in the interest of all countries;
- iv) A plan to prepare Participating Countries against the risk of a major disruption of oil supplies and to share available oil in the event of an emergency.

The strong emphasis on oil supply security is obvious in the second, third and fourth points. However, it is the first point, and in particular the prominence given to energy conservation (now called end use energy efficiency), which is the most important change from the past. While the development of new energy supply sources, and support for the associated research and development activity, had previously been prominent features of national energy policies, end use efficiency never had been. That end use efficiency could make national energy systems less vulnerable to disruption and enhance overall economic welfare was a new idea for governments and a clear break with the pre-1973 energy policies of member countries.

Of course the policy positions advocated by the IEA partially reflect the collective position of member countries. By the early 1980s, following the Second Oil Shock of 1979, most, including both the United Kingdom and Australia, had in place policies to promote

greater end use energy efficiency, to encourage fuel substitution away from petroleum to other established supply options, including coal, natural gas and nuclear energy (in Australia's case, not the latter), and to support the development of new energy supply options, including renewable energy. While many of these policy directions, such as promoting increased energy efficiency and the use of nuclear energy, had the incidental effect of curbing increased emissions of greenhouse gas emissions (although at the time these were not an energy policy concern), others, most notably promoting the substitution of coal for oil in electricity generation, had the opposite effect.

The official history of the first twenty years of the IEA notes that in 1974 'energy security [was] the paramount policy objective of the IEA' (Scott, 1995, p.35). However, by the time that history was published, two years after the United Nations Framework Convention on Climate Change (UNFCCC) was signed, priorities had widened:

The notion of energy security has [...] been broadened to include the need to strike the optimal balance among policies for energy security, environmental protection, and economic growth. It is clear that the environment element will continue as one of the driving forces of energy policy in the years to come (Scott, 1995, p.41).

This widening of priorities was formally embodied in the 'IEA Shared Goals', which were formally adopted by Ministers in 1993, effectively replacing the initial aims quoted above. The 'Shared Goals' emphasise enhanced energy use efficiency, diversified and efficient energy supply, and the liberalisation of both domestic and international energy markets (Scott, 1994, p.41).

In the years since, the centrality of 'the environment element', most particularly climate change, to the policy research activities and the policy recommendations of the IEA has steadily increased. In 2004 the Agency took a further step by including in its annual 'flagship' publication, *World Energy Outlook* an 'Alternative Policy Scenario' for the global energy future, which, it said:

analyses, for the first time, the global impact of environmental and energy-security policies that countries around the world are already considering, as well as the effects of faster deployment of energy-efficient technologies. In this

scenario, global energy demand and carbon-dioxide emissions are significantly lower than in our Reference Scenario (IEA, 2004, p. 30).

Every subsequent edition of *World Energy Outlook* has included both ‘reference’ and ‘alternative policy’ scenarios, and has consistently emphasised that enhanced energy efficiency and greater use of renewable energy sources are essential for achieving both energy security and emissions reduction goals.

Since 2005 the increase in climate change related activity by the IEA has been strongly driven by the *Gleneagles Plan of Action on Climate Change, Clean Energy and Sustainable Development*, adopted by the leaders of the G8 at their 2005 summit in Gleneagles (Scotland). Under the *Plan of Action*, the leaders agreed on a range of activities to ‘transform the way we use energy’, by which was meant increasing the efficiency with which energy is used, and diversifying the energy supply mix, including greater use of renewables. The IEA was nominated as the lead body for supporting and promoting these changes and the detailed commitments under each of these two major headings amounted to a significant new work program for the Agency.

This work has examined details of the relationship between energy security and climate change policies, within the context of liberalised energy markets. Areas of research have included an examination of the factors affecting investment decisions in the electricity industry, and the development of quantitative indicators to measure trade-offs and synergies between energy security and climate change goals. Of particular note is the increased emphasis on ensuring energy security within domestic energy systems, particularly the electricity system.

