Trading in energy efficiency in Australia: What are the lessons learnt so far?

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Keywords

white certificates, case studies, market evaluation, energy efficiency obligation

Abstract

Since 2009, three energy efficiency obligation schemes have been operating in three states across Australia. As with other schemes operating around the world, the choice of design elements such as the type of target, sectors and fuels covered, and eligible activities differs in many cases across the three schemes. The aim of this paper is to provide an overview of the Australian schemes and review the evidence on their performance as well as explore other lessons from the schemes to date.

We develop a framework to compare the schemes according to specific design elements such as targets, coverage, cost-recovery, eligible energy saving activities, penalties, trading, and banking and borrowing. We assess the schemes according to compliance, sources of energy savings, and price developments. We discuss the data requirements to evaluate the level of 'real' or additional energy savings achieved by the schemes and explain the critical concept of "additionality" of activities in this context.

We conclude that success with white certificate systems in Australia has been mixed to date. Firstly, the compliance rate in NSW was low compared to the other states, leading to penalty payments of over A$7.3 m in 2010. This may be explained by the fact that obligated parties in NSW were allowed to pass through penalties fully in their electricity tariffs. Secondly, differing coverage of sectors and eligible saving activities between the three schemes resulted in significantly varying composition of implemented energy saving activities. As expected, the cheapest and simplest eligible projects in each scheme dominated. Given these findings, one of the most crucial design elements to enhance 'real' savings is the choice of eligible activities and the number of certificates these can create. In addition, the broader regulatory environment of liable parties' compliance design needs to be taken into consideration in order to improve the compliance rate.

Introduction

Energy efficiency obligation schemes have been adopted as a mechanism to encourage energy and emissions reduction investment by a growing number of countries throughout the world. For example, schemes have been implemented in European countries including France and Italy, as well as some states of the USA (RAP, 2012). A number of Australian states have also implemented such schemes, which go under names including 'white certificates',[1] energy efficiency certificate trading, and energy efficiency portfolio standards. The common elements of these schemes are a target; obligated parties that need to contribute to meeting this target; a process for measuring, accrediting, and validating 'energy savings'; and associated enforcement mechanisms. Apart from these common elements, schemes employ a wide range of design elements. The variety of designs reflects, in part, the differing objectives, energy efficiency opportunities, market structures, and other specific features that policy makers face in their respective jurisdictions that mean there is no 'one size fits all' design. For example, policy makers' goals can include improving energy security and

1. 'White' certificates represent the reduction of energy usage; 'green' certificates represent the creation of renewable energy; and 'black' certificates represent the reduction of greenhouse gas emissions.

reliability, reducing peak demand, competitiveness, technology diffusion, or consumer welfare; creating jobs, alleviating fuel poverty, or improving the environment. Schemes can set absolute or relative targets, and cover different forms of energy, types of technology, stages of the energy conversion chain, project sizes, or sectors of the economy. Further, schemes differ in whether they engage in cost recovery (e.g. recycling revenue or regulating price increases), how they penalise infringements, and the methods of accreditation and verification employed in the calculation or estimation of energy use reduction (Bertoldi & Rezessy, 2008). Despite this variety, it is still useful to examine the performance of, and hence draw lessons from, the different schemes to determine if there are clear 'best practice' institutional and operational designs. The aim of this paper is to go beyond existing scheme comparisons such as the work of the Regulatory Assistance Project (RAP, 2012) by reviewing the design elements and experience of using energy obligation schemes in Australia in more depth.

Amidst the attention focussed on Australia's protracted struggle to implement a national emissions trading scheme,[2] it is sometimes forgotten that Australia was a front-runner in emissions-related trading of a different sort: on 1 January 2003, the state of New South Wales implemented the world's first mandatory greenhouse emissions trading scheme, which included (among others) energy efficiency activities for creating emission abatement certificates (Crossley, 2008). In 2009, the energy efficiency portion of the NSW scheme was broken off into a separate, stand-alone scheme. Also in that year, the states of Victoria and South Australia rolled out their own energy efficiency certificate schemes. In 2010, the Prime Minister's Task Group on Energy Efficiency delivered a report to the federal (national) government recommending that the government undertake analysis of the options for implementing an energy efficiency obligation scheme (Commonwealth of Australia, 2010).

The idea for a national scheme was also highlighted in the "Clean Energy Future" climate and energy policy package, which passed the Australian Federal Parliament in November 2011. Here the federal government committed to expediting the development of a national energy savings initiative on the basis of the Task Group's recommendations (Commonwealth of Australia, 2011). These recommendations include integrating and consolidating the existing state-based schemes to remove duplication and simplify the policy environment, as the state-based schemes, while similar, differ in some key areas (Commonwealth of Australia, 2010). To this end, the Australian government convened an Energy Savings Initiative Working Group, which published an interim report in August 2012 (Commonwealth of Australia, 2012) including design and implementation options for a national energy efficiency scheme.[3] This interim report illustrates the broad spectrum of existing energy efficiency policies and measures on Commonwealth level in Australia (see interim report, Figure 1). They range from performance standards to information related instruments such as the requirement to disclose the energy efficiency of residential buildings to demonstration projects e.g. for smart cities. In 2013, the Australian government plans to commence negotiations through the Council of Australian Governments (COAG) with the goal of a national scheme, or harmonised state-based schemes. As such, there is particular policy value in comparing and contrasting the design and performance of the three based schemes to date.

This paper is structured as follows: it firstly describes the design features of the existing energy efficiency schemes in Australia and highlights their key points of difference. It then assesses the performance to date in terms of the compliance of participants, type and composition of implemented activities, and price developments, and finishes with a discussion of lessons learnt and the conclusion.

Overview of schemes

There are three energy efficiency schemes currently operating in the Australian states of New South Wales (NSW), South Australia (SA), and Victoria. Together, these states represent around 64 % of Australia's population and 63 % of its electricity consumption (Australian Bureau of Statistics, 2011; Australian Energy Regulator, 2011). A fourth scheme, the Energy Efficiency Improvement Scheme (EEIS), began in 2013 in the Australian Capital Territory (ACT).

On 1 January 2003, New South Wales implemented one of the world's first operational trading schemes including energy efficiency certificates, the Greenhouse Gas Abatement Scheme (GGAS).[4] Energy efficiency was part of GGAS' broader goal of reducing greenhouse gas (GHG) emissions, which were, at the time, not regulated at the federal level. In expectation of a federal scheme to reduce GHG emissions, making significant portions of GGAS redundant, New South Wales separated the energy efficiency component from GGAS and relaunched it as the Energy Savings Scheme (ESS)[5] on 1 July 2009. While GGAS included the Australian Capital Territory from 1 January 2005 onward, the ESS does not. GGAS ended on 30 July 2012, but the ESS is ongoing.

The energy efficiency schemes in South Australia and Victoria both began on 1 January 2009: South Australia has the Residential Energy Efficiency Scheme (REES),[6] while Victoria has the Victorian Energy Efficiency Target (VEET),[7] though it is marketed to consumers as the Energy Saver Incentive (ESI). The Australian Capital Territory launched its Energy Efficiency Improvement Scheme (EEIS)[8] on 1 January 2013, covering ACT households and businesses (Australian Capital Territory, 2012).

