Relative cost and performance of Australia's Emissions Reduction Fund (ERF)

Reflecting transaction costs in bottom-up MAC estimates and the merit order of competing abatement projects

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Author: Brett Janissen

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META ECONOMICS CONSULTING GROUP PTY LTD

A.B.N. 50 143 853 123

metá - (prefix)*: sense of change of position or condition, behind or after, beyond, of a higher order …*

Contact:

Brett Janissen, Executive Director
Meta Economics Consulting Group Pty Ltd
PO Box 70
BROADMEADOW NSW 2292
brj@metaeconsult.com.au

Web: www.metaeconsult.com.au

Or: contact@metaeconsult.com.au

Glossary and abbreviations

Term	Expansion
$/tCO$_2$e	Australian dollars per tonne of carbon dioxide equivalent
$b	billion dollars ($1,000,000,000)
$m	million dollars ($1,000,000)
ABS	Australian Bureau of Statistics
ACCUs	Australian Carbon Credit Units
'bottom up' estimates	Project or technology focused estimates of abatement potential that generally do not take account of inter-industry linkages
CFI	Carbon Farming Initiative
CO_2e	Carbon dioxide equivalent (the global warming potential of different greenhouse gases are expressed relative to the warming impact of carbon dioxide. That is, their CO_2 equivalent)
CPM	Carbon Pricing Mechanism
ERF	Emissions Reduction Fund
ETS	Emissions Trading System
GHG	Greenhouse gas
kt	kilotonnes (or thousand tonnes)
MAC	Marginal abatement cost curve (which shows the incremental cost of GHG emission reductions)
Mt	megatonnes (or million tonnes)
NPV	Net Present Value (a stream of future costs and benefits that is converted to current dollar values via an appropriate discount rate, and aggregated)

Executive summary

A core test of any national GHG abatement mechanism (or set of mechanisms) is its ability to deliver an emissions target at least cost. Opportunities to reduce emissions are spread throughout the economy, they differ across businesses and households and they can change over time. In the literature, these are depicted in marginal abatement cost (MAC) curves. These describe how the cost of achieving increasing levels of emission reduction differs between activities.

Transaction costs are an overlay on abatement costs. While abatement costs indicate how much it will cost to cut or do without a quantity of greenhouse gas emissions, transaction costs reflect how much it costs to identify and describe that opportunity, measure the emissions and abatement associated with it, achieve sign-off for it and (if necessary) verify the anticipated savings afterward. For the ERF, they are the add-on expenditures incurred in securing and delivering on a contract.

The Emissions Reduction Fund (ERF) is a Commonwealth greenhouse gas abatement program with a $2.55 billion budget that requires participants to demonstrate compliance with published estimation methodologies, submit bids into an auction process and, if successful, enter contracts for the delivery of abatement over the period to 2020 (or longer in some cases). Project reporting and verification responsibilities also apply. These costs influence its effectiveness and bear comparison with a mandatory price based approach such as a carbon tax or emissions trading system.

Magnitude and implications of transaction costs

Imposing transaction cost on abatement opportunities reduces their commercial viability and changes their merit order from a buyer perspective. High transaction costs tend to have a bigger influence on merit order, and small projects – which have less opportunity to spread transaction costs across their emission base – are affected most. This can be important for the Emissions Reduction Fund (ERF) because it relies on project proponents coming forward to sell their abatement on a competitive basis. Activating low cost abatement opportunities ahead of high cost opportunities is fundamental to delivering efficient economy-wide outcomes.

Some evidence on the magnitude of transaction costs is available from the 2 year operation of the now-abandoned Carbon Pricing Mechanism (CPM), and is emerging for the ERF.

The CPM was designed to impose mandatory carbon obligations on bigger emitters and suppliers of emission intensive products (eg. energy, refrigerants, etc). The <u>compliance</u> costs of downstream consumers such as small businesses and households was likely to be negligible (because they bear no reporting or verification burden), although these entities did see the impact of the carbon price on the cost of goods and services. Survey results on reporting costs have been published by the Tax Institute.

The cost of participating in the ERF can differ according to the type and location of abatement activity. Some methods are more straightforward than others and requirements for audits and 'ground truthing' can vary. Land based abatement (consistent with methods established under the Carbon Farming Initiative) has dominated successful ERF contracts to date. Indicative on-costs for these types of projects have been reported. They include:

<u>Project development costs</u>

- initial registration - $10,000 per project

- monitoring/ sampling - $3.500 per project, per year
- reporting - $5,000 per project per report

Audit costs

- for cattle projects: $13,250 (initial audit) + $9,000 (subsequent audit) + $1,000 (site visit fee)
- for savanna & sequestration: $11,250 (initial audit) + $9,000 (subsequent audit) + $1,000 (site visit fee).

They estimated the total on-costs for a typical cattle project (with a 7 year contract life) at around $100,000 and that for a typical avoided land clearing/ managed regrowth project (with obligations over 25 years) at about $150,000.

Australia has not had a fully fledged emissions trading system in place, but compliance costs are likely to be similar to that of the CPM - with the addition of extra costs associated with carbon trading between parties. The cost of individual trades should approximate brokerage fees currently observed in the marketplace, and the level and direction of trades would reflect allocation decisions for emission permits (ie. Australian Carbon Credit Units – or ACCUs).

Our analysis applies the schedule of transaction costs listed in Table ES.1. These apply to big and small (ie. households, and businesses with turnover less than $200,000 per year) projects and, in a competitive bidding program such as the ERF, can affect the amount that program owner must recover in order for the abatement project to be commercially attractive.

Table ES.1 Assumed MACtrax transaction costs for big and small projects under alternative abatement regimes

Abatement regime	Empirical evidence	Assumed trx costs per project in 2020* - SMALL	Assumed trx costs per project in 2020*- BIG
Hypothetical ideal	Assume full informational and transparency. Assume zero transaction costs apply	$0	$0
ERF (project & contract based)	Land based projects $100,000 to $150,000 per project. No evidence on industrial projects (likely to be less)	$13,500	$20,000
Carbon Pricing Mechanism (CPM)	start-up costs of $402,000, recurrent costs of $54,000 pa (Big emitters only). Carbon Farming Initiative (CFI) transaction costs similar to ERF – minus competitive bid requirement.	$0 CFI: 0.7 x ERF	$100,000^ CFI: 0.7 x ERF
National ETS (based on CPM model)	Similar to CPM, large emitter focus (trades & brokerage affected by pattern of permit allocation)	$0 CFI: 0.7 x ERF	$110,000^ CFI: 0.7 x ERF

*assume ERF transaction costs annualised over an average 5 year project horizon, and CPM over 10 years (assuming a need to reprise start up costs). ^ Applies to approx. 400 big businesses on a mandatory basis.

These costs have been reflected in the MACtrax model, which has been developed by Meta Economics using publicly available bottom up estimates of abatement potential and costs within the Australian economy. The model examines the theoretically 'ideal' combination of abatement activities needed to deliver a 126 $MtCO_2e$ abatement outcome in 2020 (consistent with Australia's current international emissions target – according to published official estimates), and compares the likely costs and distributional implications of the ERF and ETS (modelled on the CPM) against this benchmark.

Key results

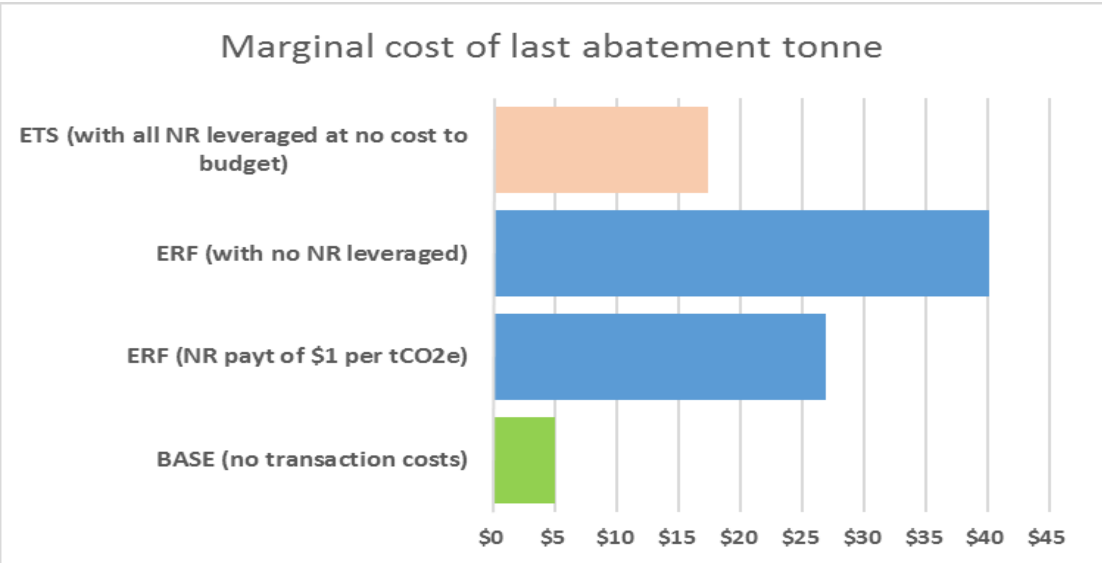
The model demonstrates that policy measures with low transaction costs are likely to produce a lower cost abatement outcome.

Figure ES.1 shows the estimated marginal cost of abatement under Ideal, ERF and ETS approaches. Measures with higher participation costs face reduced access to low cost abatement and must draw on higher cost abatement in order to reach the 2020 target.

In an ideal situation of zero transaction costs (eg. no contractual, monitoring, reporting or verification requirements), the modelling suggests that all the necessary abatement can be generated at a cost of no more than $5.00 per tonne CO2e., with a potential pool of 'no regrets' efficiency gains available within the economy worth about $10.3 billion (in NPV terms).

The transaction costs associated with the ERF drive up the marginal abatement costs faced by participants under the program. If the ERF does not pay for or leverage any 'no regrets' abatement, it faces marginal abatement costs rising to just over $40 per tCO2e. If it could mobilise this abatement at a cost of only $1 per tonne, the final tonne of abatement needed to achieve the 2020 target is estimated to cost around $26.91.

Figure ES.1 Marginal cost of delivering a 126Mt abatement outcome ($/tCO2e)



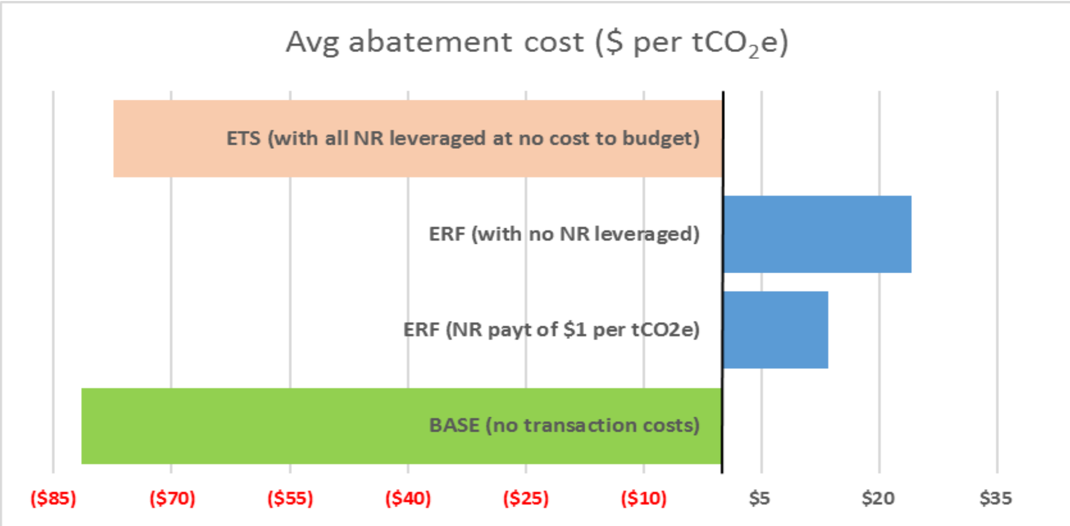
Lower project and entity level transaction costs lead to greater abatement activity under an ETS - which harnesses the incentives provided by a carbon price. It enhances the economic incentives for 'no regrets' abatement and imposes lower costs on those wishing to participate in carbon credit trading arrangements. The market price established under an ETS reflects the marginal cost of abatement, and this acts as both a cost incentive for emission reduction and a profit incentive for the sale of excess emission entitlements.

The modelling suggests that the marginal cost of delivering the 126 MtCO2e of abatement under an ETS would be around $17.36.

Figure ES.2 shows the average cost per tonne of abatement action, taking into account the net cost of all abatement that contributes to achieving the target. The analysis indicates that in theory, if all no regrets abatement could be activated at no additional cost, Australia's 2020

GHG emissions could be reduced by 126 MtCO2e at a negative cost. That is, on average, each tonne of abatement would deliver a financial benefit to the project owner of $81.40 (and an overall benefit from reduced inefficiencies of around $10.3 billion – in NPV terms). Although involving some level of transaction costs, the far reaching abatement incentives of an ETS could deliver an average cost outcome of around -$77.41. It too would be likely to support a net benefit, on average, across emitters (totalling around $9.7 billion – assuming that 'no regrets' action is effectively mobilised by the broad-based impact of a carbon price).