Perhaps the most succinct summary of the position of the IEA on the relationship between energy security and climate change mitigation is found in *World Energy Outlook 2008* (p. 3-4):

It is not an exaggeration to claim that the future of human prosperity depends on how successfully we tackle the two central energy challenges facing us today: securing the supply of reliable and affordable energy and effecting a rapid transformation to a low-carbon, efficient and environmentally benign system of energy supply. What is needed is little short of an energy revolution. [...] Securing energy supplies and speeding up the transition to a low-carbon energy

system both call for radical action by governments – at national and local levels, and through participation in co-ordinated international mechanisms. Households, businesses and motorists will have to change the way they use energy, while energy suppliers will need to invest in developing and commercialising low-carbon technologies. To make this happen, governments have to put in place appropriate financial incentives and regulatory frameworks that support both energy security and climate-policy goals in an integrated way.

It will be for national governments to determine what financial incentives and regulatory frameworks they consider appropriate. The remainder of this paper examines the very different positions adopted by the United Kingdom and Australia.

United Kingdom

In 2008 the United Kingdom derived 40 per cent of its primary energy consumption from natural gas, just under 36 per cent from petroleum and 16 per cent from coal. Nuclear and renewables supplied the remaining 8 per cent. Imports supplied about three quarters of coal and one quarter of natural gas. Petroleum was both exported and imported in significant volumes, but in net terms imports exceeded exports by an amount equal to somewhat less than one tenth of consumption (Department of Energy and Climate Change, 2010a). Until the early 1970s, the United Kingdom was amongst the world's largest coal producers, but production has declined steadily since then, to the present low level. During the 1980s and 1990s, when production of natural gas and petroleum from the North Sea was at its highest levels, the United Kingdom was a net exporter of energy. However, these resources are now in long term decline, and, in the absence of decisive policy action, import dependence is expected to grow steadily (Department of Energy and Climate Change, 2009b). Security of supply of fossil fuels is thus a major concern for the United Kingdom. The main sources of primary energy for electricity generation are gas, coal and nuclear, accounting respectively for 46 per cent, 31 per cent and 13 per cent of total electricity supplied in 2008. Hydro supplied 1.4 per cent, other renewables 4.4 per cent and net imports 3 per cent.¹

Total UK energy consumption has been near constant for some decades. Between 1990 and 2000 final energy consumption increased by 8 per cent, but from 2000 to 2008 it decreased by 5 per cent.² Greenhouse gas emissions from energy use accounted for 82 per

cent of total national emissions in 2008, a significant increase since 1990, when they were 73 per cent of the total.³ Nevertheless, the absolute level of energy related emissions in 2008 was 9 per cent below the 1990 level (Department of Energy and Climate Change, 2010a). Most of this decrease occurred in the early 1990s, when there was extensive substitution of gas for coal, particularly in electricity generation (the so-called ‘dash for gas’). The decrease in energy related emissions from 2000 to 2008 was 2.6 per cent.⁴

The United Kingdom led the world in the introduction of liberalised markets in the supply of electricity and gas. The state owned monopoly gas supply business was privatised in the late 1980s. In 1990 the electricity supply business was privatised and competition introduced into the generation of electricity. Competition in the supply of both electricity and gas to consumers was introduced in the late 1990s. All elements of the UK energy supply industry are now privately owned.

The United Kingdom could be considered to have formally adopted an energy policy framework integrating climate change and supply security objectives when it issued its 2003 Energy White Paper. The White Paper (Department of Trade and Industry, 2003, p. 6) summarised what it called the three energy policy challenges facing the United Kingdom in the following terms.

Our country needs a new energy policy. Despite the improvements we have made over the last five years, today’s policy will not meet tomorrow’s challenges. We need to address the threat of climate change. We must deal with the implications of reduced UK oil, gas and coal production, which will make us a net energy importer instead of an energy exporter. And over the next twenty years or so we will need to replace or update much of our energy infrastructure.

Both the second and third of these ‘challenges’ – reduced domestic fossil fuel production and the need for increased investment – represent threats to energy security in the medium to long term. Consistent with the approach advocated by the IEA, energy efficiency and renewable efficiency were seen as very important in addressing both climate change and security challenges. On the specific issue of long term investment needs in electricity supply and distribution infrastructure, the White Paper was confident that the existing market structures, together with the various programs to promote renewable generation, such as the

‘Renewables Obligation’, would provide adequate incentives for the required investment despite the impending decommissioning of most nuclear and coal-fired stations.

