Centre for Energy and Environmental Markets

The NSW Greenhouse Gas Abatement Scheme:

An assessment of the scheme's performance to date, scenarios of its possible performance to 2012, and their policy implications

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Centre for Energy and Environmental Markets

About CEEM and this paper:

The Centre for Energy & Environmental Markets was founded in 2004 to allow the University of New South Wales to provide interdisciplinary research and advice on the design, implementation and operation of energy and environmental markets.

The Centre formally brings together researchers from within the Faculty of Engineering, the Faculty of Commerce & Economics and the Australian Graduate School of Management. The CEEM also has active collaborations occurring across other faculties at the UNSW, and with a number of Universities and other organisations.

The CEEM has formal research partnerships with the Interdisciplinary Center for Economic Science at George Mason University and with the Power Sector Engineering Research Centre (PSerc) based at Cornell University.

This paper attempts to assess the performance of the NSW Greenhouse Gas Abatement Scheme to date, and provides some scenarios of its possible future performance to 2012, The policy implications of this assessment are then considered.

It draws greatly upon a companion paper, *An analysis of the NGAC Registry for the 2003 Compliance Period - Sources of registered NGACs, Market Concentration, Reporting Transparency, and Additionality questions*, CEEM draft discussion paper, DP_050405, April 2005.

This is an area of ongoing work for CEEM and we are actively seeking feedback and comments on the analysis methodology and findings outlined in this paper.

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Executive Summary

The NSW Greenhouse Gas Abatement Scheme (NGAS) is the most significant state-based policy measure on climate change to date in Australia. It requires NSW electricity retailers and other liable parties to meet mandatory targets for reducing the greenhouse emissions resulting from the electricity they supply or use. These parties demonstrate compliance by annually surrendering NSW Greenhouse Gas Abatement Certificates (NGACs) for emissions above this target, or paying a penalty. NGACs can be created through certified generation demand side abatement (DSA) and sequestration activities.

NGAS certainly represents an ambitious attempt to introduce a far reaching financial incentive to undertake abatement activities. However, observers including the authors raised concerns during the policy consultation process about the scheme's likely performance given its complex design, use of 'baseline and credit' trading, poor reporting transparency and likely high transaction costs.

The scheme has now been underway for two years and there is an opportunity to assess how the scheme has actually performed in practice. IPART's publicly available annual report to the Minister unfortunately provides little detail on the actual activities that have created NGACs; nor does it formally assess the performance of the scheme with respect to its policy intent of reducing greenhouse emissions.

In a companion paper (Passey et al, 2005) the authors undertook a detailed analysis of the NGAC registry for 2003. The main findings were that:

- most 2003 NGACs came from just a few types of activities,
- five organisations were responsible for creating almost 80% of 2003 NGACs,
- there is insufficient public reporting to definitively assess the performance of the scheme,
- nevertheless, it seems likely that many of the 2003 NGACs don't actually represent any additional greenhouse abatement. Over 95% of these NGACs came from generation plant constructed and operating well before the scheme began, and many of these were not required to make operational changes from 2002 to 2003 in order to create NGACs.

In this paper we use the registry analysis to attempt a more detailed assessment of the performance of the scheme in terms of its effectiveness in reducing emissions, the efficiency with which it achieves these reductions and its potential impacts on NSW electricity customers. This assessment focuses on key challenges with the present scheme's design – the complex abstractions between policy intent and actual abatement activities, the difficulties in ensuring the scheme delivers abatement that would otherwise not have happened and market trading arrangements.

Assessing NGAS performance to date:

One of the most problematic aspects of the NSW scheme are the complex 'imputed' linkages between its stated policy intent of reducing emissions created through NSW electricity consumption, it's legislated objectives that include support for abatement offsets not related to electricity, the translation of these objectives into 'imputed' mandatory targets for liable parties, and the complex 'baseline and credit' rules for accrediting abatement projects.

The problem with all these convoluted 'imputed' linkages is that physical emissions from electricity generation in NSW can continue to increase even while the scheme's declining State per-capita target is met and large numbers of NGACs are created.

Assessing additionality is always problematic in 'baseline and credit' schemes such as NGAS because it is inherently counter-factual – it requires an estimate of what would have happened ‘otherwise’. However, additionality is also essential because if the scheme doesn’t actually change behaviour there is little point implementing it.

The NSW scheme doesn’t explicitly discuss or attempt to assess additionality at all. While this avoids the measurement problem it means that the performance of the scheme can always be called into question. Even the limited publicly available information on accredited projects to date has certainly raised questions about the scheme’s likely additionality.

This has important implications, in turn, for market arrangements. NGACs representing additional abatement will have costs associated with the action beyond BAU that was taken to create them. Non-additional NGACs do not have such costs. The cost of creating NGACs also includes numerous transaction costs in accreditation, NGAC creation, auditing, registry fees and trading. These may be quite significant as IPART has rigorous auditing requirements. Unfortunately, many of these audits may be ensuring compliance with rules that don’t actually require additionality.

We have only limited insight into the prices paid for NGACs by liable parties because contractual arrangements are generally commercial in confidence. Current AFMA pricing data suggests NGAC spot prices of around A$11, with forward prices rising to over A$14 for delivery in 2009. The costs of NGAS passed through to particular NSW electricity customers will also generally be commercial in confidence. Small NSW customers on regulated tariffs pay an additional charge of A$2/MWh on every MW sold to cover retailer costs for NGAS. NSW Government-owned retailers Energy Australia, Integral Energy and Country Energy had a combined of share of over 98% of these small customers in mid 2003.

In strict economic terms, the efficiency of NGAS can be calculated from the total costs of the scheme – both from additional actions and transaction costs – divided by the greenhouse abatement achieved. Relatively high transaction costs and low additionality would suggest low efficiency for NGAS. The price impacts on NSW electricity customers are also of concern. If the present NGAC spot price is being passed through to them, there may be considerable windfall profits for NGAC providers and/or retailers.

Assessing future NGAS performance:

While NGAS performance to date is questionable, the key measure of the scheme will be its performance over its legislated life to 2012. We have therefore attempted to explore NGAS future performance. The many uncertainties involved in such analysis have necessitated a scenario approach that includes a range of plausible estimates for:

- demand for NGACs to 2012
- non-additional NGACs from existing projects that continue over the life of the scheme
- policy overlap between NGAS and other greenhouse related policy measures, and
- new generation in the NEM driven by BAU growth in electricity demand.

The outcomes of this scenario analysis are concerning. Under what appear to be conservative assumptions, the scenarios suggest that 70% or more of all NGACs created over the scheme’s life might not actually represent additional abatement. The implications of this in terms of the scheme’s effectiveness, efficiency and price impacts would be significant. This scenario analysis also suggests that proposals to extend the life of NGAS to 2020 may not resolve some of these underlying additionality questions.

Given present NSW Government energy policy deliberations that include discussion of the future of NGAS, our findings certainly seem to highlight the need for some publicly available analysis of the scheme’s present and possible future performance to be undertaken by the NSW Government. This would be a valuable contribution to the State’s current greenhouse policy debate, and help guide policy processes exploring possible design changes to the scheme.