Figure ES.2 Average cost of delivering a 126Mt abatement outcome ($/tCO2e)



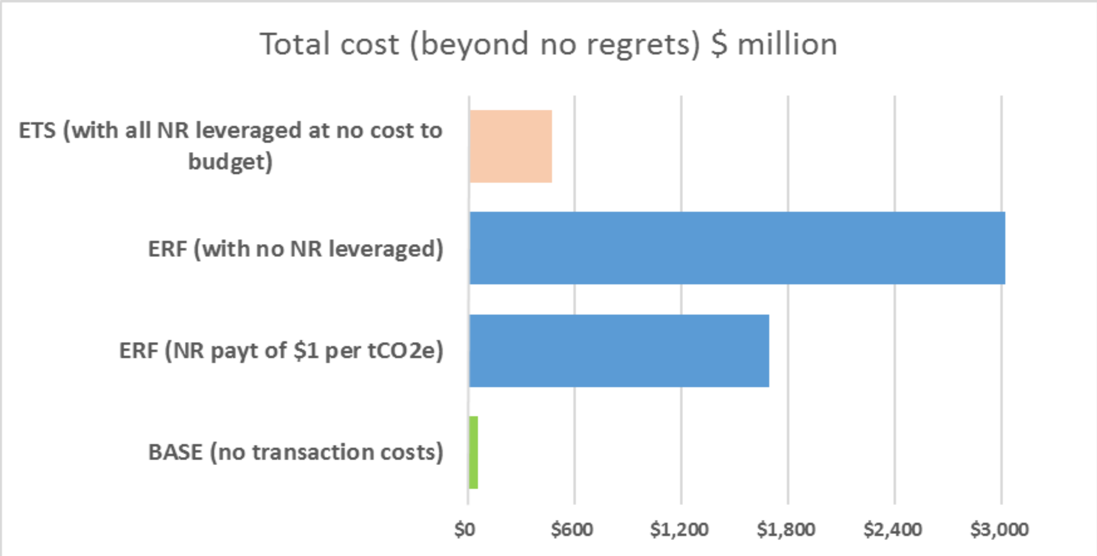
Both variants of the ERF approach (differentiated by the level of 'no regrets' abatement leveraged, and the cost paid) return positive cost estimates. The high leverage variant (which effectively purchases 'no regrets' abatement at $1 per tonne) delivers an average cost for the 126 MtCO2e target of $13.46, and a net cost overall of around $1.7 billion. The low leverage variant (where minimal amounts of 'no regrets' abatement are induced or paid for by the ERF) delivers an average abatement cost of $23.98 per tCO2e, and a net cost overall of about $3.0 billion. These outcomes would be commensurate with an average cost per tonne across all the abatement generated by the ERF of between -$5.20 and +$23.98.

However, according to these indicative bottom up abatement estimates, even with zero transaction costs, there is not enough 'no regrets' abatement in the economy to fully meet the abatement target. Making up the shortfall will entail some net costs. The total of these costs is reported in Figure ES.3.

Under ideal (and theoretical) conditions, the analysis suggests that delivery of 126Mt of abatement across the Australian economy could be achieved with a net expenditure (after no regrets options are exhausted) of around $58.9 million. By comparison, and with the introduction of transaction costs, an ETS would require net expenditures of $475.9 million to achieve the same level of emission reduction. Further, the market approach implicit in an ETS would see a total value of $643.9 million placed on this abatement, implying that over-compensation (ie. a 'producer surplus' or profit) of up to $168 million could be associated with the sale of this abatement (ie. surplus emission permits) by its owners at full market prices.

The ERF would entail expenditures of at least 2.6 to 4.7 times those likely to be required by an ETS. The expenditure estimate for the ERF, assuming purchase of 'no regrets' abatement at $1 per tonne, is $1,696.5 million and the expenditure estimate for the ERF approach if 'no regrets' options were not leveraged by the program is $3,021.4 million. Further, under the ERF, net expenditures are borne by the Commonwealth government.

Figure ES.3 Expenditure associated with 'net cost' abatement outcomes ($m)

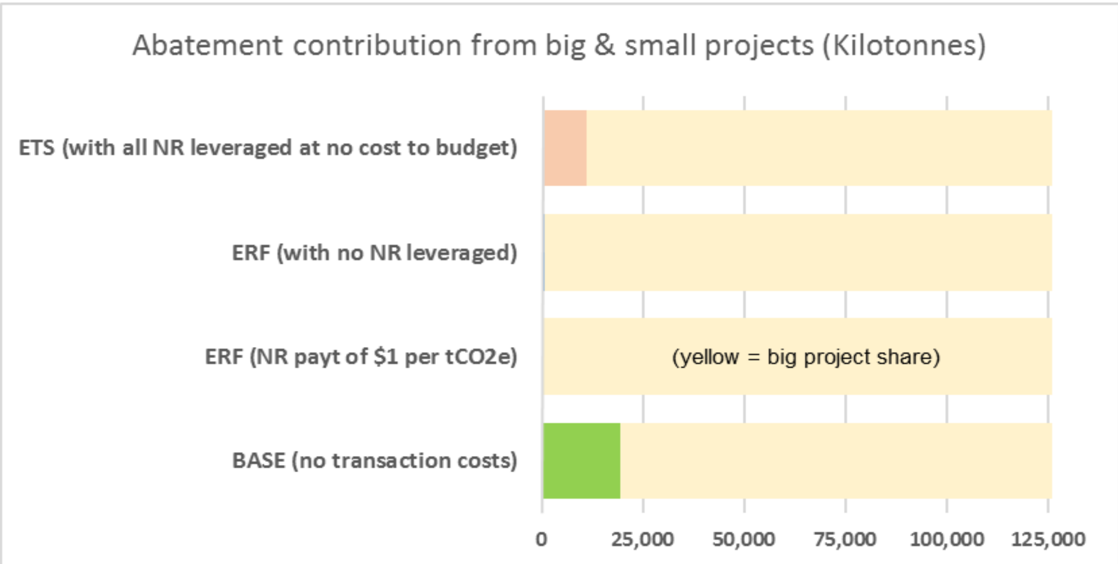


It is noteworthy that the current ERF budget allocation of $2.55 billion lies just beyond the midpoint of these estimates. Further, the model prediction of the average price to emerge from ERF auctions to date is $1.61 - if 'no regrets' action is coming forward and being funded, and $16.75. – if it is not.

The different approaches also have different distributional consequences. Under the theoretical ideal, a wide range of abatement activities contribute to the national abatement target. Of the 48 activities identified, 29 contribute to a least cost abatement solution. Activity is spread across big and small projects.

Project level transaction costs hit small projects hardest, and shifts the source of abatement into higher cost categories. Small projects, and activities in which they account for a higher abatement share, tend to make a diminishing contribution to the abatement task as transaction costs increase. The contribution of small projects to the national abatement target under the different policy settings is shown in Figure ES.4.

Figure ES.4 Contribution of big & small projects to the 126 Mt abatement task



If zero transaction costs applied, small projects are estimated to contribute about 15.4% of the abatement needed to deliver a least cost outcome. In the presence of transaction costs associated with obligations under an ETS, small projects are estimated to contribute only 9.0% of abatement. And under the ERF, small projects are expected to contribute less than 1% of the abatement purchased by the scheme.

Taking all savings and expenditures into account, the modelling indicates that Australia could deliver 126Mt of abatement in 2020 at a net benefit to the economy. A high proportion of this abatement could be delivered through actions that enhance the bottom line of households and businesses. An ETS can magnify the incentives to undertake this abatement and help drive it. If successful in unlocking these profitable emission reductions, a national ETS could deliver Australia's 126 Mt abatement target while generating a net benefit to emitters that averages out at about $77 for each tonne of (CO2e) emissions reduced. In contrast, the ERF is likely to deliver this abatement outcome at a net cost, averaging out at somewhere between $13 and $24 per tonne.

However, the scope of these programs differs significantly. Australians are paying a significant premium for abatement in return for an approach that does not produce incentives to reduce emissions on a consistent economy-wide basis.

Direct action versus a national carbon price

While the ERF is seeking to deliver an abatement outcome of around 236 MtCO2e between 2015 and 2020 through direct purchases and a 'Safeguards' mechanism to guard against excessive emissions growth elsewhere in the economy, an ETS could apply to around 3,438 MtCO2e over the same period (although the desirability of reliable and low cost reporting arrangements would probably result in slightly narrower ETS coverage).

Our modelling suggests that the ERF might need to spend up to $3 billion over this period to deliver on the emission target, and possibly allow up to another $10 billion in efficiency savings to languish. In contrast, an ETS would put a price on economy-wide emissions of around $17.36 and, in doing so, would value Australia's emission quota for the 6 year period (in the absence of international emission trading) at around $59.7 billion. The net expenditure associated with achieving the national emissions target under this approach would be about $0.64 billion, and economy-wide efficiency gains worth about $9.7 billion would be likely to flow from that. This implies a potential net economic cost of up to $3 billion under the ERF approach versus a potential net gain of around $9 billion under a national ETS.

An ETS mobilises resources on an economy-wide basis and crystallises the value inherent in the ability to emit greenhouse gases into the atmosphere. The ERF goes to considerable lengths to avoid this mobilisation. As a consequence, it also forestalls the economy-wide innovation and opportunities associated with it. Given the pool of low cost abatement that bottom-up models suggest is available in the Australian economy, the ERF might be viewed as a modest policy response suited to a modest emissions target. However, the costs and uncertainties associated with the ERF are likely to be substantial. This paper seeks to bring these issues to the attention of the public, industry and policymakers.

Efficient abatement mechanisms and policy frameworks are necessary to deliver Australia's best response to the prospect of deeper emission cuts in the future, and the economic challenges and opportunities that they bring.

Contents

Section 1

Issues and objectives

Australia is committed to assisting in international efforts to reduce greenhouse gas (GHG) emissions. The centrepiece of the current government's GHG reduction program is an auction arrangement whereby those wishing to sell abatement can compete with each other to win funding from the Commonwealth. This 'Direct Action' initiative, which buys abatement from approved projects on a contractual basis, replaces a national and mandatory carbon pricing regime. The effectiveness of the current policy in driving least cost abatement and delivering on national economic and greenhouse policy objectives is a critical issue for Australian businesses and households, and those interested in Australia's ability to accommodate more ambitious greenhouse emission targets in the future.

1.1 Australia's Emissions Reduction Fund (ERF)

As part of global efforts to fight climate change, the Commonwealth government has committed to reducing Australia's greenhouse gas (GHG) emissions to 5 per cent below 2000 levels by 2020. Deeper cuts are in prospect following the recent UN climate talks in Paris (COP21), which saw the international community commit to the goal of limiting global warming to 1.5^{o} Celcius, in order to substantially reduce the risk of catastrophic future climate impacts.

At present, the centrepiece of the government's Direct Action plan is the Emissions Reduction Fund (ERF). The ERF has a budget of $2.55 billion, and 'purchases' abatement via an auction process. Owners of suitable abatement projects register them with the Clean Energy Regulator, and 'bid' them into the auction, indicating the price per tonne of CO2e they would require from government in order to proceed. Lower bids have the greatest chance of being awarded a government contract to deliver the amount of abatement described. To date, purchase agreements worth a little over $1.2 billion have been committed under the Fund.

Projects must comply with relevant methods for estimating the amount of 'real' abatement generated. They embody the methodology for calculating emissions from a particular activity and efforts to ensure that 'business as usual' emission reduction activity is not credited under the scheme. Only projects delivering the equivalent of 2,000 tonnes of carbon dioxide per year (2,000 tCO_2e pa) – on average – can be bid into the ERF. However, smaller projects can be aggregated in order to achieve the 2,000 tonne per annum contract threshold.

Two ERF auction rounds have taken place:

ERF Round 1 – which took place in April 2015 and committed $660.5 million for the purchase of 47.33 million tonnes of CO_2e from 144 successful projects described in 107 contracts. This delivered an average abatement price of $13.95 per tCO_2e.

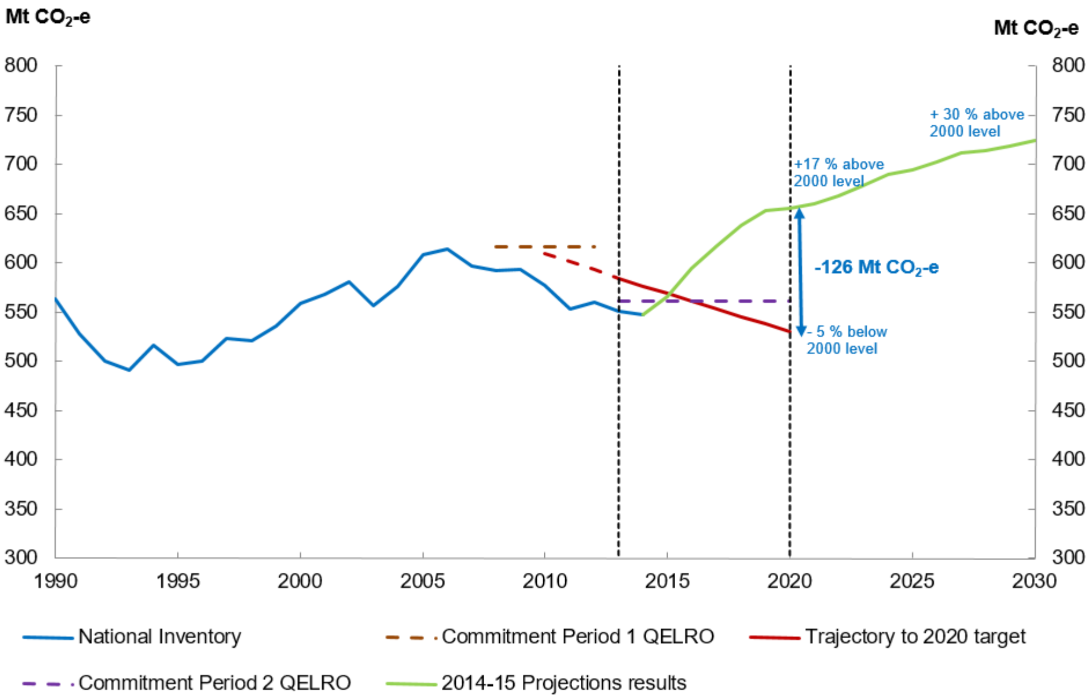
ERF Round 2 – which took place in November 2015 and committed a further $556.9 million for the purchase of 45.45 million tonnes of CO_2e from 131 projects described in 129 contracts. The average price per tonne of CO_2e paid was $12.25.

Recent projections by the federal environment department suggests that Australia must reduce its GHG emissions by a cumulative amount of around 236 million tonnes of carbon dioxide equivalent (ie. 236 $MtCO_2e$) in order to deliver on its international target commitment for the period to 2020.

Projection exercises are fraught, as highlighted by the significant revision of the 2020 target estimate between 2008 (a cumulative reduction requirement of 1,335 $MtCO_2e$) and 2014-15 (now estimated at 236 $MtCO_2e$). However, on current published estimates, achieving Australia's 2020 target is consistent with reducing projected emissions by about 126 $MtCO_2e$ from the projected emissions outcome in that year. As Figure 1.1 suggests, this gap reflects government's expectation of a significant acceleration in emissions growth in the next few years.

