Reviewing the climate change adaptation readiness of the Australian national electricity market institutions

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Assessing the current institutional arrangements for the development of electricity infrastructure to inform more flexible arrangements for effective adaptation

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9. ASSESSING THE CURRENT INSTITUTIONAL ARRANGEMENTS FOR THE DEVELOPMENT OF ELECTRICITY INFRASTRUCTURE TO INFORM MORE FLEXIBLE ARRANGEMENTS FOR EFFECTIVE ADAPTATION

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The previous Chapters have identified current institutional arrangements that are sources of maladaptation to climate change. This chapter discusses these sources of maladaptation in more detail to provide a measure of adaption to climate change and to suggest alternative more flexible arrangements to climate change. Four key issues were identified:

1. fragmentation of the NEM both politically and economically;
2. accelerated deterioration of the transmission and distribution infrastructure due to climate change requiring mechanisms to defer investment in transmission and distribution;
3. lacking mechanisms to develop a diversified portfolio of generation technologies and energy sources to reduce supply risk; and
4. failing to model and to treat the NEM as a national node based entity rather than state based.

Section 6.1 discusses how the transmission and distribution infrastructure will be subjected to accelerated ageing and subject to more faults from higher winds and temperatures. As discussed, the higher frequency of faults can be ameliorated by better design and improved maintenance but both act to increase the cost of installing new lines and running existing lines. This sensitivity of transmission and distribution to climate change makes the deferment of transmission investment more important. This chapter particularly scrutinises institutional arrangements to highlight potential sources of maladaptation to defer investment in transmission and distribution.

Stevens (2008, p. 41) discusses if the energy sector infrastructure is to adapt to climate change, a totally integrated holistic approach to the provision and management is required. Stevens notes that this approach is particularly relevant to the electricity sector and identifies two impediments to achieving suitable outcomes being the intensely competitive environment and the diverse ownership of infrastructure. So, this chapter compares the adaptation to climate change of the South Korean and Australian electricity systems to provide a gauge to Australia's success. The contrast highlights the success of the simple institutional structure of South Korea's national government and electricity monopoly over the complex institutional structure of Australia's State Governments and diverse ownership of infrastructure. Section 4.4 expands upon the comparison between these two markets.

Section 6.12 discusses the need to develop a portfolio of energy to reduce supply risk where the RET provides onshore wind and solar PV with a first mover advantage at the expense of a broader portfolio of energy. This first mover advantage for solar PV is exacerbated by the solar bonus built into a feed-in tariff.

This chapter discusses the four key issues in the following subsections.

9.1 Feed-in tariffs incorporating a renewable energy bonus

This section discusses feed-in tariffs incorporating a renewable energy bonus where the bonus acts a as a source of maladaptation but an economically neutral and sustainable feed-in tariff is essential to the development of a smart grid and adaption to climate change for the NEM.

The International Energy Association (IEA 2011c, p. 33) observes that nearly all countries now offer or are planning feed-in tariffs for solar PV but debate has shifted from *'if or how to implement a feed-in tariff'* to *'how to move to a self-sustaining market post feed-in tariff'*.

This section discusses feed-in tariffs as a source of four market failures:

- inappropriate infant industry assistance;
- exacerbating inequity;
- inadequate transmission investment deferment price signal; and
- poorly targeting myopic investment behaviour.

Additionally, this section discusses a sustainable feed-in tariff regime that addresses the four market failures together with an international comparison of feed-in tariffs.

IEA (2011c, p. 33) acknowledges internationally feed-in tariffs have been poorly designed or poorly controlled resulting in explosive markets, profiteering, political interference, over-reliance on imports, market collapses, business closures and so on. However there is now a wealth of information available worldwide to policymakers regarding the impact of various designs of feed-in tariff schemes and how and when to adjust tariffs to avoid overheated markets. Gipe (2011) provides an extensive and current discussion of feed-in tariffs.

Under the guise of an infant industry argument, the states in Australia implemented feed-in tariffs to establish the domestic PV industry. This policy has been overly successful but has produced maladaptation by creating inconsistent gross or net feed-in tariffs calculation across Australia resulting in inconsistent remuneration, causing cross subsidy of electricity resulting in inequity to favour the rich over the poor, testing policy credibility, creating poorly targeted infant industry assistance and failing to target transmission investment deferment.

The problem with infant industry assistance is that the assistance is only intended for a limited term but carries the innate problems of when to withdraw assistance and of retaining policy credibility when withdrawing assistance. For instance the ACT Minister for the Environment and Sustainable Development (Corbell 2011b) closed new applications for micro feed-in tariffs but successfully ensures policy credibility by honouring existing feed-in tariff agreements. However, Garnaut (2011, p. 15) discusses how those consumers receiving feed-in tariffs are being cross-subsidised by other consumers, which is economically inefficient. In agreement, Nelson, Simshauser and Kelly (2011) estimate the household impact of feed-in tariffs by income groupings and conclude that wealthier households are beneficiaries and the effective taxation rate for low income households is three times higher than that paid by the wealthiest households. So, there is a policy dilemma that is maintaining policy credibility perpetuates economic inefficiency and social inequity.

A resolution to this policy dilemma would be to maintain feed-in tariffs fixed permanently in nominal terms to those consumers contracted, so the influence of the agreed feed-in tariffs gradually fades out with time and are replaced by a more sustainable feed-in tariff regime.

In addition, developing a more sustainable economically neutral feed-in tariff provides a way to internalise the positive externality of deferred transmission and distribution investment for investors in embedded generation (Garnaut 2008, p. 452). However, there is debate over whether a feed-in tariff should be paid for the net or the gross contribution to the distribution grid. Farrell (2011, p. 33) discusses the major drawback of net metering, which is to optimize the size of a solar array for on-site load rather than maximise the solar array. The economic argument favours gross; this way the investor can make the decision to install the generators based on the contribution to the grid, so the feed-in tariff rate is based on the locational marginal price (LMP) to provide the right price signal for generation investment. AEMC (2011b) proposes LMP as one of five options in the transmission framework review. Under the gross payment method the householder would pay the retail rate for the total electricity consumed whether sourced from the grid or from their own generator to provide an incentive for the customer to conserve electricity and to provide a profit motive for the retailer. The charge for transmission and distributions costs need itemising on bills, as the customer does not use transmission or distributions to consume their own generated supply of electricity and to provide a price signal for the deferment in investment in transmission and distribution.

The NSW Auditor General (Achterstraat 2011) reviews the solar bonus scheme associated with the current gross feed-in tariff and discusses how prior to 2010 NSW had a net feed-in tariff. Additionally, the Auditor General recommends a review of the projected cost of the solar bonus scheme to answer the question of sustainability and recommends provision be made for an exit strategy. These changes or recommendations indicate that adaption is occurring in the right direction with the caveat that the solar bonus scheme is replaced with a sustainable gross feed-in tariff.

The Australian PV Association (APVA 2011) and Watt (2011b) discuss how solar PV has reached grid parity, that is electricity generated at the same price as coal plus transmission and distribution costs, but parity will be insufficient to ensure the appropriate economic level of household PV uptake because people suffer investment myopia over the returns from long term investments, such as, the 30-40 year life of a

PV unit. In agreement, Yates and Mendis (2009) and Williams (2011) discuss the sensitive of demand for solar PV installation to interest rates and to financing. A well-researched market failure of the retirement industry is investment myopia that has spurred government intervention in the form of superannuation using a complex array of policies including tax breaks for voluntary contributions and compulsory contributions. Similarly, the government intervenes to remedy a market failure in the provision of tertiary education to offer interest free student loans that provide equity and acknowledge the positive externalities of education. The solar PV industry also exhibits investment myopia, positive externalities and equity concerns.