Table 1 summarises the operational timeframe of each scheme. As the EEIS has only recently taken effect, we do not review it in this study.

2. See e.g. (Jones, Twomey, MacGill, & Betz, 2011) for an overview of this process.

3. See http://www.climatechange.gov.au/government/initiatives/energy-savings-initiative.aspx.

4. The scheme was renamed Greenhouse Gas Reduction Scheme in 2007, but continues to be referred to as GGAS.

5. www.ess.nsw.gov.au

6. www.escosa.sa.gov.au/electricity-overview/residential-energy-efficiency-scheme-rees-.aspx

7. www.veet.vic.gov.au

8. www.environment.act.gov.au/energy/energy_efficiency_improvement_scheme_eeis

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POLICY OBJECTIVES

The Australian energy efficiency schemes have broadly similar objectives, though each state defines them somewhat differently.

The ESS' objective is to create a financial incentive to reduce electricity consumption by encouraging energy-saving activities, act as a complementary measure to any national GHG reduction scheme, and reduce the cost of and need for additional energy infrastructure (IPART, 2010).

The REES' goal is to improve residential energy efficiency and reduce GHG emissions, assist households to prepare for increases in energy prices associated with policy responses to GHG emissions, and reduce energy costs for households. In the latter two goals, it lays particular emphasis on helping low-income households (ESCOSA, 2011). REES participants are thus not merely required to reduce energy usage by a certain amount through energy efficiency activities, but also to conduct energy audits for low-income households to determine their potential for efficiency improvements and to provide a minimum proportion of its energy efficiency activities to these households.

The VEET's objective is to reduce GHG emissions, encourage efficient use of energy, and foster investment, employment, and technological development in energy reduction industries (Essential Services Commission, 2011).

ADMINISTRATION AND LEGAL AUTHORITY

Figure 1 depicts the administrative structure of the ESS and VEET in a stylised form. The REES' structure is similar, but differs in that the parties carrying out energy efficiency activities (and energy audits, which are not required in the ESS or VEET) are not accredited to generate certificates. Instead, information about the activities and audits performed is submitted to the REES administrator, who can issue credits in respect of activities performed beyond a party's obligation.

The ESS is administered and regulated by the Independent Pricing and Regulatory Tribunal of New South Wales (IPART),[9] the REES is administered by the Essential Services Commission of South Australia (ESCOSA),[10] and the VEET is administered by the Essential Services Commission (ESC).[11]

All three of the ESS, REES, and VEET allow obligated parties to outsource the implementation of energy efficiency activities to third-party energy service companies (ESCOs), who typically perform the great majority of the energy efficiency activities in each scheme. Applicants are required to demonstrate minimum levels of competency before being accredited or approved to perform particular energy efficiency activities, and are audited regularly.

COVERAGE AND OBLIGATED/ACCREDITED PARTIES

The fuel and sectoral coverage of the scheme determines for which fuels and in which sectors energy savings activities can be implemented to create certificates. The SA REES and VEET cover both electricity and gas use, while the ESS covers only electricity.[12] However, the ESS has the widest sectoral coverage, including the residential, commercial, and industrial sectors, while the REES covers only the residential sector (with the aforementioned focus on households experiencing hardship). The VEET covered only the residential sector during its first phase, 2009–2011, but has been expanded to cover the business sector in its second phase, 2012–2014 (Essential Services Commission, 2011).

The thresholds for obligated parties differs similarly between the scheme: the REES and VEET oblige energy and gas retailers with over 5,000 residential customers to participate, while in NSW all holders of electricity retail licenses (and certain other parties that buy or sell electricity) are liable. Though this leads to a greater number of obligated parties under the ESS (see Table 2), the bulk of the liability in each state falls upon three companies that dominate the electricity and gas retail markets: AGL Energy, Origin Energy, and TRUEnergy (Australian Energy Regulator, 2011).

ENERGY SAVING TARGET

All three energy efficiency schemes set an overall scheme target based on electricity and/or gas sales. In all three schemes the targets are in tonnes of carbon dioxide equivalent (tCO_2-e), though in each case the initial calculation is made in MWh and converted to tCO_2-e using state-specific conversion factors based on the local generation mix.[13] The REES and VEET targets are absolute, while the ESS target is relative and based on the current year sales of electricity of each retailer. The ESS also exempts sales to emissions-intensive trade-exposed industries or activities, which lowers the effective target by 20 %. As an additional target, the REES specifies that 35 % of energy efficiency activities must occur in nominated 'priority' households, which are those experiencing hardship or including e.g. pensioners, and concession card holders (South Australia, 2008). Neither the ESS nor VEET have similar distributional requirements. Table 3 summarises the savings targets in each compliance year (which is in most cases the same as a calendar year; an exception is the ESS 2009 compliance year, which ran from 1 July to 31 December). The VEET reduction in residential electricity consumption compared to the 'business as usual' scenario is estimated to be around 1.3 % (Department of Primary Industries, 2011).

The individual targets for obligated parties correspond to their share in the market. They must meet their individual targets by surrendering certificates that correspond to a putative reduction in emissions or energy usage, or (in the REES) compliance data.

Scheme participants in all three states can either undertake the required energy efficiency activities themselves, have accredited providers conduct activities on their behalf, or buy certificates/credits on the market (Figure 1).

9. For more details on ESS regulations see http://www.ess.nsw.gov.au/How_the_scheme_works/Framework_and_Rules.

10. For more details on REES regulations see http://www.escosa.sa.gov.au/residential-energy-efficiency-scheme-rees/rees-regulatory-documents.aspx.

11. For more details on VEET regulations see https://www.veet.vic.gov.au/Public/Public.aspx?id=Legislation.

12. Whilst it was still part of GGAS the ESS also covered the gas sector; since the separation, the NSW gas sector is not subject to any form of energy efficiency scheme.

13. See e.g. the NSW pool coefficient: http://greenhousegas.nsw.gov.au/benchmark/key_factors.asp. Victorian greenhouse reduction rates are published in the government gazette www.gazette.vic.gov.au.

Table 1. Jurisdiction and operation of energy efficiency schemes in Australia.

Scheme	Jurisdiction	Operation
GGAS	New South Wales and Australian Capital Territory (ACT) [a]	01.01.2003-30.06.2009
ESS	New South Wales	01.07.2009-current
REES	South Australia	01.01.2009-current [b]
VEET / ESI	Victoria	01.01.2009-current [b]
EEIS	Australian Capital Territory	01.01.2013-31.12.2015

[a] *ACT from 01.01.2005*

[b] *Runs in three-year phases: 2009–2011, 2012–2014, etc.*

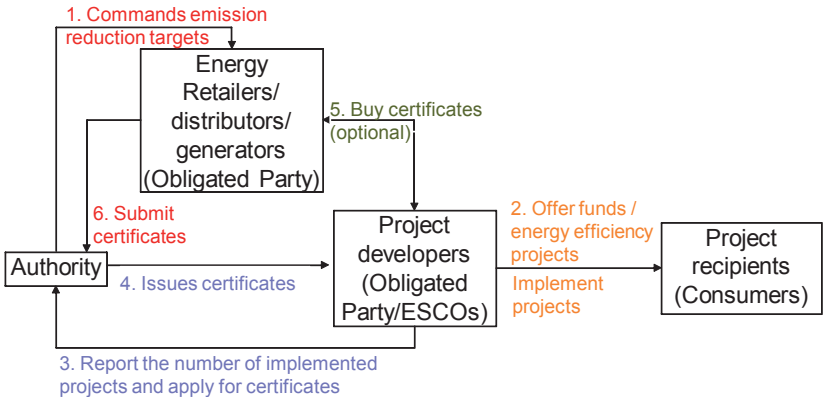

Figure 1. Administrative structure of Australian energy efficiency schemes (stylised). Source: Authors. Note: Details differ between schemes; see text.