Taking the estimated 126 Mt emissions gap at face value, it is reasonable to ask how effective the ERF is likely to be as a mechanism for closing it. Is it likely to support the goal of a least cost approach to emissions reduction? How reliable will it be in delivering on the national abatement target? And how does it compare with other policy options for driving abatement?

Figure 1.1 Australia's past and projected GHG emissions trend to 2030



Source: Department of the Environment, "Australia's emissions projections 2014-15", Commonwealth of Australia, March 2015, p.5.

These questions are particularly relevant in light of the scrapping of the national carbon pricing mechanism (CPM) in 2014, and its replacement with the Direct Action initiative. The CPM imposed a carbon price on a broad spectrum of activities across the economy and encouraged abatement by making businesses and households pay for the GHG emissions associated with their consumption choices. Around 370 business entities bore direct obligations under the CPM but, because of their role as major suppliers of energy and emission intensive products, the carbon price - and incentives to reduce GHG output – were transmitted throughout the economy.

In contrast, the Emission Reduction Fund targets abatement directly. It seeks to buy future emission reductions from individual (or aggregated) projects rather than impose a cost on emissions output on an economy wide basis. Buying future emission reductions is a tricky business because, to get value for money, it requires a knowledge of both actual emissions outcomes and what future emissions would have been *in the absence of abatement action*. Furthermore, dropping down from an economy-wide to project level focus runs the risk of unanticipated emissions growth in projects and activities that are not covered by the ERF. This risk is compounded by the fact that the ERF is effectively increasing income and investment in the enterprises that supply it, and this is likely to spill over into other parts of the economy. These concerns have been highlighted previously (eg. see the pitt&sherry submission on the ERF Green Paper, 21 Feb 2014).[1]

The proposed ERF Safeguard Mechanism is being developed as a way of ensuring that emissions in other parts of the economy do not grow excessively while the government pays for project level emission reductions. However, analysis to date suggests that in its current form it is unlikely to impose a significant brake on potential emission growth among targeted businesses and activities.[2]

Time will tell if the ERF approach can be scaled up to deliver bigger GHG emission savings in the future, or puts Australia in a strong position to go on this journey. Analysis in this report indicates that it will struggle to deliver least cost and efficiency-enhancing abatement outcomes for Australian households and industry. This analysis gives further substance and empirical backing to concerns raised by the Climate Change Authority in its December 2014 report on outcomes and lessons from the Carbon Farming Initiative.[3]

1.2 Importance of transaction costs

A key test for any national GHG abatement mechanism (or set of mechanisms) is its ability to harness and deliver abatement at least cost. Opportunities to reduce emissions are spread throughout the economy, they differ across businesses and households and they can change over time. In the literature, these are depicted in abatement cost curves. These describe how the cost of achieving increasing levels of emission reduction differs between activities.

Transaction costs are an overlay on abatement costs. While abatement costs indicate how much it will cost to cut or do without a quantity of greenhouse gas emissions, transaction costs reflect how much it costs to identify and describe the opportunity, measure the emissions and abatement associated with it, achieve sign-off for it and (if necessary) verify the anticipated savings afterward. They are the extra expenditures incurred in completing a sale or agreement.

Government programs can have differing approaches to transaction costs. Minimum energy performance standards (MEPS) obviate information search and assessment costs (and a degree of purchaser discretion) by requiring that equipment available in the marketplace meets or exceeds a threshold level of energy efficiency. These thresholds are chosen to ensure that the benefits of promoting purchases of better equipment outweigh the costs of omitting low cost-low performance equipment from the market. The Carbon Pricing Mechanism imposed mandatory emissions reporting and measurement costs on large businesses across the economy, and with a transition to full emissions trading would have allowed open market trading (and associated brokerage and registry costs) as part of its compliance regime. It utilised existing supply relationships to have the carbon price signal transmitted along the value chain to customers.

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[1] See pitt&sherry submission at https://www.environment.gov.au/climate-change/emissions-reduction-fund/green-paper (accessed 19 January 2016)

[2] See for example, Environment Victoria, "Direct Action Safeguard Mechanism provides no safeguard at all", 5 May 2015 (http://environmentvictoria.org.au/media) and Reputex, "Update: ERF safeguards – toothless tiger or hidden dragon?", 2 August 2015 (http://www.reputex.com/publications/market-update). Accessed 19 January 2016.

[3] See Climate Change Authority (2014) "Carbon Farming Initiative Review – Report", Commonwealth of Australia, Dec 2014, Chapter 4.

The ERF is a voluntary program that requires participants to demonstrate compliance with published estimation methodologies, submit bids into an auction process and, if successful, enter contracts for the delivery of abatement over the period to 2020 (or longer in some cases). Project reporting and verification responsibilities also apply.

Transaction costs are real costs and, in a voluntary program such as the ERF where incurring them is optional, they can detract from the pay-offs of participation. To the extent that the ERF embodies a higher level of discretionary transaction costs than other abatement approaches, it will be faced with a narrower pool of abatement options from which to draw. This can affect its ability to deliver least cost abatement outcomes.

Transaction costs under the ERF and carbon pricing regimes

So what does it cost to participate in Australia's flagship emission reduction programs?

Some evidence on the magnitude of transaction costs is available from the 2 year operation of the now-abandoned Carbon Pricing Mechanism (CPM), and is emerging from ERF. Some information on transaction cost associated with the Carbon Farming Initiative (CFI), which has now been rolled into the ERF, has also been published in a recent review by the Climate Change Authority.[4]

In analysis published by the Australian Tax Institute, Professor Jeffrey Pope of Curtin University's Tax Policy Research Unit outlines the findings of a survey of major Australian emitters seeking information on the cost of compliance during 2012-13, the first year of the scheme.[5] Twenty seven responses were received indicating:

- average start-up costs of $402,000, and
- average recurrent costs of $54,000.

As noted, the CPM was designed to impose mandatory carbon obligations on big emitters and suppliers of emission intensive products (eg. energy, refrigerants, etc). The compliance costs of downstream consumers such as small businesses and households was likely to be negligible (because they bear no reporting or verification burden), although these entities did see the impact of the carbon price on the cost of goods and services. Arrangements were put in place to substantially alleviate carbon cost pressures for businesses in trade exposed industries, and to compensate low income households for carbon price impacts.

The cost of participating in the ERF can differ according to the type and location of abatement activity. Some methods are more straightforward than others and requirements for audits and 'ground truthing' can vary. Auction Round 1 of the ERF was dominated by land-based abatement (much of it initiated under the Carbon Farming Initiative which was established to complement the national carbon pricing regime). In a presentation to FutureBeef in September 2015, RAMP Carbon provided an overview of indicative costs facing potential rangeland participants in the ERF program.[6] These included:

[4] Climate Change Authority (2014) *ibid*, see Section 2.4.

[5] See Pope. J (2014) "Estimating the compliance costs of Australia's carbon pricing scheme", Australian Tax Forum journal article (1 April 2014), https://www.taxinstitute.com.au/australian-tax-forum/estimating-the-compliance-costs-of-australia-s-carbon-pricing-scheme (accessed 14 Jan 2016).

[6] See RAMP Carbon presentation (by Mr Phil Cohn) https://futurebeef.com.au/resources/newsletters/futurebeef-ebulletin/your-erf-questions-answered/ (accessed 14 Jan 2015)

Project development costs

- initial registration - $10,000 per project
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They estimated the total on-costs for a typical cattle project (with a 7 year contract life) at around $100,000 and that for a typical avoided land clearing/ managed regrowth project (with obligations over 25 years) at about $150,000.

Recent industry consultations that Meta Economics has had with farmer groups and carbon service providers participating in the ERF suggest that these figures may be conservative. One NSW farmer group reported that on-costs could amount to up to 80% of the bid value of an ERF contract involving aggregation of multiple projects, and a major service provider indicated that their costs for establishing and servicing a successful ERF project was typically around 30% of the contract price.

Australia has not had a fully fledged emissions trading system in place, but compliance costs are likely to be similar to that of the CPM - with the addition of extra costs associated with carbon trading between parties. The cost of individual trades should approximate brokerage fees currently observed in the marketplace, and the level and direction of trades would reflect allocation decisions for emission permits (ie. Australian Carbon Credit Units – or ACCUs).

1.3 Implications for marginal abatement costs

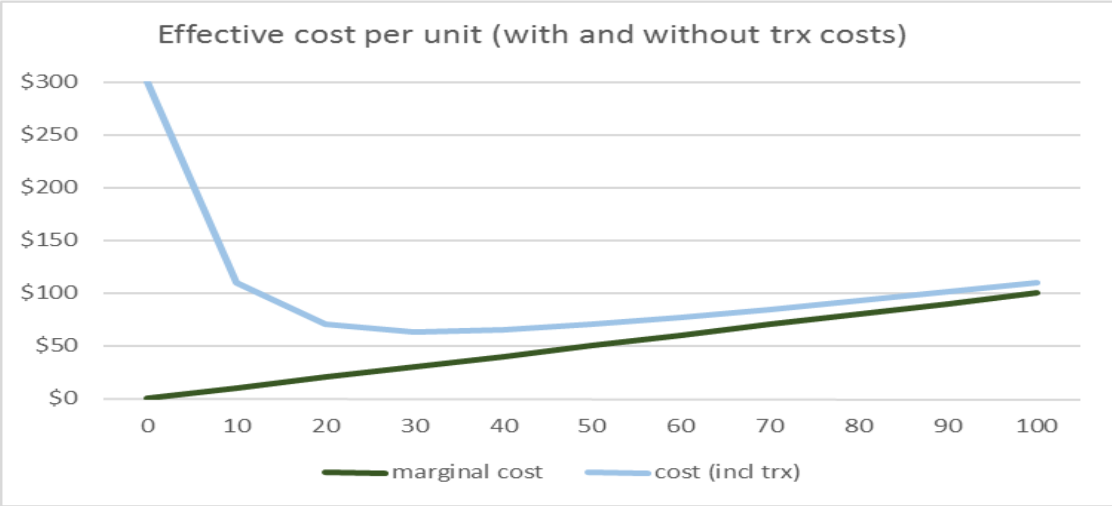
In a world where proof and accountability are required, transaction costs add to marginal abatement costs and can change the relative cost – and merit order – of abatement options.

Figure 1.2 depicts the effect of a lump sum fee of $1000 (eg. the cost of legal expertise to complete a sale contract) on the supply curve for a particular commodity. The marginal cost of supplying additional units is affected by the need to carry the transaction cost, with the impact of the fixed transaction cost on unit costs diminishing as the number of units available for sale increases. Scale allows transaction costs to be spread across larger volumes, and a bigger share of the money spent on getting the project off the ground to find its way to the project owner and investor.

While Figure 1.2 is a generic depiction of the impact of a fixed or 'lump sum' transaction cost on the cost of supplying a particular good or service, it is also a useful aid to thinking about the impact of fixed costs on the cost of generating increasing levels of GHG abatement from projects and activities within the economy. The ranking of abatement opportunities in terms of their incremental cost gives rise to what is commonly called a marginal abatement cost (MAC) curve.

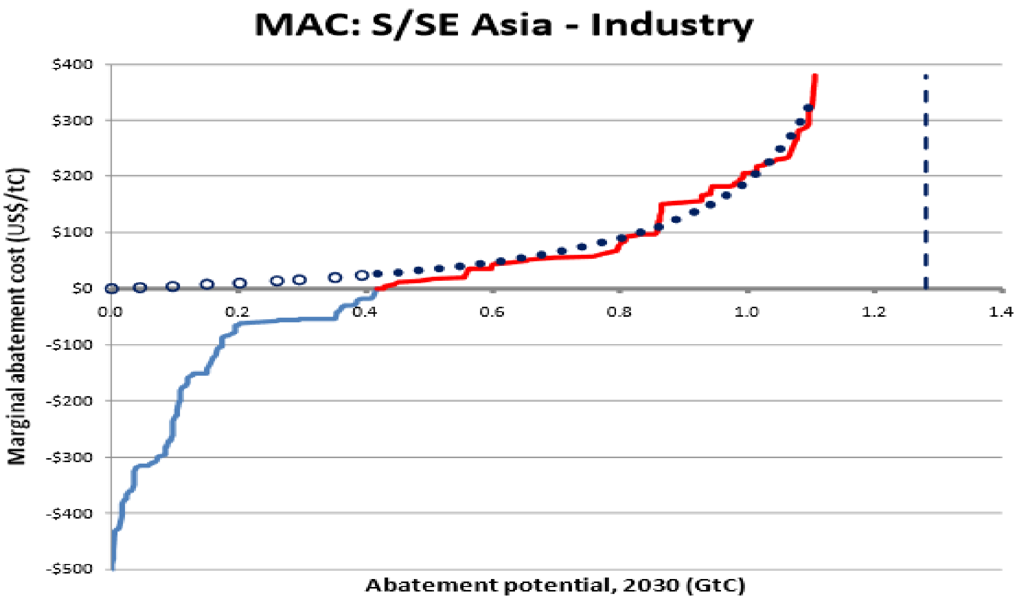
Exhausting low cost abatement opportunities before moving on to higher cost opportunities is the key to minimising the cost of any particular abatement target.

Figure 1.2 Impact of a fixed fee transaction cost on marginal supply costs



Traditionally the economic literature has depicted MAC curves as a schedule of increasingly expensive investment options, without specific reference to the nature of the activities that are generating the abatement. These 'top down' models are typically used for consideration of industry or economy-wide abatement costs and trade-offs. An example for the Asian manufacturing sector is provided below in Figure 1.3. It reflects 'no regrets' opportunities available at a negative cost (the blue line), and a smooth 'stylised' MAC curve exhibiting rapidly escalating costs as the abatement target approaches the level of emissions output for the industry.

