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Energy Efficiency Certificate Trading and the NSW Greenhouse Benchmarks scheme

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End-use energy efficiency is a measure of the level of end-use energy services (eg heating, cooling, lighting or motive power) that can be delivered per unit of energy 'consumed'. Energy services and hence efficiency can be difficult to define. Nevertheless, improvements in end-use energy efficiency will play a vital role in any effective and economically efficient response to climate change. Policy intervention is required because many energy efficiency benefits are market externalities, and because there are widespread market failures in end-use decision making – many energy users fail to undertake even cost-effective efficiency options. Unfortunately, there are many complexities and challenges for such policy making. In particular, the ability to improve energy efficiency, and the costs and benefits from doing so, are often spread between many players including infrastructure providers, equipment manufacturers, service providers and owners as well as the actual energy users.

There is growing worldwide interest in market-based policy mechanisms. It is argued that they can offer a 'one size fits all' approach with economic efficiency advantages over regulation. For example, Energy efficiency Certificate Trading (EECT) combines certificates (typically representing one MWh of 'energy savings' from increased efficiency) with market based trading between parties having 'obligations' and other parties creating 'energy savings'. Italy and the UK have introduced limited schemes, while the NSW Greenhouse Benchmarks are a particularly ambitious implementation. In this paper, we first explore the theoretical basis of EECT and some of its key implementation issues. We then consider how EECT might integrate into economy-wide greenhouse emissions trading schemes. Finally, we consider the arrangements for EECT within the NSW Greenhouse Scheme.

Experience with EECT to date is too limited to reveal its 'effectiveness' and 'efficiency' in delivering energy efficiency compared with other policy options, but there are reasons for concern. EECT offers a financial incentive to decision makers who already ignore many cost-effective energy efficiency options. There are the complexities that arise from having to measure, verify, certify, trade and acquit certificates. One of the greatest challenges is proving additionality – that is, energy savings beyond 'business-as-usual'. This requires hypothetical baselines, and these require considerable abstraction. Trading risks the 'market for lemons' problem caused by products whose 'quality' cannot be verified.

It might be expected that EECT would be easily integrated into economy-wide greenhouse emissions trading schemes. However, it is important to distinguish between 'cap and trade' schemes trading physical emissions and 'baseline and credit' schemes trading hypothetical 'emissions reductions'. The latter can incorporate EECT, but face many of the same types of design challenges as EECT. The implementation of the NSW scheme highlights many of the challenges and unresolved questions for EECT schemes. In our view, unfortunately, it fails to adequately address these. It therefore seems unlikely to deliver genuine energy efficiency improvements in a cost-effective manner.

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EXECUTIVE SUMMARY

End-use energy efficiency is a measure of the level of end-use energy services (eg heating, cooling, lighting or motive power) that can be delivered per unit of energy ‘consumed’. Energy services are often qualitative and efficiency can therefore be difficult to define. Nevertheless, it is generally agreed that improvements in end-use energy efficiency will play a critical role in any economically efficient and environmentally effective policy response to climate change.

End-use efficiency improvements offer some of the most cost-effective greenhouse gas emissions reductions available – many technical options have negative abatement costs.[2] They can have additional societal benefits, and the potential scale of improvements is great.[3]

The role of energy efficiency policy

Despite these benefits, policy intervention to promote energy efficiency is required, because:

- many of the benefits are market externalities – that is, their environmental and social ‘value’ are public goods, and
- there is widespread market failure in end-use decision making, as users fail to undertake even cost-effective efficiency options.

While market externalities are important, the greater challenge appears to be in solving existing market failures in decision-making. The reasons for such energy market failures include:

- *a poor understanding* of energy efficiency by key decision makers,
- *little motivation* for many participants facing generally low costs for energy, and
- *institutional barriers* to action for even informed and motivated decision makers.

Adding to these policy challenges are:

- the wide range of energy services,
- diverse equipment and infrastructure, and
- many and varied decision makers involved, and the linkages between their actions.

Coordination between many decision makers is often required to deliver improvements in end-use energy efficiency. This is because the ability to improve energy efficiency, and the costs and benefits associated with doing so, are often spread between many players such as infrastructure providers, equipment manufacturers, service providers and owners as well as end-users. As a result, apparently cost-effective options are often not taken up.

Appropriate policy frameworks

Given all this, there are good reasons to believe that no single policy instrument will suffice to drive optimal levels of energy efficiency across the economy. Many diverse national, regional and local measures are being undertaken worldwide (IEA, 2002a), targeting:

- different aspects of energy efficiency – services, equipment and infrastructure, and
- the range of decision makers involved.

Policy measures to promote energy efficiency can be broadly categorised into (Vine, 2003):

- support mechanisms such as the provision of information and encouragement,
- control or regulatory mechanisms including MEPS (minimum equipment performance standards) and licence conditions, and
- market mechanisms including emissions trading, taxes, tax credits and subsidies that change the energy ‘price’ seen by decision makers for different energy options.

Determining the optimal mix of such policy measures poses a great challenge, particularly given existing failures in decision-making. These offer the potential for ‘win-win’ measures that save money as well as energy. However, they also highlight the difficulties in ‘directing’ decision makers to make appropriate choices.

Energy efficiency in the electricity sector

Like many countries, Australia’s electricity industry is a major and growing contributor to greenhouse emissions (PMSEIC, 2002). The policy challenge for this industry is particularly great for reasons including the wide range of energy services it delivers, and the electrical continuum from power station to end-user that links all participants.

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[2] See IPCC (2001), UNDP (2002) and *SEDA (2002)*.

[3] For example, the recent UK (DTI, 2003) *Energy White Paper* states that “The cheapest, cleanest and safest way of addressing all our goals is to use less energy.” It also estimates that half of the emissions reductions required within the UK by 2020 can come from energy efficiency.

Furthermore, growing worldwide efforts to restructure electricity industries away from vertically integrated monopolies towards market-based competition are now changing the context of policy development for the sector.

One might expect that market based competition might address some of the existing market failures in delivering energy efficiency.[4] Experience to date, however, is mixed. A key issue is that the efficiency of a competitive industry model depends critically on informed buyers. However, the complexity of electricity markets creates particular barriers to informed decision making by end-users, a fact that restructuring has generally ignored.

Market based energy efficiency policies

There has been growing interest in the use of market based energy efficiency mechanisms for the electricity sector. In part, this reflects the industry restructuring now underway. It also follows wider trend in policy development away from 'command and control' technical regulation towards the creation of markets for delivering desired environmental outcomes.

Market based approaches to promoting energy efficiency might seem to offer some economic efficiency advantages over regulation while being compatible with market based electricity industries. However, there are likely limitations to their effectiveness, as evidenced by existing market failures in energy efficiency decision making.

The UK Energy Saving Trust (2002) notes that "Price based mechanisms, in general, will not address the information and consumer related barriers to energy efficiency investment – here regulatory solutions tend to be more effective." Market-based measures actually increase the complexity of electricity market arrangements and related decision making. This complexity may itself be a barrier to efficiency.[5]

[4] Vine (2003) assesses four general industry models from vertically integrated monopoly to full competition against 24 policy and program barriers to greater energy efficiency.

[5] There is certainly a useful role for mechanisms that reduce the transaction costs and effort required to choose optimal levels of energy efficiency. This can be done by taking some energy efficiency decisions at the societal level – for example, legislated building and product standards.

Energy Efficiency Certificate Trading

One market-based policy mechanism of growing interest and attention is energy efficiency certificate trading or EECT (IEA, 2002b). This approach combines energy efficiency certificates (typically representing 1 MWh of 'energy savings' from increased efficiency) with market based trading of these certificates between parties having energy efficiency 'obligations' and other parties creating energy savings.

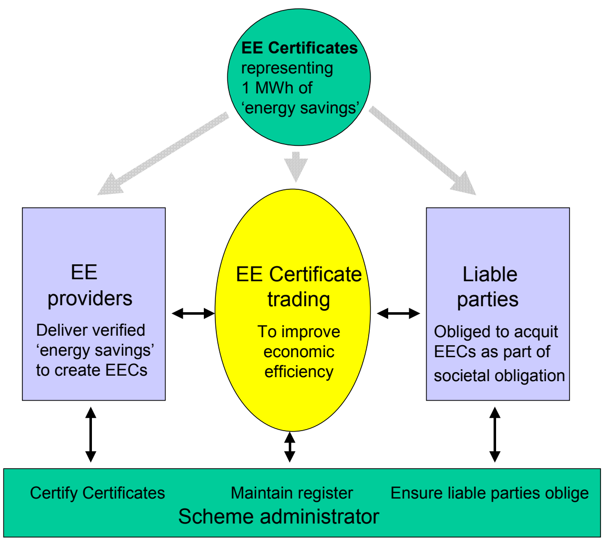
Supply-side certificate schemes for renewable energy such as the Australian MRET (ORER, 2003) have been implemented. Measuring, verifying and certifying 'energy savings' has been undertaken for several decades, from DSM programs by US utilities in the 1980s through to JI and CDM within the Kyoto Protocol.

By contrast, energy efficiency certificate trading is in its infancy. Italy and the UK have implemented limited schemes (IEA, 2002b). Interestingly, the most ambitious plans to date appear to be the recently enacted NSW Greenhouse Benchmarks scheme (IPART, 2003).

In this paper, we first explore the theoretical basis of EECT and some of its key implementation issues. We then consider how EECT might integrate into broader greenhouse emissions trading schemes. Finally, we consider the arrangements for EECT within the NSW Greenhouse Benchmarks Scheme.

EECT scheme design

The underlying design of an EECT scheme is generally as follows.



One perceived advantage for EECT is its delivery of 'measurable' energy efficiency outcomes through certificates. Another is its potential to 'reach' economy-wide to all energy service and end-use technology decision makers. In contrast, many existing programs target specific end-use technologies.

One possible limitation with EECT is the present failure of rational decision making in energy efficiency. EECT offers a financial incentive to decision makers who already ignore many cost-effective efficiency options. There are also the complexities, and hence costs, that arise from having to measure, verify, certify, trade and acquit 'energy savings'.

Measuring energy efficiency:
The key challenge to implementing EECT turns out to be separating 'energy savings' arising from increased energy efficiency from changes in energy consumption due to other causes.

Total energy consumption depends on the type and quantity of end-use energy services being provided as well as the 'efficiency' with which these are delivered. Within the wider economy just about every change –from demographics to economic growth to innovation – all influence desired energy services. Even something as random as the weather can change energy consumption from one year to the next.

Furthermore, decisions on end-use equipment to deliver these services are generally made according to a range of priorities, of which efficiency is only one – if it is considered at all. Complicating matters, technical progress and other drivers may cause consumers to choose more efficient equipment even though energy efficiency plays no part in the decision making.[6]

'Business As Usual' energy efficiency:
The objective of an EECT scheme is to reward participants for undertaking energy efficiency actions that result in measured 'energy savings' compared to what would have happened otherwise. The challenge then is how to:

- separate changes in energy consumption due to energy efficiency actions from all the other possible reasons for such a change,
- identify those energy efficiency actions that are actually motivated by this energy efficiency policy, and are hence *additional* to what would otherwise have happened, and
- measure and verify these energy savings so that they can be appropriately rewarded.

The usual approach is to create a baseline from a 'business as usual' (BAU) view of future changes in energy efficiency without EECT in place. Energy efficiency initiatives must then prove their *additionality* above and beyond this baseline, in order to be credited.

Additionality:
The inescapable problem with proving *additionality* is that it is impossible to verify what would have happened in the absence of EECT. Such schemes are therefore open to gaming or 'free-riding' off business-as-usual progress and other policy measures (ENDS, 2002a, 2002b). If a project's additionality can be properly assessed at all, there is generally a trade-off between measurement accuracy and the costs of verification (IEA, 2002c). The importance and difficulties of additionality for EECT are widely appreciated (IEA, 2002b).