There is inevitably a good deal of uncertainty as to the type and location of stations that will replace existing capacity as market participants respond to evolving price signals. But given current levels of capacity, including mothballed plant, and our expectations of growing renewables generation and energy efficiency improvements over the coming years, we are unlikely to need significant new investment in non-renewable power stations over the next five years or possibly longer (Department of Trade and Industry, 2003, p. 86).

The 2003 White Paper, while defining ‘goals’ for energy policy, contained almost no new policy initiatives of any significance. It did, however, stress the potential importance of the impending European Emissions Trading Scheme.

Central to the future market and policy framework will be a carbon emissions trading scheme... [F]rom 2005 electricity generators, oil refineries and other industry sectors are expected to be part of a much larger Europe-wide scheme. By setting caps on emissions the scheme will provide clear incentives for investment in energy efficiency and cleaner technologies at the lowest cost (Department of Trade and Industry, 2003, p. 13).

Importantly, the White Paper went on to state:

On its own emissions trading will not be enough to deliver our environmental goals. We will need additional measures, for example to stimulate further energy efficiency in business, in the public sector and in households (Department of Trade and Industry, 2003, p. 14).

In 2005 the government announced that it would conduct a review of progress towards the goals set in the 2003 White Paper, and the process was initiated with release of a review report in 2006 (Department of Trade and Industry, 2006).

This document reduced the energy policy challenges to two: ‘tackling climate change’ and ‘delivering secure, clean energy at affordable prices’. It identified achieving the right volume and type of investment in new electricity generation capacity as a key issue. Pointing

out that up to 25 GW of new capacity would be required over the next two decades, mainly to replace closing coal and nuclear power stations, it noted that, on then current projections, much of this 'generation gap' would be met by gas fired plant. This would increase the already high proportion of electricity generation fuelled by gas, with supply security implications, given the increasing dependence on imported gas. It would also lock-in, for the life of the new plants, higher emissions than would be the case if renewables and/or nuclear were to supply more of the new capacity. The document emphasised that, in the UK context, 'It will be for private sector companies to make the necessary investment decisions within the regulatory framework set by the Government', and that the task for government is to ensure that the regulatory framework provides the right incentives (Department of Trade and Industry, 2006, p. 92 et seq.). It suggested a number of possible policy initiatives to reduce policy and regulatory uncertainty, to send stronger market signals relating to the value of low carbon investments, and to improve the quality of forward looking market information. It also concluded, however, that the current electricity market framework would be capable of continuing to deliver the appropriate investments, and that 'the case for [government] intervention on grounds of security of supply has not been made' (*ibid.*, p. 95).

The review process effectively ended with the release of a second White Paper in 2007 (Department of Trade and Industry, 2007). It reached similar conclusions to the review regarding the risks to energy security arising from inadequate or inappropriate electricity supply investments, and saw no need to make major changes to the electricity market framework. Policy proposals were consequently aimed at reducing 'policy and regulatory uncertainties' by 'strengthening the EU ETS and the carbon market'; providing information to facilitate investment in new generating capacity; reform of the energy planning system; and clarifying policy on renewables, carbon capture and storage and nuclear power (Department of Trade and Industry, 2006, p. 158). In 2008 the government created a new Department of Energy and Climate Change, by combining energy policy, formerly in the business and industry portfolio, with climate change mitigation policy, formerly in the environment portfolio. In both symbolic and practical terms, this amounts to a clear statement of the intimate relationship between the two policy areas. The same year its *Energy Act 2008* implemented some of the changes contained in the White Paper. It also broadened the statutory duties of the Office of Gas and Electricity Markets (Ofgem), the body responsible for regulating the gas and electricity industries, to place greater emphasis on the achievement

of sustainable development and to oblige the Office to consider the interests of future as well as current consumers in making its determinations.