Figure 1.3 A stylised industry MAC curve



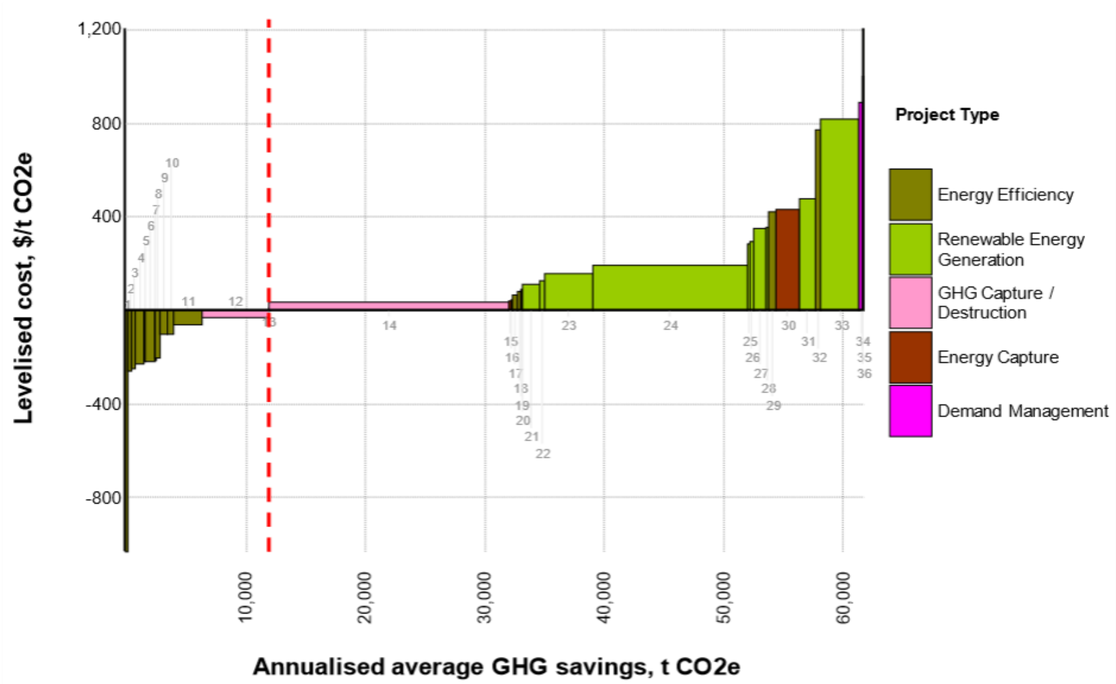
Source: Akerman F. and Bueno R. (2011), "Use of McKinsey cost curves for climate economics modelling", Stockholm Environment Institute Working Paper WP – US – 1102, p.5.

However, in recent years a more granular 'engineering' or 'bottom up' approach popularised by McKinsey & Company has found favour among industry and policy analysts. Rather than moving up a smooth and continuous slope of small and anonymous abatement actions, the bottom up approach depicts an abatement staircase that should be ascended a step at a time in order to achieve a least cost abatement outcome. This approach is intuitively appealing at a project or company level because it helps illustrate the relative cost and abatement potential of discrete emission reduction options. A MAC hierarchy developed for Hunter Water using the bottom up approach is shown in Figure 1.4.

It suggests a range of energy efficiency and demand management actions that will deliver a finite amount of greenhouse savings that can be undertaken at a profit by Hunter Water, and a large number of 'above the line' actions that will deliver additional greenhouse savings - but come at a net cost.

However, this approach needs to be applied with caution at an industry or economy-wide level. While it is a powerful visual aid for decision makers, its depiction of a hierarchy of discrete abatement opportunities available at defined prices can paper over the fact that a wide range of entities and abatement actions can be relevant at a particular price level. This is increasingly likely as we move away from the upper and lower price bounds towards the more densely populated middle.

Figure 1.4 Bottom up MAC curve for Hunter Water



Source: Water Services Association of Australia (2012), "Cost of carbon abatement in the Australian water industry", Occasional Paper 28, p.36.

While there may be only a few opportunities across the economy to generate a net saving of $500 or $1,000 from each tonne of GHG emissions saved, at a cost of $5 per tonne there may be many opportunities, and these may be in the hands of a vast number of players. What is relevant is that $5 will buy you more abatement in some categories than others, and that many decision makers with different opportunity sets can be involved.

The tensions and limitations of 'top-down' and 'bottom up' approaches to depicting and applying MAC curves for policy purposes has been noted - by McKinsey & Co and others. These concerns and caveats have been usefully summarised by Ekins, Kesicki & Smith (2011). Their key observations and warnings on the use of MAC curves in decisionmaking are:

> **Embrace complexity**: there are complex political and economic decisions to be made. The usefulness of simple summary presentations of complex issues is limited. Hard decisions about complex systems require a more sophisticated, whole-system analysis and approach; there are complex trade-offs that cannot be made into a simple set of monetised values.

Pay attention to the assumptions behind a MAC curve, alongside the MAC curve: keeping the assumptions and the MAC curve together can help ensure transparency, comprehensibility and accountability.

Always look beyond estimated technology cost: not all cost elements can be monetised; decisions about which abatement measures are prioritised must look beyond the costs presented in any MAC curve, to consider costs that may have escaped monetisation and wider issues. Basing decisions on estimated technology costs alone may not only fail to produce the promised carbon savings but also result in unintended or perverse consequences.

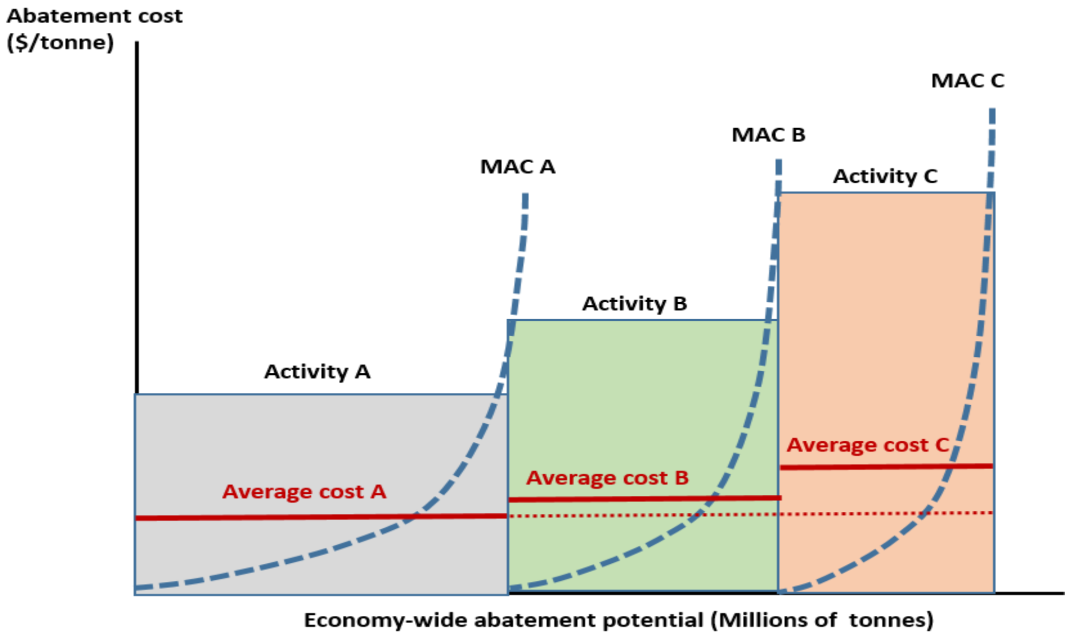
Accept uncertainty: answers presented in a single set of numbers are appealingly simple, but can conceal more than they reveal. *Forecasts of future costs and technical potential are better presented as ranges, not point values. The cost differentials between several of the competing alternatives are less than the cost uncertainties within each alternative.* [emphasis added]

Understand path dependencies: Abatement costs depend on actions pre-dating the year of the MAC curve; abatement strategies are better presented and considered as scenarios or trajectories, in which decisions in one period influence the trajectory thereafter. Cumulative emissions are a more scientifically robust indicator of global warming commitment than abatement potentials in one or two horizon years."

Ekins P., Kesicki F. & Smith Z.P (2011), "Marginal Abatement Cost Curves: A call for caution", UCL Energy Institute, University College London, April 2011, pp.4-5.

When thinking about abatement opportunities across the economy, it is important to remember that activities such as 'energy efficiency improvement' or 'enhanced forest management' embody a wide range of sites, circumstances and owners. Within each category, there will be a range of costs spanning the 'low hanging fruit' available to some and the high cost options facing others. As marginal abatement costs escalate towards a 'prohibitive' level the economy-wide abatement opportunity effectively becomes exhausted. This is depicted in Figure 1.5.

Figure 1.5 Escalating marginal abatement costs within an abatement activity



This approach allows us to map bottom-up MAC curves onto the population of emitters that can access those opportunities. More importantly, it allows us to translate estimates of the cost and abatement potential of key activities into a more detailed merit order of low cost abatement actions – and examine the impact of transaction costs on this merit order.

In Figure 1.5 above, it becomes obvious that least cost abatement action would not entail undertaking all of Activity A, then moving on to Activity B, and so on. At a cost per tonne equal to the average cost per tonne spanned by Activity A projects, it makes sense to draw abatement from all the activities represented. Activities A, B and C all have abatement available at a cost below the average abatement cost per tonne that characterises Activity A.

This approach is applied in the following sections to adapt published 'bottom up' estimates of the cost and quantum of GHG abatement opportunities available across the Australian economy to construct intra-activity MAC curves and map these onto the population of potential project owners. By distinguishing between small and large emitters and the abatement cost opportunities pertaining to each it is possible to examine the likely influence of transaction costs on private abatement incentives under the ERF, and the distribution of ERF payments across emitters and activities.

Section 2

Model development

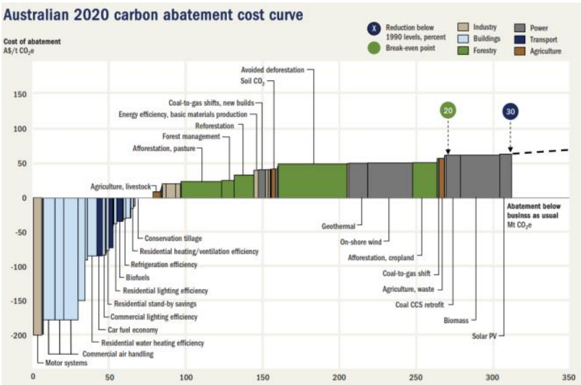
Based on published estimates of the cost and quantity of abatement opportunities in Australia, we superimpose a schedule of increasing marginal abatement costs within each opportunity category and map this onto large and small participants for each category. This allows exploration of the least cost bundle of abatement opportunities needed to deliver a specific national emissions target, and the impact of different levels of transaction cost.

2.1 Base marginal abatement cost estimates

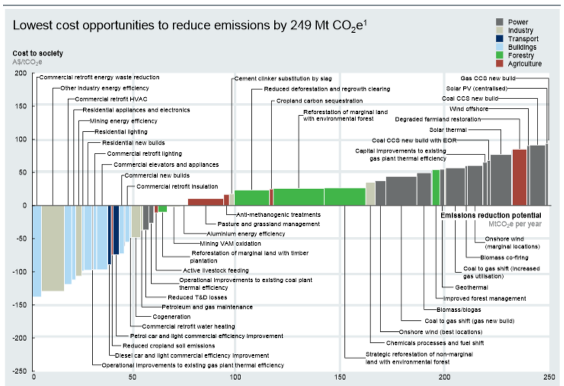
There have been various propositions put forward for a feasible 'bottom up' marginal abatement cost curve for Australia. McKinsey & Company produced one in 2008, ClimateWorks published one in 2010 (viewed from both a societal and investor perspective) and Reputex published an updated version of its own Australian MAC curve in January 2015 (see Figure 2.1).

Figure 2.1 Recent bottom-up MAC estimates for the Australian economy

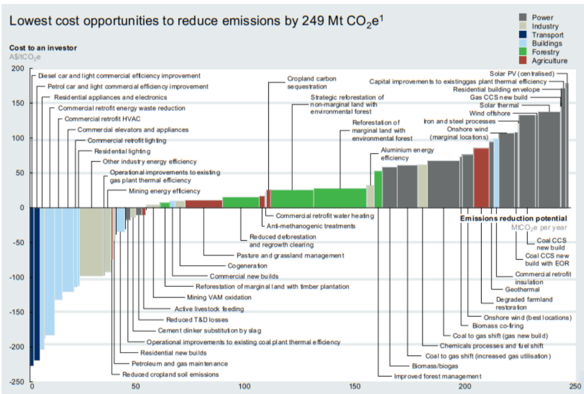
McKinsey 2008



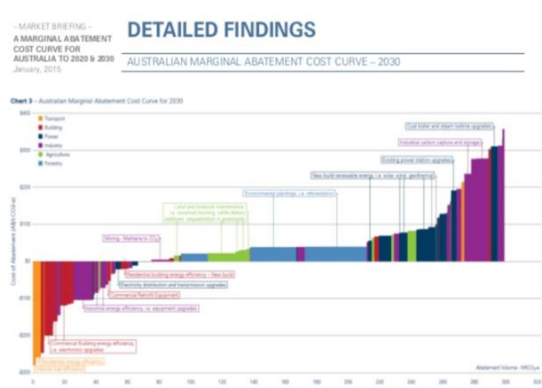
ClimateWorks 2010 (Societal MAC)



ClimateWorks 2010 (Investor MAC)



Reputex 2015



Sources: McKinsey&Company (2008), "An Australian Cost Curve for Greenhouse Gas Reduction", ClimateWorks (2010), "Low Carbon Growth Plan for Australia", Reputex (2015), "Market Update: An Updated MAC Curve for Australia to 2030".

As touched on in the previous section, changes in things such as fuel costs and exchange rates, interest rates, technology, demand, household income and the lifespan of capital equipment can affect the economics of emission reduction, and future abatement trajectories. (both ClimateWorks and Reputex periodically update their MAC estimates for these and other reasons).

Abatement costs are inherently changeable and differ across households and businesses. Further, because markets are linked together through the supply chain, expenditure to reduce one tonne of emissions in one particular project will not necessarily lead to a one tonne reduction on an economy-wide basis. This is an inherent complication with scaling up project based or bottom up analyses to make inferences about economy-wide outcomes. General equilibrium modelling and analysis is better equipped to deal with these kinds of inter-relationships and challenges, and is the preferred approach to analysing these types of emission 'leakage' effects.