It can be argued that even if additionality is near impossible to prove, EECT schemes can still play a useful role. If particular 'energy efficiency' targets and measurement rules are insufficient to require any real effort beyond BAU then there is little harm done. One problem with this view is the considerable effort required by policy makers and participants in order to establish EECT schemes. Also, some sort of baseline methodology does have to be established and this will determine the winners – and possible losers – for the scheme. Finally, other possible policy options may be foregone.

Trading
Trading in energy efficiency certificates allows a market to determine which of the many energy services, end-use technologies and associated decision makers are best placed to save energy. Policy makers have only limited knowledge of the best available 'energy efficiency' options when designing targeted programs. However, consumers may be even less informed.

One particular challenge for trading is particularly relevant for EECT given the difficulties in verifying energy savings. This is the well-known 'Market for Lemons' problem,

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[6] Laptop computers are far more energy efficient than desktop units but their increasing popularity is seemingly driven by their flexibility, rather than efficiency concerns.

outlined by Akerlof (1970). If buyers in a market are unable to verify the quality of what they are buying then sellers of 'lemons' are encouraged to enter. Unfortunately, cautious buyers then aren't prepared to pay the high prices required to cover the cost of high quality products. Good products are penalised even as poor products are subsidised (Lohmann, 2001).

Where buyers are in a market only because of legislated obligations they may not be interested in 'quality' beyond the level required for certification. For markets like EECT with severe verification challenges, this makes the 'Market for Lemons' problem even worse.

Implementing EECT:

Much work remains to be done in resolving questions of the strengths and weaknesses of EECT as a policy mechanism to promote energy efficiency. 'Learning by doing' will play an important role, yet must be done with care.

Scheme scope and design abstractions are key issues. Starting with a restricted range of allowable energy efficiency initiatives (for example, particular technologies) can enhance measurability, verifiability and hence credibility. Concepts such as energy efficiency, energy savings and additionality have to be defined, and this requires assumptions, choices and tradeoffs. This adds to scheme complexity, can obscure its real outcomes and creates moral hazards.

Assessing EECT *effectiveness* and *efficiency:*
The key issues for EECT are its:

- 'effectiveness' in driving greater energy efficiency in practice, and
- 'efficiency' in doing this at reasonable cost and effort compared against both the benefits of meeting policy objectives, and possible alternative energy efficiency measures.

The limited experience with EECT to date does not provide a clear answer on its efficiency and effectiveness. However, concerns have been raised. For example, Harrington (2002) notes EECT's reliance on having a well defined, verified and credible underlying 'commodity' and questions whether it may be less effective than regulatory approaches.

EECT within wider energy efficiency policy:
No single policy instrument will efficiently drive energy efficiency improvements across the economy. An important issue, therefore, is how EECT might work in conjunction with other energy efficiency programs. This is, indeed, the situation with existing schemes. The challenge for EECT with such mixed approaches is to actually drive verifiable 'additional' change beyond these other measures.

EECT and greenhouse trading schemes

There is growing interest in the use of greenhouse emissions trading schemes as an economy-wide policy measure for climate change. There is, however, an acknowledged need for additional policy measures to overcome a range of market barriers and reach particularly challenging areas of the economy. This is particularly true for energy efficiency.[7]

The question of how well EECT might be integrated into national and international emissions trading systems is therefore relevant.[8] Both are market schemes and it's possible, with some assumptions, to translate certified 'energy savings' to 'emissions reductions'.

Subsuming EECT within economy-wide 'emissions reductions' trading:
One approach is to subsume EECT within an economy-wide trading scheme based on certified emissions reductions created through increased energy efficiency, use of low or zero emission fuels, or carbon sequestration. The market determines how much of each activity occurs. The NSW Benchmark Scheme is an example of this approach (IPART, 2003).

A key issue is whether these different types of activities are actually equivalent and hence fungible – that is, are the climate change outcomes of new renewable generation the same as increased energy efficiency or tree plantings.

Measurement challenges are very different for each activity. Renewable energy supply is tangible enough, however, energy efficiency has no real physical existence and sequestration has severe measurement problems (Lohmann, 2001). Baseline methodologies will therefore involve considerable abstraction. A poorly designed

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[7] The IEA (2002c) EECT workshop concluded "..even in a world in which carbon is priced and traded internationally, there will still be a need for other policy instruments to promote energy efficiency". See, also, MacGill (2003).

[8] This question was discussed at the IEA DSM workshop.

methodology might allow 'easy' low-quality emissions reductions for an activity to crowd out worthy high-quality projects in the others.

Emissions versus 'Emissions credits' trading
Perhaps the greatest challenge to integrating EECT within economy-wide schemes is the fundamental difference between 'emissions' trading' and 'emissions reductions' trading. Climate change is driven by the actual quantity of greenhouse emissions going into the atmosphere – not the amount of 'emissions reductions' we might claim compared to BAU. This is why the Kyoto Protocol sets fixed physical emissions caps on developed countries.

Emissions trading therefore represents what is termed a 'cap and trade' system. A fixed quantity of permits, each representing an allowance to emit a quantity of greenhouse gases, is available. Participants must have permits sufficient to cover their emissions.

This is very different from 'baseline and credit' schemes such as EECT that trade in 'emission reductions'. These two types of schemes are related, and can under some design choices be theoretically shown to achieve equivalent outcomes. However, there are important differences that impact on their true effectiveness.

'Cap and trade' systems trade in measurable, physical emissions. 'Baseline and credit' schemes on the other hand must abstract BAU 'baselines' in order to 'credit' participants that don't emit as much as they would otherwise have. It is widely accepted that 'cap and trade' schemes are preferable for economy-wide emissions trading (AGO, 2002, CEP, 2002) for these and other reasons including higher market liquidity, fairer permit allocation and credibility.

While 'cap and trade' schemes might certainly drive improvements in energy efficiency – participants who use less energy require less emissions permits – note that there is no actual trading in 'energy savings' as such. The market commodity is physical emissions.

Combining 'baseline and credit' and 'cap and trade' schemes
An important question, then, is whether a 'baseline and credit' EECT scheme can be integrated into the 'cap and trade' systems required for economy-wide emissions trading

Some work assessing the potential to incorporate credit schemes without fixed overall emission constraints into 'cap and trade' markets concludes that mixing the two is inappropriate (Muller, 1999). The risk that the 'baseline and credit' JI and CDM measures within the Kyoto Protocol will threaten the credibility of its emission caps for developed countries has also been widely discussed (Lohmann, 2001).

Even if the credit scheme has some 'abstracted' total emission constraint, it is easy to envisage problems harmonising intangible energy efficiency 'savings' with the 'hard' permits required to cover physical emissions. Another potential problem is that of double counting across two such schemes. Consumers could be rewarded for undertaking 'energy savings' under EECT yet there might also be a financial benefit to generators who would require less emissions permits under 'cap and trade' emissions trading.

There are many unanswered questions, however, EECT clearly poses complexities for economy-wide emissions trading that some other energy efficiency policy measures might avoid.

The NSW Greenhouse Benchmarks

The NSW Greenhouse Benchmarks Scheme is one of the most ambitious implementations of EECT to date, and includes its integration into a wider greenhouse trading scheme. As such, it is useful to consider how the scheme's implementation has attempted to address the many challenges for EECT identified above.

The scheme is based on 'baseline and credit' emissions reductions trading in NSW Greenhouse Abatement Certificates (NGACs) - representing tonnes of avoided CO2 emissions. NGACs can be created by 'new' low-emission generators anywhere within the National Electricity Market, or certified Demand Side Abatement (DSA) activities and carbon sequestration projects within NSW. Here, we focus on the DSA arrangements, which are effectively an EECT scheme (MEU, 2003).

Fungibility of energy efficiency with low-emission generation and sequestration:
The NSW scheme treats low-emission generation, energy efficiency and sequestration activities as directly comparable and tradeable (fungible) through a single NGAC instrument.

However, such fungibility relies on the 'quality' of NGACs from the different activities being uniform in terms of the underlying policy objective. For a start, new renewable generation is hardly 'equivalent' to tree planting for climate protection. Furthermore, there is a risk that the design abstractions in each activity's measurement methodology, rather than their real costs, will determine which actions are undertaken.

This has been a concern for the NSW scheme. For example, initial proposals would have allowed any post-1997 low-emission generators in the National Electricity Market to create NGACs from a zero 'new generation' baseline.

Outhred (2002b) estimated that much of the NSW target could then have been achieved from gas fired plant that had *already been built* outside NSW. The scheme's effectiveness in driving emissions reductions would have been reduced, and energy efficiency 'crowded out'.[9]

DSA activities and their measurement rules: The allowed activities are, broadly:

- modifying installations to reduce electricity consumption compared to BAU,
- replacing installations with others that consume less electricity, or
- substituting electricity for other energy sources, or vice versa (MEU, 2003).

The guiding principles for the DSA rules were:

- "*additionality*: as far as possible, the rules will be crafted to ensure that only abatement measures that go beyond 'business as usual' are rewarded …,
- *rigor*: claimed reductions in electricity consumption should be accurately estimated and verified, and
- *simplicity*: eligibility rules will be crafted to be as simple as possible, without making unreasonable sacrifices in terms of additionality and rigor" (MEU, 2002).

These principles clearly reflect the challenges identified earlier in ensuring that EECT actually drives change. Establishing the credibility of such additionality clearly requires rigorous measurement and verification, yet the scheme hinges on decision makers being willing to undertake the expense and effort of responding. The three measurement rules for DSA are:

Project Impact Assessment Method: *This method calculates NGACs entitlements with a project engineering assessment. The baseline for an existing installation is its present energy use while new installations are to be baselined against NSW ' best existing practice'.*

Project assessment methods of this type underpin many of the schemes worldwide based around certified 'energy savings' from energy efficiency. Note, however, that such assessments use modeled rather than measured energy reductions to create NGACs. There are challenges and moral hazards in this. Also, NSW baselines are set at 'present energy use' for existing installations or 'best existing practice' for new installations and this does not guarantee *additionality* beyond BAU.

The metered baseline method: *This method uses measurement of energy consumption 'before' and 'after' DSA takes place. Baselines may be normalized to other process variables.*

A problem here is that measuring energy consumption 'before' and 'after' DSA takes place does not necessarily measure a change in end-use energy efficiency because other factors could influence the outcome. The present NSW rules don't appear to require that concrete abatement action be actually undertaken.

Default abatement factors method: *This method is used where common equipment items such as domestic appliances and electric motors are being installed. There is a list of eligible equipment with default abatement estimates.*

This is a common approach for reducing the transaction costs and effort required to 'credit' large numbers of relatively small installations.

The scheme's choice of approved appliance types is interesting, and illustrates some of the problems with this method. Fridges and freezers are included, so too clothes dryers and dishwashers. Air conditioners, however miss out. Perhaps the idea of certified 'energy savings' through the sale of energy efficient air-conditioners is just a little too much of a stretch.

[9] The baseline cutoff for 'new' plant has now been moved to 2002 yet it is still uncertain how much of the target may be met by existing, committed and BAU low emission plant.

Other challenges for the NSW scheme

Double counting across other measures:
As outlined previously, one major test of EECT additionality is in the scheme's potential interaction with other existing policy measures. It is interesting to note how the NSW scheme attempts to manage possible double counting with Federal policy measures already in place.

For example, NSW electricity retailers have an obligation to buy certified renewable energy certificates (RECs) equivalent to a percentage of their national electricity sales under the Federal MRET legislation (ORER, 2003). The NSW scheme allows these retailers to double count some of these RECs against their benchmark obligations (Outhred, 2002b).

Another example of double counting is the treatment of Federal Greenhouse Gas Abatement Program (GGAP) projects. This program operates by providing top-up funding to projects that will reduce or avoid greenhouse gas emissions yet aren't quite cost-effective (AGO, 2003b). Naturally enough, the Federal Government 'claims' the full emissions reductions that result from GGAP funding. The NSW scheme, however, allows GGAP projects to create NGACs as well.[10]

Double counting across scheme participants:
A common question with certified 'energy savings' is which industry participant gets to claim them. Final energy consumption for a particular energy service can be affected by decisions throughout the supply chain, from manufacturers to end-users.