The certificates are called Energy Savings Certificates (ESCs) in the ESS, and Victorian Energy Efficiency Certificates (VEECs) in the VEET. Participants in the SA REES instead submit reports on the energy audits and energy efficiency activities they have undertaken to the administrative body, which, after a compliance check, makes a determination on whether the participants are in shortfall of their target or (if requested) receive credits for surplus activities.

ELIGIBLE ENERGY SAVINGS ACTIVITIES AND CALCULATION METHODOLOGY

The number of certificates, or for the REES claimed abatement, is calculated using a baseline and credit approach for all schemes. Crucial to ensuring that the scheme delivers 'additional' activities, therefore, is the calculation of baseline energy consumption: the counterfactual scenario of what would have occurred in the scheme's absence. For example, in a rigorous scheme, the baseline should account for activities to reduce energy usage/emissions that would have been implemented without the scheme; even with the scheme in place, these 'would-have-occurred-anyway' activities do not generate certificates. This requirement is called "additionality". A scheme's measures can be regarded as additional if they effected a change in behaviour that would not have occurred in the scheme's absence. The only scheme in Australia that explicitly mentions additionality in its legislation is the VEET (see Division 2, 15.2 prescribed activities). However, there is no standardised process included to test whether activities fulfil the additionality requirement.

The lack of additionality tests may be due to the fact that counterfactual scenarios are impossible to verify and a case-by-case approach would lead to high transaction costs. Therefore, most energy efficiency schemes use a standardised method with implicit assumptions of additionality to calculate the savings, called an ex-ante approach. The ex-ante approach uses a list of energy efficiency activity types for which it calculates expected or deemed future savings versus business as usual by relying on fixed formulas for energy-efficiency measures; e.g. a given quantity of low-flow showerheads installed in the residential sector will generate a set number of certificates over their lifespan, depending on the flow rate of the showerheads they replace. This approach may also be supplemented by engineering data to more accurately calibrate the 'deeming factor' by establishing the typical difference in energy usage between different technologies or processes. For example, energy-efficient compact fluorescent light bulbs may be tested versus incandescent bulbs to estimate savings over the expected lifespan of the bulbs much more rapidly than measuring household usage. In order to account for changes of the baseline over time, the schemes modify parameters such as the maximum default emissions abatement factor: e.g. the factor for compact fluorescent lamps (CFLs) was lowered from 0.9 to 0.15 in NSW, reflecting lowered expectations that installation of these products was additional. Thus, additionality has been taken into account, but without a standardised process. Table 4 summarises the methodologies and the activities used in each scheme.

The NSW ESS recognises three different methods for claiming the energy savings:[14]

14. New South Wales, 2009. Examples taken from http://www.ess.nsw.gov.au/.

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Table 2. Coverage and obligated/accredited parties to energy efficiency schemes in Australia.

Scheme	Obligated parties & *fuel coverage*	Sectors covered	No. of obligated parties (2012)	No. of accredited providers (2011)
GGAS	All holders of *electricity & gas* retail licenses and certain other parties	Residential, industrial	44	151
ESS	All holders of *electricity* retail licenses; direct retail suppliers; direct customers of NEM	Residential, commercial, industrial	33	75
REES	Companies with over 5,000 residential *electricity and/or gas* customers	Residential	7	NA*
VEET / ESI	Companies with over 5,000 residential *electricity and/or gas* customers	Residential to 2011; Residential and business from 2012	14 (2011)	93

*Sources: GGAS (IPART, 2011a, 2012a); http://www.greenhousegas.nsw.gov.au/benchmark/participant_list.asp, retrieved 03.08.2012 N.B. Scheme now ended. ESS (IPART, 2011b); http://www.ess.nsw.gov.au/For_Liable_Entities/List_of_Liable_Entities retrieved 03.08.2012. REES (ESCOSA, 2011); http://www.escosa.sa.gov.au/residential-energy-efficiency-scheme-rees/rees-obliged-retailers.aspx retrieved 03.08.2012. * Providers are not accredited in the REES.*

Table 3. Energy efficiency savings targets by scheme and compliance year.

Year	ESS		VEET/ESI		REES		
	Percentage of sales	$ktCO_2$-e	Percentage of sales	$ktCO_2$-e	Percentage of sales	$ktCO_2$-e	Audits
2009	0.4%	302	4.0%	2,700	1.7%	155	3,000
2010	1.2%	871	4.1%	2,700	2.5%	235	5,000
2011	2.0%	1,473	4.1%	2,700	3.3%	255	5,000
2012	2.8%	1,887	8.2%	5,400	3.5%	255	5,667
2013	3.6%			5,400		335	5,667
2014	4.0%			5,400		410	5,667

Source: ESS figures show the "effective target" from (IPART, 2010); REES figures from http://www.escosa.sa.gov.au/residential-energy-efficiency-scheme-rees/rees-targets.aspx, retrieved 07.02.12; VEET figures from (Essential Services Commission, 2011). Shaded columns are approximate calculations by the authors on the basis of aggregate demand data and carbon dioxide equivalent intensity indexes from www.aemo.co.au, retrieved 11.03.13.

- The Project Impact Assessment Method (ex-post approach), which is a case-by case approach that calculates the savings based on an engineering assessment of energy consumption of the equipment (e.g. refrigeration units), process, or system (e.g. compressed air systems) before and after the activity is implemented.
- The Metered Baseline Method, which establishes energy consumption over time on a site before any energy saving activities take place, repeats the process afterward, and establishes the difference as the saving. Examples include a line upgrade in a manufacturing plant, or behavioural changes in the way electricity is used in schools or hospitals.
- The Deemed Energy Savings Method, which estimates the typical energy savings for a range of common end-user equipment (e.g. light bulbs, shower heads, appliances), adjusted for the expected life span and usage patterns of that equipment. Under this methodology the energy savings certificates are created upfront, rather than over the life of the activity, which can provide greater incentives to undertake an energy savings activity (if not to continue it after the certificates have been received).

The VEET and REES, by comparison, use only a deemed savings methodology. The VEET also covers commercial lighting and end-user equipment such as televisions, clothes dryers, pool pumps, stand-by power controllers, in-home displays, electric motors, refrigerated display cabinets, and refrigeration fans (Victoria, 2012a).[15]

The greater methodological scope of the ESS is due to its history as a component of the (much larger) GGAS, which necessitated coverage of the industrial sector. The REES and VEET began with coverage of just the residential sector and the VEET has only recently begun to expand to the business sector, both of which can be adequately addressed using only deemed savings. Deeming is often less appropriate for the industrial-scale energy efficiency (and greenhouse gas abatement) activities that GGAS covered. The experience under the then 'Demand Side Abatement Rule' thus imbued the ESS with greater institutional knowledge from its outset, though Victoria has already begun to consider harmonising the VEET with the ESS and we expect it will adopt non-deeming methodologies as it expands to cover the business sector (ESC Victoria, 2012b).