However, the primary focus of this study is not to predict economy-wide emission outcomes from project based abatement - although this emerges naturally from the analysis as a result of the publicly sourced bottom up estimates that have been as a guide to Australia's abatement potential. The study's key objective is examining how the direction, relativity and magnitude of abatement outcomes is likely to be affected by policy approaches involving different levels of transaction cost. Notwithstanding the shortcomings of bottom up approaches in estimating marginal abatement costs (and the cost of achieving future economy-wide targets), the simplicity and specificity they provide makes them a good starting point for developing the transaction cost model described in this section. While the accuracy of the model predictions may be contested at the margin, core findings regarding trends, patterns, relativities and trade-offs are likely to be meaningful and instructive. This is the key role and policy contribution of models.

Given the interest in testing the efficacy of GHG reduction measures in delivering on national abatement targets, we have developed a set of 2020 MAC curves that draw on the projects and average abatement cost estimates reflected in the studies above.

2.2 Fitting a monotonically increasing MAC curve

To facilitate the analysis, we assume a monotonically increasing MAC curve describes the incremental cost of abatement within each activity. That is, there is a smooth (but not necessarily linear) ascent from the lowest to highest cost options. To stay true to the bottom up model's depiction of finite abatement availability for discrete abatement activities, we sought a functional form for marginal abatement costs that increased asymptotically toward the upper limit of an activity's abatement potential. That is, for an opportunity offering 5 million tonnes (Mt) of abatement potential, the cost of abatement beyond this level approaches infinity, and the cost of abating the last few tonnes of CO_2e via this abatement opportunity was very high.

This configuration was illustrated previously in the MAC curves of Figure 1.5.

The functional form spans the range of abatement possibilities for a particular activity and delivers a total cost of abatement across the range that closely approximates that proposed by the bottom up model. Consequently, it also delivers an average cost of abatement (ie. cost in today's dollars of delivering on a defined 2020 emission outcome) that closely matches that of the bottom up model.

A (Hermite) polynomial was settled on as best displaying these attributes. It has the following general form:

For activities where ${}^{x}C_A<0$: ${}^{x}C_i = {}^{x}\mu.(a.{}^{x}Q^3_i + b.{}^{x}Q^2_i) + 1.4\ {}^{x}C_A$ and

For activities where ${}^{x}C_A \geq 0$: ${}^{x}C_i = {}^{x}\mu.(a.{}^{x}Q^3_i + b.{}^{x}Q^2_i) + ({}^{x}C_A - 15)$

where: ${}^{x}C_A$ is the average cost ($/t$CO_2$e) of abatement for the activity 'x'

${}^{x}C_i$ is the cost of producing emission reduction unit ${}^{x}Q_i$ (ie 100Kt CO_2e), and

${}^{x}\mu$ is a scaling parameter reflecting the amount of abatement available from activity 'x', and a and b are constants (where a = b/2).

MAC curves reflecting these algorithms were generated in an MS Excel spreadsheet as the basis for what will hereafter be referred to as the **MACtrax model**.

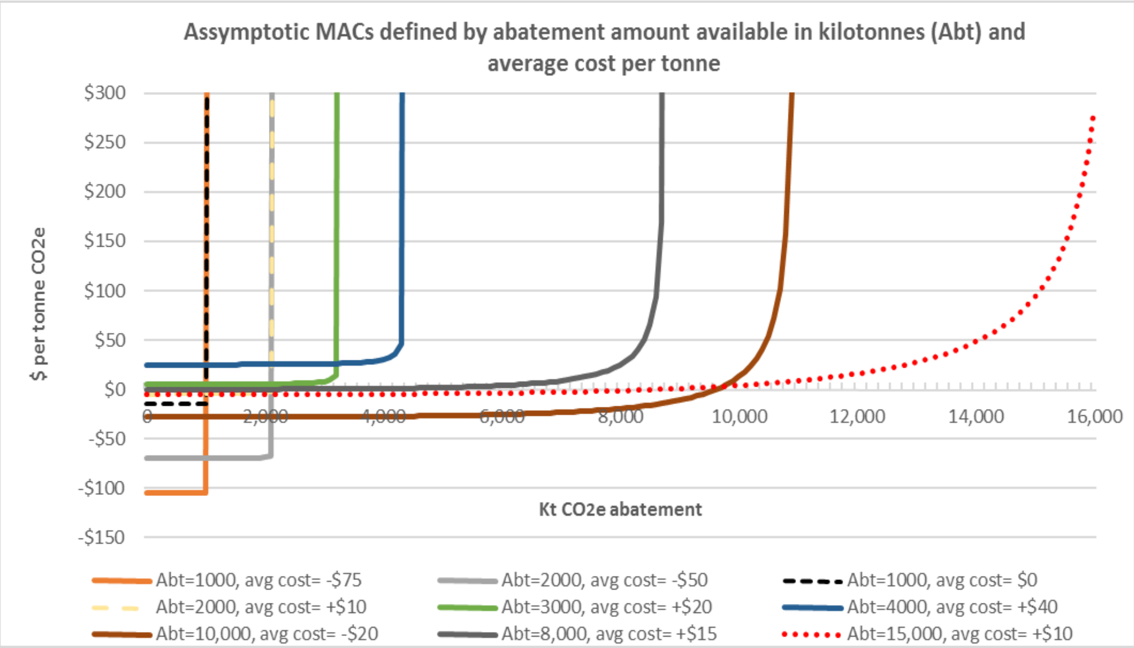
The terms added at the end of the polynomial function are used to assign a point of origin for the function – which would normally begin at the origin (ie. zero abatement for zero cost). The availability of 'no regrets' options associated with improved investment and management decisions necessitates a negative cost starting point for some functions. For abatement opportunities with average costs below zero, the first unit of abatement is assumed to be available at a cost of 1.4 x average cost (eg. for an average cost of -$20 per tonne, the first tonne of abatement is available for -$28.00).

For abatement activities with an average cost of zero or greater, the first unit of abatement is assumed to be available at a cost of $15 per tonne less than the estimated average cost for that activity. Hence, an activity exhibiting an average abatement cost of $0/t$CO_2$e will begin to show abatement opportunities at -$15, and an activity with an average cost of $20 per tonne will begin to show opportunities at $5 per tonne.

These starting points are 'placeholders' and can be updated as superior information on the national cost and distribution of abatement opportunities comes available.

Graphical representations of the MACs generated for the bottom up abatement opportunities captured in the MACtrax model are shown in Figure 2.2.

Figure 2.2 Examples of MAC functions generated in MACtrax



2.3 Linking abatement opportunities to owners

Estimates of the relative size of abatement projects are also built into the MACtrax model.

The model links an abatement activity to data on the size distribution of the relevant population. Population information comes from relevant ABS industry, household and motor vehicle datasets. In general, the model applies the assumption that the distribution of abatement opportunities from a particular activity mirrors the distribution of production in the industry (or industries) for which the activity is relevant. For instance, energy efficiency improvements in the commercial sector, offering a total abatement pay-off of around 5 $MtCO_2e$ are assumed to be distributed across the 1,048,198 businesses in that sector, with the share of abatement opportunities matching the contribution to industry revenue of those businesses.

The model draws on the ABS count of businesses (ABS 8165.0) and divides these into 'small' and 'large' emitters.' Small' emitters are considered to be those with a turnover under $200,000 per year (which includes households for our purposes), and 'Big' emitters are deemed to be those with an annual turnover greater than that. In the commercial sector, small emitters account for about 61% of operating entities and around 3.5% of turnover. Similarly, big businesses account for 39% of operating entities and around of 96.5% of turnover. Correspondingly 96.5% of abatement potential is assigned to these large entities as a group, and averaged across their number. ABS estimates of household and business numbers can also be applied at the State and Territory level.

Again, these distributions are place holders and can be adjusted on the basis of better information. For instance, while MAC estimates indicate that around a 4Mt CO_2e saving from improved energy efficiency in the aluminium industry is available and ABS data show that two-thirds of the businesses allocated to that industry code are 'small', the MACtrax model has been adjusted to reflect the full abatement opportunity set belonging to big businesses in that industry. MAC curves are fitted to the abatement opportunity set spanned by these groups. Potential abatement associated with deployment of more energy efficient technology are assumed to be driven by government mandate (eg. Minimum Energy Performance Standards (MEPS)) and therefore accessible as an aggregated parcel of projects with minimal levels of transaction cost applying.

These data are used to calculate the average abatement available per business (or household) because, under project based arrangements such as the ERF, contracts need to be put in place with these businesses in order for the abatement to proceed.

To keep the model computationally tractable, abatement delivered from particular activities is measured (and ranked to form a merit order of abatement costs) in incremental units of 100,000 tonnes of CO2e. A higher level of resolution would be possible, but would directly increase the number of cells and processing demands of the model while offering only a small gain in accuracy.[7]

A summary of assumed abatement activities, average costs, potentials and the number of project owners is provided in Appendix 1.

2.4 Factoring in transaction costs

Transaction costs are modelled as a fixed cost imposed on each project owner wishing to enter an abatement contract. Smaller projects have less ability to 'spread' the abatement cost and therefore bear a higher transaction cost per tonne of abatement. All project owners must cover

[7] The MACtrax spreadsheet currently occupies about 13Mb of memory.

the cost of actual abatement plus their transaction costs in order to break even. These costs are reflected in the adjusted marginal costs of abatement factored into ERF bids, and affect the merit order of abatement offers. An entity with only 100 tonnes or so of abatement per annum to offer will find the costs of entering an ERF contract prohibitive. Notwithstanding this, or perhaps in recognition of it, ERF eligibility guidelines apply a minimum abatement threshold of 2,000 tonnes per annum to participants - but encourage interested proponents with projects under 2,000 tCO_2e pa to pursue aggregation options. However, bundling a number of small projects into one large project would no doubt involve its own set of extra challenges and transaction costs.

In this analysis we examine least cost abatement outcomes under a range of transaction cost regimes. These draw on the empirical discussion of transaction costs in section 1.2. A summary of transaction costs assumed by the MACtrax model for small and big project owners under different abatement regime is shown in Table 2.1. This reflects the bid preparation, legal and monitoring, reporting and verification (MRV) costs of the ERF, those relevant to the Carbon Pricing Mechanism (CPM), and a potential emissions trading system built on that national model of mandatory carbon reporting and acquittal obligations. The per-contract transaction costs reflected in Table 2.1 are converted to an annualised cost per tonne of abatement by referencing the average abatement available for small and large entities (as defined above) within defined industry and activity groups.

Table 2.1 Assumed MACtrax transaction costs for big and small projects under alternative abatement regimes

Abatement regime	Empirical evidence	Assumed trx costs per project in 2020* - SMALL	Assumed trx costs per project in 2020*- BIG
Hypothetical ideal	Assume full informational and transparency. Assume zero transaction costs apply	$0	$0
ERF (project & contract based)	Land based projects $100,000 to $150,000 per project. No evidence on industrial projects (likely to be less)	$13,500	$20,000
Carbon Pricing Mechanism (CPM)	start-up costs of $402,000, recurrent costs of $54,000 pa (Big emitters only). Carbon Farming Initiative (CFI) transaction costs similar to ERF – minus competitive bid requirement.	$0 CFI: 0.7 x ERF	$100,000^ CFI: 0.7 x ERF
National ETS (based on CPM model)	Similar to CPM, large emitter focus (trades & brokerage affected by pattern of permit allocation)	$0 CFI: 0.7 x ERF	$110,000^ CFI: 0.7 x ERF

*assume ERF transaction costs annualised over an average 5 year project horizon, and CPM over 10 years (assuming a need to reprise start up costs). ^ Applies to approx. 400 big businesses on a mandatory basis.

Bringing these elements together, transaction costs are reflected in abatement cost structures and ERF participation incentives as follows:

1. estimate the transaction costs pertinent to securing and delivering on an ERF abatement purchase contract (or other abatement incentive scheme)
2. adjust as necessary by 'big' and 'small' projects

3. estimate the number of big and small entities engaged in a particular abatement activity
4. assume that the distribution of abatement potential estimated for each activity matches the distribution of big and small entities (in terms of turnover shares)
5. assume big entities operate big projects and small entities operate small projects
6. determine the average size of big and small abatement projects by dividing the relevant quantity of total abatement pertaining to each group by the number of entities in each group
7. distribute the relevant transaction costs over big and small abatement projects (and participating entities) on a 'dollars per tonne' basis.

Note that under both the CPM and (hypothetical) ETS, the Carbon Farming Initiative (CFI) is relevant as a credit-based supplement to the mandatory carbon pricing arrangement. The CFI has been rolled into the new ERF structure – with the addition of a competitive bidding component which is likely to increase the risks and costs of participation. We have estimated that a return to a market-based arrangement for CFI-based credits would result in a reduction in project based transaction costs of about 30% relative to the ERF. These estimates are subjected to sensitivity analysis, with results discussed later in this report.

Results of MACtrax model simulations focused on Australia's 2020 abatement target follow.

Section 3

Results

Imposing transaction cost on abatement opportunities reduces their commercial viability and changes their merit order from a buyer perspective. High transaction costs tend to have a bigger influence on merit order, and small projects – which have less opportunity to spread transaction costs across their emission base – are affected most. This can be important for the Emissions Reduction Fund (ERF) because it relies on project proponents coming forward to sell their abatement on a competitive basis. Activating low cost abatement opportunities ahead of high cost opportunities is fundamental to delivering efficient economy-wide outcomes.