Section 4.7 discusses Origin Energy's (2007) argument for interest free loans for efficient energy investment to address positive externalities and equity concerns. A similar argument can be made for interest free loans for solar PV. However, people usually pay for their solar PV or solar hot water heating installations by increasing their house mortgage. This is appropriate in the case of long term investments such as solar PV. This approach works for house owners but not for renters. The fact that proportionately more low income individuals rent houses goes some way to account for the highest (richest) quintile having twice the rate of solar PV installations compared with the lowest (poorest) quintile (Bell & Foster 2012). The low solar PV penetration in the lowest quintile is due to the dual problem of low income and rental accommodation. Trying to address this poverty trap with subsidised loans is insufficient. A solution is required that acknowledges the tenant-landlord relationship and the consequent misalignment of benefits and costs. Section 10.2.4 further discusses energy poverty.

Foster et al (2011, p. 2) discusses how solar PV has acknowledged potential to defer transmission investments, which are largely driven by peak demand. However, residential solar PV is insufficient and there is a requirement for significant commercial solar PV installation but unlike countries such as Germany and Spain, Australia has until recently very few incentives for commercial installations. Williams (2011) discuss the commoditisation of residential solar PV, which is evidence that the residential segment of the solar PV market has moved beyond infant industry status and beyond infant industry support requirements. Whereas the large and medium-scale solar PV segments are still in their infancy and still warrant direct infant industry support because the installation of medium and of large-scale solar PV requires a much higher degree of skill than residential solar PV.

In infant industry assistance, Corbell (2011a) announces the first feed-in tariff in Australia for large scale solar. The plan uses a feed-in tariff reverse auction for the two large scale solar generation plants capable of powering 7000 homes. The reverse auction appears a much more appropriate method to target an infant industry than the oversubscribed fixed micro feed-in tariff. The advantage of the reverse auction is that each time the auction is held the technology matures and the feed-in tariff becomes smaller, which provides an inexpensive way to maintain policy integrity and support infant industries. Additionally, the two issues of over subscription and of overly supporting an infant industry become redundant. This large scale feed-in tariff policy is a well-adapted approached to climate change compared to the micro feed-in tariffs policies.

IEA (2011c) and Renewable Energy Policy Network of the 21st Century (REN21 2011) provide a comparison of countries' feed-in tariffs. REN21 (2011, p. 52) notes that Australia, Canada and the US have only state or province feed-in tariff policies, which contrasts with all the other countries that have national feed-in tariff policies. Australia's fragmentation of policy by state induces inconsistency among feed-in tariffs providing a source of maladaptation. The Australian Minister for Climate Change (Wong 2008) discusses how a CoAG Working Group is considering harmonising state feed-in tariffs for solar and other renewable energy technologies where there is a proposal for the preparation of an options paper on a nationally consistent approach to feed-in tariffs. However a national policy has yet to appear.
REN21 (2011, p. 84) compares when various countries and states have adopted a feed-in tariff. The following list compares the adoption dates for the states in the NEM with South Korea.

- 2003 South Korea
- 2007 SA
- 2008 Qld
- 2009 ACT, NSW and VIC

This comparison shows that the NEM is institutionally slow at adapting to climate change measures compared to South Korea. Section 4.4 discusses using REN21's (2011, p. 84) international comparison of feed-in tariff adoption year as a climate change adoption performance indicator.

Furthermore, the NSW Independent Pricing and Regulatory Tribunal (IPART 2011) is calling for submissions on establishing a fair and reasonable feed-in tariffs for electricity generated by small-scale solar PV. In comparison, IEA (2011c, p. 37) discusses how South Korea is one of the first countries to supersede the feed-in tariff where the RPA (Renewable Portfolio Agreement) will replace the feed-in tariff scheme in 2012. Under the RPA, the government in conjunction with private enterprise plan to install 1.2 GW capacity of solar PV by the end of 2016. This RPA is another indicator that Australian institutions are slow at adapting to climate change.

9.2 Carbon pollution reduction scheme

The price signal from the carbon pollution reduction scheme (CPRS) is intended to transform the current portfolio of high CO_2 emissions generators in Australia in favour of a lower emissions portfolio. The CPRS starts with a carbon tax in July 2012, which converts to an emissions trading scheme (ETS) in July 2015. The CPRS has the following four sources of maladaptation to climate change:

1. CPRS supplanting RET;
2. ETS market failure;
3. trading carbon credits internationally; and
4. international corruption.

Regarding CPRS supplanting RET, Garnaut (2008, p. xxxii) states *"There are structural reasons to expect market failure in response to carbon pricing in relation to the*

information required for optimal use of known technologies; to research, development and commercialisation of new technologies; and to network infrastructure." Garnaut (2008, pp. 403-60) suggests using policies to directly address the stated failures that will also negate the need for the RET. However, under CPRS without RET gas generators can simply replace coal generators. This coal to gas transformation would fail to diversify Australia's portfolio of energy sources. Furthermore, CPRS in conjunction with RET ameliorates the effects of domestic corruption and political lobbying. Section 9.4 further discusses the RET.
Section 9.6 discusses Garnaut's (2008, p. xxxii) comments regarding network infrastructure market failure.

Regarding ETS market failure, Ellerman and Joskow (2008) discuss three market failures in the European Union (EU) ETS, being over allocation, price volatility and windfall profits for generators. Ellerman and Joskow (2008) consider these learning experiences, which can be overcome by using more accurate information, by allowing the banking of credits between compliance periods and by increasing the frequency of auctioning. Despite these learning experiences, Lewis (2011) reports on a further EU ETS collapse in carbon prices, which results from a combination of over allocation and the aftermath of the global financial crisis in Europe. The EU ETS provides Australia with many valuable lessons and shows that developing a robust ETS comes with many unforseen problems, so it is prudent to maintain the RET.

Regarding trading carbon credits internationally, Garnaut (2008) discusses how trading provides a mechanism to lower the overall costs to the world of the transformation to lower CO_2 emissions. However, this trading proposal has three major problems being, international corruption, losing government revenue, and losing a policy tool to promote renewable energy sources domestically.

In relation to international corruption, Transparency International (TI 2011) produces an international corruption perception index on 182 countries. Table 9-1 shows the 16 least corrupt countries where Australia is ranked 8^{th}. The index compiles the results form a number of surveys to allow basic statistical analysis. Since most of the world ranks as more corrupt than Australia, this does raise credibility issues over an international trade in carbon credits. For instance in the least corrupt country New Zealand (NZ), Stock (2011) reports on the NZ ETS experience in trading carbon credits internationally where the price for a NZ Unit (NZU) went from $22 in May 2011 to $11 in late November 2011. This halving in the price of a NZU was the result of NZ emitters' ability to import carbon credits. However Stock (2011) claims that some of the UN-backed Certified Emissions Reductions (CER) are of suspect validity and predicts that the New Zealand Government will substantially curtail the import of CER.