15. See also www.veet.vic.gov.au/Public/Public.aspx?id=VEETActivities.

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Table 4. Energy savings activities and calculation methodologies.

Scheme	Calculation Methodologies	Activities	Additional Factors
ESS	Project Impact Assessment Model (ex-post) Metered Baseline Method (ex-post) Deemed Energy Savings Method (ex-ante)	Commercial and industrial equipment, industrial sites and processes, commercial buildings, lighting and lighting technologies, whitegoods, motor power correction	(Probability of) Installation Discount Factor
REES	Deemed Savings Method (ex-ante)	Residential lighting, shower heads, space conditioning, space heating/cooling, water heaters, fridges and freezers	
VEET / ESI	Deemed Savings Method (ex-ante)	Residential and commercial lighting, shower heads, space conditioning, space heating/cooling, water heaters, fridges and freezers, end-user equipment	Regional factor

Source: (ESC Victoria, 2012a; ESCOSA, 2012a; New South Wales, 2009), www.ess.nsw.gov.au.

While the three schemes are broadly similar in their deeming methodology, each has its idiosyncrasies. Table 5 shows the different requirements for light bulbs and calculates example savings for an identical activity under each scheme. While the minimum requirements are generally the same, the schemes use different variables to calculate the deemed abatement for each product. For example, the ESS includes a discount factor to reflect the probability of installation of the appliance post-delivery, while the VEET adjusts for the region in which the installation occurred.

The inclusion of factors to differentiate between regions is sensible, insofar as regions differ significantly in their greenhouse gas emissions for electricity production as some areas may not be connected to the grid. In Australia, where states are all large – in comparison to Germany, Victoria is ~2/3^{rds} as large, NSW twice as large, and SA almost three times – not all areas with a state are connected to the grid; this may not hold for other countries. Adjusting for the likelihood of installation is also sensible, and allows a better reflection of the real savings being achieved. However, the Installation Discount Factor in NSW is determined based mainly on the likelihood of an installation occurring at all (accounting for e.g. fraud, or the expertise and background of an individual Accredited Certificate Provider), without assessing whether the installation would have occurred without the scheme. Therefore there may be room for improvement by using the factors to reflect the likelihood of installation that is additional, e.g. by monitoring behaviour of peer groups not covered by such a scheme.

TRADING, BANKING, BORROWING, AND PENALTIES

Trading

One of the potential advantages of white certificate schemes is the flexibility to reach the given target across time and participants. While all three of the ESS, REES, and VEET allow liable parties to outsource the implementation of energy efficiency activities to third parties (see Administration and Legal Authority), only the ESS and VEET allow the certificates (ESCs and VEECs, respectively) to be traded, and neither provides an official trading platform. Thus, there is little public information on the volume of certificates traded.

As the REES involves retailers submitting data about energy efficiency activities (rather than certificates), there is no trading of current-year activities. However, if the administrator determines that a retailer has carried out activities in excess of its target, it can issue credits for that excess which can then be traded to other retailers.

Banking and borrowing

Certificates created under the ESS do not expire, and can be 'banked' indefinitely for future use (IPART, 2011b). VEECs expire six years after creation, and can be used at any time during this period (Victoria, 2012b).

Participants in the REES who report an excess of energy audits or energy efficiency activities do not automatically receive 'credits' for these, but must apply to ESCOSA in writing (ESCOSA, 2012). REES credits can be banked indefinitely.

As none of the ESS, VEET, or REES issue certificates or permits that become valid in future years e.g. like cap and trade schemes such as the EU emissions trading schemes, there is no 'borrowing' in the sense that a certificate for year *t* is used to meeting liabilities for year *t-1*. However, the ESS and REES each allow participants to fall short of their targets in a given year by up to 10 % without penalty, so long as the shortfall is carried over and met in the following year (ESCOSA, 2012; IPART, 2011b). The VEET, in contrast, imposes a penalty for any level of shortfall (Victoria, 2012b).

Penalties

The ESS began with a penalty rate of AU$23.03 per tCO_2-e (around €18), which is adjusted yearly to the consumer price index (CPI) and rose to $23.99 per tCO_2-e for 2011 and $24.86 for 2012 (€19 at time of writing). This penalty can be paid instead of submitting certificates, however, unlike purchases of certificates the penalty is not tax deductible; including the goods and services tax (GST), this means the effective ESC ceiling price was AU$34.27 (€26) in 2011, and $35.51 (€27) in 2012 (IPART, 2011b; 2012).

The VEET has a civil "energy efficiency shortfall penalty" of $40 + GST per VEEC i.e. per tCO_2-e, which can be paid instead of submitting certificates (ESC Victoria, 2010). The penalty is indexed yearly to the Melbourne CPI (Victoria, 2012) and was $42.73 (€33) for the 2012 compliance year.[16] As the penalty is

16. https://www.veet.vic.gov.au/Public/Public.aspx?id=AuditandCompliance, retrieved 22/08/2012.

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Table 5. Selected requirements and deemed lifetime emissions savings for light bulbs[a].

	ESS	REES	VEET
Requirements	Lifespan ≥ 10,000h Lumens ≥ 500	Lifespan ≥ 10,000h Minimum lumens, dependent on variables Colour temperature ≤ 3000 Kelvin[b]	Lifespan ≥ 8,000h Lumens ≥ 25/Watt Colour temperature 2700–4000 Kelvin[b]
Variables	Replacement lamp wattage Probability product was installed	Original lamp wattage Directional/Non-directional lamps	Lumen/Watt rating Installation in metropolitan or regional areas
Formula	Default Savings Factor (0.45 MWh) x Installation Discount Factor (1)[c] x Certificate Conversion Factor (1.06)	none	Product abatement factor (0.41) x Regional abatement factor (0.98 or 1.04)
Saving	0.477 tCO2-e	0.43 tCO2-e (directional lamp) 0.18 tCO2-e (non-directional)	0.4019 tCO2-e (metropolitan) 0.4264 tCO2-e (regional)

[a] Replacement of a 53 W halogen lamp with a 15 W CFL, 2,700 K, 1,000 lumens, 10,000 h median lamp life, meeting standard AS/NZS 4847.1:2010 with proof of purchase, delivery, and installation.

[b] Colour temperatures below 3,500 Kelvin are considered "warm".

[c] With proof of purchase and delivery (but not installation) the ESS discount factor falls to 0.9; any further missing documentation reduces the ESS discount factor to 0.0.

Source: Authors, using (ESCOSA, 2012b; New South Wales, 1995, 2009; Victoria, 2012a).

not tax-deductible, the effective ceiling price for VEECs for 2012 is AU$55.55 (€43).

If an obligated party in the REES falls short of either its audit or activities target by more than 10 %, ESCOSA can either require the shortfall be met in the following year or impose a penalty. The payment of the penalty relieves parties of the obligation to perform energy efficiency activities, but not of the obligation to perform energy audits. (i.e. parties have to pay the penalty *and* make good the audit shortfall (ESCOSA, 2012).) The penalty amounts are AU$10,000 (€7,700) for failing to meet a target, plus AU$70 (€54) per tCO_2-e not abated by undertaking energy efficiency activities and AU$500 (€385) per audit for audits not undertaken.