The Climate Change Act 2008 requires the government to set mandatory, unconditional national emissions reduction targets over both the long term (2050) and over successive five year periods, set three periods at a time. The first three five year budgets, extending to 2022, will require the United Kingdom by 2020 to reduce its emissions by 18 per cent relative to 2008. The suite of measures which the (then) government propose to achieve these emission reductions are set out in the *UK Low Carbon Transition Plan*. There will be no net international transfers of emissions units, other than through the EU Emissions Trading Scheme (and these are expected to be small), meaning that the United Kingdom plans to achieve the emissions reduction targets entirely through reducing its own national emissions. Emissions relating to energy use are planned to contribute the great majority of the required emissions reductions (Department of Energy and Climate Change, 2009c).

Early in 2009 Ofgem launched what it called Project Discovery (Office of Gas and Electricity Markets, 2009, p. 2), with the objective of exploring ‘whether current market arrangements are capable of delivering secure and sustainable energy supplies.’ In early 2010 it released a consultation paper, setting out its conclusions from a year of study through Project Discovery (Office of Gas and Electricity Markets, 2010a). It states, contrary to the White Paper of three years earlier:

We have identified a number of concerns with the current arrangements and have concluded that significant action will be called for given the unprecedented challenges facing the electricity and gas industries. We are keen to work with consumers, industry and government to find the best way forward. Prompt action will reduce the risk to energy supplies and environmental objectives, and can help reduce costs to consumers.

In a press release accompanying the publication of the consultant paper, Ofgem was more outspoken (Office of Gas and Electricity Markets, 2010b):

- Ofgem recommends far reaching energy market reforms to consumers, industry and government;

- The unprecedented combination of the global financial crisis, tough environmental targets, increasing gas import dependency and the closure of ageing power stations has combined to cast reasonable doubt over whether the current energy arrangements will deliver secure and sustainable energy supplies
- Prompt action will reduce risk to energy supplies, help lower costs to consumers and help progress towards climate change targets.

The body of the paper examines a number of different options for major changes to the UK gas and electricity markets, all of which involve substantial changes to both structure and operation, with a greater degree of government intervention. This could be seen as reversing the direction which UK energy policy had followed for the preceding twenty years and an acknowledgment that highly liberalised energy markets may not be capable of achieving major emission reductions while maintaining supply security. Adding a price on emissions to these market structures may achieve marginal emission reductions without endangering supply security. The large and rapid changes to the energy system, which achieving significant emission reductions will necessitate, will in turn require more far-reaching changes to institutional structures and policy settings, if supply security is to be maintained. Consistent with the integrated energy and climate change policy approach, the options are assessed against criteria which include confidence of achieving supply security, confidence of achieving the 2020 emissions reduction targets through domestic reductions, and confidence of achieving the 2020 renewables targets.

The new government which took office following the election in May 2010 was no less committed than its predecessor to achieving deep cuts in emissions, and appeared to attach greater urgency to addressing the emissions reduction/supply security dilemma. In its first of a promised series of annual energy statements, released in July 2010, it strongly emphasised the need to ensure secure supplies of electricity, which it saw as being achieved both by increased energy efficiency and stronger incentives for private investment in new, low emission electricity generation capacity (Department of Energy and Climate Change, 2010b). The centrepiece of its energy efficiency program was a proposed Energy Security and Green Economy Bill, to place heavier obligations on energy companies to increase the efficiency with which their customers use energy. To support new generation investments, the Statement foreshadowed legislation and other actions to establish a higher and more certain carbon price, re-confirmed a previous commitment to establish what the government

called a Green Investment Bank, and committed itself to a comprehensive electricity market reform review, culminating in an Energy White paper in early 2011.

Australia

Relative to current and foreseeable domestic consumption, Australia has large resources of coal and natural gas (both conventional and coal seam gas) (Department of Resources, Energy and Tourism, 2010). It is currently the fourth largest producer and largest exporter of coal in the world (Australian Bureau of Agricultural and Resource Economics, 2009) and is also about the tenth largest exporter of natural gas (as LNG) (BP, 2009). Its known resources of petroleum are far more limited and net imports currently account for about one third of total consumption, a proportion which is expected to increase in coming years (Department of Resources, Energy and Tourism, 2010). Petroleum supplies about 34 per cent of total primary energy consumption. Emissions of greenhouse gases from fossil fuel extraction processing and use account for 71 per cent of Australia's total emissions. They have grown by 42 per cent since 1990, while all other emission sources have decreased (Department of Climate Change and Energy Efficiency, 2010.). Moreover, in per capita terms, Australia is amongst the highest emitting countries in the world. It has very high per capita energy consumption and a particularly heavy reliance on coal for electricity generation. Coal accounts for 40 per cent of total primary energy consumption, of which just under one third is brown coal (lignite). This has very high moisture content and is an intrinsically inefficient source of combustion energy. Australia also has very large resources of uranium and solar radiation and, at least relative to domestic energy consumption, wind and wave energy.