Table 9-1 International Corruption Perception Index for 2011

Country Rank	Country / Territory	CPI 2011 Score	Country Rank	Surveys Used	Standard Deviation	Range		90% confidence interval	
						Max	Min	Lower bound	Higher bound
1	New Zealand	9.5	1	9	0.05	9.7	9.1	9.4	9.5
2	Denmark	9.4	2	8	0.05	9.5	9.1	9.3	9.5
2	Finland	9.4	2	8	0.07	9.8	9.1	9.3	9.5
4	Sweden	9.3	4	9	0.08	9.7	8.9	9.2	9.4
5	Singapore	9.2	5	12	0.13	9.5	8.1	8.9	9.4
6	Norway	9.0	6	9	0.07	9.3	8.7	8.9	9.1
7	Netherlands	8.9	7	9	0.11	9.3	8.1	8.7	9.1
8	Australia	8.8	8	11	0.12	9.4	8.2	8.6	9.0
8	Switzerland	8.8	8	8	0.22	9.4	7.5	8.4	9.1
10	Canada	8.7	10	9	0.15	9.3	8.1	8.4	8.9
11	Luxembourg	8.5	11	8	0.25	9.1	7.1	8.1	8.9
12	Hong Kong	8.4	12	11	0.17	9.1	7.3	8.1	8.7
13	Iceland	8.3	13	8	0.27	9.5	7.1	7.8	8.7
14	Germany	8.0	14	10	0.18	9.1	7.1	7.8	8.4
14	Japan	8.0	14	12	0.27	9.1	5.7	7.6	8.5
16	Austria	7.8	16	10	0.24	8.9	6.7	7.4	8.2

(Source: TI 2011)

The credibility problem could be overcome by only allowing the buying of carbon credits from selected countries, such as the highly ranked countries in Table 9-1. However, the problems of losing government revenue and of dissipating CPRS's role to promote renewable generation still exist.

9.3 Mineral resource rent tax supplementing the CPRS

This section discusses how the mineral resource rent tax (MRRT) is necessary to supplement the CPRS as the CPRS fails to address or causes the following two maladaptations to climate change:

- exporting fossil fuels; and
- exporting the additional fossil fuels that CPRS will make uneconomical to burn in Australia

The CPRS will reduce the use of coal for electricity generation in Australia, which is effective for CO_2 emissions reduction in Australia. However this reduction in coal use means that more coal is available for export and unless every coal importing country has similar policy measures to Australia, then the Australian CPRS has only succeeded in switching the location of where the CO_2 is emitted. The switching problem is a maladaptation to climate change and is an unintended consequence of the NEM's adaption to climate change.

In addition to the switching problem there is the increasing use of coal overseas. For instance Bardsley (2011) reports on China's increase use of power and implementing renewable energy but there is also an overall increase in coal use. The amount of coal

Australia burns compared to the amount exported is trivial, so the Australian CPRS in isolation is really just tokenism.

Introducing the MRRT addresses the gap in the CPRS by helping coal importing countries moderate their use of coal and addressing the switching problem. The MRRT is a win for climate change but is also a win for Australia for the following five reasons:

- fossil fuels are finite;
- the temporary resource boom causes capital destruction in other more long term industries;
- MRRT is superior to resource royalties by maximising revenue from the economic rent;
- MRRT may moderate the more destructive mineral exploration, so protect the Australian environment; and
- the revenue from the MRRT provides funds for a sovereign or future fund or capital development.

Fossil fuels are a finite resource, which Shafiee and Topal (2009) estimate depletion time of 35, 107 and 37 years for oil, coal and gas respectively, so it is important for Australia to derive benefit by extracting the maximum economic rent from their sale over their short life. Shafiee and Topal's (2009) estimated depletion time for gas may have to be revised given the recent CSG discoveries. Additionally, many of the shareholders of resources companies are foreign, so the profits go overseas, which compounds the requirement to extract the maximum economic rent for Australia. In particular, China's managed exchange rate has enabled China to build up huge foreign reserves, which can be used to buy Australian resources companies, so China can obtain most of the economic rent. AAP (2011) reports on China's 'resource imperialism' as a risk for Australia and that the state of China is not playing by the same short term gains of the capitalist society and it is naïve to assume everything is fine. This sentiment is echoed in Burrell (2011) who quotes the Premier of Western Australia after the sale of Premier Coal to China *"From the state's point of view, the Premier Coal project is the major supplier of coal to the state-owned coal power stations, … That contract will continue, but we do have some concerns about security of supply and what this means for the long term."* A MRRT would help conserve and maintain mineral resources as a strategic asset.

The resources boom is causing a high and volatile exchange rate for Australia. According to traditional economic theory, the economy adjusts to the high exchange rate by people switching employment from declining areas of the economy, such as tourism and manufacturing, into the mining sector. However Keen (2011) discusses this simple switching of employment or economic restructuring as a free trade fallacy because there is an associated cost of the capital destruction in manufacturing and tourism, as the capital loses value and falls into disrepair. Furthermore Lamont (2011) comments that the economic restructuring could possibly be justified if mining was a permanent way of life but resource booms bust and mineral resources are finite. Lamont (2011) recommends the MRRT as a way to moderate exchange rate fluctuations and ameliorate the capital destruction effect in the manufacturing and tourism sectors.

An explanation of the prisoner's dilemma as a model of cooperation and conflict is introduced because the dilemma captures the cooperation and conflict aspects of the MRRT at both the interstate and international levels. The classic dilemma centres around two isolated unconvicted prisoners guilty of the same crime but the police are unable to convict either prisoner. If both prisoners remain silent, they both received relatively short sentences. If either prisoner confesses to convict the other prisoner, they walk free and the other prisoner receives a very long sentence. If they both confess to convict one another, both receive a medium sentence. Assuming a one off situation and that both prisoners behave selfishly, both prisoners confess to convict one another. But if the situation is repeated and the prisoners can communicate, the outcome would favour cooperation. The analogy between the prisoner's dilemma and MRRT is that cooperation between governments leads to higher revenue and selfishness between governments leads to poorer revenues but there is always the incentive to cheat on any MRRT agreement.

Henry (2009, p. xvii) considers tax on the following four items the most robust and efficient taxes:

- personal income;
- business income;
- private consumption; and
- economic rent from land and resources – (MRRT).

Henry (2009, p. xvii) recommends that resource royalties be replaced by the MRRT. In agreement, Verrender (2011) discusses how the state based royalty system is antiquated and inefficient and how inconsistencies in state and federal taxation cause investment misallocation and where investors can play one state off against another undermining taxation efforts. Additionally, Taylor (2011) discusses how the states undermine the Federal Governments tax revenue. Replacing the state based royalties and federal tax on minerals with a MRRT, which the state and Federal Governments could share, would help maximise tax revenue from economic rent and avoid these prisoner's dilemma scenarios. However, Henry (2009, p. xvii) concedes that the revenue from MRRT will be more volatile than from the existing resource royalties, which the MRRT will replace.

The resource boom has generated exploration of gas from new sources such as coal seam gas. For instance Roberts (2011) reports on a claim from Santos that the only way to meet the surge in demand for gas are unconventional methods such as coal seam gas extraction. But Klan (2011) discusses how the process of extracting coal seam gas damages the aquifers and uses a carcinogenic mixture of *benzene, toluene, ethyl-benzene and xylenes* (BTEX) to aid the cracking of the aquifers to release the gas in a process called fracking. Darling (2011b), the Queensland Minster of the Environment, discusses the results of an investigation into the carcinogenic contaminants formaldehyde and thiocyanate found in aquifers near a Kingaroy site using the coal seam gas extracting chemical where the contaminates were most likely the results of agricultural practices, as such, there is some uncertainty over the possible contamination that may be caused by coal seam gas extraction. A resource boom is short lived compared to the aquifers, which if left uncontaminated and managed could provide Australia with a permanent source of water and given the projected decreases in rainfall these aquifers become more important. The MRRT would moderate this extreme form of exploration, so help to preserve the aquifers and coal seam gas until a less toxic and damaging technique is developed to remove the gas. The ABC (2011b) reports on moves by the Western Australian Government to introduce legislation to require public disclosure of environmental management reports for fracking projects and the Queensland Minister of the Environment (Darling 2011a) announced a ban on BTEX, so there appears some adaption to moderate the potential harm from this process.