Consider the case where a scheme participant earns 'deemed' NGACs by selling an efficient electric motor. This motor is part of an upgrade to another participant's production line that can also create NGACs. How might the 'energy savings' be divided amongst these participants?

Changing baselines and project lifetimes:
Two key challenges with determining energy efficiency baselines are:

- technical progress over time, and
- policy developments in related areas.

These are particularly important when a policy mechanism has a medium to longer-term time horizon. The NSW scheme has a legislated lifetime of ten years, yet it is not clear how baselines will be adjusted over this time.[11]

Credits for early action:
Another possible problem is where EECT follows earlier voluntary schemes. It might seem reasonable to give participants 'credit' for their earlier efforts, yet difficulties can arise. For example, the NSW scheme allows NGACs to be created for DSA activities claimed under the earlier voluntary arrangements. There were, however, verification difficulties with these (EPA, 2002; IPART, 2001). Some poorly quantified and near unverifiable claims may now be given financial value.

Compliance arrangements:
Verification clearly has a key role in EECT schemes and the possible tradeoffs between rigor and credibility versus clarity and simplicity may be difficult to judge, and police. The NSW Independent Pricing and Regulatory Tribunal (IPART) has the difficult task of administering the scheme.

Verification methods aren't yet finalized, but are likely to be complex and involve third parties (IPART, 2003). They will have to provide consistent and fair treatment across the wide range of possible DSA activities. Other key questions include how the needs for transparency against commercial-in-confidence considerations will be balanced, and what input into the scheme's operation will be available to stakeholders interested in the environmental integrity of the policy measure.

Conclusions

EECT is an interesting and novel market-based approach to promote energy efficiency. Its effectiveness and efficiency in comparison with other possible policy measures is yet to be determined. However, there would seem to be some serious limitations and considerable difficulties with EECT schemes. It will be important to continue working on other energy efficiency policy measures at the same time.

[10] Consider an example where GGAP contributes 20% of the total investment in a project resulting in 100 MTCO2 of emissions savings from BAU. The NSW scheme allows the participant to create 80,000 NGACs as well (MEU, 2003).

[11] For example, a project to upgrade an antiquated and highly inefficient production line with standard 2003 equipment might continue to earn NGACs (despite no evidence of *additionality*) through to 2012.

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1 Introduction

End-use energy efficiency – that is, reducing the amount of energy required to deliver the energy services our society desires[12] – has a critical role to play in any economically efficient and environmentally effective policy response to climate change.

Energy efficiency options are widely agreed to offer some of the most cost-effective greenhouse gas emissions reductions opportunities available. Indeed, many options have negative abatement costs – that is, the cost savings from using less energy more than compensate for any additional capital expenditure. Their use also reduces all the other environmental impacts of energy supply, while other societal benefits can include increased energy security and economic development opportunities.[13]

The potential scale of such energy efficiency improvements is also very great. For example, the UK *Energy White Paper* (UK DTI, 2003) suggests that up to half of the emissions reduction target set for the UK economy by 2020 can come from improving energy efficiency.[14]

1.1 The role of energy efficiency policy

The potential economic, environmental and social benefits of increased energy efficiency is acknowledged by virtually all governments – for example, the recent UK (DTI, 2003) *Energy White Paper* states that "The cheapest, cleanest and safest way of addressing all our goals is to use less energy." Closer to home, the Australian Greenhouse has a number of active mandatory and voluntary energy efficiency initiatives (AGO, 2003a).

1.1.1 The need for policy

There is a clear need for policy intervention to promote energy efficiency because:

- many of the benefits are market externalities – that is, their environmental and social 'value' are public goods rather than private benefits captured by individual market participants, and
- there is widespread market failure in demand-side decision making as energy users fail to undertake even highly cost-effective energy efficiency options – options resulting in reduced energy costs that more than cover any additional investment that may be required.[15]

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[12] Considerable care must be taken with terminology here. Energy efficiency is often defined in terms of the required energy input to deliver a given level of end-use energy services. Other terms frequently used include 'energy savings' or 'energy reductions' and 'demand abatement' which all signify a reduction in energy use from expected or 'business as usual' levels. The term 'demand management' is generally used to describe activities that include energy efficiency, but also actions focussed on specific locations and times of energy demand. See Section 2 for more discussion on the importance of appropriate definitions when considering energy efficiency.

[13] See, for example, the IPCC (2001) *Third Assessment Report (TAR)*, the recent UNDP (2002) *World Energy Assessment* and, closer to home, the final report of IPART's (2002) *Inquiry into demand management.* Other societal benefits arising from energy efficiency can include energy security concerns, industry development and job creation.

[14] See also Greene and Pears (2003) for information on energy efficiency opportunities and recent developments in Australia.

[15] The UK Cabinet Office (2002) *Energy Review* estimates that cost-effective energy efficiency potential in the UK is some 30% of present energy demand, equivalent to potential annual savings of £12 billion. Energy SA's recent (2002) *Energy Efficiency Potential in South Australia* report estimates that South Australia could cost effectively reduced electricity demand by 20% by 2020. NSW's Sustainable Energy Development Authority, SEDA (2002) has recently reported that "Numerous studies indicate up to 20% potential energy savings (on average) with efficiency measures that deliver at least 20% internal rate of return."

The challenge of developing policies and measures that correct for market externalities is receiving a great deal of attention. One particular difficulty is in appropriately 'valuing' such externalities so that these costs and benefits can be 'introduced' into energy markets.

The greater challenge, however, appears to be in improving energy-related decision-making. The reasons for poor decision-making are complex, however, they include a poor understanding of energy efficiency options, and insufficient attention to its importance, by key decision makers.[16] For many consumers of energy services, the low cost of energy and the effort required to contemplate energy efficiency options means decisions are often driven by other priorities. Even where decision makers have the knowledge and motivation, they often face other types of barriers to taking action.[17]

Adding to these policy challenges are the:

- very wide range of energy services enjoyed in our society,
- diverse end-use technologies for delivering these services,
- critical role of energy infrastructure in enabling energy services and particular technologies,
- the many decision makers involved – end-users, yet also infrastructure developers, equipment manufacturers and suppliers, service providers, installers, owners and managers, and
- the critical interdependences between decisions by these players.

Appendix 1 highlights some of these difficulties by showing the energy conversion chain and relevant decision makers for a particular energy service.

1.1.2 Appropriate policy measures and mechanisms for energy efficiency

Given all of the above, there are many reasons to believe that no single policy instrument will suffice to drive appropriate levels of energy efficiency across the economy.[18] Instead, many diverse international, national, regional and local policy measures are being used to target different aspects of energy efficiency, as well as the many and varied decision makers involved.[19]

Policy measures intended to promote energy efficiency – amongst possibly a number of objectives – can be broadly categorised into (Vine et al., 2003):

- support mechanisms such as the provision of information, encouragement and possibly assistance,
- control or regulatory mechanisms including minimum equipment performance standards and electricity retailer licence conditions, and
- market mechanisms including environmental taxes, emissions trading, tax credits and subsidies that change the effective 'price' seen by decision makers for different energy options.

Determining an appropriate mix of such policy measures is a great challenge, and the subject of considerable ongoing work. Policy development must, particularly, be informed by the existing failures in demand-side decision-making on energy efficiency. This failure offers the potential for 'win-win' measures that deliver immediate economic as well as wider societal benefits, yet highlights the challenges in 'directing' demand-side decision makers.

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[16] See, for example, the IEA (2000) DSM report that describes 14 policy barriers and 10 program barriers to increased energy efficiency.

[17] The Energy Saving Trust (2002) notes that "There is a broad consensus that the key barrier to energy efficiency is related to individuals' knowledge, motivation and ability to optimise their energy use (p. 5)."

[18] For example, the Energy Saving Trust (2002), states that it is "…the broad consensus of the energy efficiency community worldwide, that a package of policy instruments is required (p. 5)."

[19] See, for example IEA (2002) *Dealing With Climate Change - Policies and Measures in IEA Member Countries*. The latest volume details more than 200 new policies and measures undertaken in the year 2000 to address energy-related emissions in IEA member countries. Many of these measures are directed towards improving energy efficiency. The IEA's (2000) DSM program on *Mechanisms for Promoting Demand-Side Management in Changing Electricity Businesses* uses a classification system with 25 broad policy mechanisms for promoting energy efficiency.

1.2 Energy efficiency in the electricity sector

For many countries, the electricity industry is one of the major contributors to overall greenhouse emissions. The Australian electricity industry is responsible for almost one third of national climate change emissions, and has had the highest rate of emissions growth of any sector over the last decade (PMSEIC, 2002).

The industry should therefore be a major target for energy efficiency policy development. The challenges previously identified in such policy development are, if anything, even greater for the electricity industry than other energy sectors for reasons including

- the large and growing range of energy services for which it is the only or preferred energy source,
- the electrical continuum from power station to end-use that links decision making at all stages of the energy conversion chain,
- its use by virtually everyone in our society, and
- its role as an 'essential public good'.

1.3 Energy efficiency in restructured electricity industries

There are growing worldwide efforts by countries to restructure their energy, particularly electricity, industries away from vertically integrated monopoly structures towards greater competition. This is changing, in part, the context of energy efficiency policy development for the sector. In particular, restructuring is changing some of the key decision-making responsibilities of industry participants.

It might be expected that greater market based, competitively driven, decision making in the electricity sector might help address some of the existing market failures in delivering energy efficiency. Experience in the electricity industry, however, is mixed to date.[20] While some barriers can be overcome through restructuring others remain, new barriers may appear, and falling prices for electricity for many consumers in restructured industries have reduced the value to them of improving energy efficiency.[21]

A key issue is that the efficiency of a competitive industry model depends critically on informed decision-making by buyers. However, the complexity of electricity markets creates particular barriers to informed decision making by consumers, a fact that electricity industry restructuring has generally ignored. Policy makers are now exploring the potential of existing, modified and possible new approaches for such industries. There are growing efforts, in particular, into market based policy measures. However, lack of experience and the complexity of efficient electricity market designs add greatly to the difficulty of analysing possible policy options and anticipating their outcomes.[22]

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[20] The IEA (2000) DSM report explores this question, assessing four general electricity models from vertically integrated monopoly to full competition against 24 policy and program barriers to greater energy efficiency. One key question is the extent to which restructuring to date has reached into the demand-side of the industry.

[21] A recent report from the EU SAVE programme (2002) states that "Although there are some economic incentives inherent in the market system for energy companies to engage in end-use energy efficiency, the incentives are too weak for consistently increasing such activities to levels motivated by the potential for energy efficiency and the broader energy and climate policy objectives… In those Member States, which have combined the implementation of the EU Internal Markets for electricity and gas with a supportive policy framework, energy efficiency programmes by energy companies are continuing or even expanding in volume and scope. In Member States without such a policy, such activities have gradually reduced with the introduction of retail competition, and are carried on only by a smaller number of more innovative companies."

[22] See, for example, the IEA (2000) DSM report for its discussion on appropriate policy mechanisms for energy efficiency in restructured industries.

1.4 Market based energy efficiency mechanisms

There has been growing interest in the use of market based energy efficiency mechanisms for the electricity sector. In part, this reflects the industry restructuring now underway. It also follows wider trend in policy development away from 'command and control' technical regulation towards the creation of markets whose participants determine the economically optimal way to achieve desired environmental policy outcomes.