Twenty years ago Australia embarked on a program to introduce market liberalisation to both the electricity and gas industries. Vertically integrated statutory monopolies, owned by State governments, were turned into disaggregated businesses, competing in generation and retailing, and in some states were privatised. Starting in 1998, the National Electricity Market (NEM) was introduced, as an integrated wholesale market covering over 90 per cent of Australian electricity consumption in eastern and southern Australia (the geographically isolated electricity supply systems in Western Australia and the Northern Territory are excluded). This embraces full competition at both wholesale (between generators) and at retail (between suppliers of electricity to consumers). There is similar retail competition in

the supply of gas and increasing competition at wholesale with the discovery and development of new gasfields and the construction of a more inter-connected pipeline network.

The competitive market frameworks for electricity and gas are set respectively by the National Electricity Law and the National Gas Law. This framework is an agreement between the federal government and all state and territory governments, and its application extends to the whole country, not just those parts covered by the National Electricity Market. They are the key foundation documents for Australian domestic energy policy. Each contains succinct statements of the objective of the liberalisation policy, as follows.

7—National electricity market objective

The objective of this Law is to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to—

- (a) price, quality, safety, reliability and security of supply of electricity; and
- (b) the reliability, safety and security of the national electricity system.⁵

23—National gas objective

The objective of this Law is to promote efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas.⁶

It is noteworthy that neither of these objectives contains any reference to climate change or other environmental concerns. This was a conscious and deliberate decision of the Ministerial Council on Energy, the body responsible for the two Laws, at the time when they were being reviewed and amended in 2004. In response to submissions arguing that environmental sustainability, including climate change mitigation, should be part of the NEM objective, the Council's response was: 'Environmental objectives are more appropriately dealt with in other policy instruments.' (Ministerial Council on Energy, 2004a)

The objectives are very important because, under the respective Laws, the body responsible for making the market Rules may only make Rules which will or are likely to contribute to the achievement of the objectives and, more generally, must have regard to the objectives when performing its functions (Ministerial Council on Energy, 2004b).

The consequence of this framework is that, contrary to the approach advocated by the IEA and adopted by the United Kingdom, climate change mitigation is entirely external to the Australia domestic energy policy process and divorced from, rather than integrated with the key energy policy objectives, including energy security. This approach to energy policy was fully reflected in the (then) government's energy policy White Paper of 2004 (Department of the Prime Minister and Cabinet).

The consequence of this energy policy approach for national emissions is seen in the most recent official projection of Australia's energy supply and demand. The modelling for this projection allowed for Australia's only major emissions mitigation program, which is a renewable electricity mandate scheme, called the Renewable Energy Target (RET). The current version of the scheme requires renewable generation to increase by 2020 from the current level, of about 10 per cent of total electricity generated, to about 20 per cent. The modelling also allowed for the impact of the (now postponed) national emissions trading scheme, called the Carbon Pollution Reduction Scheme (CPRS). The design of the CPRS proposed very broad coverage, including all energy related emissions, and some other emission sources. Targets (caps) had not been set, but it was expected that a 2020 target would be a reduction from 2005 emission levels of between 5 per cent and 15 per cent. Most importantly, there was absolutely no limit on the use of imported emission units to meet domestic commitments under the CPRS. Accordingly, the modellers chose to represent the CPRS by a gradually increasing emissions price, which could be thought of as the international market price of Certified Emission Reductions (CERs).