REES penalty revenues collected must be used to assist people who may have missed out on energy efficiency improvements had the scheme participants not had a shortfall, or be used to support other energy efficiency or renewable energy initiatives in South Australian households.

COST RECOVERY

In order to recover the costs of the obligation, retailers will pass through the costs to households by raising their electricity prices. In a fully liberalised electricity market such as the Victorian one, the pass-through costs are not transparent. However, in electricity markets with regulated electricity tariffs such as in New South Wales and South Australia, the pass-through costs are regulated by the pricing authorities. In New South Wales, IPART determined the pass-through rate based on a study by Frontier Economics (Frontier Economics, 2010). Frontier suggested retailers be allowed to pass through the penalty rate (after tax), as the penalty functions as a price cap. They argue that the real costs of EE obligations are difficult to estimate, as they depend on targets and the price of the surrendered certificates. Given the illiquidity and missing transparency of the market, certificate prices are difficult to obtain; prices are also difficult to estimate, as they reflect the costs of overcoming the barriers to energy efficiency. The allowable pass through rates are summarised in Table 6 (AU$1 = €0.80 at time of writing).

Schemes evaluation

To evaluate the performances of the schemes in delivering energy efficiency we assess the compliance of participants, type and composition of implemented activities, and price developments.

COMPLIANCE PERFORMANCE

Table 7 summarises the compliance performance of the ESS, REES, and VEET during 2009–2011. In contrast to most other energy or environmental trading schemes, it was common in Australia for energy efficiency schemes to deliver fewer certificates than targeted. The shortfalls exceeded the allowed shortfall ('borrowing') limits in NSW, leading to substantial penalty payments.

The NSW ESS produced a shortfall in all three years of its operation, ranging from 29,012 certificates in 2010 to 152,300 certificates in 2011; penalty payments peaked at over AU$7 million in 2010.

Interestingly, the companies with the highest shortfall in 2010 were Integral Energy and Country Energy with a total in excess of AU$5 million (Table 8) – both were owned by the NSW government at that time. Note that revenue from penalty payments in NSW flows into the general government budget, and that the full penalty payments after tax can be passed through to consumers by the electricity companies (see Cost Recovery, above). This situation illustrates a potential problem when the parties designing and enforcing market rules are connected with parties active in the market. While we have no evidence to suggest the NSW government designed the ESS penalty rules with this scenario in mind, nor that it influenced Integral Energy or Country Energy to incur these fines or IPART to set the cost recovery in the

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Table 6. Yearly allowable pass through rates for regulated electricity tariffs from state-based EE schemes.

Scheme	2009-10	2010-11	2011-12	2012-13
New South Wales Energy Savings Scheme [A]	(see note B)	0.07 c/kWh (2009–10 dollars)	0.11 c/kWh (2010–11 dollars)	0.146 c/kWh (2010–11 dollars)
South Australia Residential Energy Efficiency Scheme	$10.30 per customer[C] (Dec 2009 dollars)	$2.50 (gas) $12.55 (electricity) per customer[C] (Dec 2010 dollars)	$2.50 (gas) $12.55 (electricity) per customer (Dec 2010 dollars)	none set

[A] Figures for NSW do not include energy losses, which can increase the allowances by between 5–9 per cent depending on the network in question.

[B] Regulated tariffs for the period 1 July 2007–30 June 2010 were determined in June 2007, before the ESS was established. Hence there are no available data on pass-through costs for this period specific to the ESS. However, the predecessor for the NSW ESS, the NSW GGAS, contributed between 0.34c/kWh and 0.36c/kWh to the 2009–10 regulated tariffs. (IPART, 2007)

[C] A REES pass through amount of $13.46 per average residential customer applied from 1 July 2009 to 30 June 2010. Following a review of actual REES costs incurred in 2009 and 2010, the efficient REES costs for those years were determined to be $10.30 per customer. Between August 2010 and January 2011, the REES pass through amount declined to $1.79 per customer, to account for the over recovery of revenue in 2009/10. The efficient REES cost in 2010/11 was determined to be $12.55 per customer. After that there is no specific allowance set, with standing contract prices now allowed to operate within a band set by the Relative Price Movement (RPM) process.

Source: For NSW ESS, (IPART, 2010c) and (Frontier Economics, 2011); for SA REES, (ESCOSA, 2010).

way they did, the ESS penalty rules are structured such that the incentive and possibility for the NSW government to raise extra revenue by stealth exist. Full market privatisation would solve the problem, and this process is currently underway in NSW, but in the interim – or where privatisation of state assets is not desired – quarantining the penalty revenue from general government revenue is another solution. For example, NSW might consider adopting South Australia's practice of using penalty payments to assist people who may have missed out on energy efficiency improvements had the scheme participants not failed to meet their targets, or using them to support other energy efficiency and renewable energy initiatives. This will also ensure that customers who have paid for an energy efficiency scheme through higher bills will at least see some form of energy or greenhouse gas savings implemented.

Though the number of certificates surrendered in Victoria was well below the target and the VEET does not allow borrowing, only one company, Momentum Energy, was issued penalties for a (modest) shortfall. This situation was due to electricity and gas consumption being lower than forecast. In such cases, the VEET may allow compliance deficits to be made up during following years.

In South Australia, the only company issued a shortfall penalty leading to penalty payments was Lumo Energy, who were fined AU$243,750.

PRIMARY SOURCES OF ENERGY SAVINGS

Figure 2 shows the types of energy efficiency activities that have been implemented in the three schemes from 2009–2011. One can observe the importance of 'low-hanging fruit', as a majority of activities in each scheme have been give-away measures such as the free compact fluorescent lamps (CFLs) provided to households in SA and Victoria by a range of retailers and private certificate providers. Lighting activities were similarly popular in NSW under the pre-ESS GGAS scheme (not shown) until 2008, when the maximum default emissions abatement factor for CFLs was reduced from 0.9 to 0.15. This was in response to new energy performance standards which it was thought would remove incandescent lamps from sale by November 2009 thus making further replacement by CFLs non-additional (IPART, 2009).

Residential CFL give-aways in NSW were replaced by shower head give-aways, and in 2011 IPART lowered the default shower head abatement factor because it assessed that the market had reached saturation. It removed shower heads altogether in December 2011. Thereafter, the focus moved to *commercial* lighting, which supplied 47 % of ESCs in 2011 (IPART, 2012).

A further noteworthy development in the ESS is the steady decline of 'End User Equipment' savings, a large proportion of which have come from lighting activities assessed under the Project Impact Assessment Method (PIAM), itself a carry-over from the (industry-focussed) GGAS.

Destruction of pre-1996 fridges (often used as second fridges) has also been very popular in Victoria since the VEET was expanded to include them.

In conclusion, there has been far less diversity in energy efficiency activities than might be expected for an approach intended to facilitate private parties to determine the most appropriate ways to save energy. It is clear that the chosen set of rules for what types of activities are included, and the estimated abatement that they offer, is the key determinant of actual delivered outcomes.