Norway and Chile are mineral resource rich countries that have successfully implemented a MRRT to provide reserves of foreign exchange in a sovereign or future fund. However, Hepworth (2011c) reports the second biggest mining company in the world called Vale is warning that new mining investments in Australia are at risk because of the CPRS and MRRT and alternative countries for investment will be sort. This situation is another prisoner's dilemma scenario where there is the potential for Australia to promote the MRRT internationally through an organisation of mineral exporting countries. An international MRRT would help moderate bubbles, CO_2 emissions and increase government revenues for mineral exporting countries.

9.4 Renewable energy targets

Table 6-1 shows the renewable energy targets (RET) that are the required GWh of renewable source electricity legislated by the Australian Government (2011) in the *Renewable Energy (Electricity) Act 2000.*

The objects of this Act are:

(a) to encourage the additional generation of electricity from renewable sources; and
(b) to reduce emissions of greenhouse gases in the electricity sector; and
(c) to ensure that renewable energy sources are ecologically sustainable.

This is done through the issuing of certificates for the generation of electricity using eligible renewable energy sources and requiring certain purchasers (called liable entities) to surrender a specified number of certificates for the electricity that they acquire during a year.

This section discusses each object of the RET legislation for sources of maladaptation in an order that aids clarity of argument.

Object (b) to reduce emissions of greenhouse gases in the electricity sector
Garnaut (2008, p. xxxii) states that *"No useful purpose is served by other policies that have as their rationale the reduction of emissions from sectors covered by the trading scheme [CPRS]. The Mandatory Renewable Energy Target should be phased out."* In an ideal world the phase out of RET is totally warranted but there are at least four considerations that make the use of two policy instruments to address one policy target necessary, being:

- market failure;
- corruption;
- political lobbying; and
- conflict of interest.

The previous section discusses the market failure of EU ETS and that Garnaut (2008, p. xxxii) expects market failure in Australia's response to carbon pricing due to structural problems. The RET would provide a backup policy to achieve carbon emissions reductions when the Australian ETS fails. Garnaut also proposes trading carbon emission abatements internationally. However, if Australia were importing carbon emission abatements from Europe right now, the failure of the European ETS would push down the price of imported carbon emission abatements, which would undermine Australian efforts to reduce carbon emissions and undermine support for developing electricity from renewable energy.

Furthermore, the previous section also discusses the experience of the NZ ETS and the corruption in the UN-backed CER, which would have similar consequences for an Australian ETS as the European ETS market failure described above. Again the RET provides a safety net for renewable energy generators and carbon emission abatement against ETS corruption or contagion from ETS market failure elsewhere.

In addition, Section 6.7 discusses the conflict of interest between state ownership of coal generators and private companies or individuals introducing renewable energy generators, particularly onshore wind generation. Parkinson (2011b) discusses Victorian legislation introduced to restrict new onshore wind generating capacity and block expansions of the interconnectors between SA and Victoria, which will prevent the flow of surplus electricity from SA's wind generators to the rest of the NEM. The RETs provide protection for renewable generators against such politically induced maladaptation.

The coal industry as a political lobby group has fought a long battle with the government over the introduction of the CPRS and MRRT. For instance Orr and Costar (2012) discuss the Australian Electoral Commission's slow disclosure of political lobbying and donations *"More successful were the big miners… The Mining Council of Australia reported $4 million and the Association of Mining Export Companies $2.2 million. But this was just the tail-end of the anti-mining tax campaign, the bulk of which (over $22 million more in advertising) had been spent in the previous financial year and helped bring down Rudd's prime ministership."* This slow disclosure is a flaw in the electoral process that undermines the democratic process and is a source of maladaptation to climate change. Orr and Costar (2012) call for a real time disclosure of political lobbying and donations via a publically accessible website among other measures to remedy the situation. These measures would address this source of maladaptation.

There is no doubt that the coal lobby group will try to water down the CPRS once the ETS is introduced. The mining industry has the wealth to instigate further national advertising campaigns against the CPRS and MRRT. The renewable energy sector is fragmented and small in comparison. The RET protects the renewable energy sector in case the coal lobby is successful in undermining the CPRS.

CoAG (2009) proposes a *"review of the operation of the RET scheme will be undertaken in 2014 to coincide with the review of the CPRS so that the review of RATE [RET-affected, trade-exposed] assistance can be conducted in parallel with the planned review of assistance for EITE [emissions-intensive, trade-exposed] industries."* This CoAG review of the RET and the CPRS is an area of policy uncertainty. Intense pressure from the coal industry could see the CPRS watered down and the RET expire, which would hamper the development of renewable generation.

Object (c) to ensure that renewable energy sources are ecologically sustainable
The CPRS in isolation would fail to meet this object for two reasons, the import of cheap carbon emission abatement credits and the substitution of gas for coal as a source of energy.

Object (a) to encourage the additional generation of electricity from renewable sources
This object uses the plural of source but so far the RET has reinforced the first mover advantage of onshore wind and solar PV generation. There lacks a mechanism to develop a portfolio of generator technologies and energy sources to reduce risk of supply. For instance, Ball et al. (2011) discuss how historically Australia's ample supply of coal has underpinned its power system but competing countries have used a variety of different energy sources and, as a result of this diversity, many have a more resilient power system to provide future electrical power.

However, given the policy uncertainty surrounding CPRS, the requirement for a broader portfolio of energy generation and the first mover advantage of onshore wind and small scale solar PV, a more selective RET that allocated targets to specific renewable energy generation and size would help reduce policy uncertainty and expand the portfolio of energy to better meet the original intent of the legislation '*to encourage the additional generation of electricity from renewable source**s***'.

For instance, a selective RET for solar thermal and large scale PV would help address the failure of the Solar Dawn Project and the Moree Solar Project to strike power purchase agreements, which are a necessary pre-requisite to obtain finance from the banks (Parkinson 2011a). A selective RET would require some coordination to ensure that the renewable energy generator could be commercial deployed.

Rather than using the RET, Garnaut (2008, p. xxiii) suggests addressing the expected market failure in carbon pricing with policies on research, development and commercialisation of new technologies. The Moree Solar and Solar Dawn Projects' failure to achieve a power purchase agreement show that the current research, development and commercialization policies are insufficient without a more selective RET based on energy technology and size. Additionally, there is a requirement to improve power purchases agreements (PPA) processes to finalise a project. Sections 12.3.1 and 12.3.2 further discuss RET and PPA, respectively.

9.5 Smart Grids

"A Smart Grid is an electricity network that can intelligently integrate the actions of all users connected to it - generators, consumers and those that do both – in order to efficiently deliver sustainable, economic and secure electricity supplies." (Smart Grids 2011)

This section discusses smart grids to provide climate change adaption indicators for use in section 4.4 to test a proposition regarding the institutional structure best suited to adapt to climate change. Smart Grid (2011) considers seven components comprise a smart grid:

- the smart grid;
- the smart house;
- renewable energy;
- consumer engagement;
- operations centres;
- distributed intelligence; and
- plug-in vehicles.

There is a need for a number of climate change adaption indicators to measure all seven components. Additionally, some of these components are dependent on another component, so a plan to manage the implementation of a smart grid is required. For instance the Korea Smart Grid Institute (KSGI 2011) manages the Korean government's smart grid road map shown in Table 9-2 and uses the interrelating components in its definition of a smart grid:

1) **Smart Power Grid**
Open power grids will be built to allow various kinds of interconnections between consumption and supply sources. The roll-out of such networks will pave the way for new business models, and the building of a power grid malfunction and automatic recovery system that will ensure a reliable and high quality power supply.