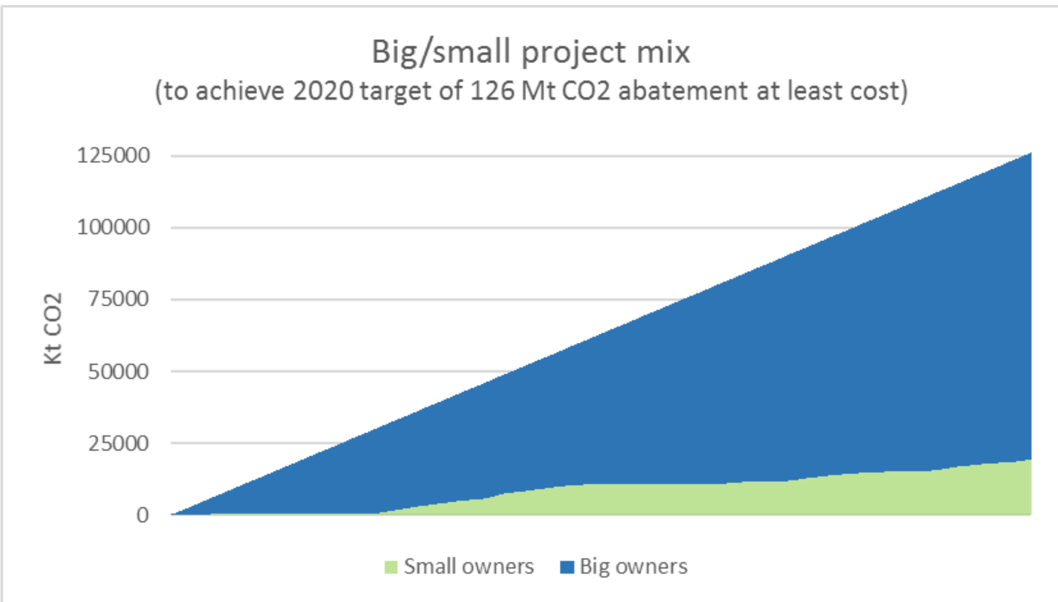
3.1 An optimally efficient GHG abatement set

The hypothetical ideal is a situation without transaction costs. In this world, the costs of inspection, reporting, verification, brokerage, legal and advisory services are obviated. All abatement opportunities are accessible and a least cost hierarchy or merit order can be determined from that set. This provides a benchmark for testing the relative cost and performance of real world policies and programs.

The MACtrax model was used to investigate the least cost mix of projects that could be actioned now to deliver a 126 MtCO2e abatement outcome in 2020, in line with its current greenhouse gas target settings.

Under conditions of zero transaction costs, the MACtrax model suggests a mix of activities across small (ie. all households and businesses with turnover less than $200,000 per year) and big entities as depicted in Figure 3.1.

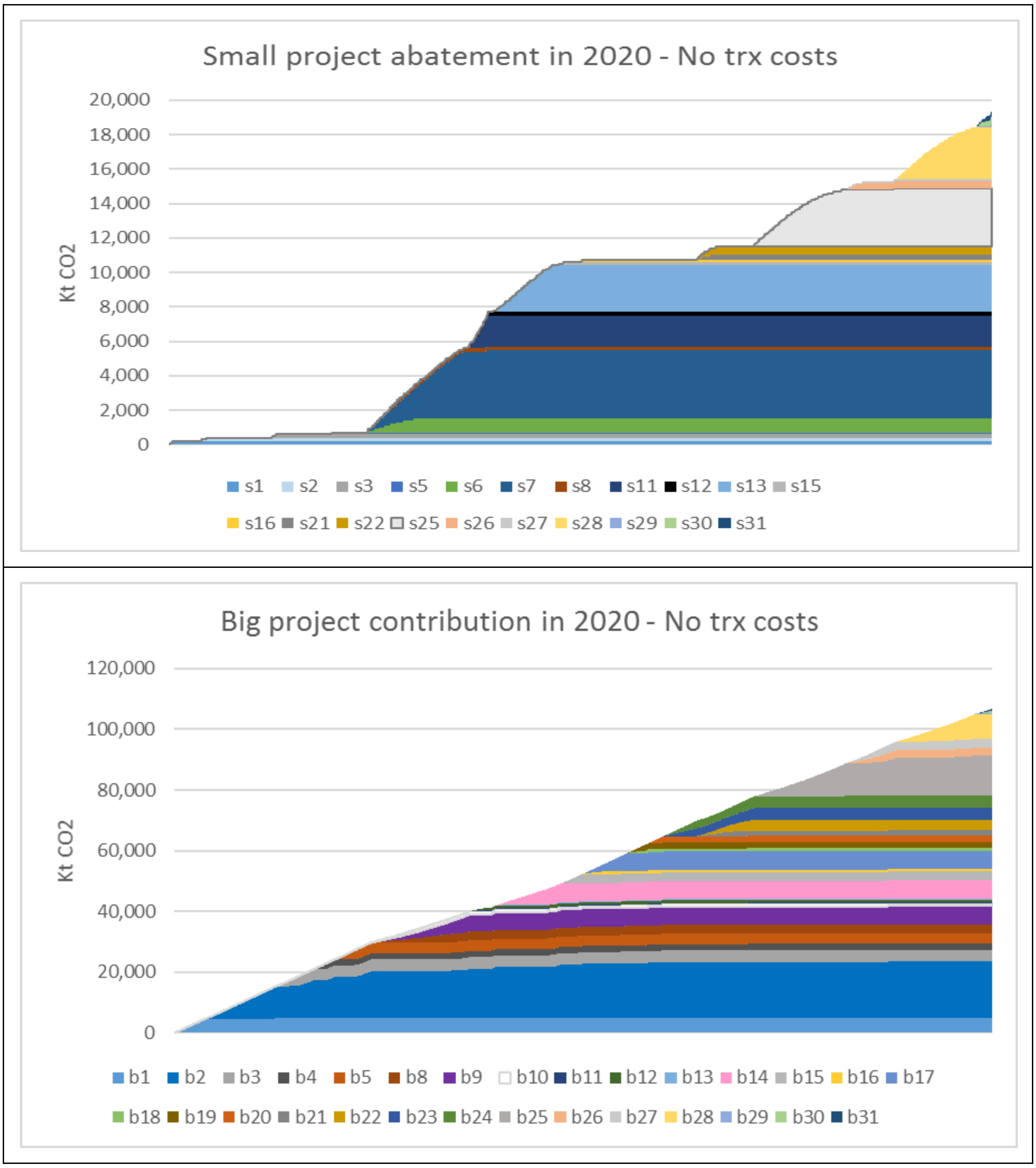
Figure 3.1 Optimal least cost mix of 2020 abatement contributions by size of project contributor



Based on consideration of relative abatement costs, the 'efficient' emission reduction hierarchy would see small entities contribute about 7.8 Mt (15.6%) of the first 50 Mt of 2020 abatement outcomes, and about 14.4 Mt of the first 100 Mt. They would supply about 15.4% of the total abatement needed to deliver on the 2020 GHG emissions target.

The source and type of least cost abatement projects is shown in Figure 3.2. (As noted, project codes are shown in Appendix 1).

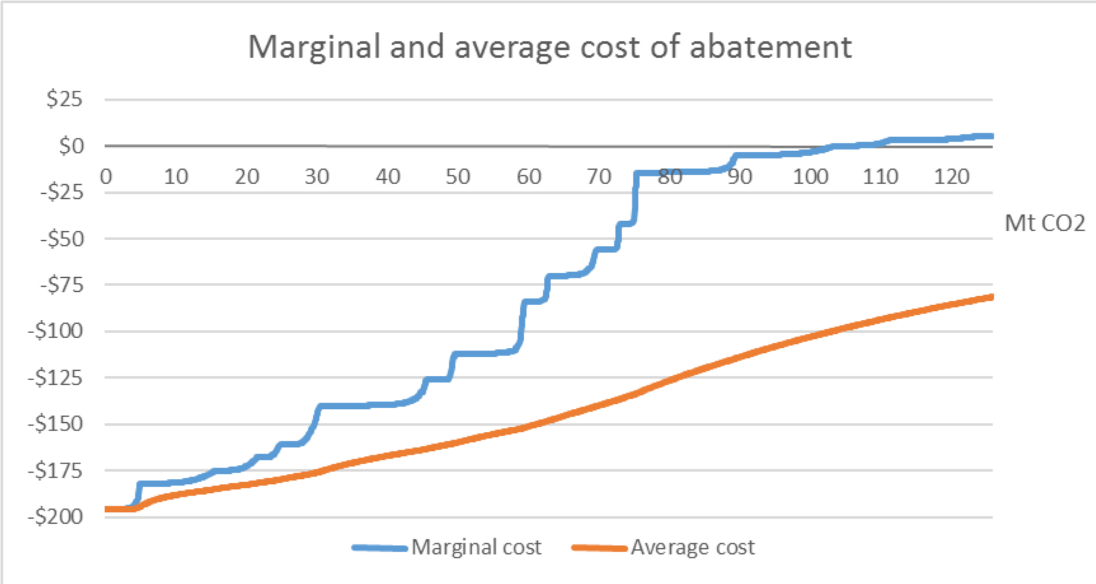
Figure 3.2 Abatement project mix across small and big entities



The modelling suggests that around 105 MtCO2e could be delivered on a 'no regrets' basis. That is – at a net cost of zero or less through activities such as energy efficiency improvements, waste reduction, enhanced commercial land management or improved production planning and management. The total cost of the residual abatement required to achieve the 2020 target with these efficiencies in place is estimated at around $59m.

The costs associated with delivering increasing amounts of abatement according to the bottom up MAC estimates and model assumptions described are shown in Figure 3.3. This suggests the marginal cost of the last tonne of CO_2 required to hit the target is around $5 per tonne. The implied total value of 'no regrets' savings is in around $10.3 billion.

Figure 3.3 Theoretical cost of moving toward the 2020 GHG target



However, in the real world some degree of transaction cost is inevitable. Identifying and obtaining good quality information is not costless, and the desire to reduce risk and increase certainty often introduces a need for specialist legal, financial and technical advice.

The impact of transaction costs on the ability of competing greenhouse policy approaches to deliver efficient and cost effective outcomes is explored below.

3.2 Implications for the Emissions Reduction Fund

The Emissions Reduction Fund involves the voluntary participation of project owner in a reverse auction arrangement which requires them to compete on price to win government contracts to deliver future emission reductions.

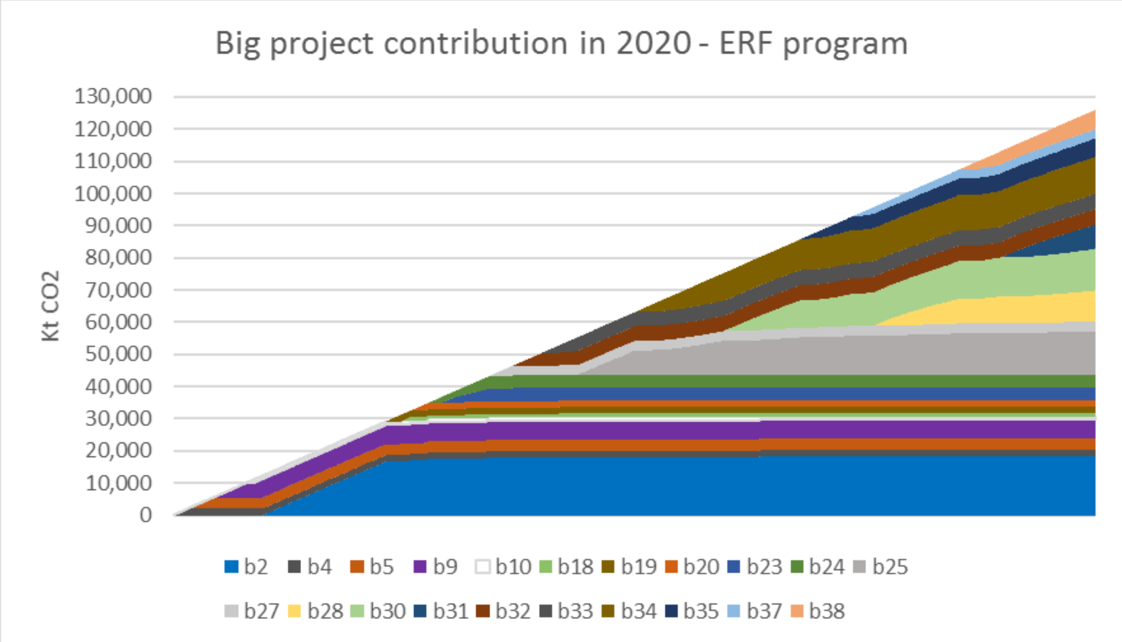
A threshold implication of this program design is that it imposes costs and uncertainties on those wishing to participate, and a further set of costs (in terms of project level reporting, monitoring, etc) on those that are successful in the auction process and are awarded government contracts.

These costs can substantially alter the economics of abatement projects and affect their merit order, in addition to decisions around whether a project will be bid into the ERF process at all. The project level transaction cost assumptions reported in Table 2.1 are annualised over a typical 5 year contract horizon to give a representative cost per abatement project for big and small entities.

Transaction costs of **$13,500** and **$20,000** are assumed to impact on 2020 abatement cost estimates for small and big project owners respectively. These costs must be spread across the annual abatement covered by an ERF contract.

With these costs in place, the least cost mix of abatement projects is significantly affected. Most notably, small projects are much less competitive under ERF transaction cost requirements. In the base ERF simulation, only big project proponents are rewarded contracts. This project mix - adding to 126 $MtCO_2e$ - is shown in Figure 3.4.