SPOT PRICES AND TRADING

As mentioned above, the markets for energy efficiency certificates in Australia have been dominated by illiquidity and low transparency. Given the design of the schemes, certificate prices should reflect the costs of reducing barriers to energy efficiency activities rather than the costs of the activities themselves. In the two schemes that allow for trading, prices started low and have substantially increased over time, almost reaching the penalty level (which functions as an effective price cap) – see Figures 3 and 4. This may be due to the fact that cheap activities become less available over time as the low-hanging fruit is picked and it becomes more expensive to overcome the barriers of the next level of activities. However, there is also

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the question of whether the markets are competitive, and how companies' ability to pass through costs – e.g. up to the penalty level in NSW – may affect price setting behaviour.

Summary and discussion

The choice of the most appropriate policy instruments to promote energy efficiency has been a topic of debate in many countries in the context of energy security and climate change. The use of energy efficiency obligation schemes (linked with some type of trading option) is one policy mechanism that has been adopted by a number of countries in recent years. This paper has compared the designs and reviewed the experience of the energy efficiency schemes adopted by three Australian state governments since 2009.

The variety of design choices both globally and among the state schemes is, in part, indicative of the experimentation and learning that occurs in the early stages of any new design mechanism, and in time there may be some convergence in the schemes' design elements. However, it is also the case that differences can reflect different priorities of governments and regulators. Further, differing energy efficiency opportunities and industry structures mean that 'one size fit all' schemes may not be desirable or appropriate. The above description of the Australian schemes has illustrated such design differences. These differences in part reflect differences in state priorities, such as the inclusion of audits in South Australia with an emphasis on low income households. Perhaps the most significant difference is the role of the 'market' in NSW and Victoria compared to South Australia. For instance, the low number of obligated parties – only seven – in South Australia is not high enough to make for a competitive market, therefore 'trading' has not been a focus in the design of this scheme.

To date, the general perception among analysts of the Australian state schemes is that they have been, by and large, an effective tool to deliver end user energy savings. The states currently operating schemes are aiming to continue to do so, or to have their schemes rolled into a new national scheme. However, this analysis has shown that the schemes may have not been as effective as planned. One way to assess the effectiveness is to assess compliance performance. The question to be asked is: Did companies comply with their targets?

As explained above, minor penalties have been paid in Victoria and South Australia. However, NSW has levied substantial penalties for non-compliance. What is even more striking is that government-owned companies have not been leading by example in NSW, but were the highest fined companies in 2010. This has led to a tacit transfer of money from households to the NSW government, as households bear the final burden of penalty payments through increased electricity tariffs. In exchange for those transfers households did not receive any energy efficiency measures, since the companies did not implement any activities but simply paid the fine. In order to avoid such distributional effects in the future, the NSW government should ensure that penalty payments are at least used to improve energy efficiency as they are in the South Australian scheme.

Another problem in determining the effectiveness of such schemes is that counting the number of certificates created may not give an adequate picture of the amount of real energy savings. One would need to compare the actual consumption after

Table 7. Compliance performance in Australian energy efficiency schemes by year, 2009–2011.

	ESS ESCs			VEET VEECs			REES Activities			REES Audits		
	2009	2010	2011	2009	2010	2011	2009	2010	2011	2009	2010	2011
Surplus (shortfall) from previous year	0	(139,843)	(29,012)	0	(148,491)	92,361	0	54,989.6	61,308	0	679	2,201
Created /carried out	276,942	764,385	1,086,120	3,724,493	2,365,036	1,914,202	208,335	248,083	200,594	3,674.50	6,527	3,326
Target for t	289,118	858,004	1,414,315	2,700,000	2,700,000	2,700,000	155,000	235,000	255,000	3,000	5,000	5,000
Surrendered /submitted	148,928	651,655	1,063,564	2,547,700 + 3,809	2,940,852	2,570,229	same as creation			same as creation		
Surplus (shortfall) carried forward	(139,843)	(29,012)	(152,300)	(148,491)	92,361	(37,410)	53,335*	68,072.6 ^	6,902^	674.5^	2,206^	527^
Penalties, units	1,997	317,180	251,361	952	0	0	0	0	2,875	0	0	25
Penalties, AU$	$45,989	$7,304,675	$6,029,848	$38,080	0	0	0	0	$221,250	0	0	$22,500

Source: Authors, from (ESC Victoria, 2010, 2011, 2012a; ESCOSA, 2012a; IPART, 2010b, 2011b, 2012b), VEET Register of Energy Efficiency Certificates (https://www.veet.vic.gov.au/Public/PublicRegister/Search.aspx, retrieved on 14/11/2012) and own calculations (noted with ^).

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Table 8. NSW ESS participant energy savings shortfalls by year.

	2010		2011	
	Certificates	**Penalty (AU$)**	**Certificates**	**Penalty (AU$)**
AGL Sales Pty Ltd	37,225	$857,291.00		
Country Energy*	76,918	$1,771,421.54		
Infigen Energy Markets Pty Ltd	2,794	$64,345.82	7,410	$177,757
Integral Energy *	141,010	$3,247,460.00		
Lumo Energy (NSW) Pty Ltd	242	$5,573.26		
Momentum Energy Pty Ltd	7,859	$181,015.00	9,525	$228,493
TRUenergy Pty Ltd	39,135	$901,278.00	196,752	$4,719,844
TRUenergy Yallourn Pty Ltd	11,769	$271,040.00	37,103	$890,056
Total	**316,952**	**$7,299,424**	**250,790**	**$6,016,150**

*Source: (IPART, 2011b, 2012b). *Note: NSW government owned in 2010.*

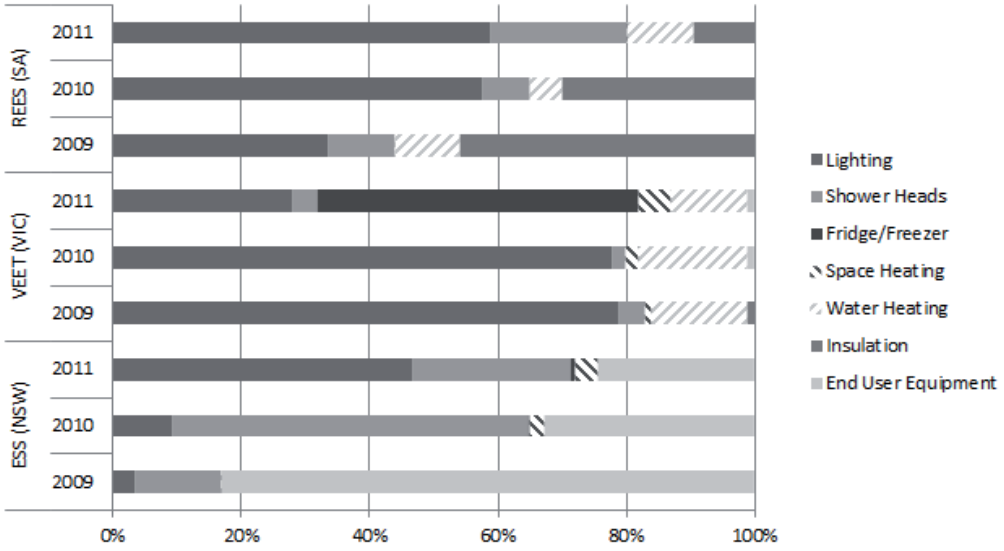

Figure 2. Energy Efficiency Activities (Proportional) by Scheme and Year. Source: Authors, based on data from (ESC Victoria, 2011, 2012c; ESCOSA, 2012a; IPART, 2011b).

the scheme to the reference consumption without the scheme. Hardly any of the schemes provide information on this. Only in the Regulatory Impact Assessment of the VEET one can find information that allows the calculation of around 1.3 % of energy savings in residential electricity consumption in 2009 compared to the 'business as usual' scenario (Department of Primary Industries, 2011)

Determining the actual effectiveness of a scheme is particularly difficult in the case when the 'additionality' of activities has not been assessed carefully. In the Australian energy efficiency schemes, additionality is not explicitly assessed – even though it has been included in the VEET legislation – since they rely mainly on the ex-ante approach using a deemed saving method.