2) **Smart Consumer**
It aims to encourage consumers to save energy by using real-time information and producing smart home appliances that operate in response to electric utility rates.

3) **Smart Transportation**
It aims to build a nationwide charging infrastructure that will allow electric vehicles to be charged anywhere. It also establishes a V2G (Vehicle to Grid) system where the batteries of electric vehicles are charged during off-peak times while the resale of surplus electricity takes place during peak times.

4) **Smart Renewable**

It aims to build a smart renewable energy power generation complex across the nation by rolling out microgrids. This will ultimately lead to the emergence of houses, buildings, and villages which can achieve energy self-sufficiency through the deployment of small-scale renewable energy generation units in every end-user premise.

5) **Smart Electricity Service**

With the launch of a variety of energy-saving electricity rate plans, this service aims to improve consumers' right-to-choose by satisfying their different needs. In addition, it wants to deliver a wide array of added electricity services through the marriage of electricity and ICT, and to put in place real-time electricity trading system for the transactions of electricity and derivatives.

Table 9-2 South Korea's Smart Grid Roadmap

Implementation Directions by Phase	First Stage (2010~2012) 'Construction and operation of the Smart Grid Test-bed' (Technical validation)	Second Stage (2012~2020) 'Expansion into metropolitan areas' (Intelligent consumers)	Third Stage (2021~2030) 'Completion of a nationwide power grid' (Intelligent power grid)
Smart Power Grid	- Real-time power grid monitoring - Digital power transmission - Operate optimal distribution system	- Predict possible failures in power grids - Connect the power system with that of other countries - Connect the power delivery system with distributed generation and power storage devices	- Self-recovery of power grids - Operate an integrated energy Smart Grid
Smart Consumer	- Power management of intelligent homes - Various choices for consumers including rates	- Smart power management of buildings/factories - Encourage consumers' power production	- Zero energy homes/buildings
Smart Transportation	- Build & test electric vehicle charging facilities - Operate electric vehicles as a pilot project	- Expand electric vehicle charging facilities across the nation - Effective maintenance and management of electric vehicles	- Make the presence of charging facilities commonly available - Diversify charging methods - Utilize portable power storage devices
Smart Renewable	- Operate microgrids by connecting distributed generation, power storage devices and electric vehicles - Expanded utilization of power storage devices and distributed generation	- Optimal operation of the power system with microgrids - Expand the application of power storage devices	- Make renewable energy universally available
Smart Electricity Service	- Consumers' choice of electricity rates - Consumers' selling of renewable energy	- Promote transactions of electrical power derivatives - Implement real-time pricing system nationwide - Emergence of voluntary market participants	- Promote various types of electrical power transactions - Promote convergence for the market of electricity-based sectors - Lead the power market in Northeast Asia

(Source: KSGI 2011)

KSGI (2011) discusses a 'test-bed' funding of a total of 64.5 billion won, which will be invested between 2009 and 2013 on Jeju Island in the first stage of the roadmap. Jeju is located off the most southerly tip of Korea. Jeju offers isolations from the mainland grid and offers high levels of solar radiation and wind speeds to test the integration of renewable energy. Additionally, Jeju is a semi-autonomous region, so modifying legislation to accommodate smart grid technology is more readily achieved. Jeju had a population of 531,887 in 2005 and area of 1,848 km^2, so the test-bed is of significant dimensions. The second stage of the roadmap is a rollout of smart grid technology to the mainland's metropolitan areas and the third stage to the remainder of South Korea. The monopoly ownership of both transmission and distribution by the Korean Electric Power Company (KEPCO) allows an easily coordinated deployment of smart grid technology. Korea is leading the world in an integrated approach to deployment of smart grid technology. A report by KSGI on the first stage of the deployment is due out in May 2013 in the Korean language.

The International Energy Agency (IEA 2011b) also recognises the importance of energy efficiency, decentralised energy or distributed generation, renewable heat and thermal storage (BLUE Map scenario) to improve demand flexibility, while real-time pricing and dynamic communication with smart energy networks to accommodate an increased share of intermittent renewable electricity, helping to reduce the need for expensive electricity storage.

Seoul and South Korea are also good examples of decentralised energy and innovation. For example, the Seoul Metropolitan decentralised energy network is the third largest decentralised energy network in the world supplying electricity and thermal heating and cooling to more than 1 million households and nearly 2,000 customers of commercial and public buildings across a 1,500km network. Innovation includes the development of double lift heat fired absorption chillers using the district heating network and the utilisation of LNG.

Italy is the world leader in deployment of smart meters, where the former state owned monopoly utility called *E*nte *N*azionale per l'*E*nergia e*L*ettrica (Enel 2011) deployed 33 million smart meters over a five year period from 2001.

However more recently in Australia, the Prime Minister et al. (Gillard et al. 2010) announced a $100 million funding agreement for the 'Smart Grid, Smart City' program. The CSIRO (2010a) discuss how 'Smart Grid, Smart City' *"will deploy a live, integrated, commercial size smart grid in the Newcastle area, with parts of the trial also conducted in Newington, Sydney's central business district (CBD), Ku-ring-gai and Scone, NSW"*. The results of this test bed will be available to other electricity companies to enable a piecemeal national rollout of smart grid technology. Smart Grid Australia (SGA 2011) discusses the importance of R&D conducted in parallel with these test installations to better inform the national rollout.

The following section further discusses the relationship between monopoly ownership and climate change performance outcomes. Smart Grid (2011) and KSGI (2011) in Table 9-2 provide a list of potential climate change adaption indicators, which section 4.4 further discusses. Potential indicators include:

- roadmap;
- real time power grid monitoring;
- digital power transmission;
- smart meters and home management systems;
- smart appliances;

- consumer choice over dynamic pricing;
- plug-in electric vehicles and infrastructure;
- power storage;
- renewable energy penetration and integration;
- home power generation / Feed-in tariffs;
- consumer engagement / time of use programs;
- self-healing grid; and
- improving visualisation of grid and sharing of information.

9.6 Institutional complexity and the NEM grid as a natural monopoly

Chapters 4 and 6 find institutional fragmentation induced maladaptation to climate change particularly present in transmission and distribution. The more detailed analysis in the previous sections finds that fragmentation induced maladaptation is apparent in the feed-in tariff, CPRS with MRRT and smart grid. These three sources of fragmentation induced maladaptation contribute directly or indirectly to maladaptation of the transmission and distribution networks.

Regarding political fragmentation, REN21 (2011, p. 52) groups Australia, Canada and the US together as unique amongst other countries in their response to climate change being state or province based rather than national. Section 2.3 also discusses state based ownership of transmission and distribution as a cause of fragmentation maladaptation. This fragmentation induced maladaptation becomes apparent when facing a major challenge such as adaption to climate change, which requires numerous simultaneous changes to the grid to accommodate renewables and smart grid technologies. For instance the California Energy Commission (CEC 2009, p. 5) states *"major regional transmission projects that involve multiple jurisdictions and utilities and are needed for integrating remote resources, reducing costs, improving market operations, providing long term strategic benefits and improving operating flexibility, don't have a clear path forward."* As, simultaneously coordinating changes across a grid, can affect all the owners in different ways, then meeting the vested interest of multiple owners quickly becomes an intractable problem. Garnaut (2008, p. 446) describes transmission as a market failure requiring attention. AEMC (2011b, p. iv) proposes a single national co-ordinating transmission network service provider (TNSP) to manage the planning of all transmission assets in the NEM and a NEM wide transmission business to manage locational marginal pricing for generators (AEMC 2011b, pp. iii-iv). These two companies could partially address the fragmentation maladaptation by transforming the NEM's transmission into a pseudo monopoly. However the proposal adds yet another two companies operating in NEM adding to the complexity. Garnaut (2008, p. 446) discuss the public good aspects of interconnectors.