Market based approaches to promoting the societal benefits of energy efficiency might seem to offer some economic efficiency advantages over conventional 'command and control' measures while being highly compatible with market based electricity industries. However, while these policy developments show promise, there are likely limitations to their effectiveness, as evidenced by existing market failures in decision-making.[23] The UK Energy Saving Trust (2002) notes that "Price based mechanisms, in general, will not address the information and consumer related barriers to energy efficiency investment – here regulatory solutions tend to be more effective."[24] It should also be noted that market-based measures would actually increase the complexity of electricity market arrangements and related decision-making. This additional complexity may itself be a barrier to efficiency.[25]

1.4.1 Energy Efficiency Certificate Trading

One market-based policy mechanism of growing interest and attention is that of energy efficiency certificate trading.[26] This approach combines energy efficiency certificates (representing a unit, typically MWh, of 'energy savings' from increased energy efficiency) with market based trading of these certificates between parties who have energy efficiency 'obligations' and other parties who are 'creating' energy savings.[27]

There is only very limited experience with such mechanisms for energy efficiency to date. Certificate schemes for renewable energy such as the Australian MRET scheme (ORER, 2003) have been running for a number of years, with some reported success. Measuring, verifying and certifying 'energy savings' has been an area of work for numerous years varying from DSM programs by US utilities in the 1980s, through to the JI and CDM mechanisms within the Kyoto Protocol.[28] Emissions trading schemes for air and water pollutants have also been implemented in some countries.[29]

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[23] For example, the Energy Saving Trust (2002) notes that "Neo-classical economic conceptions of regulation as inherently less efficient than market based instruments cannot be applied to energy efficiency, because of the extent of market failure... In practice, some examples of regulation have proved very cost-effective."

[24] The Energy Saving Trust (2002) submission to the UK *Energy White Paper* argues against the idea that only policies to 'price' greenhouse emissions are needed to drive energy efficiency. This "…would only be effective if the only barrier was the failure of existing market prices to include the externalities of energy use. Whilst this certainly is a barrier, it is not the only one, nor even the most important. (p. 16)"

[25] There would certainly seem to be a useful role for mechanisms that reduce the complexity, and hence transaction costs and efforts, required of decision makers in choosing optimal levels of energy efficiency. This can be done by taking some energy efficiency decisions at the societal level – for example, legislated minimum energy performance standards for equipment, building codes and government directed infrastructure projects.

[26] The IEA DSM program, Task VI, held a workshop on energy efficiency certificate trading in April, 2002 (IEA, 2002b).

[27] See Harrington's (2002) presentation on *Energy Efficiency Certificate Trading* given at the IEA workshop for a general discussion of this approach.

[28] The Rocky Mountain Institute has details of some US Utility DSM programs available on its website www.rmi.org. Details on the Joint Implementation and Clean Development Mechanism measures of the Kyoto Protocol are available on the IPCC website, www.ipcc.ch.

[29] The US EPA's SOx emissions trading scheme is often cited as a successful example of emissions trading although not everyone agrees – see, for example Moore (2003). Details of the NSW EPA's innovative Hunter River Salinity Trading scheme are available from their website, www.epa.nsw.gov.au.

Nevertheless, energy efficiency certificate trading is in its infancy. Italy and the UK have recently implemented limited schemes.[30] However, the most ambitious plans for energy efficiency certificate trading to date appear to be those of the recently enacted NSW Greenhouse Benchmarks scheme. This scheme allows the creation of NSW Greenhouse Abatement Certificates (NGACs) denoted in 'avoided MtCO2 emissions' from Demand Side Abatement activities as well as low emission generation and carbon sequestration activities.[31]

1.4.2 Outline of this paper

In the following Sections, we first explore the theoretical basis of EECT and some of the key implementation issues that are likely to arise. One key challenge is shown to be creating measurable and verifiable 'energy savings'.

In Section 3 we then consider how EECT might fit into broader GHG emissions trading schemes, and the particular challenges this is likely to involve. The differences between 'emissions trading' and 'emissions reductions' trading are shown to of vital importance.

The arrangements for energy efficiency certification and trading within the NSW Greenhouse benchmarks scheme, and how well these address the issues raised in the two previous sections, are described in Section 4.

In Section 5 we discuss possible ways forward given the difficulties identified with these present arrangements. This includes both the role that EECT might play in an overall policy framework for energy efficiency, and key aspects of any successful scheme design and implementation.

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[30] Both the UK and Italian schemes were outlined at the IEA DSM workshop on EECT. See Ofgem (2002a) and Malaman and Pavan (2002) for more details.

[31] The legislation, regulations and rules for this scheme are available on the scheme administrator's website, www.greenhousegas.nsw.gov.au (IPART, 2003).

2 Energy efficiency certificate trading

2.1 Scheme design

EECT schemes have four main attributes (see Figure 1):[32]

- energy efficiency certificates (EECs) representing a measured and verified unit of energy savings from energy efficiency (eg. 1 saved MWh of electricity) undertaken by some party,
- a government directed legal obligation on some group of parties that they regularly acquit some number of these certificates as part of their societal obligations (voluntary initiatives marketing energy efficiency 'benefits' to concerned consumers are also possible),
- parties that are able to undertake energy efficiency actions that can be measured and verified in order to create certificates, and
- trading so that parties obliged to acquit certificates can choose to buy certificates from other parties as an alternative to undertaking their own energy savings.

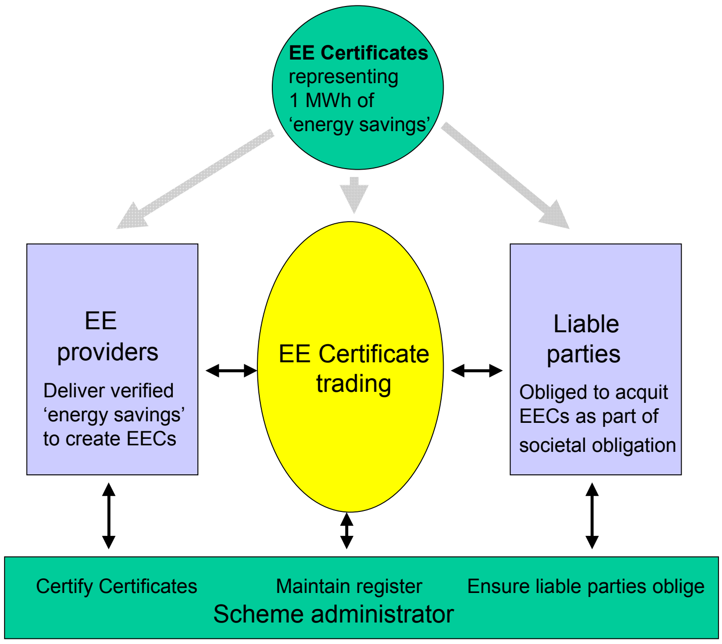

Figure 1. General design of Energy Efficiency Certificate Trading schemes.

Such an approach works by creating a property right to a public good, in this case the public environmental, energy security and perhaps welfare 'goods' derived from increased energy efficiency. This property right obtains value through having governments impose 'public good' obligations on relevant parties, or through voluntary 'green consumer' preferences.

Trading offers the potential to improve economic efficiency as those parties who are able to create this public good at lowest cost can sell to obligated parties who have only more expensive options for energy savings.

[32] See Harrington's (2002) presentation on *Energy Efficiency Certificate Trading* given at the IEA workshop.

One perceived advantage for such an approach is its delivery of 'measurable' energy efficiency outcomes. Another is its potential to 'reach' right across the wide range of energy service and end-use technology decision makers who may be able to contribute in some way to energy savings.

The market could enable those best placed to take energy efficiency measures to act, and to be rewarded for doing so. In contrast, many traditional energy efficiency programs target specific end-use technologies and may not provide easily quantified 'energy savings' outcomes.

As noted in Section 1.4, there are potential limitations with such an approach in comparison with other possible policy directions. In particular, there is the present failure of rational 'business as usual' decision making in energy efficiency. EECT offers an additional financial incentive to decision makers, who already ignore many cost-effective energy efficiency options.

There are also the complexities, and hence transaction costs, that arise from the need to measure, verify, certify, trade and acquit 'energy savings'. Some decision makers might also need targeted help in order to be able to participate in such a scheme because of particular institutional and organisational barriers.

The question of what mix of these different types of policy measures can best achieve overall societal energy efficiency objectives is clearly the critical one and remains the subject of a great deal of ongoing work. In this paper, we limit ourselves primarily to considering some of the major challenges inherent within EECT based approaches, and how these might be addressed in practical implementations of the mechanism.

2.2 The challenge of measuring energy efficiency

The key challenge with this approach and, indeed, a range of other energy efficiency related policy measures actually turns out to be separating 'energy savings' arising from increased energy efficiency from other changes in energy consumption.

One problem is what exactly is meant by the term 'energy efficiency'. The US EIA (1995) has argued that the definition of 'energy efficiency' is essentially philosophical ranging from the energy intensity of delivered services to energy savings from changing lifestyles.

Increasing energy efficiency is often defined to mean reducing the required energy input for delivering some given level of end-use energy services. Energy savings or reductions can then be said to 'arise' from such a reduction in energy inputs. The problem, however, is that this 'technical' form of energy efficiency is only one factor in final energy consumption. [33]

2.2.1 Factors driving energy consumption

Energy consumption within the economy depends on the:

- type and quantity of energy services delivered, and
- end-use equipment and infrastructure used to deliver these services.

Separating out the impact of changes in energy efficiency on this overall energy consumption is a great challenge. The types and levels of energy services desired and available to consumers certainly

[33] This distinction between energy services and technical energy efficiency and can become quite blurred. For example, a Green Building Partnership (2003) for a recent Australian Commercial Building " ..created a unique Green Lease to put the onus on the tenants to operate efficiently within their space and maximise the environmental benefits of the building…Such actions described in the lease include choosing efficient lighting, turning off appliances, using photocopiers that reuse paper, and utilising the recycling facilities." Here, energy efficiency is clearly considered to include behaviour as well as appropriate end-use equipment.

change over time. Within the wider economy just about every change - from demographics to economic growth to innovation in products and services – all influence overall energy consumption. Even something as random as weather variations may influence energy consumption of a particular energy service from one year to the next.

Furthermore, decisions on end-use equipment to deliver these energy services are generally made according to a range of priorities, of which energy efficiency is only one – if its considered at all. If energy efficiency concerns do influence this decision making, then the benefits are a mix of public and private – the customer saves on their energy bills while society benefits from the reduction in environmental impacts from energy supply. In some cases, particular groups of industry participants might directly benefit from another participant's energy efficiency actions.[34]

Complicating matters, technical progress and other influences may cause consumers to choose more efficient equipment even though energy efficiency plays no part in the decision-making. For example, laptop computers are far more energy efficient than traditional desktop units but their increasing use is seemingly driven by their flexibility and convenience, rather than energy efficiency concerns (see Figure 2).

Figure 2. Laptop computers generally have lower performance and cost considerably more than desktop units (as shown above for two recent computer options available from the *Dell Computers* website). Nevertheless, the popularity of laptop computers continues to grow because of their flexibility and convenience. Laptops also happen to be generally far more energy efficient than desktop units but this is probably incidental for most consumers.

2.2.2 'Business As Usual' Baselines for Energy Efficiency

EECT is built on the premise that parties are rewarded for undertaking energy efficiency actions that result in measured and verified 'energy savings' compared with what would have happened otherwise. The challenge then is how to:

- separate changes in energy consumption due to energy efficiency actions from all the other possible factors that can change consumption,
- identify those energy efficiency actions that are actually motivated by this energy efficiency policy , and hence *additional* to what would otherwise have happened, and
- measure and verify energy savings arising from these actions so that they can be appropriately rewarded.

The usual approach is to create a baseline from a 'business as usual' (BAU) view of future changes in energy efficiency without any EECT policy measure in place. Energy efficiency initiatives must then prove their *additionality* above and beyond this baseline, in order to be credited. Such mechanisms are known as 'baseline and credit' schemes.

[34] Consider, for example, how a decision by one participant to reduce their electricity consumption might improve supply quality for all other consumers in that part of the electrical network.

The inescapable problem with proving this *additionality* is that its impossible to verify what would have happened in the absence of this policy measure. Adding to this challenge is, of course, the clear evidence that 'business as usual' progress in energy related decision-making is often *irrational* because cost-effective energy efficiency options are not always taken.