Figure 3.4 Least cost ERF project mix to achieve the 2020 GHG target



Relative to the 'no transaction cost' scenario, the ERF approach sees a variety of potential abatement activities drop out of contention (or, more realistically, make a significantly reduced contribution to abatement outcomes). These include:

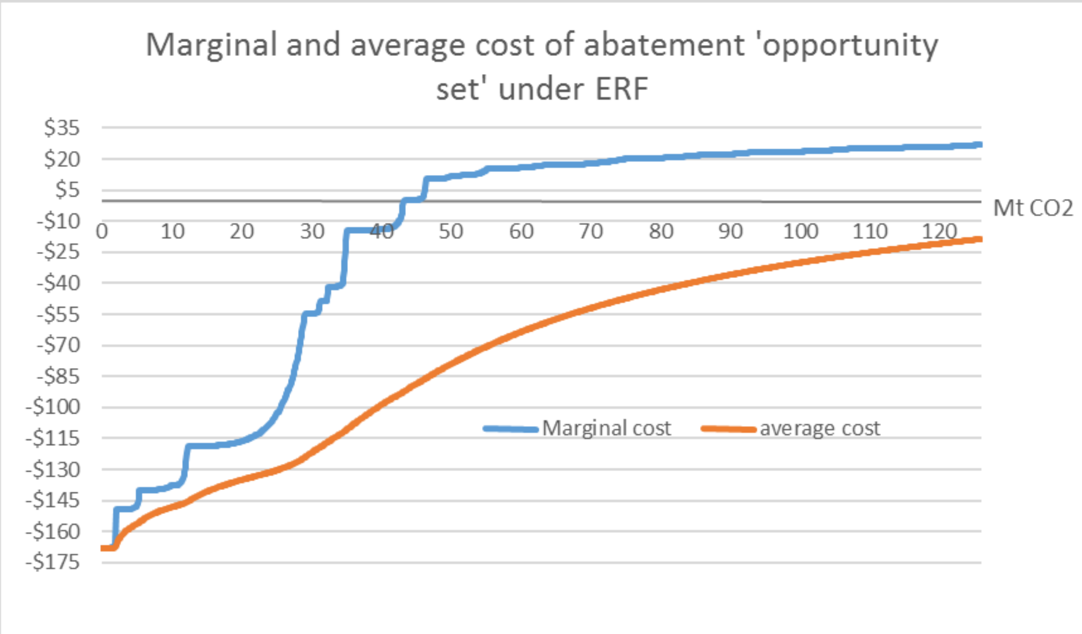
- All small projects (owned by households and businesses with turnover less than $200,000 per annum)
- b1 Commercial energy efficiency improvement
- b3 Commercial retrofit - HVAC
- b6 Residential lighting improvements
- b7 Residential new construction efficiency
- b11 Diesel car & LCV efficiency improvement
- b12 Reduced cropland soil emissions
- b13 Petrol car & LCV efficiency improvement
- b14 Commercial new construction efficiency
- b15 Commercial retrofit of insulation
- b16 Commercial retrofit of efficient water heaters
- b17 Cogeneration opportunities
- b21 Livestock & feeding – methane reduction
- b22 Reforestation of marginal land with plantation
- b26 Anti - methanogen livestock treatments, and
- b29 Cropland carbon sequestration

Other abatement is substituted from higher (abatement) cost activities to achieve the 2020 abatement target. In the analysis above, this is sourced from:

- b32 Chemical processes & fuel substitution
- b33 Wind power – best onshore sites
- b34 Electricity - coal to gas shift (new builds)
- b35 Biomass/ biogas
- b37 Electricity – geothermal, and
- b38 Coal to gas shift (increased gas utilisation).

Under the revised merit order created by the overlay of ERF transaction costs, the marginal and average cost of delivering a 126Mt abatement outcome in 2020 is as shown in Figure 3.5. Notional ERF transaction costs are assumed to apply to all projects within the scope of the scheme.

Figure 3.5 Cost of moving toward the 2020 GHG target under ERF transaction cost regime



Under this construct the net outlay required (beyond 'no regrets' action) to achieve the 2020 emissions target is estimated at a little over $1.65 billion. The cost of the last tonne necessary to achieve this target is around $26.90, and inclusion of 'no regrets' abatement delivers an average cost per tonne outcome for the 2020 target that is less than zero (ie. about -$18.66 per tCO2e).

The ability to access and motivate 'no regrets' abatement is highly relevant to overall cost outcomes. As shown in Figure 3.5, although marginal cost rises above $20 per tonne to deliver on the 2020 target, the average cost remains comfortably below zero because of the significant value of 'no regrets' action that acts to offset the burden of 'costly' abatement beyond about 45 MtCO2e.

However, we strike a program design dilemma here.

In a competitive auction based program such as the ERF, the expected return from selling 'no regrets' abatement to government is approximately zero. And at a price of around zero, it is reasonable to expect that interest in bidding this kind of abatement into the system will be very modest indeed.

Further, the abatement estimation methods and activity baselines employed by the ERF are designed to guard against excessive levels of this type of abatement entering the system. The Department of the Environment, which has policy responsibility for the ERF, notes that ... '[its] methods ensure that emissions reductions are genuine—that they are both real and *additional to business as usual operations* [italics added].'[8]

'Business as usual' is a highly subjective term, but normally implies actions that could reasonably be expected to be undertaken by a normal business (or other entity) operating in an Australian context. Understandably, government does not wish to 'over-pay' for abatement, buy abatement arising from false or exaggerated claims or use tax payer dollars to fund emission reduction opportunities arising from poor or perverse business management practices. Nevertheless, an effective greenhouse policy response should offer strong incentives for 'no regrets' abatement actions to be adopted. The ERF confronts a difficult task in motivating identification and adoption of no regrets opportunities while ensuring that tax payer dollars are not directed toward projects that would have occurred anyway or reward those who have recklessly increased their emissions as a result of incompetence or guile. These have always been inherent challenges for a baseline & credit based approach.

Capturing 'no regrets' abatement in the ERF

The treatment of 'no regrets' abatement under the ERF is problematic. Theoretically, it should be available at a price of zero dollars or less, and government should be reluctant to subsidise emission reductions that stack up economically in their own right. But to ignore this pool of savings is to overlook the lowest cost projects and activities in the national abatement opportunity set. Information and decisionmaking in the real world is far from perfect, and while it is easy to assume away the waste, misallocations and inefficiencies arising from this as being trivial or transitory, real world experience suggests that these problems can be both significant and persistent.

It is difficult to know how reliably the ERF methods reflect 'business as usual' abatement opportunities in different activities and sectors, or how effectively they draw the line between profitable abatement (which government should be reluctant to subsidise) and that which requires top up funding in order to proceed.

From an owner's perspective, a single project could potentially combine a mix of 'no regrets' and 'costly' abatement. It is easy to imagine a situation where a particular change in process or technology could generate a 4,000 tonne per annum emission cut on a 'no regrets' basis, but an alternative option costing 30% more could yield a 7,000 tonne per annum reduction. As a potential ERF bidder, the project owner would be interested in how much of the potential 7,000 tonne reduction could be sold into the ERF under the applicable method, and also what they would need to sell this abatement for in order to cover their investment and other expenses. Beyond this, most project proponents are likely to have a strong interest in profiting from the deal (why participate otherwise?), but also be aware that the reverse auction component of the ERF exerts strong downward pressure on prices. Setting price too far above cost magnifies the risk of an unsuccessful bid - and the prospect that the effort put into formulating the bid will be entirely wasted.

It is possible to model the implications for expenditures if some 'padding' of bids with 'no regrets' abatement eventuates under the ERF methodologies and auction processes. It is also possible to examine the implications for budget expenditure and overall costs if <u>no</u> 'no

[8] See http://www.environment.gov.au/climate-change/emissions-reduction-fund/publications/factsheet-emissions-reduction-fund-emissions-reduction-methods (accessed 4 Feb 2016).

regrets' action was funded by the ERF - and it languished as a result. This would reflect a precise and restrictive application of strict 'beyond business as usual' crediting requirements. The results of this analysis are shown in Figures 3.6 and 3.7.

They depict a situation where project proponents can extract a token payment of $1 per tonne for their 'no regrets' abatement (and respond to an effective floor price set at this level). Two scenarios are presented. One in which all relevant no regrets abatement is funded at this level, and another where the ERF does not fund 'no regrets' abatement- and it fails to materialise as a result. These are identified as 'weak' and 'strong' no regrets exclusion scenarios.

The marginal and average cost outcomes reflected in Figures 3.6 and 3.7 below relate to emission prices paid by the ERF and its overall budget expenditure. Activating 'no regrets' action has a value to the economy in its own right and, within the constructs of the model, is estimated to be worth around $4.0 billion commensurate with ERF transaction costs, and over $10.3 billion in a hypothetical scenario where transaction costs to evaluate, undertake and demonstrate abatement do not need to be incurred at all.

Figure 3.6 Marginal and average budgetary cost implications of different ERF approaches to 'no regrets' abatement

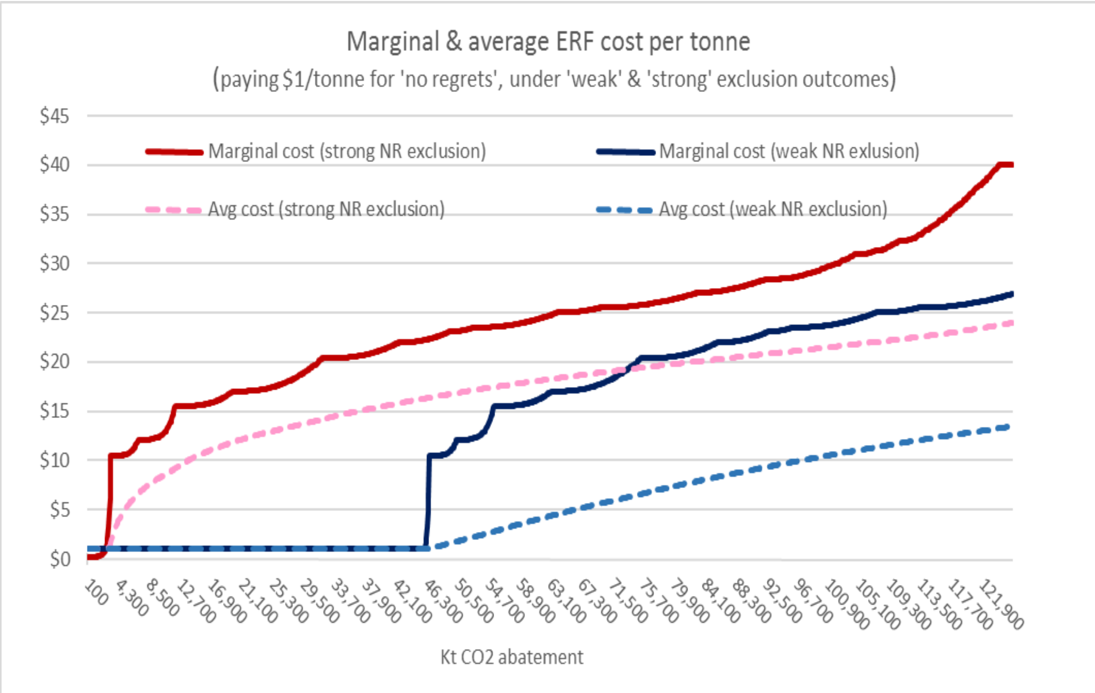


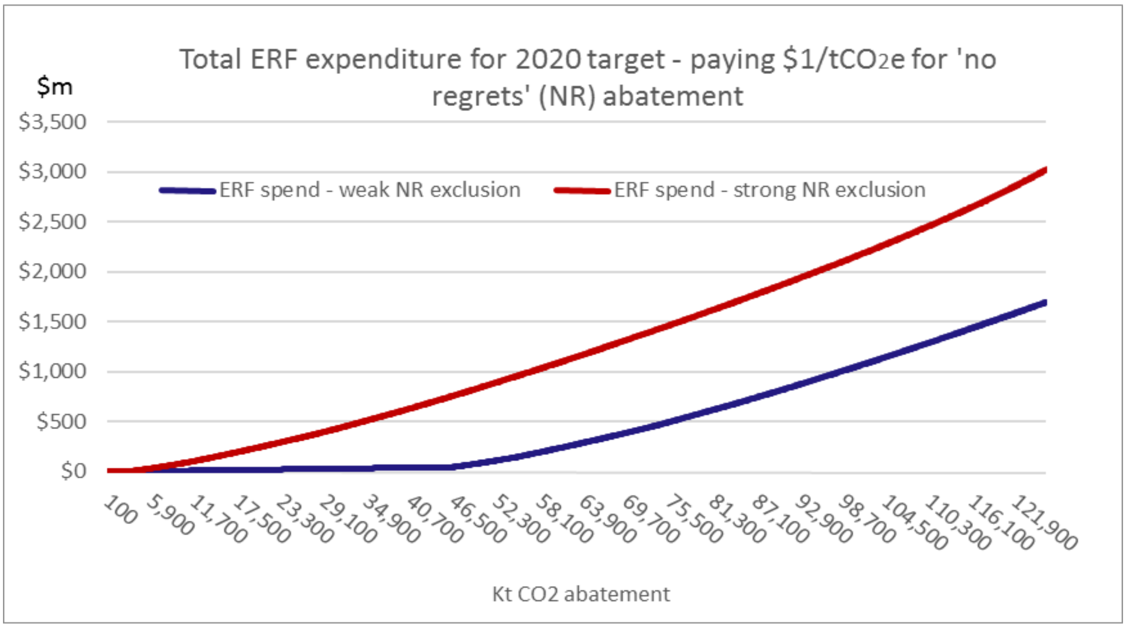
Figure 3.6 illustrates the effect of a $1 per tonne floor price on the marginal cost of abatement available to the ERF. The treatment of 'no regrets' abatement makes a significant difference to the amount of low cost abatement that the ERF can access. With weak barriers to 'no regrets' abatement, the average cost of abatement under the ERF remains at $1 per tonne for around the first 46 million tonnes and then increases in response to increasing marginal costs which rise to just under $27 per tonne. Under this scenario, the cost to the Budget of achieving the 2020 target averages out at around $13.46 per tonne.

With strong barriers to 'no regrets' abatement in place, access to 'low hanging fruit' is heavily restricted. The cost of delivering the final tonne necessary to achieve the 2020 emissions target rises to about $40, and the average cost to the Budget of delivering the 2020 target is just under $24 per tonne of ERF abatement.

The expenditure implications of these scenarios are shown in Figure 3.7.

It suggests a total ERF expenditure of around $1.70 billion is needed to achieve the 2020 target if 'no regrets' opportunities are accessed and leveraged by the scheme at a modest cost. In addition to this funding the private sector also enjoys the benefit of efficiency gains associated with 'no regrets' investment. As noted, this has an estimated value of around $4 billion.

Figure 3.7 ERF expenditures with and without token funding for 'no regrets' abatement



If the ERF approach locks out or fails to leverage no regrets opportunities, expenditure under the ERF to deliver 126 million tonnes of abatement rises to around $3.02 billion. Importantly, if no regrets opportunities are allowed to languish, $4 billion in potential savings will also be lost to the economy.

3.3 Implications for an emissions trading system (ETS)

Transaction costs under a mandatory national emissions trading system will fall on those obliged to report on and pay for emissions output, and can also entail brokerage fees associated with the sale and purchase of emission permits (eg. Australian Carbon Credit Units (ACCUs) and other authorised script). Emissions trading can reflect a speculative element and also be driven by changes in emission needs associated with relative prices and growth opportunities in the economy. Trading patterns and volumes will also be fundamentally affected by permit allocation arrangements put in place by government.