CONTENTS

Introduction

The NSW Greenhouse Gas Abatement Scheme (NGAS) is the most significant state-based policy measure on climate change to date in Australia. It "requires NSW electricity retailers and certain other parties to meet mandatory targets for reducing the emission of greenhouse gases from the production of the electricity they supply or use." (IPART, 2004). These targets are based on 'imputed[1]' NSW emissions from the electricity sector compared to a declining per-capita emissions target. Liable parties are assigned shares of the overall emissions target equivalent to their respective market shares of State electricity sales. They demonstrate compliance with their benchmarks by annually surrendering NSW Greenhouse Gas Abatement Certificates or NGACs, each representing a notional tonne of CO_2-e of 'avoided' GHG emissions, to cover any excess 'imputed' emissions above their benchmark. Alternatively, they can pay a penalty of A$10.50/t$CO_2$-e. NGACs can be created through certified generation,[2] energy efficiency and sequestration activities.

The stated policy intent of the scheme is to reduce ''greenhouse gas emissions created through NSW electricity consumption'' (NSW Government, 2001). An earlier, largely voluntary State benchmarks scheme that shared many of the fundamental design features of the current scheme failed to achieve this objective over its legislated life of 1997–2001 (NSW EPA, 2002).

Changes to the scheme design were developed during 2001-03. These included introducing penalties for non-compliance, amending the measurement of different types of abatement activities, introducing a certificate-based trading system and providing alternative arrangements for large consumers and projects deemed to be of 'state significance.' The new arrangements commenced on 1st January 2003.

NGAS certainly represents an ambitious attempt to introduce a far-reaching financial incentive for reducing electricity-related greenhouse emissions in NSW. During the policy consultation process, however, observers including the authors (Nolles et al, 2002; Outhred et al, 2002; MacGill et al, 2005) raised concerns about the scheme's likely performance because of:

- its complex design *abstractions* that effectively separate the stated policy objectives and defined targets (electricity-related greenhouse emissions per NSW resident) from actual physical emissions from the state's electricity sector,
- difficulties in ensuring that the scheme actually drives *additional* abatement by only crediting NGACs for activities that clearly go beyond business-as-usual and aren't actually being driven by other policy measures
- a lack of *transparency* in the reporting of the scheme's operation and in legislated assessments of its performance
- *complex* operational requirements placed on participants, that seem likely to cause significant transaction costs, and
- *trading arrangements* that may actually increase the costs of meeting the scheme's policy objectives, and unfairly impact on some parts of the community.

The scheme has now been underway for over two years, and there is the opportunity to assess how the scheme has actually performed to date. IPART, the scheme administrator and compliance regulator, delivered its first annual report on the *Operation of the Scheme and compliance during 2003* in June 2004.

[1] We use the term "imputed" to indicate firstly, that it is difficult to define emissions due to NSW electricity consumption in the context of an interconnected National Electricity Market and, secondly, that actual NSW emissions are related to the benchmark scheme in only an indirect manner.

[2] Nominally low-emission generation which in this context means below the published pool average greenhouse intensity.

This report, however, did not provide much detail on the actual projects that created NGACs in the year, nor the organisations involved. Nor did it formally assess the performance of the scheme with respect to its policy intent of reducing greenhouse emissions.

In a companion paper, (Passey et al, 2005) we presented the findings of an independent search through the 2003 NGAC registry that identified the different activities and associated organisations creating NGACs in that year. This analysis focussed particularly on questions of the scheme's transparency, and which activities might represent real emissions reductions driven by the scheme.

In this paper, we use this registry analysis to make a more detailed assessment of the performance of the scheme to date in terms of:

- its effectiveness in reducing greenhouse emissions,
- the efficiency with which it might have achieved this, and
- its potential impacts on NSW electricity customers.

This analysis focuses on scheme performance with respect to the design challenges identified in our earlier work on the scheme:

- *abstraction*: have the scheme's complex procedures and rules for determining 'imputed' abatement targets and accrediting abatement activities effectively detached the scheme's policy objectives from its operation in practice,
- *additionality*: has the scheme actually delivered greenhouse abatement that would not have happened in its absence, and
- *market trading*: how does the NGAC market appear to be performing.

Building on this assessment, we then explore the possible future performance of the scheme over its mandated life to 2012. We develop a range of scenarios for:

- Projected NGAC demand
- The effective abatement delivered by existing projects within the scheme,
- The impact of other greenhouse policy measures on scheme performance, and
- Other business-as-usual developments in the National Electricity Market that might also affect the scheme.

We use these scenarios to explore the question of how the scheme may perform over its legislated life. The paper concludes with some thoughts on how the scheme might be improved given these findings.

NGAS operation to date

This section briefly summarises the findings of the NGAS registry analysis undertaken by Passey et al (2005).

NGAC liabilities: For their 2003 obligations, liable parties surrendered 1,167,392 NGACS. Renewable Energy Certificates (RECs) required from retailers under the Federal Mandatory Renewable Energy Target (MRET) can also be used to meet liable parties' NSW benchmarks to the extent they correspond to electricity sold in NSW. In 2003, 544,518 RECs equivalent to 488,432 NGACs were also used to meet liabilities.[3] Large electricity customers who have elected to manage their own greenhouse gas benchmark may meet their obligations with non-tradable Large User Abatement Certificates (LUACs) created by undertaking activities that don't relate to electricity consumption. No LUACs were registered for 2003.

The number of NGACs that each liable party is obliged to surrender each year is not publicly available, however, IPART (2004) reports that no parties incurred a penalty for the year.

NGAC creation: IPART accredited 113 projects to create NGACS for abatement for 2003. For the 2003 liability period, 6,662,994 NGACs were registered through Generation or DSA activities.[4] Table 2 over the page provides more details.

Pre-existing waste coal mine and landfill gas projects dominate. Over 95% of the NGACs came from projects that were commissioned before the start of the scheme. Just over 40% of the 2003 NGACs were from projects outside NSW.

Market trading: The five major organisations creating 2003 NGACs are identified in Table 1. It can be seen that NSW Government owned Integral Energy, alone, registered almost half the total NGACs for the year. Note also that IP Hazelwood is over 90% owned by IP, so four participants accounted for almost 80% of NGACs created for 2003.

Table 1. Market share of major providers for 2003 NGACs

	NGACs registered	% of total NGACs registered	Cumulative % total
Integral Energy	3,048,880	45.8	45.8
Energy Developments Ltd (EDL)	1122260	16.8	62.6
AGL	542625	8.6	71.2
International Power (IP)	285002	4.3	75.5
IP Hazelwood	251199	3.8	79.3

While the market share of electricity retailers in NSW is not publicly available, the three NSW Government-owned electricity retailers – Energy Australia, Integral Energy and Country Energy – continue to dominate. Together, therefore, they have responsibility for a substantial majority of the NGAC liability each year.

[3] RECs are multiplied by the NSW pool coefficient to obtain the equivalent number of NGACs.
[4] Note that registration of NGACs for a particular year can occur up to 30th June of the following year.