Projections prepared for the Department of Resources, Energy and Tourism indicate that, with these and other current policy settings, primary energy demand will increase by 35 per cent by 2030, relative to the 2008 level (figures for intermediate years, including 2010, are not published) (Syed *et al.*, 2010). When generic emission factors are applied to the projected mix of primary fuels, it is found that the projected growth in primary energy demand implies an increase in energy combustion emissions of about 21 per cent above 2008 levels and 38 per cent above 2000 levels. In other words, far from reducing energy emissions below current levels, the projection suggests that they will increase significantly, notwithstanding a price on emissions applied through the government's proposed emissions trading scheme. By implication emission caps under the scheme could only be met by purchase on the world market of large volumes of CERs, or other internationally recognised

credits. The official economic modelling undertaken as part of the design process for the emissions trading scheme, confirms that this was indeed the expectation of the schemes designers (Australian Treasury, 2008).

In designing its CPRS, the government considered the possible impact of the Scheme on energy security, and took advice on the issue from the various agencies responsible for administering and operating the national electricity and gas markets. It also received submissions from owners of coal fired power stations, which argues that imposition of a price on emissions would result in devaluation of their generation assets and reduced creditworthiness of their businesses, which could cause the retirement of plant before replacement plant could be installed, with obvious negative effects on electricity supply security. In response, the government decided to provide the most severely affected generators with financial assistance, in the form of a quota of administratively allocated permits, with the quantity allocated depending on the emission intensity of the individual generator (more emissions intensive plant would receive more permits) and extending over five years, provided that the plant continued to operate for that period (Australian Government, 2008). With that provision, the government then concluded that:

Energy security can be maintained through the setting of a target range for emissions cuts that allows for a smooth transition to lower-emissions technology. Any minor amendments that are required to the energy market frameworks can be accommodated within the current rules amendment processes (Australian Government, 2008, pp 13-48.)

A separate official assessment of energy security concluded that this assistance, together with the detailed information about CPRS design provided by the government, would provide investors with the information and confidence they would require to make timely and appropriate investment decisions, thereby mitigating risks to electricity supply security (Department of Resources, Energy and Tourism, 2009).

Later in 2009 the Australian Energy Markets Commission (AEMC), the body responsible for administration of the national electricity and gas markets, published the results of an extensive review of the adequacy of energy market frameworks to support efficient transition, in the light of the CPRS and the Renewable Energy Target. It concluded that the broad frameworks are capable of supporting an efficient transition and that no more

than a few incremental improvements to the framework would be required (Australian Energy Markets Commission, 2009a).

Notwithstanding the conclusions about the adequacy of supply security under the arrangement proposed for the CPRS, electricity generation businesses continued to argue that they required more generous assistance if risks to supply security were to be avoided. It argued that the proposed Scheme did not:

adequately address the stranding of coal-fired generation assets. A measured transition to full auctioning (as proposed in most other schemes to date) would enable a greater volume of permits to be administratively allocated to affected generators to ensure there is no disproportionate loss of economic value on the sector's balance sheets or a rise in costs to such a level as to compromise both the ability to refinance, and/ or re-invest in existing power plant (National Generators Forum, 2009).

In a political compromise, made in an (ultimately unsuccessful) attempt to achieve Parliamentary support for the passage of its CPRS legislation, the government, proposed to increase the number of administratively allocated permits supplied to emissions intensive generators and to extend the duration of such assistance, and hence the potential operating life of these generators, to ten years. Responding to a formal invitation to comment on these proposals, the Australian Energy Markets Commission observed that 'there remains the potential risk that [the proposed assistance] may slow the transition away from carbon-intensive generation.' (Australian Energy Markets Commission, 2009b)

There are several interesting aspects to this denouement. Firstly, the perceived risks to electricity supply security arise from possible damage to the financial integrity of the owners of emissions intensive power stations. It has never been suggested that, in a hypothetical worst case situation (bankruptcy of an owner), the physical asset of the power station, under new ownership, would be incapable of continuing to operate. Secondly, the generation assets which, it has been suggested, might be at risk of closure are all privately owned. It has never been suggested that any of the coal fired generators which are publicly owned (by the State governments of New South Wales, Queensland and Western Australia) might be at risk of closure.⁷ While the question of whether the benefits of liberalised energy markets can only be realised if all market participants are privately owned is a regular topic of public debate in

Australia, it has received little attention in the particular context of energy security and climate change.