This vexed question continues to plague 'baseline and credit' schemes in general, and certainly energy efficiency policy mechanisms relying on measurable and verifiable energy savings. For example, recent UK plans to allow emissions reduction projects to sell credits under the UK's emissions trading scheme have stumbled over the question of additionality.[35]

2.2.3 Ensuring additionality

Key tests of additionality include ensuring that:

- other policy measures did not require the energy efficiency action to be taken regardless, and
- investment in the energy efficiency project would not have been made without the financial incentive of certificate sales.

Unfortunately these tests still leave mechanisms open to gaming by participants or 'free-riding' off business-as-usual progress and other pre-existing policy measures.[36] To add to these problems, there is also the question of how baselines should be adjusted over time given technological and policy progress.

The difficulties of additionality and its importance in establishing verifiable and credible energy savings from energy efficiency initiatives have been noted by proponents of EECT[37] yet there are no obvious answers.[38]

There are, of course, many possible energy efficiency projects that deliver energy reductions beyond any likely 'business as usual' baseline. Other projects might be less clear-cut, yet still be widely accepted as offering credible energy savings beyond BAU. To the extent that projects can be properly assessed at all, there is likely to be a trade-off between accuracy (and hence credibility) as well as economic efficiency, against high administration and compliance costs.[39]

2.2.4 Is additionality actually required?

One might argue that even though proving additionality may be near impossible, EECT schemes can still play a role in energy efficiency policy. If particular 'energy efficiency' targets and measurement rules are insufficient to require any real effort beyond 'business-as-usual' then there is little harm done. If sufficiently challenging, then the scheme will promote additional activity as intended.

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[35] See The ENDS (2002a) report on "*Cautious' plans for projects under emissions trading scheme"* which includes statements like – "officials underestimated the difficulty of demonstrating that emission savings from a project are truly additional to a "business as usual" baseline" and "Officials revealed that Ministers were concerned that weak rules might damage the trading scheme's environmental integrity".

[36] Tests of additionality and their failings are discussed in the above ENDS (2002a) and also (2002b) reports. Previous publications by the authors on the NSW benchmarks scheme also discuss the failings of 'baseline and credit' schemes – see, for example, Outhred (2002a; 2002b; 2002c). See also IPMVP (2002) which outlines an international protocol for measuring energy and water savings.

[37] A recent IEA (2002d) *DSM Spotlight Newsletter* reporting on the Italian EECT scheme notes that the first key issue is to "..ensure that energy efficiency certification represents actual savings (ie. Savings realized over and above the spontaneous market trends".

[38] One would expect that renewable energy certificate trading would not face any problems with additionality – the MWh output of a new renewable energy generator can be easily measured. Even so, the Australian MRET scheme has encountered baseline problems. In this case the problem lies with baselines established to count 'new' generation from improvements made to existing large hydro plant. See BCSE (2002) for more details.

[39] This point is made in the IEA (2002c) DSM *Workshop Summary*, available on the www.dsm.iea.org website. A recent ENDS (2002a) report on troubles in the UK emissions market includes "Project developers claim that too strong an emphasis on environmental integrity will kill the scheme."

There are several problems with this view. One is the considerable effort by policy makers and demand-side decision makers to establish EECT schemes – effort that might prove to be wasted. Another problem is that some sort of baseline methodology has to be established and this will determine the winners – and possible losers – amongst scheme participants. Society is best served when the winners are actually those that most contribute to the underlying policy objective. Finally, the efforts required to establish EECT schemes, and unrealistic expectations of their ability to deliver energy efficiency, may hamper progress on implementing other energy efficiency policy measures.

2.3 Trading

Trading in energy efficiency certificates offers the potential to increase the economic efficiency with which an overall 'energy savings' target is met by allowing the market to determine which of the many energy services, end-use technologies and associated decision makers are best placed to create energy savings.

Policy makers can have only limited knowledge of the best available 'energy efficiency' options when designing highly end-use or technology specific programs. However, there is also the potential for consumers to be unaware and uninterested in their available choices. Certainly, some of the relevant decision making groups are going to better informed, organised and responsive than others – broadly targeted instruments can fail to 'reach' these groups even if they have excellent energy efficiency options.

Another important issue with trading is the need to measure, verify, certify, register, trade and finally acquit certificates – potentially billions of them if the certificate unit is 1MWh 'energy savings' as typically proposed. Each of these stages adds another layer of transaction costs.

One challenge with trading is particularly relevant for EECT given the difficulties in verifying and certifying measurable energy savings. This is the well-known 'Market for Lemons' problem, outlined by economist George Akerlof (1970).

If buyers in a market are unable to verify the quality of what they are buying then sellers of poor products (lemons) are encouraged to enter the market. Unfortunately, cautious buyers then won't be prepared to pay the high prices required to fund high quality products. The result is that good products are penalised even as poor products are subsidised.[40]

Where buyers are in a market only because of legislated obligations then they may well not even be interested in the 'quality' of what they are buying (beyond ensuring that it meets 'certification'). They will, instead, seek out the lowest available prices, and the 'lemons' problem becomes even worse.

2.4 Implementing EECT

Much work remains to be done in resolving questions of the strengths and weaknesses of EECT as a policy mechanism to promote energy efficiency.[41] Part of this work is 'learning by doing' as in the UK and Italian schemes now underway. Development of these two schemes would seem to have stressed, however, the importance of minimising the inherent risks with testing such a novel and little understood policy initiative.

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[40] This problem is discussed by Lohmann (2002) *Carbon Trading: Avoiding Market Collapse*, Corner House Briefing for the case of the Kyoto Protocols 'baseline and credit' JI and CDM measures.

[41] This was widely discussed at the IEA (2002b) DSM workshop.

2.4.1 Scheme scope

In terms of EECT, one critical decision is that of initial scope. Starting with a limited definition of allowable energy efficiency initiatives (for example, particular technologies or types of energy services) can enhance measurability, verifiability and hence credibility yet perhaps reduces competition, innovation and economic benefits. Allowing a wide range of activities may encourage these latter factors, yet risk the credibility of the scheme.[42]

In light of this, the UK and Italian EECT schemes appear to be taking a cautious approach.[43] The present NSW Greenhouse rules on demand side abatement, however, appear, to have few if any explicit limitations on the types of projects that might potentially be permitted.

2.4.2 Necessary abstractions

One key issue with 'baseline and credit' schemes, and certainly EECT, is that of the significant *abstraction* required in their implementation. Concepts such as energy efficiency, energy savings and additionality have to be defined, and this requires assumptions, choices and tradeoffs. All of these necessary abstractions, and the process of determining them:

- add to the complexity of such schemes,
- make it far harder to determine the real outcomes of the measure, and
- create moral hazards for both scheme designers as well as participants.

2.4.3 Assessing EECT's *effectiveness* and *efficiency as a* policy measure

The key question, in the end, is whether EECT mechanisms can make an effective and efficient contribution to an overall policy objective of promoting energy efficiency across the economy. Here, 'effectiveness' refers to the ability of EECT to actually promote greater energy efficiency. 'Efficient' refers to whether EECT can do this at reasonable cost and effort in comparison to both the benefits of meeting these objectives, and the other possible energy efficiency policy measures that might be used.

Our limited experience with EECT to date would not seem to have answered this question, and it certainly lies beyond the scope of this paper. Harrington (2002) notes EECT's reliance on a well defined, verified and credible underlying 'commodity' and suggests that it may be less effective than other approaches including, for example, labelling, minimum energy performance standards (MEPS) and building codes. These latter approaches can change the behaviour of large numbers of participants at low transaction and compliance cost.

2.4.4 EECT within wider energy efficiency policy frameworks

As noted in Section 1.2, there are many reasons to believe that no single policy instrument will suffice to drive optimal levels of energy efficiency across the economy. An important issue, therefore, is how an economy-wide EECT might be combined with targeted programs in order to address the whole range of barriers to energy efficiency. The UK, Italian and NSW EECT schemes have all been

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[42] See the discussion by Hans Nilsson posted to the web Forum for the IEA DSM (2002b) workshop for a more detailed explanation of this.

[43] The IEA DSM Spotlight magazine (2002d) report on the Italian EECT scheme quotes officials saying that "…it will be crucial to guarantee a gradual phase-in of the whole system to ensure credibility and transparency, to define rules and guidelines which combine simplicity and thoroughness, and to introduce instruments that allow market actors a certain degree of flexibility in meeting their goals." The IEA DSM Workshop presentation on the Italian scheme (Malaman and Pavan, 2002) discusses the use of a list of 14 classes (and 35 subclasses) of eligible projects.
Ofgem, the administrator of the UK energy efficiency commitment, has approved four classes of measures for the scheme – lighting, heating, insulation and appliances (2002b). More generally, The ENDS Report (2002a) quotes the UK government's position on their emissions trading scheme as being that it would not be feasible to produce at the outset comprehensive rules on the "highly complex and technical area" of baselines and additionality. Furthermore, "it would be unwise to risk the development of a stable market through the early introduction of a large supply of project credits."

implemented within wider policy frameworks that include other mechanisms – for example, Mandatory Equipment Performance Standards (MEPS) on appliances and equipment.

Note, however, the challenge for EECT with such mixed approaches. EECT has to actually drive measurable and verifiable 'additional' change – that is, change above and beyond all these other policy measures. Otherwise, why bother with the complexities, costs and effort of running such a trading scheme. As noted in Section 2.2, however, ensuring such additionality is very difficult.

3 EECT and greenhouse emissions trading

3.1 GHG emissions trading

There is considerable and growing interest in the use of greenhouse, sometimes referred to as carbon, emissions trading schemes as an overall policy framework to guide climate change action at the national and international level.[44] Again, there are perceived advantages in allowing a market to determine least cost options within the economy for achieving desired overall emissions reductions.

Actions to mitigate climate change generally fall within four broad categories:

- improved efficiency throughout the energy conversion chain from energy supply to the delivery of energy services,
- a shift to lower emission fossil fuels and renewable energy resources,
- reducing GHG emissions from a range of industrial processes, and potentially
- sequestration of greenhouse gases within the biosphere or in geological storage.

Determining the optimal mix of such actions in the short and longer-term is a great challenge for policy makers. In theory, an economy-wide emissions trading scheme could be all that's required to drive economically efficient levels of low emission fuels, energy efficiency, revamped industrial processes and sequestration.

One key question is whether such trading schemes can actually 'reach' across these four categories of actions, and the decision makers involved in each, in order to drive the optimal emissions reductions options available. Most emissions trading proponents acknowledge the need for additional policy measures to overcome some market barriers and reach particularly challenging areas of the economy.

This is a particular concern for energy efficiency. The need for programs that support energy efficient technologies, particularly for decision makers with little interest in energy issues, has been particularly stressed by policy experts.[45] It might be expected that some types of measures and mechanisms might be better suited than others to work in parallel with national emissions trading, and this is an area of ongoing work.

3.2 Integrating EECT into GHG emissions trading

The question of how well EECT might be integrated into national and international emissions trading systems is particularly relevant. Given that both are market based trading schemes and that it is possible, with some assumptions, to translate certified 'energy savings' to 'GHG emissions reductions' the two types of schemes might seem particularly compatible.[46]

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[44] See for example the AGO (2002) submission to the CoAG Energy Market Review and the CEPS (2002) report on Emissions Trading and the New EU Climate Change Policy.

[45] For example, an AGO (2002) submission to the CoAG review on the potential for an Australian emissions trading system states that "In addition to a national emissions trading system, there is likely to be a need for supplementary measures that address market impediments and aim to promote consistent incentives for abatement and innovation in those areas of the economy that an emissions trading system would have trouble reaching. The need for programs that respond to information deficiencies and facilitate efficient technology choice - particularly among those for whom greenhouse or energy efficiency issues are not core business - would also be warranted." Also, with regard to energy efficiency, the IEA (2002c) EECT Workshop outcomes included general agreement that "..even in a world in which carbon is priced and traded internationally, there will still be a need for other policy instruments to promote energy efficiency, particularly for end-users."

[46] This question was discussed at length at the IEA DSM (2002b) workshop on EECT.