Table 2: 2003 NGACs by Operator and Project (Passey et al, 2005)

Operator	Project	NGACs	% of total	Cumulative
Integral Energy	Tower and Appin collieries	2,468,419	37.05%	37.05%
	Smithfield natural gas cogen	580,461	8.70%	
		3,048,880	45.76%	45.76%
Tower and Appin (1996[5]) and Smithfield (1997) are eligible to create NGACs from all generation.				
Energy Developments	Landfill gas	1,122,260	16.84%	62.60%
Seven landfill gas plant commissioned from 1992 to 1995 are Category A and are eligible to create NGACs for avoided methane emissions from generation above their REC or PPA-derived baseline. Three landfill gas plant commissioned from 1998 to 2002 are eligible to create NGACs for avoided methane emissions from all their generation,				
AGL	Landfill gas	493,545	7.41%	
	Sewage and natural gas	75,837	1.14%	
		569,382	8.55%	71.15%
Four 1995 landfill gas plant create NGACs in the same way as the equivalent Category A EDL plant. West Nowra (2002) creates NGACs in the same way as the equivalent Category D EDL plant. Werribee (1997) can create NGACs for generation above the its average generation from 1997 to 2001. Varnsdorf (~1994) and Coopers Brewery (2003) can create NGACs from all generation.				
International Power	Natural gas	285,002	4.28%	75.43%
Pelican Point (2001) can create NGACs for net sent out generation above its average over 1997-01 if using the Relative Intensity rule.				
International Power Hazelwood	Coal-fired	251,199	3.77%	79.20%
Hazelwood (1964) created NGACs through actions taken under the GES.				
CS Energy	Natural gas	228,718	3.43%	82.63%
Swanbank E (2002) can create NGACs from all generation.				
Energy Australia	Landfill gas	160,449	2.41%	
	Hydro and DSA	13,521	0.2%	
		173,970	2.61%	85.24%
Lucas Heights (1995) and Belrose (1995) create NGACs in the same way as the equivalent Category A EDL plant. Glenbawn (1995) can create NGACs for generation above either the PPA-derived baseline, or if no PPA then from all generation.				
Country Energy	Tahmoor (DSA & Gen)	120,943	1.81%	
	Hydro & Biomass	52,721	0.79%	
		173,664	2.61%	87.85%
Tahmoor (2001) can create NGACs from all generation.. Three hydro plant from 1992 to 1996 can create NGACs for generation above their REC or PPA-derived baseline. Nymboida (1928) and Oaky (1950s) can create NGACs for generation above either the PPA-derived baseline, or if no PPA then from all generation. Broadwater (1996) can create NGACs for generation above their REC or PPA-derived baseline., and by reducing its emission intensity through cogeneration.				
TXU	Landfill gas	109,839	1.65%	
	Hydro	42,821	0.64%	
		152,660	2.29%	90.14%
Berwick (1992) can create NGACs in the same way as the equivalent Category A EDL plant above. Three hydro plant from 1994 can create NGACs from generation above their REC or PPA-derived baseline. Three hydro plant from 1989 to 1993 can create NGACs from generation above either the PPA-derived baseline, or if there is no PPA then from all generation.				
Eraring Energy	Coal-fired	129,086	1.94%	92.08%
Eraring (1984) created NGACs through actions taken under the GES.				
Visy Pulp & Paper	Biomass cogeneration	113,489	1.70%	93.78%
Tumut (2001) created NGACs under the DSA Rule most likely under the Generation Emissions Method.				
Delta Electricity	Coal-fired	94,537	1.42%	95.20%
Mt Piper (1992/93), Vales Point (1978/9) and Wallerawang (1957/80) created NGACs through actions taken under the GES.				

[5] A year in brackets is the reported year of commissioning

Assessing NGAS performance to date

With the registry analysis presented in the previous section, we can now attempt to assess the performance of the scheme to date in delivering on its policy intent of reducing greenhouse emissions. This assessment focuses on the key design challenges noted earlier – abstraction, additionality and market arrangements – and their potential impacts on the scheme's effectiveness, efficiency and equity.

Abstractions of 'imputed' benchmarks and abatement activities:

One of the most problematic aspects of NGAS are the complex 'imputed' linkages between:

- its stated *policy intent* of reducing greenhouse gas emissions created through NSW electricity consumption,
- the scheme's l*egislated objectives* 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." (NSW Government, 2002)
- its *requirement that liable parties* "…meet mandatory targets for reducing the emission of greenhouse gases from the production of the electricity they supply or use." (IPART, 2004) and the calculation of how many NGACs each NSW retailer must surrender each year, and
- the complex *'baseline and credit'* approach taken in accrediting abatement projects, and then measuring the quantity of abatement they deliver.

Policy intent: The climate system responds to physical greenhouse emissions and international frameworks such as the Kyoto Protocol therefore set national targets for developed countries based on their physical emissions. Emissions reductions in this context mean a physical reduction in greenhouse emissions.

Legislated objectives: NGAS, however, is based on estimates of emissions created through NSW electricity consumption rather than physical greenhouse emissions from NSW electricity generation. The liable parties are electricity retailers who don't actually create physical emissions, rather than the NSW generators who do.

The scheme gives credit for non-electricity related activities including sequestration – this despite the many difficulties in both accurately measuring the abatement arising from land-use change, and then ensuring that the carbon remains sequestered for the hundreds to thousands of years required to protect the climate.

The scheme also includes interstate activities that will only very indirectly impact physical emissions in NSW. For example, some 40% of claimed abatement towards reductions in NSW per-capita emissions for 2003 was created in States other than NSW – and this without any agreed legal framework between State governments for how credit for this abatement might be 'transferred'.

Requirements on liable parties: Retailer NGAC targets are then derived from a complex calculation involving the scheme's declining per-capita emissions target, state electricity demand, an 'imputed' pool emissions coefficient calculated from selected existing generators in the State and other adjustments. This calculation is not intuitive or accurate, particularly with respect to the imputed NSW pool coefficient, and how NGACs are calculated using it.[6] Emissions reductions

[6] The number of NGACs created by so-called low emission plant is based on the difference between the emission intensity of this plant and the NSW pool coefficient. This effectively assumes that the low-emission plant will equally displace all plant included in the pool coefficient calculation. As discussed in Passey et al (2005), this is unlikely to be the case.

claimed by the scheme don't actually mean a physical reduction in total emissions. Instead they are an estimate of how emissions have been reduced from what they otherwise would have been. Such reductions can never be accurately measured or verified as they rely on estimates of outcomes that never actually get to happen.

'Baseline and credit' assessment of abatement: Ensuring additionality is one of the great challenges of 'baseline and credit' schemes such as NGAS. The scheme must attempt to determine a Business-As-Usual (BAU) baseline for all included activities, so that credit can then be awarded for actions that clearly go beyond this. NGAS uses a complex set of rules to define what activities are eligible to create NGACs, and how much abatement particular projects can claim. We consider the actual additionality required by these rules in the next section. However, its worth noting that over 95% of NGACs for 2003 came from generation plant constructed well before the scheme began, and many of these plant were not required to make any changes in their operation from 2002 to 2003 in order to create NGACs.