- Public goods—Infrastructure that is a pure public good (that is, non-rival and non-excludable) may be underprovided because the infrastructure provider is unable to capture the full benefits of its investment.

- Natural monopoly—Where infrastructure is best provided by a single firm, the firm may, without competition or regulation, underprovide and overcharge for use of the infrastructure.

The whole of the transmission and distribution in Korea is treated as a public good and forms a single natural monopoly called KEPCO, but KEPCO also owns most of the generation in Korea, which is not a natural monopoly. As discussed, Korea's response to climate change has been much faster than Australia, so the proposition that Australia's slow response is caused by institutional fragmentation will be discussed further in section 4.4.

What follows is a comparison between the Korean and Australian transmission and distribution. Table 9-3 shows the size of the Korean transmission system with a total transmission length of 30,676 km operated by KEPCO. In comparison six transmission companies in the NEM operate just over 40,000 km of transmission (Grid Australia 2011). In addition the NEM also has some privately owned interconnectors.

Table 9-3 Size of the South Korean transmission system

Branches	Line length (km)			Supports (unit)		
	Overhead	Underground	Total	Steel towers	Other	Total
765 kV	835	0	835	902	0	902
345 kV	8,326	254	8,580	11,176	13	11,189
154 kV	18,249	2,528	20,777	26,703	406	27,109
66 kV	252	1	253	610	384	994
180 kV HVDC	29	202	231	0	617	617
Total	27,691	2,985	30,676	39,391	1,420	40,811

(Source: KEPCO 2011 Transmission)

Table 9-4 shows the size of the Korean distribution system with a total line length of 428,259 km in 2010. Business Wire (2010) reports that KEPCO is South Korea's sole power distributor, serving 13 million households.

Table 9-4 Size of the South Korean distribution system

Year	Length (km)	Transformers	Supports
2010	428,259	101,692	8,343
2009	420,257	99,629	8,218
2008	410,014	96,865	8,052
2007	401,485	92,964	7,895
2006	393,304	88,266	7,608

(Source: KEPCO 2011 Distribution)

In comparison the NEM serves 8 million end users (AEMO 2011g) with thirteen distribution companies as shown in Table 9-5.

Table 9-5 Distribution and transmission companies operating in the NEM

State	Distribution Companies	Transmission Companies
NSW	3	2
VIC	5	1
QLD	2	1
SA	1	1
TAS	1	1
ACT	1	0
Total	**13**	**6**

(Source: EUAA 2011)

Furthermore, Australia, Canada and the US have state or province base policy responses to climate change (REN21 2011, p. 52), which provides these counties with similar institutional fragmentation problems. Table 9-6 compares the electricity consumption and production in kWh and GDP for Australia, Canada, US and South Korea. GDP is given in purchasing power parity (PPP) equivalent in millions of US dollars.

Table 9-6 International fragmentation comparison - raw data

Raw data	Australia	Canada	US	South Korea
Consumption (GWh)	225,400	549,500	3,741,000	402,000
Production (GWh)	232,000	604,400	3,953,000	417,300
GDP (PPP US$ millions)	882,400	1,330,000	14,660,000	1,459,000
States or Provinces	8	13	51	1

(Source: CIA 2011)

Table 9-7 is the electricity consumption and production and GDP in Table 9-6 divided by the number of political entities in the country that is state, province or territory.

Table 9-7 International fragmentation comparison per political entity

Per political entity	Australia	Canada	US	South Korea
Consumption (GWh)	28,175	42,269	73,353	402,000
Production (GWh)	29,000	46,492	77,510	417,300
GDP (PPP US$ millions)	110,300	102,308	287,451	1,459,000

Table 9-7 shows that Australia has the smallest amount of power administered by a political entity, which means even in comparison with the other fragmented countries, Australia has more political overhead per unit of electricity consumed or produced. As for GDP per political entity, Australia and Canada appear comparable in that each political entity administers about one third the GDP per political entity in the US. This high political overhead per unit of electricity and low GDP per political entity corresponds with the slow response to climate change for each political entity in Australia. Australia is the most fragmented of the fragmented group of three countries, where there is duplication of effort over relatively little electricity with relatively few resources.

These fragmentation or coordination and planning problems in NEM are recognised by the MCE and by the establishment of the AEMO and AEMC and the numerous reports addressing coordination problems. However, the AEMC (2010) role is *"to be the rule maker for national energy markets … [AEMC's] key responsibilities are to consider rule change proposals, conduct energy market reviews and provide policy advice"* AEMC (2009, p. viii) comments on their terms of reference *"MCE does not anticipate that this review will result in fundamental revision of market design …"*. So, recommending a rationalisation and amalgamation of the ownership of transmission and distribution would be beyond the scope of the AEMC's brief. Hence, there appears no obvious mechanism in Australia to achieve the rationalisation that has occurred in South Korea to transmission and distribution, which was the product of the Japanese occupation followed by a series of military dictatorships. In contrast each state within Australia in isolation developed transmission and distribution systems, which were natural monopolies. However these once independent systems are now linked producing one natural monopoly with multiple owners. In agreement, Stevens (2008, p. 24) recognises that there are strategic national planning problems to meet climate change due to the diverse ownership, particularly in the electricity sector, which may require government intervention to achieve desired outcomes. For instance, South East Queensland Water (SEQWater 2011) and SEQ Water Grid (2011) provide an example of government intervention promoting rationalisation following the linking of once independent natural monopolies.

Following the water reforms, the Queensland Minister for Energy and Water (Robertson 2011a) discusses the approval of a new Workforce Framework to protect the rights of staff being moved between councils and SEQ distributor-retailers. The framework's principles reassured workers that labour savings was not the driver for the SEQ water reforms. The framework protects the rights of workers for three years. This sort of measure is an important consideration when the word rationalisation is mentioned as people fear the loss of their jobs. This fear would be a source of maladaptation to climate change pending any rationalisation.

In addition the National Broadband Network (NBN 2011) provides an example of a government lead initiative of a natural monopoly to transform Australia's copper telecommunications network into fibre optics. This transformation would become far more logistically challenging if the telecommunications network had a similar fragmented ownership pattern to the NEM. The NEM will undergo similar transformations with the introduction of smart grid technologies, such as real-time measurement and smart metering where both projects would benefit from monopoly purchasing power and reduced coordination costs. Both these technologies can defer investment in transmission and distribution. Smart Grid Australia (2011) suggests that the NBN also provides the means to deliver aspects of smart grid technology.

The use of distributed generation within a smart grid can defer investment in transmission and distribution. To accommodate distributed generation, the NEM is undergoing a transformation from the traditional unidirectional generator-transmission-distribution-consumer model to a distributed and bidirectional model, where a combined transmission and distribution monopoly is better placed to coordinate the transformation. For instance the Korean Smart Grid Institute (2011) discusses Korea's smart grid road map with near completion of the test bed in Jeju Island and with an expected national rollout starting in 2012 for completion in 2030. KEPCO's monopoly transmission and distribution is well suited to accommodate this transformation.

In a further source of maladaptation, Garnaut (2008, p. 452) discusses how the revenue of a distribution businesses is calculated on the value of the asset base, which creates the incentive to build more distribution infrastructure. So, promoting distributed energy is in direct conflict with this arrangement. In agreement, Hepworth (2011b) reports on an Energy Users Association of Australia (EUAA 2011) report, which claims a systematic bias towards inflated forecasts of the capital and operating spending when their tariffs were set. Furthermore, Hepworth (2011b) reports that the most costly increase in consumer electricity bills are in transmission and fossil fuel costs. Hepworth (2011b) reports the Chairman of the Australian Energy Regulator (AER) Andrew Reeve saying how the rules governing the charging for electricity networks had to change.