Only sporadic interventions to reflect additionality, e.g. lowering the abatement factor for CFLs, can be reported. The use of deemed saving method reflects the understandable desire to lower the transaction costs of such schemes, but comes at the price of diminishing the integrity of the schemes. The schemes would need to include some ex-post control group measurements to adjust the deemed savings. However, there is often little incentive on either the part of the regulator or regulated entities to make efforts to verify the additionality of deemed savings, the latter being satisfied taking payments for energy efficiency actions that would have occurred anyway, and the former being in a position to state that their scheme is a success and that their claimed targets have been achieved at relatively low costs. The process of developing and updating the lists and factors is crucial to achieve the genuine and lasting energy savings and emissions reduction that are the ultimate goal. A more independent, transparent, detailed, and regularly reviewed approach for this central element to reflect the additionality of activities should be a priority that will greatly improve the effectiveness of such schemes.

Finally, the Australian schemes seem to have been quite efficient, in the sense that the cheapest measures have been implemented. This seems positive at the first glance, given that the schemes aim to use the market to discover the cheapest

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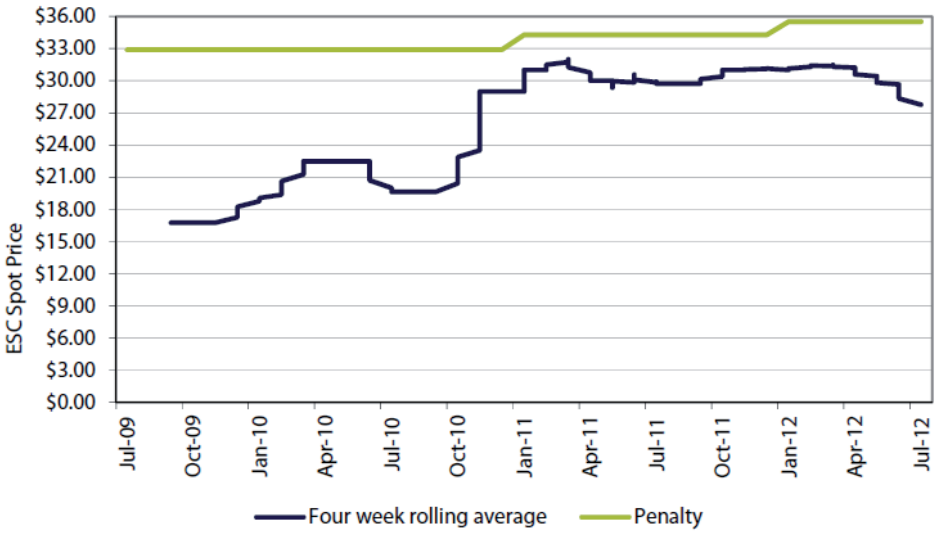

Figure 3. Trends in the NSW EES ESC spot price over the period July 2009 to July 2012. Source: (IPART, 2012, p. 52).

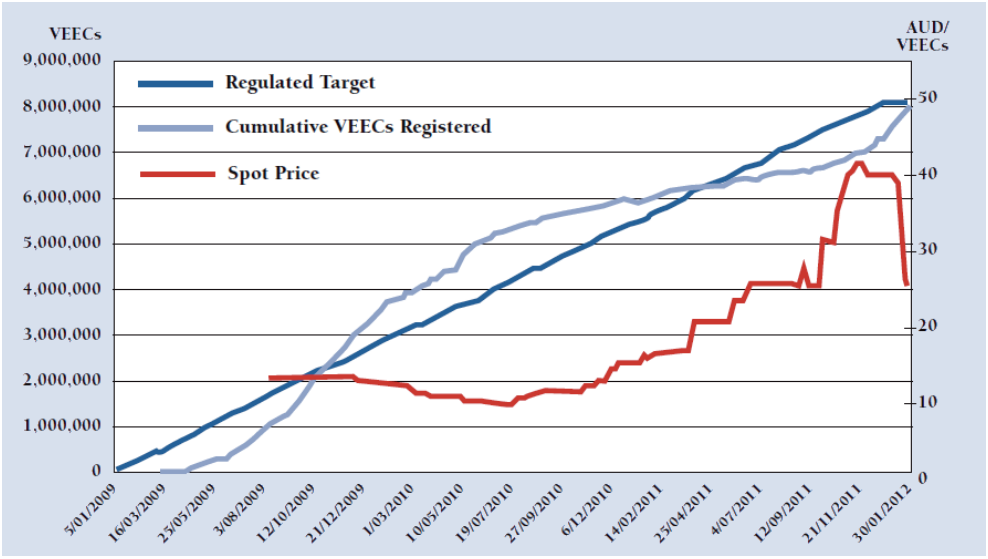

Figure 4. Historic Spot Price vs. Cumulative VEEC Registration 2009–January 2012. Source: (RAP, 2012, p. 26).

activities. However, this only leads to an efficient reduction in energy use overall if those schemes take additionality into account. Otherwise business-as-usual is implemented, costs are passed-through to consumers but no additional savings are achieved. Furthermore, focussing on the lowest-cost options may be a bit short-sighted, as it may lead to a sort of "cream-skimming", whereby only quick and easy activities are taken up – such as lighting and shower heads by neighbourhood door knocking – but larger measures necessary in the long run, such as deep retrofits of buildings, are not implemented. This raises the question for further research into if those schemes could be designed so as to deliver deep-retrofits and other long-lived but more expensive measures or if other policies are necessary. Given the problems of determining additionality it also raises the questions, if there are better approaches of implementing such schemes by rather focusing on a cap on electricity consumption than a baseline and credit approach for energy savings.

References

Australian Bureau of Statistics. (2011). 3101.0 – Australian Demographic Statistics, Jun 2011. Canberra, ACT: Australian Bureau of Statistics. Retrieved from http://www.abs.gov.au/ausstats/abs@.nsf/mf/3101.0.

Australian Energy Regulator. (2011). *State of the Energy Market 2011*. Melbourne, Australia. Retrieved from http://www.accc.gov.au/content/index.phtml/itemId/1021485.

Bertoldi, P., & Rezessy, S. (2008). Tradable white certificate schemes: fundamental concepts. *Energy Efficiency*, *1*(4), 237–255. doi:10.1007/s12053-008-9021-y.

Commonwealth of Australia. (2010). *Report of the Prime Minister's Task Group on Energy Efficiency*. Canberra, ACT.