The impacts of these design abstractions

There is a range of possible reasons why NGAS was designed with all of these imputed linkages – for example, State Government jurisdiction of NSW retailer licenses. Unfortunately, all these imputed linkages in NGAS mean that physical electricity generation emissions in NSW can continue to climb even while the scheme's declining State per-capita target is met.

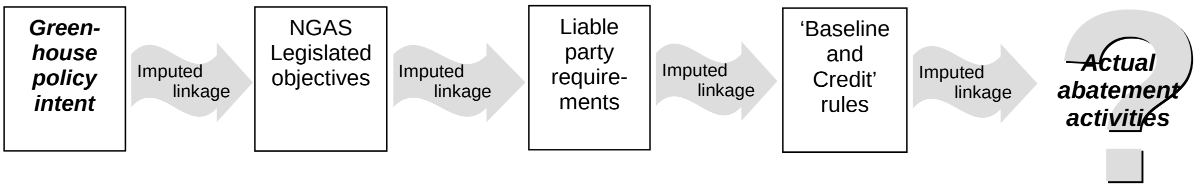


Figure 1: The convoluted linkages between policy intent and physical greenhouse abatement activities in the NSW Greenhouse Gas Scheme.

The potential confusion is depicted in Figure 1, and highlighted by media stories such as the following:

> NSW energy retailers have reduced greenhouse gas pollution by more than eight million tonnes since 2003, the economic regulator said on Tuesday. This has been done through an increased use of renewable energy, improved generator efficiency and avoiding methane emissions under pollution targets set by the NSW NGAS.... "The NGAS was introduced in 2003. In the first 20 months more than eight million tonnes of emission reductions were registered," IPART CEO James Cox said in a statement.[7]

The registration of eight million NGACs is easily verified from the NGAS registry. However, the connection between real reductions in emissions and the creation of NGACs is tenuous – defined only by the NSW scheme's complex and highly abstracted rules of what can be counted as abatement. The claim of reduced emissions of eight million tonnes since 2003 because eight million NGACs had been registered is simply incorrect – for example, the Tower and Appin waste coal gas plants have been operating since 1996 but were still able to create nearly two and a half million NGACs for 2003 from 'avoided methane emissions.' Their use of mine methane for power generation in years 02/03 and 03/04 was actually less than for the years 99/00, 00/01 and 01/02 (Illawarra Coal, 2004).

These confusions highlight the risks with complex and highly abstracted scheme designs, and the difficulties in assessing how they are actually performing with respect to their policy objectives.

[7] Industry Search News Article, 9/2/05.

Additionality:

As noted above, ensuring additionality is problematic in 'baseline and credit' schemes such as NGAS because it is inherently counter factual – it requires an estimate of what would have happened 'otherwise'. Additionality, however, is essential because if the scheme doesn't actually change physical behavior from what would otherwise happen then there are no good reasons to implement it, and many good reasons not to.

This is a fundamental problem for 'baseline and credit' schemes, and this approach was rejected for the EU Emissions Trading Scheme (CEPS, 2002), and the CoAG Energy Market Review's proposed national emissions trading scheme for Australia (CoAG, 2002).

The problems in attempting to estimate *additional* abatement are many. It may result from both:

- investment in activities that reduce emissions compared to the investments that otherwise would have occurred – for example, construction of a gas-fired plant rather than a coal-fired unit which has lower direct costs but higher emissions, yet also
- operational changes in existing projects – for example, increased production from existing gas-fired plant in response to the financial incentives provided by a scheme.

The many factors that can drive investment decisions make additionality hard to measure in the first case. Additionality from operational changes, however, is even harder to measure because of all the possible reasons why operational decisions such as production levels might change – everything from market demand to the weather.

Key tests in assessing additionality of an activity under a 'baseline and credit' greenhouse abatement scheme such as NGAS include:

- Did the project commence before the scheme began? – for example, low-emission generating plant in the NEM that was operating or under construction before the scheme began. If a project did already exist, has the scheme materially changed operating decisions from what they otherwise would have been and therefore reduced emissions?
- With projects that do commence after a scheme is implemented, would the same project have happened regardless (Business-As-Usual)? – for example, new coal-fired plant in the NEM built to address growing demand. If it is a BAU investment, again, has the scheme changed operating decisions from what they otherwise would have been?
- Is the project also being driven by other government programs? – for example, renewable plant constructed because of the Federal MRET. If so, how much of the project and its emission reductions can be attributed to the greenhouse abatement scheme?

Clearly, additionality can be extremely difficult to calculate. Because the energy sector is generally capital-intensive with long asset lives, the key to sustained emissions reductions is through changing patterns of investment towards lower-emission generation and greater energy efficiency. Given this, and the particular problems of assessing additionality for operational changes, 'baseline and credit' schemes for emissions reduction such as the Clean Development Mechanism (CDM) focus on driving new investment that clearly wouldn't have happened without the scheme. The CDM has rigorous, detailed, transparent and widely discussed processes for testing the additionality of proposed projects.[8]

The NSW scheme doesn't *explicitly* discuss or attempt to assess additionality at all.[9] While this approach avoids the enormous potential difficulties of actually trying to make this assessment, it does means that the performance of the scheme can be brought into question.

[8] See www.cdm.unfccc.int for more information on CDM.
[9] Some early draft versions of the NSW scheme rules discussed the importance of additionality, however these were removed in the final scheme implementation.

This leads to another important requirement for assessing scheme performance – the public availability of data so that independent parties can form their own views on the additionality of projects. Again, the CDM Executive Board requires high considerable disclosure for proposed projects. NGAS, on the other hand, does not provide sufficient public information for some important tests of project additionality to be made by independent observers (Passey et al, 2005).

Despite the lack of formal additionality assessments in NGAS, and the very limited public information provided on accredited projects, there appears to be cause for concern with the additionality of NGAS, as shown in Table 3.

Table 3: The questionable additionality of some NGAS activities

Category of NGAS activity	2003 NGACs (% of total)	Additionality questions
Category A fossil fuel plant	over 3 million (45.9%)	NGAC production dominated by Tower and Appin coal waste gas plants built in the mid 1990s and operating well prior to the scheme – their entire annual generation is eligible to create NGACs.
Renewable energy plant	almost 2 million (29.2%)	Landfill gas plants built and operating well before the scheme began create the great majority of these, and can claim NGACs for the abatement due to 'avoided' methane emissions from the landfill above their MRET baseline.[10] Those built after 1996 can create RECS and therefore 'avoided methane' NGACs for their entire output. Even new landfill plants don't necessarily reduce 'methane' emissions because of widespread EPA requirements that landfill gas must be captured and flared, if not used for generation.
RECs from NSW retailers MRET obligations	almost 490,000	MRET can be used to meet participants' liabilities under the NSW Benchmarks Scheme to the extent that these RECs correspond to NSW electricity sales. Because MRET is a mandatory Federal program, these NGACs are not additional.
Category D fossil fuel plant	over 350,000 (5.3%)	The majority of these NGACs came from Swanbank E in Queensland which came on line in 2002.
Demand Side Abatement (DSA) activities	almost 350,000 (5.2%)	These projects are among the most problematic for assessing additionality as there is a large ongoing investment in a very wide range of energy-using technologies, yet most investment decisions pay little attention to energy efficiency.
Category C fossil fuel plant	over 280,000 (4.3%)	For these plant, also built and operating before the scheme commenced, generation above their average annual generation from 1997 to 2001 is eligible to create NGACs. However, the annual output of many generators has been increasing because of growing electricity demand in the NEM.