3.2.1 EECT in parallel with schemes for low emission fuels and sequestration

One possible economy-wide climate policy measure would be to develop similar 'baseline and credit' schemes for emissions reductions from low-emission fuels and sequestration. A national policy target of economy wide 'emissions reductions' could then be divided across the four schemes. Each would operate separately.

3.2.2 Subsuming EECT within economy-wide 'emissions reductions' trading

It is also possible to subsume EECT within an economy wide trading scheme based around certified tonnes of avoided CO2 emissions created through any of increased energy efficiency, use of low or zero emission fuels or carbon sequestration. In this case, the amount of emissions reductions required from each type of activities is not specified. Instead, the market determines how much of each type of activity is undertaken. The NSW Benchmarks scheme is an example of such an approach.

In terms of overall climate change policy objectives, one important issue is whether such different activities are actually equivalent and hence fungible – that is, are the climate change outcomes of new renewable generation the same as those for increased energy efficiency or increased tree plantings.

One obvious difference is in measurement. Renewable energy supply is tangible enough, however, energy efficiency has no real physical existence – it is the absence of consumption that might otherwise have occurred. Most sequestration activities have little relationship to energy at all, and would seem to have severe measurement challenges of their own.[47]

Beyond measurement, is the need to establish baseline methodologies for each type of activity. Considerable abstraction will be required in the different measurement methodologies (with associated assumptions and choices) required. A poorly designed methodology might allow 'easy' low-quality emissions reductions to be created for one of these activities – for example, from BAU developments over time. The 'magic' of markets could then lead to a 'race to the bottom' as these 'easy' emissions reductions crowd out worthy high-quality projects in the other types of activities.

Another important issue is how these different activities contribute to driving wider, longer-term change in the economy. Effective climate change mitigation will require far reaching and long-term changes in our use of energy.[48] It is clear that some types of actions taken now might play a much greater role in fundamentally restructuring our economy for this longer-term challenge than others. For example, is planting trees really equivalent to developing a vibrant renewable energy industry.[49]

3.3 Emissions trading versus 'Emissions credits' trading

Even if the above challenges can be resolved there is still a fundamental difference between 'emissions' trading versus 'emissions reductions' trading that will need to be addressed. Climate change is driven by the actual quantity of greenhouse emissions going into the atmosphere – not the amount of 'emissions reductions' we might claim compared to BAU emissions. This is clearly acknowledged in the Kyoto Protocol which sets fixed physical greenhouse emissions caps on developed countries.[50]

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[47] See, for example Lohmann (2001).

[48] It is estimated that stabilising atmospheric CO2 levels will require global emissions reductions of around 60% in the medium to longer term.

[49] For example, the cost of many renewable energy technologies continues to fall as their use grows. Increasing renewable energy generation now may not be the least cost option for reducing emissions in the short term, yet evolve to be highly cost competitive in the longer term.

[50] Note, however, that the JI and CDM measures within the Kyoto Protocol are actually 'emissions reductions' measures. One 'surprising' result of this is that total aggregate emissions from those countries that have taken on caps may actually rise, even while they achieve the overall emissions cut required of them (Lohmann, 2001).

Emissions trading between these countries represents what is termed a 'cap and trade' trading system. In such systems, a fixed quantity of permits, each representing an allowance to emit some unit quantity of greenhouse gases, is available for all participants.[51] Participants must have permits sufficient to cover their emissions, and these permits can be traded.

This is very different from 'emissions credits' trading schemes such as EECT, termed 'baseline and credit' schemes. Such schemes are dependent on having a BAU baseline for all participants. Those who can reduce emissions below their baseline earn credits, which they can then sell to other participants who are exceeding their particular BAU baseline.

While these two types of schemes are related, and can under some sets of design choices be theoretically shown to achieve equivalent outcomes, there are important differences that impact on their likely respective effectiveness. 'Cap and trade' systems trade in measurable, physical emissions. 'Baseline and credit' schemes on the other hand must abstract 'baselines' of BAU behaviour of participants in order to then 'credit' those participants that don't emit as much as they would otherwise have.

Indeed, some 'baseline and credit' schemes may place no limits on overall physical emissions at all; for example, CDM within the Kyoto Protocol.[52] Other schemes may impose some overall emissions target but this generally requires various levels of abstraction.[53] Many proponents of emissions trading strongly favour 'cap and trade' for reasons including these, as well as higher market liquidity, fairer permit allocation and greater credibility and reliability.[54]

While 'cap and trade' schemes might certainly drive improvements in energy efficiency – participants who use less energy require less emissions permits – note that there is no actual trading in 'energy savings' as such. The market commodity is physical emissions. Certified 'energy savings' by their very nature can only be created through a 'baseline and credit' approach calculated from hypothetical BAU emissions.

3.4 Combining 'baseline and credit' and 'cap and trade' trading schemes

An important question, then, is whether a 'baseline and credit' EECT scheme can be integrated into the 'cap and trade' systems that are preferred for national and international emissions trading. This is an area of considerable work. Muller (1999) assesses the potential to incorporate credit schemes (without fixed overall emission constraints) into 'cap and trade' markets and suggests that mixing the two is inappropriate. The risk that the 'baseline and credit' JI and CDM measures within the Kyoto Protocol will threaten the credibility of its emission caps for developed countries has been widely discussed (Lohmann, 2001).

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[51] The question of how these permits should be initially allocated amongst participants is an important and controversial one – see, for example, the AGO's (2002) paper on National Emissions Trading.

[52] This is discussed by Muller (1999).

[53] The NSW greenhouse benchmarks scheme claims to set an overall emissions target for the state's electricity sector below its present levels even while the rules are such that substantial physical increases in emissions may occur even while this 'target' is met. See Outhred (2002a; 2002b) for more discussion on this issue.

[54] The AGO's (2002) CoAG submission states "It is clear that a mandatory 'cap and trade' system lends itself to much lower levels of monitoring and verification cost than voluntary arrangements that trade in project-based 'abatement' credits defined against a 'business-as usual' baseline. In the latter case, abatement monitoring relies on judgements about the level of emissions that would have occurred in the absence of an abatement action, and the future time period over which that action is considered to be valid for crediting purposes. Under baseline and credit - particularly with a project-based scheme - a much greater level of effort is required to establish confidence, at a market level, that a systematic emissions constraint is being applied."

The CEPS (2002) report on Emissions Trading and the New EU Climate Change Policy also proposes a 'cap and trade' system, stating "The advantages of emissions trading will only materialise both if the emissions market is efficient and liquid and if the scheme leads to credible reductions in GHG emissions… Experience with credit schemes in the US shows that cap-and-trade schemes tend to be simpler to manage and provide higher liquidity in the market, and hence higher efficiency."

Given the challenges in measuring and verifying intangibles like ‘energy savings’ it is easy to envisage problems harmonising ‘easy’ energy efficiency credits with the ‘hard’ permits required to cover physical emissions.

Another potential problem is that of double counting across two such schemes. Consumers could be rewarded for undertaking ‘energy savings’ under EECT yet there might also be a financial benefit to generators who would require less emissions permits under ‘cap and trade’ emissions trading.

We can expect to see considerable work on this question given the growing efforts to establish ‘cap and trade’ greenhouse emissions trading schemes including some which will need to account in some way for pre-existing ‘baseline and credit’ efforts. There is, however, no question that EECT poses some complexities for emissions trading that other energy efficiency policy measures such as technical regulation could well be able to avoid.

4 The NSW Greenhouse Benchmarks Scheme

The NSW Greenhouse Benchmarks Scheme would seem to be one of the most ambitious implementations of EECT to date, including its integration into a wider greenhouse emissions trading scheme. As such, it is useful to consider how the scheme's implementation has attempted to address the many challenges identified earlier in this paper.

4.1 Scheme design

The NSW Government introduced Greenhouse gas emissions targets for the NSW Electricity Industry[55] in 1995 as a key policy measure to support climate change actions including improvements to energy efficiency.

The scheme set emissions reductions benchmarks for NSW electricity retailers based on calculated NSW emissions from the electricity sector compared against a declining per-capita state emissions target. Retailers could demonstrate compliance through certified low-emission generation, energy efficiency and sequestration activities. Unfortunately, over the legislated life of these conditions (1997-2001) this voluntary regime failed to achieve its specified targets.[56]

Given this failure, the NSW government has recently modified the scheme.[57] The stated policy intent of these new measures is to "reduce greenhouse gas emissions associated with the production and use of electricity and to encourage participation in activities to offset the production of greenhouse gas emissions."[58]

The major changes have been to ease the benchmark target timeline for retailers, introduce penalties for those retailers who do not meet their benchmarks and establish 'baseline and credit' emissions reductions trading in NSW Greenhouse Abatement Certificates (NGACs) - representing tonnes of avoided CO2 emissions.

NGACs can be created by 'new' low-emission generators anywhere within Australia, certified demand side abatement activities within NSW, or carbon sequestration projects in NSW. Large energy users are also now given the option of choosing emissions reductions arrangements not necessarily related to their energy use.[59]

The authors have previously contributed to discussions regarding these changes to the scheme – see for example, Nolles (2002) and Outhred (2002a, 2002b, 2002c, 2002d). In this paper we focus on the demand side abatement arrangements – effectively an EECT scheme – for the revised NSW Greenhouse Benchmarks Scheme.

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[55] This was done as part of the Electricity Retailer Licence Conditions under the NSW Electricity Supply Act (1995).

[56] Documented initially in the Annual Reports of the NSW Licence Compliance Advisory Board (LCAB) and later by the Independent Pricing and Regulatory Tribunal (IPART, 2001) and the NSW Environmental Protection Authority (EPA, 2002).

[57] In December 2001 the NSW government (2001) released a Position Paper proposing reform of the licence condition. A number of options papers on different aspects of the scheme – quantifying retailer targets, the rules for crediting low-emission generation and energy efficiency actions, and possible trading mechanisms – were released over 2002, and the legislation, regulations and rules were finalised in January 2003.

[58] From the Overview to the Electricity Supply Amendment Bill (2002).

[59] There is a separate rule for creating non-tradeable Large User Abatement Certificates.

4.2 Design scope and principles for demand side abatement

4.2.1 Fungibility of energy efficiency with low-emission generation and sequestration:

The NSW scheme treats low emission generation, energy efficiency and sequestration activities as directly comparable and tradeable (fungible) through a single instrument, the NSW Greenhouse gas Abatement Certificate (NGAC).

As previously noted this has the potential advantage of exploiting the lowest cost abatement opportunities available for NSW. It is possible of course that one or other type of activity could prove the easiest way to meet the entire emissions reductions target. Although this can signify an economically optimal outcome it does mean, for example, that the scheme might not drive any energy efficiency activities.

The key point, however, with such fungibility is that it relies on the quality of NGACs from the different types of activities being uniform in terms of the underlying policy objective. The risk is that it will be the design choices for each activity's measurement methodology which determine which are undertaken, rather than the real 'costs' of these activities to create emissions reductions.

This has been a real concern for the NSW scheme. For example, initial NSW government proposals would have allowed low-emission (mainly gas fired) generators located anywhere within the Australian National Electricity Market[60] and commissioned after mid-1997 to create NGACs for their entire energy output (calculated from the difference between their greenhouse intensity per MWh with that of the NSW 'pool' of existing – largely coal fired – generators).

In Outhred (2002b) we estimated that much of the NSW target could then have been achieved from gas fired plant that had *already been built* in states outside NSW. The effectiveness of the scheme in driving additional emissions reductions would clearly be compromised. Also, it would clearly be hard for energy efficiency options to compete against such low cost (clearly 'business-as-usual') 'abatement'.[61]

Although the baseline cutoff for 'new' plant has now been moved to 2002, it is still uncertain how much of the target may be met by existing low emission plant. Modelling efforts to estimate what proportion of NGACs will come from the different activities have been undertaken, yet hinge critically on estimates of business-as-usual change in the electricity industry.