More generally, it is clear that, in the Australian policy context, responding to climate change is not only treated as external to and separate from energy policy, but that it is also seen as an issue of lower priority than preserving the economic benefits which are considered to flow from retaining and strengthening the liberalised market framework for the electricity and gas supply industries.

Conclusions

The risk of severely disruptive climate change cannot be reduced without making changes to energy systems, so as to reduce the consumption of fossil fuels, which in terms of both size and speed of the changes required are so large as to constitute, in the words of the IEA, an ‘energy revolution’. Revolutionary changes are likely to be disruptive of established energy systems, and to the services they provide, of which energy security is amongst the most important. However, as the IEA has been arguing for over a decade, energy security and climate policy goals can and should be integrated because both are addressed by policies which emphasise increasing end use efficiency and greater use of renewable sources of energy. That said, realising these synergies on a scale and at a rate which is ‘revolutionary’ is unlikely to leave unaffected the existing institutional structures and governance arrangements of the energy system. As the two national case studies presented here show, this is particularly true for states with a liberalised energy market framework.

In recent years, the United Kingdom, which has set itself relatively ambitious goals to reduce emissions by domestic action, has changed its policy framework so as to integrate energy security and climate policy goals, as advocated by the IEA. However, the United Kingdom faces a further challenge to maintain the security of electricity supply, in particular, while it transforms its energy system. With a liberalised market framework for the electricity supply industry, government options to affect the nature and level of energy system investments are necessarily indirect, and the outcomes of any particular government actions are uncertain, depending as they must on the decisions of multiple market participants. This problem was recognised by Ofgem in 2009 and, following the election of May 2010, the new Conservative-Liberal Democrat government has acknowledged the seriousness of the

problem and committed itself to addressing it by changing the electricity market structure in ways which will necessarily be more interventionist.

In Australia, by contrast, the energy policy framework deliberately and explicitly treats climate change response as external to energy policy, making it effectively impossible to integrate energy security and climate-policy goals, and ensuring that climate policy presents no challenge to the pursuit of further market liberalisation. It is hardly surprising, then, that the national political process has failed to produce a commitment to strong emissions reduction goals or policies which will do more than curb the steady growth of energy related emissions. What is more, both the government and the opposition parties expect purchasing international emissions units to play an important part in achieving, in accounting terms, more ambitious emissions reductions.

The overall conclusion is very simple. If states set themselves ambitious emissions reduction goals they will need to make radical changes to their energy systems, which, in the absence of decisive policy action, are likely to be deleterious to domestic energy security. By contrast, modest reduction goals will not require far-reaching energy system changes and will pose little threat to energy security, but will also do little to mitigate climate change.

Notes

¹ Calculated from Tables 5.1.2 and 5.3 in Department of Energy and Climate Change, 2010a.

² Calculated from Table 1.4 in Department of Energy and Climate Change, 2010a.

³ *ibid.*

⁴ *ibid.*

⁵ This definition appears in each separate Act, eg: National Electricity (South Australia) Act 1996

[http://www.legislation.sa.gov.au/LZ/C/A/NATIONAL ELECTRICITY \(SOUTH AUSTRALIA\) ACT 1996.aspx](http://www.legislation.sa.gov.au/LZ/C/A/NATIONAL ELECTRICITY (SOUTH AUSTRALIA) ACT 1996.aspx)

⁶This definition appears in each separate Act, eg: National Gas (South Australia) Act 2008 See

[http://www.legislation.sa.gov.au/LZ/C/A/NATIONAL GAS \(SOUTH AUSTRALIA\) ACT 2008.aspx](http://www.legislation.sa.gov.au/LZ/C/A/NATIONAL GAS (SOUTH AUSTRALIA) ACT 2008.aspx)

⁷ It should be noted that these power stations use black, rather than brown coal, and thus are inherently less emissions intensive than the privately owned power stations in Victoria. Nevertheless, it is expected that they will suffer some loss of asset value.

References

Australia Department of Climate Change and Energy Efficiency, (2010) *Australian National Greenhouse Accounts: National Greenhouse Gas Inventory*.