As noted above, there is insufficient publicly available data to fully assess the additionality of the NGAS scheme for 2003. However, of the 6,662,994 NGACs registered for that year:

- more than 95% appear to have come from installations that were built or committed well prior to the commencement of the scheme
- the great majority of NGACs created from these pre-existing projects did not actually require any operational changes in response to the scheme's commencement in 2003
- over 40% of NGACs came from interstate projects – widening the area within which accredited activities can be located means more potential BAU projects that will still be able to create NGACs.

[10] The high greenhouse intensity of methane means large numbers of NGACs can result from relatively small amounts of renewable generation.

Market arrangements

As noted earlier, four organisations created almost 80% of the 2003 NGACs. This clearly represents significant market concentration. NSW Government-owned retailers also dominate NGAC demand.

There are clearly some interesting possible interactions between the NGAC market and the NSW retail electricity market, and also through the predominance of government-owned organisations in both the NGAC supply and demand markets.

For example, 46% of 2003 NGACs were created by a single participant, Integral Energy. Integral Energy is an electricity retailer and distribution network operator based in Western Sydney. It is the second largest of the NSW State Owned electricity utilities. It is in the somewhat unique position in having the largest single supply of NGACs, whilst also competing against other firms in the retail electricity market. The NGAC market is relatively small in comparison to the NSW retail electricity market, and might conceivably be impacted by market positioning in the latter. We hope to explore these market design questions in future work.

NGAC costs and prices:

The costs of creating NGACs include:

- the cost of any additional action beyond BAU required to be eligible to create NGACs, and
- transaction costs involved in accreditation, certificate creation, auditing, registry fees and trading of these NGACs.

For non-additional activities, seemingly the great majority of NGAC creation in 2003, there are no additional costs directly associated with the activity. The actual costs of any additional actions to create NGACs are commercial-in-confidence under NGAS.

The transaction costs may be significant, particularly for small projects because IPART has certainly implemented rigorous auditing requirements.[11] Unfortunately, many of these audits may be ensuring compliance with rules that don't require additionality. This would be particularly unfortunate – high cost accreditation and auditing processes that don't actually test for additionality, and therefore don't necessarily improve the performance of the scheme.

We have only limited insight into the prices paid for NGACs because the contractual arrangements between liable parties and certificate providers are also commercial in confidence. Retailers and other liable parties also seem likely to face significant transaction costs in meeting their obligations under the scheme.

In addition to a high degree of market concentration, the NGAC market is characterised by:

- a lack of market surveillance – note that there is no formal market surveillance or market monitoring performed in the NGAC market.
- relatively small size and Illiquidity (AFMA, 2005a).

Current AFMA pricing data suggests NGAC spot prices of around A$11, with forward prices rising to over A$14 for delivery in 2009 (AFMA, 2005b).

The cost of the NGAS scheme passed through NSW energy consumers is also generally commercial in confidence. For customers with negotiated contracts, presumably the price increase they see from the scheme will be some combination of the price paid by the retailers,

[11] For example, the SEDA lighting upgrade case study (available on the NGAS website) was eligible for estimated 15000 NGACS. However, there were initial costs for SEDA in preparing the application and funding a $10,000 audit. A report confirming that SEDA has inspected the stores and ensured that the units are still installed and fully operational, and that the layout of stores and their use has not materially changed is required each year. There are possible spot audits too.

and the nature of the negotiations between the retailer and these customers. Large electricity consumers may elect to become direct participants, and manage their own benchmark obligations. Some of these parties may use LUACs to meet their obligations. The additionality of these might also be called into question given present scheme rules.

For small customers who have remained on regulated tariffs, the most recent IPART (2004b) price determination includes an allowed additional charge of A$2/MWh on every MWh sold to cover retailer costs for the NGAS scheme. Energy Australia, Integral and Country Energy had a combined market share of over 98% of all small customers in mid 2003.

Efficiency and equity concerns:

In strict economic terms, the efficiency of NGAS in delivering abatement equals total costs of any 'additional' action and all scheme transaction costs divided by the actual greenhouse emissions abated. Relatively high transaction costs and low additionality would suggest low efficiency.

The price impacts on energy end-users depend greatly on how much retailers are paying for NGACs, and how these costs are passed through to end consumers. If end-users are paying close to current spot NGAC prices then the very low additionality of the scheme to date suggests considerable potential windfall profits to the certificate providers and/or retailers. The possible cashflows are shown in Figure 2.

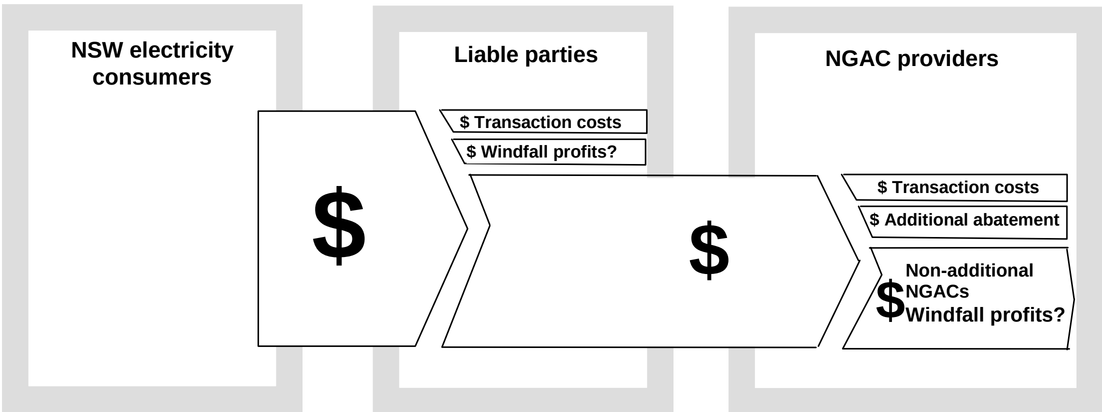


Figure 2: Possible cash flows through the NSW Greenhouse Gas Scheme.

The equity considerations are concerning. For example, if NSW electricity retailers were to pass the present NGAC spot price of around A$11 through to their customers for all NGACs created in 2003, that would represent a cash flow of over A$70 million. If transaction costs were 10% of this NGAC price, that would represent a total cost of around A$7 million. If only 10% of the 2003 NGACs were additional, this then represents actual abatement expenditure (investment and operational changes) of well under A$7 million. The remaining A$59 million might then represent windfall profits to NGAC creators and/or retailers.

Assessing future NGAS performance

In our assessment of NGAS performance for 2003, we stressed the low apparent additionality of the scheme in that year. However, the key measure of its performance as a policy instrument will be its performance over the mandated life of the scheme to 2012.