Regarding an impediment to the NEM adapting to climate change, the traditional role of mergers and acquisitions to enforce capital discipline and rationalise the market is lacking in the NEM's transmission and distribution as the majority of transmission and distribution is held by state owned companies. In contrast, David (2011) discusses acquisition of privately owned transmission companies in the Philippines. The National Grid Corporation of the Philippines (NGCP) has petitioned the Energy Regulatory Commission (ERC) to buy the transmission assets of the Cebu Energy Development Corporation (CEDC) for provisional approval authorising NGCP to acquire the assets of CEDC. However, state ownership in Australia acts as an impediment to this form of rationalisation, so rationalisation would require political inspiration.

In another conflict of interest to defer transmission investment by the introduction of distributed generation is the state ownership of the coal generators where attaching distributed energy to the grid only provides competition for the coal generators. For instance Parkinson (2011b) discusses legislative moves in Victoria to block further onshore wind generation and an interconnector expansion between SA and VIC.

Under the current framework, the AEMC (2009, p. vi) discusses the lack of appropriate mechanism to address the addition of cluster of generators in geographic remote locations where these clusters are primarily onshore wind generation encouraged by the RET. Garnaut (2008, p. 448) also discusses the cluster problem and associated free rider problem. Adopting a monopoly transmission and distribution company would fail to completely solve this cluster problem but does significantly reduce the complexity of the problem.

AEMC (2009, p. vi) expects that the expanded RET and to a lesser extent the CPRS will fundamentally change the utilisation of the network over time both between regions and within regions. These expanded changes to flows are likely to put pressure on the existing framework governing transmission and distribution (AEMC 2009, p. vii). So, AEMC recommends a local price signal for generators adjusted for congestion, as the locational price signal will lead to more efficient decisions. The AEMC (2011b, p. iv) proposal for a single national co-ordinating TNSP to manage transmission planning and a NEM wide transmission business to manage locational marginal pricing for generators (AEMC 2011b, pp. iii-iv) is as close as the AEMC could come within their terms of reference to recommending monopoly ownership of transmission grid.

9.7 Privatisation induced maladaptation and alternatives

This section discusses (DRET 2011a) white paper calling on the privatisation of state owned energy companies. The privatisation of state owned enterprises (SOEs) has potential for maladaptation to climate change in the following ways:

- importing culturally insensitive CEOs to cover the perceived shortage of Australian CEOs to manage the newly privatised energy companies;
- the change in focus from the three-year election cycle to a quarterly business reporting cycle;
- the failure to address fragmentation of a natural monopoly;
- being offered one policy option when there are alternatives to the simple false dichotomy of either state ownership or private ownership;
- selling assets at the tail end of the global financial crisis is poor timing;
- privatised coal generators requiring subsidies to shut down;
- increasing the complexity of smart meter deployment; and
- confusing retail customer churning for market efficiency.

The culturally insensitivity of non-Australian CEOs controlling large natural monopolies is a potential source of maladaptation for the NEM. For instance Oakes (2009) interviews the new CEO of Telstra, David Thodey, about the previous US imported CEO Sol Trujillo. During Trujillo's tenure about $25 billion was wiped from Telstra's market value and customer complaints increased by 300%. News (2007) reports the then Prime Minister John Howard complaining about Trujilo's 30% pay increase of $11 million being an abuse of the capitalist system. Natural monopolies are vulnerable to such abuse and there is little need for restraint for Trujillo with no long term vested interest in Australia's well-being. Additionally, Trujillo was constantly in conflict with the political leaders of Australia over a wide range of issues. In contrast the current Australian CEO's of the NBN and Telstra, Michael Quigley and Thodey just quietly and diplomatically go about their business.

The change from state ownership with a three year election cycle to the free market with quarterly reporting periods promotes short-termism in the energy sector where assets have a life of 40 years or more. The White Paper also claims that private companies are more innovative as a reason for privatisation. The inventiveness and short-termism of the free market is exemplified by Enron who invented numerous techniques to improve quarterly results. Enron was audited by Arthur Anderson who provided Enron with a clean bill of health shortly before Enron's bankruptcy. Given Australia's relative lack of corruption shown in Table 9-1 and lack of experience in dealing with people from such a business culture, there is cause to seriously doubt a role for foreign citizens managing Australia's energy assets or a requirement for a raft of audit legislation to contain inappropriate behaviour.

Additionally, the transfer of ownership from state to private sector fails to address the issue of fragmentation in the NEM, in particular the natural monopoly that is the NEM grid. However, there is the remote possibility of mergers and acquisitions resulting in a single holding company for transmission and distribution but this rationalisation process would be very torturous and wasteful. For instance following Telstra's privatisation and leadership by Trujillo, the retail and network arms of Telstra are being separated to form the NBN and Telstra retail. This experiment in privatisation of a combined network and a retail business provides a tortured and wasteful route to rationalisation of the network as a natural monopoly under government control and the retail business in the private sector.

Furthermore, the White Paper also offers a false dichotomy of either private ownership or state ownership. Banks (2009) calls for policy based on evidence and for policy advice to offer alternatives to help prevent ideology informing policy. There are alternatives to this dichotomy. For instance KEPCO is 51% owned by the South Korean government and the reminder in private hands. This split ownership allows KEPCO to more readily raise capital, which is one of the reasons suggested for privatisation. KEPCO is a world leader in innovation, so the White Paper's innovation argument for 100% privatisation is weak. Another alternative is state and Federal Governments maintain 51% joint ownership of a company that owns all transmission and distribution in the NEM to address fragmentation and fully privatise all generation and retail assets to address conflict of interest issues. There are alternatives to total privatisation that would better address fragmentation and conflict of interest and would be less susceptible to free market failures like Enron. Section 4.4.1 discusses a research question to test the adaption performance of alternative economic structures to climate change.

Selling assets at the tail end of the GFC is poor timing for two reasons:

- the credit contraction reducing the saleable value of the assets; and

- the uncertain economic conditions warranting a discount on the value of the assets.

This uncertainty discount or risk premium induced by the GFC is compounded by the forthcoming introduction of the ETS. This credit contraction and risk premium could be avoided by selling the assets after the global recovery from the GFC and after the ETS establishes some stability.

However, the following issue remains for privatised coal generators. Namely, members of the ageing fleet of coal generators will eventually become uneconomic to run once the ETS comes into effect when the Federal Government will come under pressure to offer compensation, as is currently the case with the brown coal generators in Victoria. This scenario undermines posited gains from privatising the coal generators. Other than reducing conflict of interest to grid access, the gains from privatisation are marginal because the NEM trades via a gross pool market, so coal generators are already subject to an essential feature of market discipline. Government compensation to privatised coal generators to shut down due to the CPRS remains a vex issue.

Furthermore, the introduction of in-house-display equipped smart meters and of dynamic pricing will have a large impact on ameliorating peak demand. The issue over whether retail is privatised detracts from the national roll out of smart meters and the introduction of dynamic pricing. The privatisation of retail and customer churning makes a systematic roll out of smart meters more challenging as the benefits from smart meters are spread amongst four stakeholders: the customer, retailer, distribution operator and transmission operator (WEC 2010). Due to customer churning, the retailers are unable to guarantee returns from the smart meter installations, so installation is usually organised by the distribution operator. However, the stakeholder organising the roll out will determine a suite of smart meter features that benefits itself, leaving out desirable features that benefit the other stakeholders. For instance the roll out of smart meters in Victoria was organised by the distribution operators where the feedback advantages of the smart meters was promulgated to the public to smooth the way for the installations but the in-house-displays became an optional extra to be purchased by the customer. This caused an adverse customer reaction who felt misguided by the distributors. There is a requirement for careful evaluation of smart meter features to ensure that all stakeholders benefit from installation.