4.2.2 Activities that constitute demand side abatement:

The allowed activities for demand side abatement within the NSW scheme are, broadly, projects that reduce greenhouse emissions compared with emissions without the project by (MEU, 2003: 2):

- modifying installations resulting in reduced electricity consumption compared to what otherwise would have been the case,
- replacing installations with other installations that consume less electricity ,
- substituting sources of energy for electricity or substituting electricity for other energy sources, or
- on-site generation.

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[60] The Australian NEM covers NSW, yet also Victoria, South Australia, the ACT and Queensland (ESAA, 2002).

[61] The actual cost to these low-emission generators of producing NGACs would only be the transaction costs involved. Note, however, that if a project, for example an industrial plant upgrade, is allowed to create abatement NGACs even though the project would have proceeded anyway, then the real cost of these NGACs is, again, only the transaction costs involved.

These activities all clearly represent demand side abatement of some form, and demonstrate the very wide range of actions that fall within the ‘energy efficiency’ area. We again, however face the difficulty of the very different measurement methodologies (with associated assumptions and choices) required for such varied types of demand-side activities. There is the potential that somewhat arbitrary design decisions might end up greatly favoring one type of energy efficiency option over the others.

4.2.3 Design principles

The proposed principles for scoping activities recognized under the revised NSW DSA methodology were given as (MEU, 2002: 7):

- “*additionality*: as far as possible, the rules will be crafted to ensure that only abatement measures that go beyond ‘business as usual’ are rewarded under the benchmarks scheme. In practice, determining what is truly additional and what would have occurred in any event is often difficult; so that only abatement measures going beyond ‘business as usual’ are rewarded,
- *rigor*: claimed reductions in electricity consumption (and associated emissions)should be accurately estimated and verified, and
- *simplicity*: eligibility rules will be crafted to be as simple as possible, without making unreasonable sacrifices in terms of additionality and rigor.”

These principles clearly reflect the challenges identified earlier in this paper in the discussion of EECT schemes. Of key concern is that the policy measure actually drives change. If its targeted outcomes will happen anyway there is little point, and much to argue against, implementing a policy measure. Establishing the credibility of such additionality clearly requires rigorous measurement and verification, yet the efficiency of the scheme hinges on demand-side decision makers being willing to make the effort of understanding and responding to the scheme.

One might question whether any level of complexity in the rules would be sufficient to rigorously prove additionality for energy efficiency, particularly given the difficulties experienced in implementing measures elsewhere. Regardless, the challenge of managing any potential tradeoff between additionality and credibility against rigor and simplicity is considerable, as shown below.

4.3 Demand side abatement rules

Within the NSW scheme, demand-side NGACs can be calculated using one of three approaches:[62]

- project impact assessment,
- metered baseline method, or
- default abatement factors method.

The key issue with these three approaches is the need to ensure additionality beyond ‘business as usual’ in a rigorous yet simple manner. We consider each of the abatement methods in turn, then a number of other relevant issues to the scheme.

4.3.1 Project Impact Assessment Method

Methodology:
This method calculates NGACs entitlements from an “engineering assessment of only the equipment, process or system that is the subject of demand side abatement” (MEU, 2003: 4). This engineering assessment is to use “reasonable assumptions and generally accepted engineering methods, models and formulae... chosen by the Abatement Certificate Provider.” Project assessment methods of this type underpin many of the schemes worldwide based around certified ‘energy savings’ from energy efficiency (see Section 2.2).

[62] See MEU (2003). We do not consider the ‘generator’ method for electricity substitution at user installations.

The baseline for abatement activities on existing installations is based on the consumption of the existing equipment, systems or processes factoring in its operating characteristics and, where necessary, a range of default efficiencies provided by the scheme administrators for some equipment.

Possible concerns with the accuracy of such calculations are addressed by applying a confidence factor to each project that scales the number of NGACs that can be created. New installations are to be baselined against the best existing similar installations in NSW, or otherwise in Australia.

Our assessment:
It is difficult to see how the quality of NGACs created according to this methodology could be guaranteed. It should be clear, for example, that the methodology as defined in these rules may not actually test *additionality* beyond 'business as usual' in any of the key ways explored in the earlier discussion (Section 2.2) – that is,

- showing improvement beyond underlying technical progress in standard equipment,
- ensuring that changes are not being driven by other policy measures or
- proving that additional investment was made.

4.3.2 The metered baseline method:

Methodology:
This method uses measurement of energy consumption 'before' demand side abatement takes place to establish a 'baseline'. Measurements performed after DSA has commenced allow participants to calculate the impact of the abatement measures. Baselines may be calculated as unaffected by output, per unit of output, or normalized to other variables.

Where a baseline for a particular process is defined with reference to its output, projects which increase production output proportionally more than any consequent increase in energy consumption will be able to create NGACS equivalent to this difference. There are special arrangements for new or existing office buildings based around an Australian Building Greenhouse Rating Scheme.

The measurement period can be as short as one day or as long as a year subject to it covering at least one of any regular and known cycle in consumption. There are also some arrangements to cover unexplained baseline variability – including the option of avoiding even having to consider possible unexplained variations if they are prepared to give up 10% of their possible NGAC allowance (MEU, 2003: 10).

Our assessment:
Although it is difficult to assess how this methodology may actually be applied in practice, it would in some ways seem to offer an even weaker test of additionality than the project assessment method. There appears to be no clear need to prove that concrete abatement action of any sort was actually undertaken – it is changes in metered consumption that count.

As discussed earlier, there are many possible reasons, other than energy efficiency improvements motivated by the NSW scheme that might see such changes in metered consumption for a particular industrial process.

4.3.3 Default abatement factors method:

Methodology:
This method can be used where common equipment items such as domestic appliances and electric motors are being installed. There is a list of such equipment that is eligible, along with default abatement (tonnes) over the equipment's operating life. The baselines for such installations are based on the 'energy star' ratings scheme in place within Australia under the National Appliance and Equipment Energy Efficiency Program.

Our assessment:
This is a common approach for reducing the transaction costs and effort required to measure and certify energy savings from large numbers of relatively small installations.

The scheme's choice of approved appliance types is interesting. Fridges and freezers are included, so too clothes dryers (see Figure 1) and dishwashers. Air conditioners, however miss out. Perhaps the idea of certified 'energy savings' through the sale of energy efficient air-conditioners is just a little too much of a stretch.

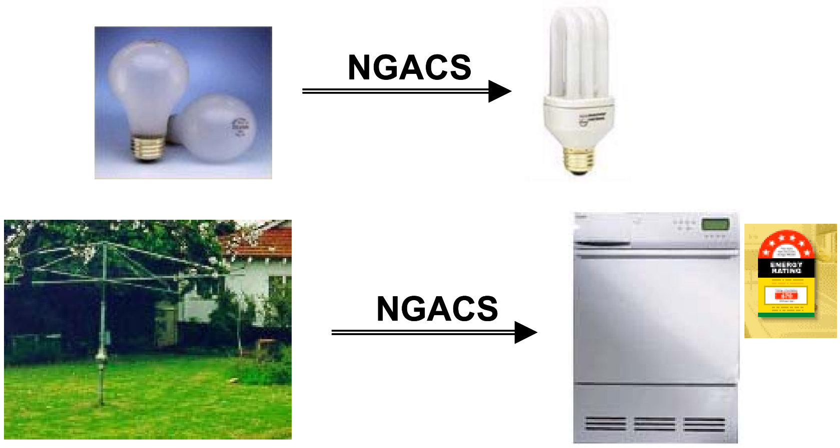

Figure 3. The NSW Benchmarks scheme effectively rewards participants for upgrading from incandescent light globes to compact fluorescent units. However, it also rewards them for upgrading their 'Hills Hoist' outdoor clothes line to an 'energy efficient' electric unit.

One difficulty is assessing how such installations actually end up being operated. For example, the NSW deeming methodology may only be used if the installation remains in place and operative for the defined 'default service lifetime' corresponding that installation. These default service lifetimes, however, range from five to eight years and it is hard to imagine how such a guarantee can be made – unless of course participants were made to wait for that period before they get the NGACs.

Note also that an Australian Minimum Equipment Performance Standards program is currently driving changes in domestic appliances[63], and this will impact on the NSW scheme's baselines.

4.4 Other challenges for the NSW Benchmarks scheme

4.4.1 Double counting across other policy measures:

As outlined previously, one major test of EECT additionality is in the scheme's potential interaction with other existing policy measures that impact on the energy sector. It is interesting to note how the NSW scheme attempts to manage possible double counting with other Federal policy mechanisms already in place.

For example, NSW electricity retailers have an obligation to buy certified renewable energy certificates (RECs) equivalent to a percentage of their national electricity sales under the Federal MRET legislation. The NSW scheme allows these retailers to double count some of the emission reductions arising from this obligation against their benchmark obligations.[64]

[63] See the AGO website for more details, www.greenhouse.gov.au.

[64] See Outhred (2002b) for more details. NSW retailers are only able to claim emissions reductions from their MRET obligation for their NSW electricity sales.

In terms of DSA within the NSW scheme, another example of double counting across several policy measures is the treatment of GGAP projects. The federal GGAP (Greenhouse gas abatement program) operates by providing top-up funding to projects that will reduce or avoid greenhouse gas emissions.

A competitive selection process attempts to find projects that request the lowest GGAP funding and net national cost per tonne of "reasonably assured and additional CO2-e estimated to be abated in 2008-2012" (AGO, 2003b).

As noted earlier, emissions reduction projects normally combine public benefits (the reduced emissions for one) with private benefits - for example, lower energy costs. The intention with GGAP is to bridge the funding gap for projects where it is not strictly cost-effective to choose lower emission technology or process. In the same way, the NSW scheme is meant to drive energy efficiency improvements by providing project developers with possible additional revenue from the sale of NGACs.

Naturally enough, the Federal Government currently claims the full emissions reductions that have arisen as an outcome of any GGAP program funding. The NSW scheme, however, also allows GGAP funded projects to create NGACs equivalent to the proportion of the project not funded by GGAP. This is hardly consistent treatment of the two policy measures by the NSW scheme (see Figure 4).

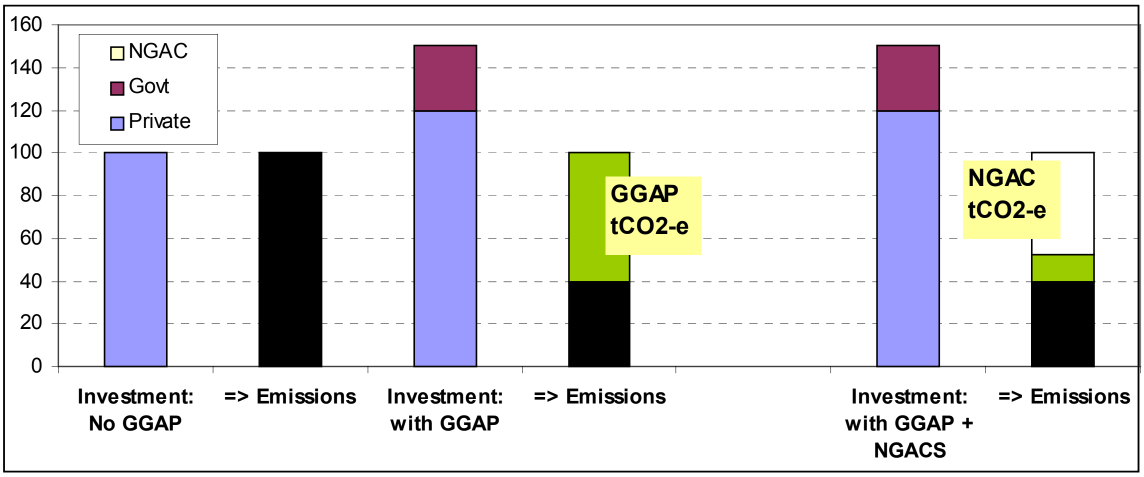

Figure 4. An example of how the NSW Scheme could double-count activities undertaken within the Federal GGAP program. In this case, GGAP funding gives a project developer the incentive to invest additional capital in a more efficient project than otherwise planned. By providing 20% of the total project funding, GGAP has therefore 'driven a 60% emissions reduction over what would otherwise have happened. While the GGAP program will claim this entire reduction, the NSW scheme would also allow the project developer to create NGACs for most (80%) of this emissions reduction.