There are good reasons to gradually ramp up highly novel policy measures to enable participants to gain an understanding and capacity to act. This would certainly seem to apply the NGAS. As IPART has itself noted, “At this early stage of the Scheme, most abatement projects have come from electricity generation or DSA projects already in place prior to the official commencement of the scheme. …In future years, the incentives offered by the Scheme will encourage the development of new projects..” (IPART, 2004, pp. 14).

In this section, therefore we attempt to make some estimates of how the scheme might perform over its mandated life to 2012. In particular, we focus on the role that new projects might play in meeting the scheme’s targets, and what proportion of these projects might actually be additional – that is, a result of the NGAS scheme.

We noted earlier the numerous problems in assessing the performance of the scheme given the poor transparency of present NGAS reporting arrangements. Assessing the future performance of NGAS involves even greater challenges given the need to make estimates of future electricity demand in NSW, electricity supply across the NEM, and the impacts of other Government greenhouse policy measures. We use a scenario approach to explore the possible impacts of these uncertainties.

The potential impact of scheme abstractions

Future operation of NGAS will not, unfortunately, resolve many of the problems noted earlier with the highly abstracted design of the scheme that only tenuously connects the stated intent of real reductions in physical emissions with the actual imputed ‘emissions’ and hence required number of NGACs.

As noted in the NSW Energy Green Paper, physical emissions from NSW electricity generation are increasing, and can continue to do so even while the NGAS target is met. The disconnect between NGAS and ‘cap and trade’ schemes based on physical emissions, as used in the EU emissions trading scheme, is stark. Note also that the Kyoto Protocol targets for developed countries are physical caps on emissions, with only a very limited role for ‘baseline and credit’ activities under the CDM.

Also, and as demonstrated in the next section, it seems entirely possible that the majority of future NGACs could come from projects outside NSW. Finally, a number of sequestration and LUAC abatement activities that don’t relate to electricity supply and use have now been accredited. Future claimed abatement from these activities does not seem to address the policy intent of reducing physical emissions from NSW generation in a meaningful way.

The potential additionality of the scheme

In this section, we present some scenarios of possible future NGAC supply from new projects over the scheme’s mandated life to 2012. It is important to note the many uncertainties and required assumptions in developing such scenarios. Nevertheless, they do help illustrate some of the potential *additionality* problems with NGAS.

NGAC demand over the mandated life of the scheme

We use IPART's demand estimate for NGACs as shown in Figure 3. There are many uncertainties in making such a projection. IPART notes that only a very basic model is used to generate their curve, and that "You should rely on your own judgement about future demand for NGACs." (Drysdale, 2005).

IPART also doesn't provide any detailed information on how this estimate was made. For example, it is unclear whether its estimates of electricity consumption in NSW account for the range of energy efficiency policies and programs that are being implemented by Federal and the State Government. The demand projection does not include NGACs earned by NSW retailers from meeting their Federal MRET obligation. If NSW retains its current share of total Australian electricity consumption, MRET will be ramping up NGAC creation until 2010 when it will be providing around 2.5 NGACs a year, and this level will then continue until 2020. None of these NGACs can be considered to be additional.

We use the IPART NGAC demand scenario provided by Drysdale (2005). It sees a total requirement of around 140 million NGACs over the life of the scheme.

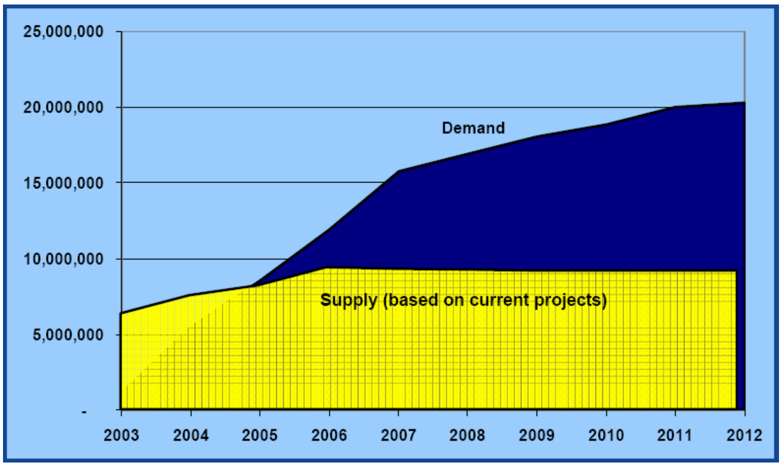


Figure 3: IPART projections of NGAC demand over the scheme's mandated life to 2012 (taken from Drysdale, 2005)

NGACs from existing projects

As noted by Passey et al (2005) it appears that almost all the projects that created NGACs for 2003 will be able to continue to do so each year over the life of the scheme. The number of NGACs produced by these projects could rise with operational changes driven by some combination of BAU and the scheme. NGAC production for many projects will rise if, as IPART projects (Drysdale, 2005), the NGAS imputed pool coefficient increases over coming years. NGAC creation from some other projects may fall – for example, with declining methane production from some landfill sites.

A number of accredited projects did not register NGACs for the 2003 year, but can be expected to do so in coming years. Some of the most significant appear to have similar additionality challenges to those outlined previously, including a waste coal mine gas project receiving Federal Greenhouse Gas Abatement Program (GGAP) funding and coal-fired plant commissioned in 2002 in Queensland. In total, these projects seem likely to be able to create hundreds of thousands of NGACs annually. IPART has some estimates of NGAC supply from current projects that see the number of these NGACs climbing to over 9 million a year in 2006 before ramping down slightly over the rest of the scheme (Drysdale, 2005).

We consider three conservative scenarios for NGAC supply from current projects:

- 6 million non-additional NGACs a year for the life of the scheme – equivalent to around 10% of 2003 NGACs being additional, and all projects that have been accredited but didn't create certificates for 2003 representing additional abatement
- 6.6 million non-additional NGACs a year – equivalent to assuming no 2003 NGACs were additional, but that all projects that have been accredited but didn't create certificates for 2003 represent additional abatement
- 7.5 million non-additional NGACs a year from 2004 onwards – equivalent to just over 15% of the NGACs expected from currently accredited projects actually being additional

NGACs from projects also driven by other Government policy measures

A range of Government policy measures that began before NGAS commenced will drive abatement activities that are also able to create NGACs. Estimates of how many NGACs might be created are difficult to make given present and future uncertainties about the impacts of the scheme. The AGO has estimated a potential overlap of 13.5 Mt CO_2-e between NGAS and other Australian Government measures in 2010 as shown in Table 4.