Commonwealth of Australia. (2011). *Securing a Clean Energy Future*. Canberra, ACT: Commonwealth of Australia.

Commonwealth of Australia. (2012). *Progress Report National Energy Savings Initiative*, Canberra ACT.

Crossley, D. J. (2008). Tradeable energy efficiency certificates in Australia. *Energy Efficiency*, *1*(4), 267–281. doi:10.1007/s12053-008-9018-6.

Department of Primary Industries. (2011). *VEET Regulatory Impact Statement*. Retrieved from http://www.dpi.vic.gov.au/energy/environment-and-community/energy-efficiency/energy-saver-incentive-scheme/veet-ris-part-1-3.

ESC Victoria. (2010). *Victorian Energy Efficiency Target Scheme Performance Report* 2009. Melbourne. Retrieved from https://www.veet.vic.gov.au/Public/Public.aspx?id=Publications.

ESC Victoria. (2011). *Victorian Energy Efficiency Target Scheme Performance Report 2010*. Melbourne. Retrieved from https://www.veet.vic.gov.au/Public/Public.aspx?id=Publications.

ESC Victoria. (2012a). *Victorian Energy Efficiency Target Scheme Performance Report 2011*. Melbourne, Australia. Retrieved from https://www.veet.vic.gov.au/Public/Pub.aspx?id=295.

ESC Victoria. (2012b). ESC Public Forum 22.06.2012 (slides). Energy Services Commission Victoria. Retrieved from https://www.veet.vic.gov.au/Public/Pub.aspx?id=286.

ESC Victoria. (2012c). ESC Public Forum 24.02.2012 (slides). Energy Services Commission Victoria. Retrieved from https://www.veet.vic.gov.au/Public/Pub.aspx?id=263.

ESCOSA. (2010). *2010 Review Of Retail Electricity Standing Contract Price Path; Final Inquiry Report & Final Price Determination*. Adelaide. Retrieved from http://www.escosa.sa.gov.au/library/101208-ElectricityStandingContract-Price-FinalPriceDetermination-PartA.pdf.

ESCOSA. (2011). *Residential Energy Efficiency Scheme Administration of the Scheme in 2010*. Adelaide. Retrieved from http://www.escosa.sa.gov.au/electricity-overview/residential-energy-efficiency-scheme-rees-/rees-annual-reports.aspx.

ESCOSA. (2012a). *REES Annual Report: Administration of the Scheme for Stage 1 2009-2011*. Adelaide. Retrieved from http://www.escosa.sa.gov.au/Publications/DownloadPublication.aspx?id=2191.

ESCOSA. (2012b). Residential Energy Efficiency Scheme Code 04. Energy Services Commission of South Australia. Retrieved from http://www.escosa.sa.gov.au/projects/105/rees-code.aspx.

Frontier Economics. (2011). *Energy costs – annual review for 2011/12 and 2012/13; A final report prepared for IPART*. Retrieved from http://www.ipart.nsw.gov.au.

Frontier Economics. (2010). Energy purchase costs – *A final report prepared for IPART*. Retrieved from www.ipart.nsw.gov.au.

IPART. (2007). *Promoting retail competition and investment in the NSW electricity industry; Regulated electricity retail tariffs and charges for small customers 2007 to 2010*. Sydney. Retrieved from http://www.ipart.nsw.gov.au/files/8dc10897-35f0-4a6e-854e-9f6d00da1ba3/Electricity_Retail_Review_-_Final_report_and_determination_-_Web_version_-_June_2007.pdf.

IPART. (2009). *Compliance and Operation of the NSW Greenhouse Gas Reduction Scheme during 2008*. Sydney. Retrieved from http://www.greenhousegas.nsw.gov.au/documents/syn59.asp.

IPART. (2010a). *Introduction to the Energy Savings Scheme*. Sydney: Independent Pricing and Regulatory Tribunal of New South Wales. Retrieved from http://www.ess.nsw.gov.au/files/51028fae-34be-4714-859c-9f5d012a87c3/Intro-to-ESS.pdf.

IPART. (2010b). *Compliance and Operation of the NSW Energy Savings Scheme during 2009*. Sydney. Retrieved from http://www.ess.nsw.gov.au/files/8adb1e48-3cb0-457d-86c7-9f5e00f8898a/ESS-SchemeReport-2009.pdf.

IPART (2010c). *Review of regulated retail tariffs and charges for electricity 2010-2013.* Sydney. Retrieved from http://www.ipart.nsw.gov.au/Home/Industries/Electricity/Reviews_All/Retail_Pricing/Review_of_regulated_electricity_retail_tariffs_and_charges_for_small_customers_2010_to_2013/18_Mar_2010_-_Final_Determination/Determination_-_Review_of_regulated_retail_tariffs_and_charges_for_electricity_2010_-_2013_-_March_2010.

IPART. (2011a). *Compliance and Operation of the NSW Greenhouse Gas Reduction Scheme during 2010 Report to Minister*. Sydney. Retrieved from http://www.greenhousegas.nsw.gov.au/documents/syn59.asp.

IPART. (2011b). *Compliance and Operation of the NSW Energy Savings Scheme during 2010 Report to Minister*. Sydney. Retrieved from http://www.ess.nsw.gov.au/files/edc85498-353d-4d48-82d6-9fad00e2bd98/ESS-Scheme-Report-2010.pdf.

IPART. (2012a). *Compliance and Operation of the NSW Greenhouse Gas Reduction Scheme during 2011*. Retrieved from http://www.greenhousegas.nsw.gov.au/documents/SchRep11.pdf.

IPART. (2012b). *Compliance and 0peration of the NSW Energy Savings Scheme during 2011*. Sydney. Retrieved from http://www.ess.nsw.gov.au/files/c47ace4e-5d0d-4986-9145-a0f200a94243/ESS-Scheme-Report-2011.pdf.

Jones, M. C., Twomey, P., MacGill, I., & Betz, R. (2011). Australia – Finally a Carbon Pricing Scheme? In J. Peetermans (Ed.), *Greenhouse Gas Market Report 2011* (pp. 2–6). International Emissions Trading Association. Retrieved from http://www.ieta.org/index.php?option=com_content&view=article&id=419:ghg-market-report-2011.

New South Wales Electricity Supply Act 1995 No 94 (1995).

New South Wales Energy Savings Scheme Rule of 2009 (2009). Retrieved from http://www.greenhousegas.nsw.gov.au/Documents/ESSRule.pdf.

RAP. (2012). *Best Practices in Designing and Implementing Energy Efficiency Obligation Schemes*. Retrieved from http://www.ieadsm.org/Files/Tasks/Task XXII – Energy Efficiency Portfolio Standards/Publications/%281%29RAP_IEADSM Best Practices in Designing and Implementing Energy Efficiency Obligation Schemes 2012 June%286%29.pdf.

South Australia Electricity (General) Variation Regulations 2008 Part 1 – Preliminary Part 2AA – Residential Energy Efficiency Scheme (2008).

Victoria Victorian Energy Efficiency Target Regulations 2008. Pub. L. No. S.R. No. 158/2008 (2012). Retrieved from https://www.veet.vic.gov.au/public/Pub.aspx?id=7.

Victoria Victorian Energy Efficiency Target Act 2007 (2012).