4.4.2 Possible double counting across scheme participants:

A common concern with certified 'energy savings' is the question of which industry participant actually gets to claim them. Final energy consumption – and hence possible energy savings – for a particular energy service can be affected by decisions throughout the supply chain from manufacturers to equipment retailers through to the consumer.

For example, there would seem to be some possible problems with the allocation, or double counting, of energy savings across the NSW scheme's range of demand-side activities and measurement methodologies.

Consider the case where a scheme participant might earn 'deemed' NGACs through the sale of an energy efficient electric motor. This motor is part of an upgrade to another participant's production line that reduces energy consumption per unit of output and hence might also be used to create NGACs.

How will the 'energy savings' arising from this energy efficient motor be divided between the two participants? There would seem to be a clear potential for double counting unless there are strict rules on NGAC allocations for all such cases.

4.4.3 Changing baselines and project lifetimes:

Two key challenges with establishing energy efficiency baselines are:

- technical progress, which tends to improve the conversion efficiency of industrial processes and end-use equipment over time, and
- ongoing policy developments in related areas.

This is particularly important when a policy mechanism has a medium to longer-term time horizon. The NSW scheme has a legislated lifetime of ten years, yet it is not clear how baselines will be adjusted over this time to reflect these above changes.

The project lifetime over which energy saving can be claimed is also important in this regard. The NSW scheme does not appear to limit the period of time over which a demand-side activity can continue to claim NGACs. For example, a project to upgrade an antiquated and highly inefficient production line with standard 2003 equipment can not only earn NGACs (despite no evidence of project additionality beyond business as usual) but also could conceivably continue to earn NGACs each year through to 2012.

4.4.4 Credits for early action

EECT schemes are likely to be implemented in policy environments, which already have 'energy efficiency' promotion activities underway. The problems with double counting across policy measures have already been noted.

Another possible problem is where EECT follows earlier voluntary schemes where participants have chosen to undertake emissions reductions without any legal requirement to do so. It might seem reasonable to give such participants 'credit' for these earlier efforts, yet this can raise serious difficulties.

For example, the NSW scheme allows NGACs to be created for demand side abatement activities claimed under the earlier voluntary benchmark arrangements. One might argue that the revised arrangements are an extension of the earlier scheme and that earlier efforts should be recognized.

Note, however, that the original benchmark target timeline has been eased by five years and that these projects (many up to four or five years old) may still be generating NGACs in 2012 measured from their original baseline.

Furthermore, the problems of effectively delivering demand side abatement through the earlier benchmark arrangements for 'electricity sales foregone' have been widely noted including (EPA, 2002) and IPART (2001). For example, these earlier rules allowed 'deeming' of quantified emissions reductions from retailer spending on advertisements promoting energy efficiency to their customers. Some poorly quantified and near unverifiable claims made under voluntary arrangements may now be given financial value.

4.4.5 Compliance arrangements:

Verification clearly has a key role in EECT schemes and the possible tradeoffs between rigor and credibility versus clarity and simplicity have been discussed.

The Independent Pricing and Regulatory Tribunal (IPART) is the administrator of the scheme and as such is responsible for monitoring and verifying the creation of abatement certificates, and the compliance of abatement certificate providers with the scheme. IPART is also responsible for the monitoring and enforcing of benchmark participants' compliance with their benchmarks.

At this time arrangements for verifying abatement activity haven't been finalized, however, "Accredited certificate providers are likely to be required to have the abatement activity giving rise to abatement certificates independently verified as a condition of their accreditation."[65]

The role of such independent verifiers is likely to be key, yet the lack of clarity in the rules for the scheme would seem to allow considerable potential for error. It is possible that a very wide and diverse range of activities will attempt to create NGACs and it will be difficult to provide consistent and fair treatment across all of these.

Key questions include how the needs for transparency against commercial-in-confidence considerations can be balanced, and what possible input into the operation of the scheme is available to stakeholders interested in issues such as the environmental integrity of the policy measure. IPART may be faced with an unenviable compliance and auditing role.

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[65] This is stated on the schemes website, www.greenhousegas.nsw.gov.au.

5 Discussion

In this paper, we have argued that energy efficiency has a very important role to play in efforts to mitigate climate change, and offers a range of other societal benefits. It is clear that energy markets to date have failed to deliver even cost-effective levels of energy efficiency into the economy, because of a range of market barriers and failures. Climate change action is going to require far greater efforts in energy efficiency.

The clear need for policy measures that promote greater energy efficiency has seen considerable and diverse efforts to date, with varying degrees of success. The challenge of developing effective mechanisms for the wide range of energy services and technologies in use is significant. Perhaps of even more importance are the great number, varied capabilities and sometimes limited options available to all of the decision makers involved in energy use.

Recent worldwide moves towards restructured energy industries with market-based competition have, in some ways, made the challenge of good energy efficiency policy even greater. Certainly, some traditional mechanisms may not be well suited to competitive energy markets, while there may be new opportunities for market based energy efficiency measures.

We are now seeing growing interest in the potential of energy efficiency certificate trading schemes within restructured electricity industries. Such market-based approaches would seem to offer economic efficiency advantages and a ‘one size fits all’ alternative to more conventional measures targeted at particular technologies and decision makers.

One important issue is whether the wide range of ‘energy efficiency’ options within the economy and the very different barriers they face can all be addressed through a single universal mechanism. It may be that EECT works best when somewhat targeted to a limited range of end-use services and technologies. This would seem to be the approach taken by the UK energy efficiency commitment. The scope of the NSW benchmarks scheme, in contrast, is economy wide.

The key question, then, is whether EECT mechanisms can make an effective and efficient contribution to an overall policy objective of promoting energy efficiency across the economy. Here, ‘effectiveness’ refers to the ability of EECT to actually promote greater energy efficiency. ‘Efficient’ refers to whether EECT can do this at reasonable cost and effort in comparison to both the benefits of meeting these objectives, and the other possible energy efficiency policy measures that might be used.

Our limited experience with EECT to date would not seem to have answered this question, and it lies beyond the scope of this paper. There are, however, reasons for concern. One is the vexed question of how we can measure, verify and certify ‘energy savings’ beyond ‘business as usual’. The inescapable problem with proving this *additionality* is that its impossible to verify what would have happened in the absence of such a policy measure. Policy measures based around certified energy savings to date have highlighted the very real difficulties in this. Again, carefully targeted schemes for a limited range of energy services and technologies are advantaged

Trading of certificates only adds to this challenge. Failure to establish a credible energy savings ‘commodity’ puts the entire market at risk as dubious free-rider projects (lemons) crowd out worthwhile efforts, and confidence in the entire policy mechanism falls.

Another key question is how compatible EECT might be with the national and international emissions trading schemes now being explored. However, it is important to distinguish the ‘cap and trade’ schemes in physical greenhouse emissions favoured by proponents of national emissions trading against 'baseline and credit' schemes in strictly hypothetical 'emissions reductions' such as EECT. The credibility of such claimed 'emissions reductions' is again critical.

The implementation of the NSW scheme highlights many of the challenges and unresolved questions for EECT schemes. Unfortunately this would seem to be more through its apparent failures to address many of these difficulties, than its success in overcoming them. It is, perhaps, surprising to see such an ambitious implementation of 'emissions reductions' trading given these uncertainties and the clear weaknesses of its present arrangements.

All will agree in the importance of finding new and more effective policy measures for energy efficiency and the valuable role of 'learning by doing' in this. However, we would argue for caution, a little humility and a great deal of care in this learning. The UK and Italian experiments in EECT appear far more measured, constrained and cautious than the NSW scheme.

New policies can have far-reaching and entirely unexpected effects – not all pleasant. This risk must be minimised, then accepted. Alternatively, implementing policies that don't actually drive any meaningful change and have little credibility is potentially even more damaging.

Finally, the key to policy 'learning by doing' is of course the learning. This necessarily requires great transparency and wide stakeholder participation in assessing the performance of the policy. Such participation has to go beyond those with obligations and those who benefit by helping to meet these obligations. For environmentally targeted policy, stakeholders whose primary interest is in the environmental integrity of the scheme must be involved. Schemes that hide critical implementation decisions behind the veil of 'corporate in confidence' considerations for the participants may, and should, struggle to be seen as credible.

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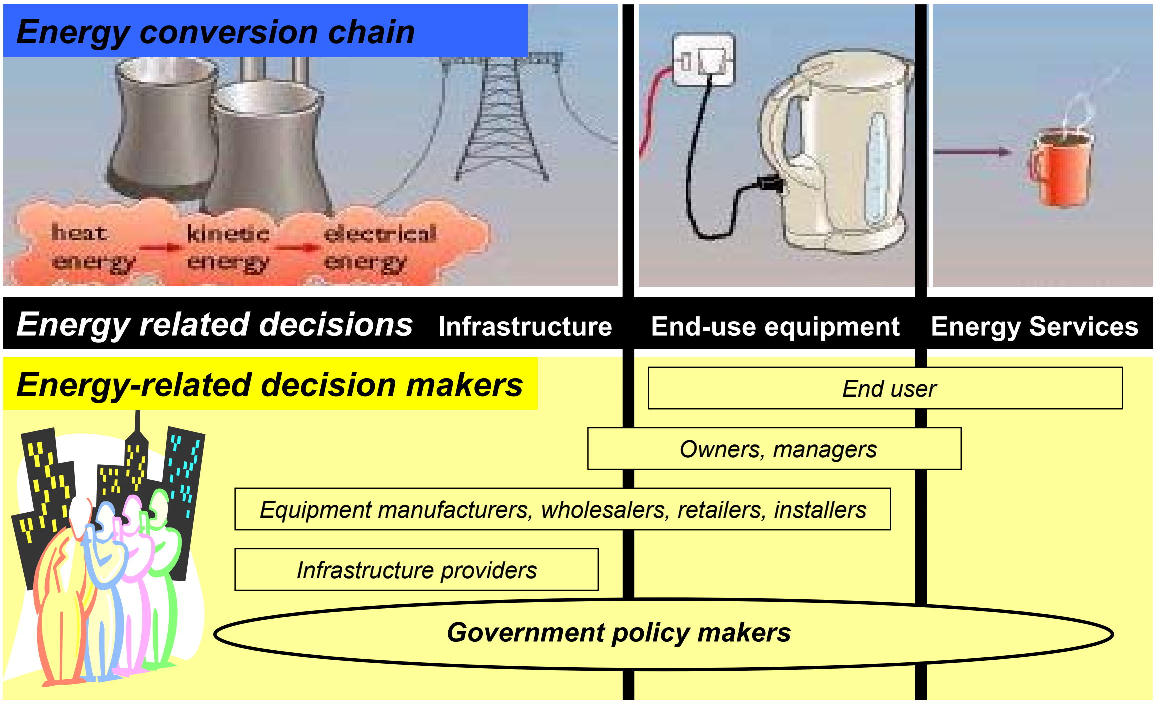
7 Appendix



The energy conversion chain, energy related decision and relevant decision makers for the energy service of a 'nice hot cup of tea.'

The amount of energy required to deliver this service depends on how often the end-user desires tea, the chosen end-use equipment for heating the water (an electric jug or perhaps an open saucepan on an electric stove) and the operation of this equipment (does the user boil a full jug or just sufficient for their cup).

The end-use equipment will have previously been chosen by the end-user, or perhaps someone else like a building owner or manager.

This equipment also has to be chosen from what's manufactured and available locally, and that choice will also be dependent on what energy infrastructure is available (is electricity even available, or just an open fire).

A particular participant's decisions are therefore shaped by the decisions, past and present, of potentially many other participants. All these then contribute to how efficiently the particular energy service is delivered to the end-user.