Table 4: AGO estimate of NGAS Gross Abatement for 2010 (AGO, 2004)

NSW BAU emissions (Mt)	**69.7**
NSW target emissions (Mt)	**51.5**
Gross emissions saved (Mt)	**18.1**
Overlap	**13.5**
Demand-side schemes (MEPS, Efficient Buildings, EEBP)	4.3
MRET & Green Power	2.5
Generator Efficiency Standards (GES)	1.6
GGAP projects – electricity projects	0.5
GGAP projects – fugitive projects	2.6
Waste Sector abatement – Landfill and sewage projects	2.0
NSW Scheme Net Emissions Abatement (Mt)	**4.7**

Demand-side schemes such as MEPS and Building rating schemes can impact on NGAS both through reductions in NSW electricity demand (and hence the NGAC target each year) and, in some cases, through the ability to generate Demand-Side-Abatement NGACs. Estimating this overlap is particularly challenging, but it can be expected to be large given present and emerging policy efforts to drive energy efficiency. It is not clear how the IPART NGAC demand scenario might factor in these demand-side policy efforts.

The Federal GES overlap with NGAS is difficult to estimate because of the complexity and lack of reporting transparency in the scheme's rules for calculating NGACs from such activities. Nevertheless, it is also likely to be significant, and we are already seeing a number of generating plants with GES agreements producing substantial numbers of NGACs.

The *Federal GGAP* overlap with NGAS is particularly concerning. GGAP works by supporting projects that will significantly reduce emissions from BAU growth, and require only modest Federal capital grant support per tCO_2-e abated in order to make the project cost effective. Nevertheless, projects that received GGAP funding before 1st Jan 2003 can create NGACs equivalent to their entire estimated abatement. This is clearly a free-rider for most of the GGAP projects of round 1 and 2. The closing dates for applications in these two rounds were 2000 and 2001 respectively. The claimed abatement from these two rounds is over 25 million tCO_2-e over

2008-12. The AGO estimate of 2.5 million tonnes of overlap with GGAS in 2010 may be quite conservative.

GGAP projects after 1st Jan 2003 can create NGACS only in proportion to the funding provided by the generator as opposed to the Federal government. This, however, still effectively awards NGACs for the cost-effective (BAU) component of the project – that is, what would have been done anyway given normal project financing. Hopefully, financing calculations for future projects will include the revenue stream from the NGACs. Nevertheless, it is likely there will be considerable non-additionality.

Waste sector abatement: As demonstrated in our analysis of the 2003 registry, there is considerable double counting between NGAS and earlier policy measures such as MRET driving reductions in waste methane emissions. There are new landfill projects now coming on line. These will typically burn methane that was previously flared and in such cases there aren't actual 'avoided methane' emission reductions. Estimated NGAC revenues may form some part of the financing stream for these projects although this revenue is only legislated until 2012 – far shorter than most investment horizons for generating plant. NGAS, however, may drive additional efforts for gas collection or similar changes in operation.

We consider two government policy overlap scenarios:

- a midpoint estimate that half the AGO's estimated demand-side, GES, GGAP and Waste sector overlap to 2010 actually represents new non-additional NGACs. This represents around 5.5 million NGACs a year in 2010. This rough estimate is assumed to ramp up from 2004 to 2012 in a linear fashion
- only half of the above policy overlap actually takes place – that is, 2.75 million non-additional NGACs/year in 2010, again linearly ramped from 2004 to 2012.

NGACs created through BAU growth in demand

BAU growth in both baseload and peak demand is expected to require construction of additional plant before 2012 (NEMMCO, 2004). It is likely nearly all such plant will have lower emissions intensity than the NSW pool coefficient, and be able to create NGACs. The emissions intensity of coal-fired plant will almost always be lower than this pool coefficient because of technology improvements in this type of plant over the last 20 years. The emissions intensity of intermediate and peaking plant will be lower again as these are generally gas-fired units.

The impact that NGAS might have on new investment and the operation of existing plant is very difficult to estimate (ABARE, 2004). It been argued that the legislated end of the scheme in 2012 does not provide a sufficient revenue horizon to directly change investment patterns (Delta Electricity, 2005). In terms of operational changes, the NGAC income from increasing generation from existing gas plant might be of the order of A$5/MWh for CCGT plant and A$2.50/MWh for peaking units at present prices. It is unclear how much this might change the merit order of gas plant with respect to coal generation in the NEM. Estimates from ACIL Tasman (2003) suggest that marginal costs of NEM coal-fired plants are almost all more than A$5/MWh cheaper than those of CCGT plant. Growth in NEM demand is likely to be a far more important driver of new plant and increased generation from existing plant than the NSW scheme.

Increased coal-fired generation:

In order to obtain some scenarios of non-additional NGACs we assume that no new coal plants other than Kogan Creek come on line before 2012. There are numerous committed and proposed upgrades to existing plant to increase their capacity. The ability of these upgraded plant to create NGACs is unclear. However, Kogan Creek alone might be able to earn in the order of one to two million NGACs to 2012.[12] A number of other coal-fired plant in the NEM will be able to create

[12] This 750 MW unit operating at a 90% capacity factor at an emissions intensity of 0.85 tCO_2-e/MWh might be able to earn in the order of 400,000 NGACs a year.

more NGACs if their annual generation increases – for example, Millmerran in Queensland. We do not attempt to estimate the possible non-additional NGACs arising from this.

Increased gas-fired generation:

We use ABARE estimates of increased gas-fired electricity generation to 2012 and proportion this via ABARE's State split estimates for 2009-10 to estimate the increased gas generation in all NEM states other than Queensland (where we assume additional gas generation is driven by that State's 13% Gas Scheme). We assume this comes from 90% intermediate and 10% peaking plant with emissions intensities of 0.55 tCO_2-e /MWh and 0.75 tCO_2-e /MWh respectively (higher than best-practice plant given the mix of old and recent plant that would be involved).

The NGACs that might be generated for additional generation beyond 2003 levels can then be roughly estimated, and total around 11 million NGACs to 2012. ABARE (2004) states that its electricity projections factor in the NSW scheme, noting "The scheme is expected to provide economic incentives to investment in gas fired electricity in New South Wales — forecast to grow by 5.8 per cent a year over the full outlook period — although the exact impact of the New South Wales scheme cannot be fully anticipated at this time." ABARE projects that additional NSW gas generation will be responsible for around 20% of the increase across the NEM (not including Queensland).

Other work suggests there should be a considerable increase in gas-fired generation in NSW over the next decade under BAU conditions. For example, an IES (2004) report for IPART finds that the lowest cost generation mix for NSW includes considerable gas-fired CCGT and open-cycle plant. Given that NSW currently has only around 160MW of CCGT, 50MW of peaking plant yet almost 12,000 MW of coal base load plant, efficient market investment might see considerable new gas-fired plant coming on-line.

We consider two scenarios:

- 90% of the 13 million or so NGACs that might be created from Kogan Creek and ABARE projections of increased gas generation in the NEM are not-additional; that is, they result from projected increases in coal and gas-fired generation largely driven by BAU increases in electricity demand
- 60% of these NGACs are not additional; that is, the NSW scheme actually drives 40% of the increased generation claiming NGACs

These scenarios represent very rough estimates based on both highly uncertain projections of generation to 2012, and the additionality of the NSW scheme in driving these changes as compared to the impact of growing demand. As such, they are illustrative only.