Additionally, there is confusion in the literature between retail customer churning and market efficiency. Any relationship between churning and market efficiency will be modest unless the customer has all the available pricing options presented in an unbiased way that can be readily compared. Hence the retail market requires design to ameliorate information asymmetry to harness the full benefit for the customer. A website comparing all the retail pricing options and the ability to swap retail provider on the website would go some way to meeting these requirements. Additionally, an opt-in rather than an opt-out clause for door-to-door sales would reduce biased presentations and reduce unnecessary churning. Sections 3.1 and 3.2 further discuss privatisation of retail and generation and the introduction of smart meters and dynamic pricing, respectively.

9.8 Further criticisms of the CPRS

Chapter 7 discusses how incentives for renewable energy should be structured to engender a robust secure energy infrastructure that will eventually lead to a high penetration of non-intermittent renewable energy infrastructure resilient and adaptable to climate change. This will need to combine the benefits of decentralised energy, centralised energy, renewable electricity, renewable gas and renewable heat infrastructure rather than electricity infrastructure alone with all of its intendant problems going forward into the 21st century.

The current structure of the CPRS will not deliver the desired results above in isolation as discussed in Sections 10.2 and 10.4. Further arguments against the CPRS are the lack of transparent to consumers as it applies to the wholesale price of electricity and so attaches a carbon cost to all forms of energy generation including low carbon natural gas and zero carbon renewable energy. This implies that generators are not really incentivised to reduce their emissions as they can simply pass on the costs through the wholesale market, as their competitors do. This argument is only partially valid. It is true that the CPRS lack transparency as it acts through the market. However, alter the introduction of the CPRS fossil fuel generators have an additional cost to non-fossil generator. This cost imposition relatively incentivises renewable energy and disincentives fossil generators.

Regarding lack of transparency, consumers cannot see the carbon tax on their energy bills so there is no driver or incentive for consumers to implement energy efficiency to switch to lower carbon fuels or generate their own energy. The argument against this lack of transparency is that the carbon price signal contains all the information required to make the optimal decision. However, there are well documented biases that show that people are imperfect optimisers (Bell 2009 sec. 2.1.3.3). Additionally, people have bounded rationality (Simon 1972), so it is perfectly rational to use rule-of-thumb. Tisdell (2013) discusses the implications of bounded rationality within the electricity industry.

As previously discussed, the CPRS is definitely not a standalone solution. The transparency issue is just one more reason to consider compliments to the CRPS, such as, those taken in UK and Germany.

9.9 Further alternatives or compliments to the CPRS

This section describes UK and German schemes that are used in addition to the European CPRS. The section also discusses criticisms of these schemes.

9.9.1 Climate Change Levy in the UK

The Climate Change Levy (CCL) (HMRC 2013) introduced by the Labour Government in the UK in 2001 and extended by the incoming Conservative led Coalition Government to 2023. The CCL applies to non-domestic energy users but was fiscal neutral in that the cost of the CCL was offset by a 0.3% employer’s rate reduction in National Insurance contributions. The residential and transport sectors are exempt from the CCL as are good quality combined heat and power (CHP) and renewable energy.

A reduction of up to 65% (originally 80% on start-up of the CCL) from the CCL may be gained by energy-intensive users provided they sign a Climate Change Agreement which commits the user to specified energy or carbon reduction targets within a specified time period (typically 5 years) which are agreed between the Government and each industry sector having regard to the nature and type of use of energy for each industry sector.

As the CCL is shown on energy bills this also provides a transparent incentive for consumers to implement energy efficiency and switch to CHP and/or renewable energy. Energy companies and a new breed of Energy Services Companies (ESCOs) were also incentivised to provide and finance a wide range of energy services to reduce greenhouse gas emissions.

This funding mechanism for CCL is flawed because it effectively acts as a tax on the poorer households to subsidise the richer households to install energy efficiency equipment. This situation is compound by the link between poorer people being more likely to be in rental accommodation and there lacks incentive for landlord to install energy efficiency equipment. A similar situation is analysed within an Australian context in Bell and Foster (2012) regarding the installation of solar PV and the residential solar PV feed-in tariff. The findings are the requirement for incentive for landlords to install solar PV and a method to split the benefits of the installation between the landlord and the tenant. In contrast, homeowners can and do extend their mortgages to install such equipment. It must be recognised that in the long term installation of solar PV or energy efficiency equipment will benefit everyone by moderating future electricity price rises but the CCL and Australian solar feed-in tariffs are a regressive way to achieve this goal.

9.9.2 Renewable Energy Sources Act in Germany

An alternative approach to reducing emissions and moving towards a renewable energy future is Germany's Renewable Energy Sources Act (EEG). This act became law in 2000 and was amended in 2004, 2009 and 2012. In 2011, around 17% of electricity, 8% of heat and 6% of fuel used in Germany was generated from renewable sources. The 2012 Act set a target to increase the share of renewable energy to 40% by 2020 and to 80% by 2050 with similar targets for greenhouse gas emission reductions.

The three main principles of the EEG are:

- investment protection through guaranteed feed-in tariffs and connection requirements;
- no charge to Germany's public purse; and
- innovation by falling feed-in tariffs (degression of 1% a year)

The innovation by falling feed-in tariff is intended to exert cost pressure on manufacturers leading to technologies becoming more efficient and less costly.

Another outcome of the EEG is to move Germany away from fossil and nuclear fuels and centralised electricity infrastructure towards renewable energy sources and a decentralised electricity infrastructure, taking advantage of decentralised thermal energy networks and renewable gases. The decentralised energy approach generates greater economic benefits than the cost of the EEG through avoided grid network investment and charges and other savings such as reduced environmental impacts and related economic benefits. According to a European Commission study, the net benefit of the EEG exceeds the additional costs of initial investment by 3.2 billion Euros. In addition, the EEG generates more competition, more jobs and more rapid deployment for manufacturing.

Germany now has one of the most expensive domestic electricity prices in world. This situation begs for a more cost effective approach. The EEG has the innate problem of using a calculated feed-in tariff rather than use a more cost effective market determines feed-in tariff. Large scale and residential scale renewable energy requires different methods to develop a market determined feed-in tariff.

Wood and Muller (2012) provide a comprehensive discussion of the use of a feed-in tariff reverse auction for large scale solar PV capacity. A reverse auction involves would-be sellers making lower bids to undercut other bidders to provide a good or service to a buyer. This approach is well suited to developing a portfolio of renewable energy, as discussed in Section 6.12. However, feed-in tariff reverse auctions are unsuitable for small scale solar PV for three reasons: inequity; the transaction costs involved for numerous participants in the auctions; and the logistical cost of maintaining numerous feed-in tariff rates.

Bell and Foster (2012) discuss a market determined feed-in tariff to promote the spread of solar PV and other small scale renewables in the residential sector. Where there is a requirement to establish price signals to enable DSM, such as, the introduction of TOU billing and TOS payments for non-scheduled generators. Together TOU and TOS payments provide appropriate price signals for the diffusion of energy storage technologies, such as batteries, into the NEM. The eventual deployment of EVs, with their large battery storage, could aid DSM if the appropriate TOU and TOS price signals are in place. Without these price signals, EVs will exacerbate the existing peak demand problem in the NEM.