Australia Department of Resources, Energy and Tourism, (2009) *National Energy Security Assessment 2009*. (Canberra)

Australia Department of Resources, Energy and Tourism, (2010) *Australian Energy Resource Assessment*. (Canberra)

Australia Ministerial Council on Energy, (2004a) *Response to Key Issues Raised by Stakeholders on the Exposure Draft of the National Electricity Law*, (Canberra)
<http://www.ret.gov.au/Documents/mce/quicklinks/consultation.html>

Australia Ministerial Council on Energy, (2004b) *Energy Market Reform : National Electricity Law And National Electricity Rules*, (Canberra)
<http://www.ret.gov.au/Documents/mce/quicklinks/consultation.html>

Australian Bureau of Agricultural and Resource Economics (2009) *Australian commodity statistics 2009*. (Canberra)

Australian Energy Markets Commission (2009b) *Review of Energy Market Frameworks in light of Climate Change Policies: Final Report*. (Sydney)

Australian Energy Markets Commission (2009b) *Letter to Department of Climate Change dated 23 November 2009*,
<http://www.climatechange.gov.au/government/initiatives/cprs/Proposed-CPRS-Negotiation.aspx>

Australian Government, (2008) *Carbon Pollution Reduction Scheme: Australia's Low Pollution Future*, Canberra. (Canberra) www.climatechange.gov.au

Australian Treasury, (2008) *Australia's low pollution future: the economics of climate change mitigation*. (Canberra)

BP (2009) *BP Statistical Review of World Energy June 2009* (United Kingdom) (London: BP), www.bp.com/statisticalreview.

Department of Energy and Climate Change (United Kingdom) (2009a) *Digest of UK Energy Statistics*. (London: The Stationery Office)

Department of Energy and Climate Change (United Kingdom) (Report prepared by M. Wicks) (2009b) *Energy Security: A national challenge in a changing world*. (London: The Stationery Office)

Department of Energy and Climate Change (United Kingdom) (2009c) *UK Low Carbon Transition Plan: National strategy for climate and energy*. (London: The Stationery Office)

Department of Energy and Climate Change, (2010a) *UK Emissions statistics*. (United Kingdom) (London: The Stationery Office)
http://www.decc.gov.uk/en/content/cms/statistics/climate_change/gg_emissions/uk_emissions/2008_final/2008_final.aspx

Department of Energy and Climate Change, (2010b) *Annual Energy Statement: DECC Departmental Memorandum*. London: The Stationery Office)

Department of Trade and Industry (United Kingdom) (2003) *Our energy future - creating a low carbon economy.*, (London: HMSO)

Department of Trade and Industry (United Kingdom) (2006) *The Energy Challenge: Energy Review Report*. (London: The Stationery Office)

Department of Trade and Industry (United Kingdom) (2007) *Meeting the Energy Challenge: A White Paper on Energy*. (London: Department of Energy and Climate Change.)

Department of the Prime Minister and Cabinet, (Australia) (2004) *Securing Australia's Energy Future*. (Canberra)

International Energy Agency (1982) *World Energy Outlook*. (Paris: Head of Publications Service)

International Energy Agency (2005) *World Energy Outlook 2005*. (Paris: Head of Publications Service)

International Energy Agency (2008) *World Energy Outlook 2008, Executive Summary*. (Paris: Head of Publications Service)

National Generators Forum (2009) *Submission to Department of climate Change on exposure draft of the Carbon Pollution Reduction Scheme legislation*. Available at <http://www.ngf.com.au/html//>

Office of Gas and Electricity Markets (United Kingdom) (2009) *Project Discovery Energy Market Scenarios*. (London: OFGEM)

Office of Gas and Electricity Markets, (United Kingdom) (2010) *Project Discovery: Options for delivering secure and sustainable energy supplies*. (London: OFGEM)

Scott, Richard (1994) *The history of the International Energy Agency, Volume II: Major policies and actions of the IEA*. (Paris: OECD/IEA)

Syed, A, Melanie, J, Thorpe, S and Penney, K (2010), *Australian energy projections to 2029-30*, ABARE research report 10.02, prepared for the Department of Resources, Energy and Tourism, Canberra