Additionality scenarios for NGAS

We can now consider some possible scenarios of supply and demand in the NGAS market over its mandated life to 2012, and what effective 'additionality' these might represent. The possible impact of the individual scenarios discussed in the previous section are given in Table 6. The possible impacts of a mix of these scenarios are given in Table 7.

Table 6: Some supply scenarios of non-additional NGACs for 2003-12

Scenario options	NGACs (million)	Non-additional contrib. to NGAC demand (%)
IPART estimated total NGAC demand	**138**	
6 million non-additional NGACs/year from existing projects	60	43%
6.6 million non-additional NGACs/year from existing projects	66	48%
7.5 million non-additional NGACs/year from existing projects	74	54%
Non-additional NGACs from policy overlap	35	26%
Non-additional NGACs from half this policy overlap	18	13%
Non-additional NGACs from 60% of BAU NEM generation	8	6%
Non-additional NGACs from 90% of BAU NEM generation	12	9%

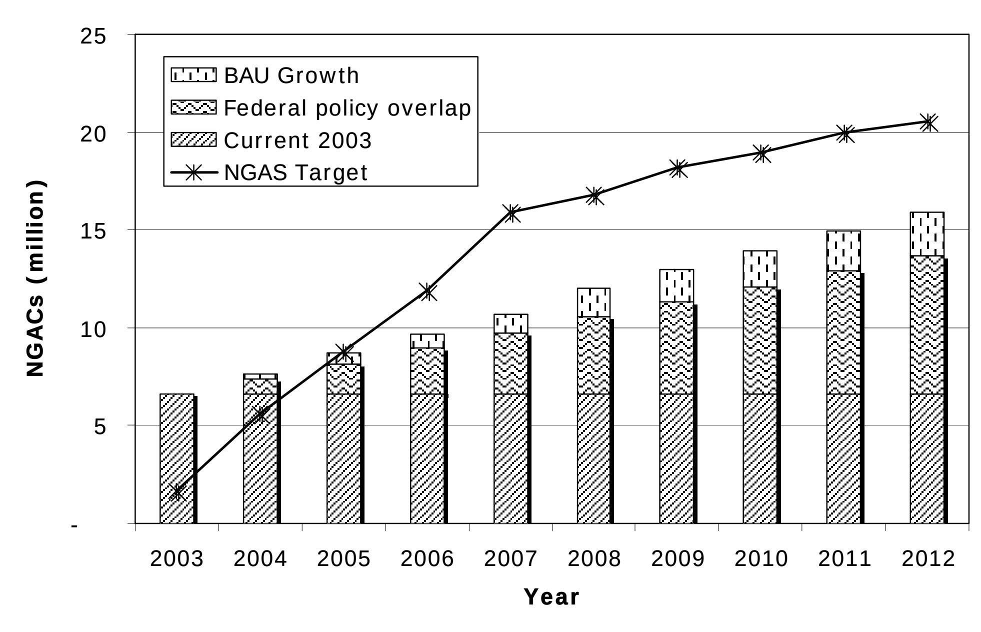
Table 7: Estimates of non-additional NGACS over 2003-12 for a range of scenario mixes

Scenario mix	½ policy overlap + 60% BAU plant	½ policy overlap + 90% BAU plant	policy overlap + 60% BAU plant	policy overlap + 90% BAU plant
6 million non-additional NGACs from existing projects	62%	65%	75%	78%
6.6 million non-additional NGACs from existing projects	67%	70%	79%	82%
7.5 million non-additional NGACs from existing projects	72%	75%	85%	88%

These scenarios are concerning. Even under conservative assumptions the additional abatement actually driven by the scheme could be less than 30% over its legislated life. If this is the case, NGAS would prove to be rather ineffective in delivering emissions reductions – 70% or more of the NGACs sold to 2012 would represent no additional abatement.

A depiction of one possible NGAC demand and non-additional supply scenario over the scheme's life is presented in Figure 4.

Figure 4: An NGAC supply and demand scenario for NGAS to 2012
(scenario assuming non-additional existing NGACs of 6.6 million a year, government policy overlap and 90% non-additional BAU generation growth in the NEM)



This particular scenario represents over 80% non-additionality over the life of the scheme. It also demonstrates some of the potential implications of extending the NGAS scheme life to 2020 as suggested in the NSW Government's Energy Directions paper.

Continuing efforts to strengthen energy-related climate change policy and BAU development of the NEM may continue to greatly reduce the effectiveness of the scheme even if it were is extended for another 8 years. For example, the NSW Government has recently announced a NSW Demand Management fund that is projected to reduce emissions by some 800,000 tCO_2-e /year by 2011 (DEUS, 2005). This might result in activities that can also produce NGACs. Also, Allen Consulting Group (2004) modelling suggests considerable new gas-fired plant may enter the NEM in the post 2012 period.

Growing government policy overlap with the scheme and new BAU gas-fired generation in the NEM would mean that extension of NGAS to 2020 might still result in relatively low levels of additionality, and physical increases in emissions from the NSW generation sector.

Future market arrangements

The arrival of new NGAC providers should reduce the present market concentration on the supply side with time. Reductions in the present market concentration of liable parties will depend on how successful non-franchise retailers are in obtaining market share within the NSW retail market, and whether large users choose to directly become liable parties.

The very limited publicly available data on the price and volumes of NGACs traded on spot and forward markets does suggest that market participants see a tightening of NGAC supply in coming years. If the market is working efficiently, forward NGAC prices might largely reflect the marginal cost of additional abatement activities. That is, of course, a big 'if' given present market arrangements.

Efficiency and equity:

The likelihood of relatively low additionality over the life of NGAS and relatively high transaction costs suggest potentially low economic efficiency for the scheme.

Again, if current spot and forward prices for NGACs are passed through to NSW electricity customers, there would seem to be some potential for windfall profits to the certificate providers and/or retailers.

For example, if the average price for NGACs over the life of the scheme is A$14 as current forward price curves suggest (AFMA, 2005b), then electricity customers might pay in the order of A$2 billion over the life of the scheme. If transaction costs are responsible for 10% of the price of each NGAC, that represents around A$190 million. If 80% of NGACs are non-additional that would represent expenditure of around A$350 million on additional abatement yet possible windfall profits of about A$1.4 billion for NGAC providers and/or retailers over the life of the scheme.

Conclusion

In this paper we have attempted to assess the performance of NGAS in terms of its effectiveness in reducing emissions, the efficiency with which it achieves these reductions and its potential impacts on NSW electricity customers. This assessment focused on key challenges with the present scheme's design – the complex abstractions between policy intent and actual abatement activities, the difficulties in ensuring the scheme delivers abatement that would otherwise not have happened and market trading arrangements.

This assessment is limited by the limited public reporting of some key aspects of the scheme. Nevertheless, our analysis does raise questions about both the likely effectiveness of the scheme in actually reducing NSW emissions from electricity generation, and the efficiency with which it drives abatement.

Given present NSW Government energy policy deliberations that include discussion of the future of NGAS, our findings highlight the need for some publicly available analysis of the scheme's present and possible future performance to be undertaken by the NSW Government. This would be a valuable contribution to the State's greenhouse policy debate, and help guide policy processes exploring possible design changes to the scheme.

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