It is reasonable to assume that the set up and compliance costs of an ETS would be similar to those experienced under the recently abandoned Carbon Pricing Mechanism (CPM). As noted, an ETS would involve the additional costs of brokerage. But unlike the ERF, it would not involve a requirement to prepare individual project bids for participation in a reverse auction, with uncertain prospects of success. Another critical difference is the obligatory and focused nature of its compliance costs. If it followed the approach of the CPM, around 400 major companies would have mandatory reporting and acquittal obligations under a national ETS. Importantly, these costs apply regardless of the preferences or disposition of the individual firms involved and therefore form a backdrop to their decisions regarding abatement efforts and emissions output. These are what economists refer to as 'sunk' costs and are not relevant to the value these organisations put on their individual abatement efforts or the incentives they face for action.

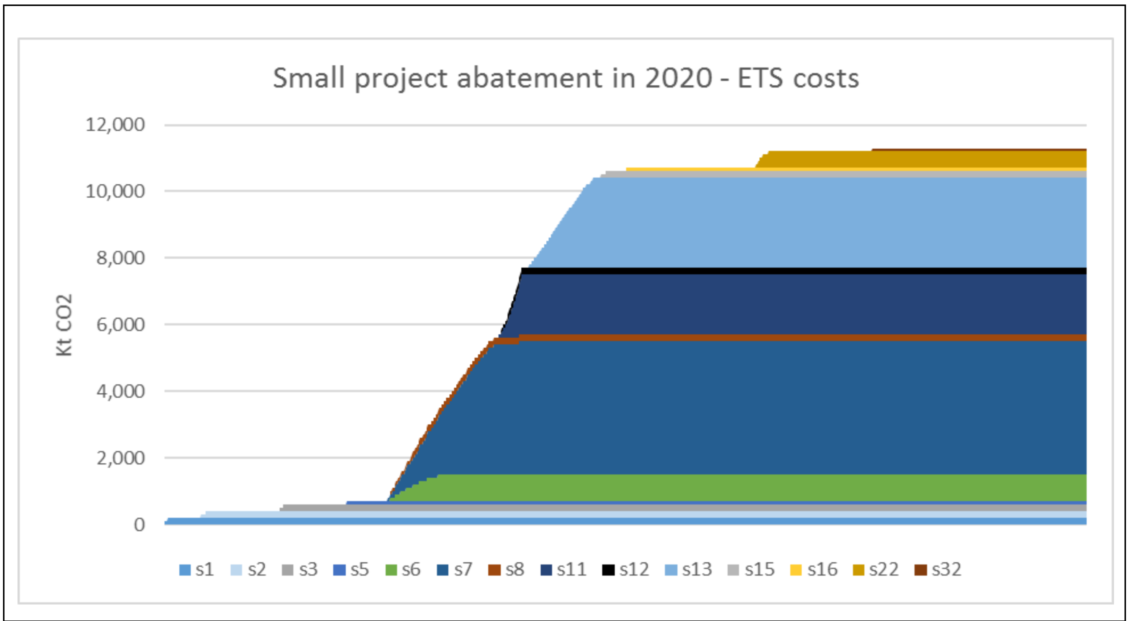
As with the ERF and the CPM before it, abatement from the farming and forestry sector giving rise to carbon credits is likely to continue to involve some degree of transaction costs because of the project based contracts necessary to support this activity. However, unlike the ERF, this abatement would not be subject to purchase via successive rounds of auction; it could be sold into a national market at a floating or pre-determined price. The set of annualised transaction costs assumed to apply to the operation of a national ETS are shown in Table 3.1.

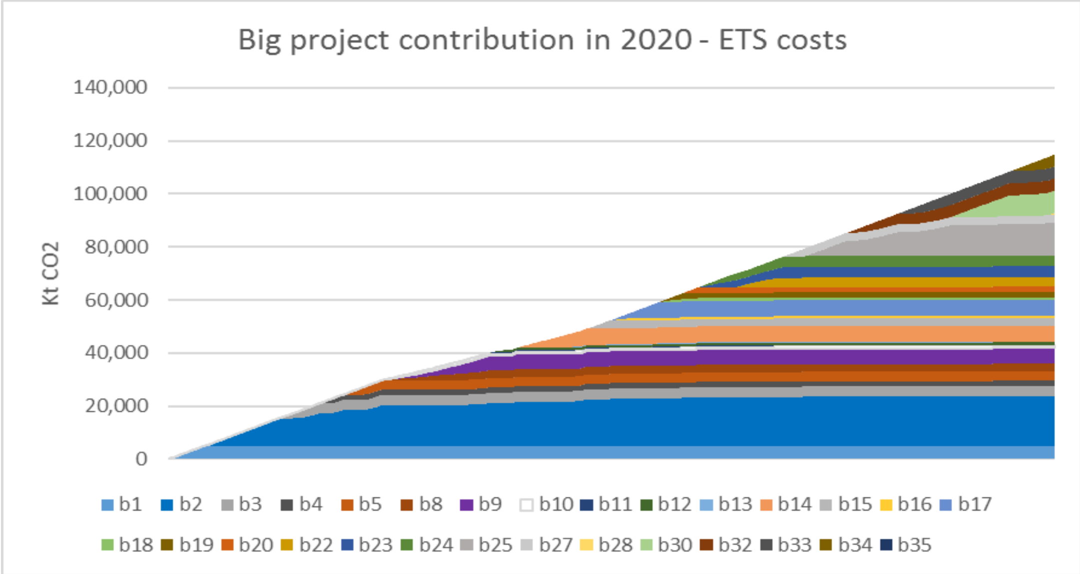
Table 3.1 Transaction costs assumed for an ETS

Abatement source	Assumed trx costs per project in 2020* - SMALL	Assumed trx costs per project in 2020*- BIG
Households	$0	na
Industry & services	$0	$0
Land, agriculture & forests (CFI)	$9,450	$14,000

These transaction costs give rise to the least cost abatement set indicated in Figure 3.8. Small entities contribute around 11.3 Mt (9.0%) of the 126 MtCO2e required to deliver on Australia's 2020 emissions target. Due to its lower transaction costs, the ETS approach draws on a wider and deeper pool of abatement projects than is available to the ERF.

Figure 3.8 Least cost ETS activity mix to achieve the 2020 GHG target: Small and Big abatement projects

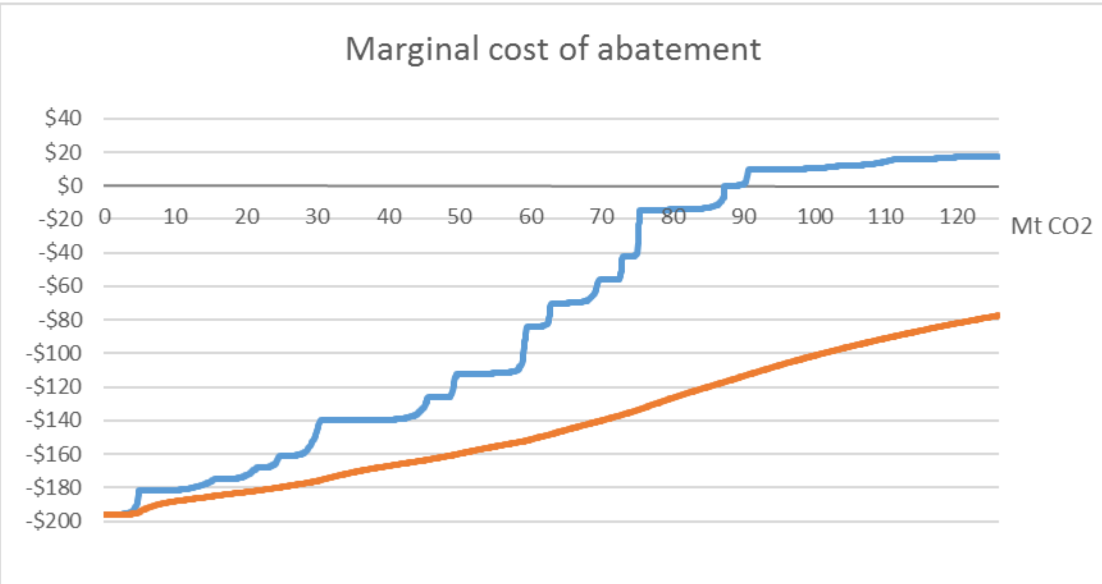




This characteristic culminates in lower marginal and average abatement costs associated with achieving the 2020 abatement target. These costs are shown in Figure 3.9.

Under an ETS, delivery of a 126 MtCO2e abatement outcome is associated with a marginal cost of around $17.40 for the final tonne of abatement needed to reach the 2020 target. Assuming the price impact of an ETS successfully drives 'no regrets' abatement opportunities, the average cost associated with reaching this target is negative, and estimated at around -$77 per tCO2e. Net expenditures (beyond no regrets action) of $476m are implied by this abatement effort, with a potential 'producer surplus' or profit overall associated with this of around $168 million with the market value of tradable emissions reflecting the market clearing marginal abatement cost.

Figure 3.9 Cost of moving toward the 2020 GHG target under ETS transaction cost regime



Under an ETS the burden of this 'above the line' cost falls on emitters rather than government expenditure. Further, no regrets abatement incentives are driven by a market price for carbon reflecting marginal cost. Under the cost structure above, this reflects a return of $17.40 for each tonne of emissions avoided, and the potential to sell abatement at that price for those holding surplus emission allowances.

The cost and revenue implications of this depend on the distribution of emission entitlements by government among emitters. These distributional decisions are relevant to broader policies around long term abatement incentives, equity objectives and government expenditure and revenue settings.

3.4 Sensitivity analysis

These results reflect a range of model assumptions and could influence outcomes. Key parameters were varied to test their impact on results and relativities. Parameter variations were:

- 15% increase in estimated transaction costs
- 15% decrease in estimated transaction costs, and
- 15% increase in cost of 'no regrets' abatement opportunities.

The results of this sensitivity analysis are reported in Tables 3.2 and 3.3. These show the cost impact of variations in transaction costs against a backdrop of default assumptions around the availability of 'no regrets' opportunities (Table 3.2) and a diminished pool of these opportunities (Table 3.3). The average and marginal cost associated with delivering the 2020 abatement target are shown, along with the estimated net 'out of pocket' expenditure associated with achieving the target under each approach. For the Ideal (no transaction costs) and ETS scenarios, this expenditure equals the cost of abatement beyond the 'no regrets' level (ie. that for which a net cost in NPV terms is involved).

Table 3.2 Sensitivity analysis: base model abatement costs

Model outcome	Base parameter outcomes	15% higher trx costs	15% lower trx costs
Hypothetical ideal (no transaction costs)			
Terminal MC	$5.00	<< ditto	<< ditto
AC target delivery	-$81.40	<< ditto	<< ditto
Net spend	$58.9 million	<< ditto	<< ditto
ERF (project & contract based) – assuming $1/tonne payt for 'no regrets' (NR) action (floor price)			
Terminal MC	$26.91	$28.69	$24.76
AC target delivery	-$5.20	-$1.90	-$8.83
Net spend	$1,696.5 million	$1,815.7 million	$1,557.0 million
National ETS (based on CPM compliance model)			
Terminal MC	$17.36	$18.34	$15.69
AC target delivery	-$77.41	-$77.11	-$77.82
Net spend	$475.9 million	$513.0 million	$424.3 million

For the ERF, we have reported results for the approach where a modest amount is paid to encourage identification and adoption of 'no regrets' opportunities under the program. This is modelled as a $1 per tonne floor price for successful bids, which can include 'no regrets' abatement. This means that the ERF pays $1 more per tonne for 'no regrets' abatement than an ETS approach.

Table 3.3 Sensitivity analysis: revised abatement costs - exhibiting 15% increase in' no regrets' cost base[a]

Model outcome	Base parameter outcomes	15% higher trx costs	15% lower trx costs
Hypothetical ideal (no transaction costs)			
Terminal MC	$5.00	<< ditto	<< ditto
AC target delivery	-$68.78	<< ditto	<< ditto
Net spend	$60.2 million	<< ditto	<< ditto
ERF (project & contract based) – assuming $1/tonne payt for 'no regrets' (NR) action (floor price)			
Terminal MC	$26.99	$28.71	$25.31
AC target delivery	+$1.34	+$4.63	-$2.20
Net spend	$1,707.1 million	$1,828.7 million	$1,571.5 million
National ETS (based on CPM compliance model)			
Terminal MC	$17.36	$18.38	$15.72
AC target delivery	-$64.82	-$64.51	-$65.22
Net spend	$478.0 million	$517.1 million	$427.9 million

Notes: [a] a 15% cost uplift factor is applied to all activities with an average cost of $0 or less.

Overall, the results indicate the emergence of a logically consistent set of estimates from the model, and robust patterns of relative value. Higher transaction costs and a reduced pool of low cost savings have the expected effect of increasing the cost of abatement needed to achieve the 126Mt target (though in the ideal situation of no transaction costs, the target can still be achieved at a marginal cost of $5 per tonne – even under a scenario where the cost of 'no regrets' opportunities increases by 15%).

Under a scenario where both the cost of 'no regrets' opportunities and project transaction costs are 15% higher than expected, the sensitivity analysis suggests that net expenditure under an ERF approach (paying $1 per tonne for 'no regrets' abatement) would increase from around $1.696.5 million to $1.828.7 million (an increase of about 7.8%). In comparison, the expenditures estimated under an ETS increase from $475.9 million to around $517.1 million (about 8.7% - albeit off a lower base). The cost increase of $132.2 million under the ERF is nearly three times that estimated for the ETS ($41.2 million).

The average cost of delivering the target is sensitive to transaction costs and the ability to access 'no regrets' abatement. Small variations in these factors can lead to significant variations in overall average costs., with the ERF exhibiting the largest variations in percentage terms (again, a feature of the lower base values (in absolute terms)).

Section 4

Conclusions

The Emissions Reduction Fund (ERF) imposes contractual obligations on participants on a project by project basis, and involves high transaction costs as a result. This reduces its access to low cost abatement opportunities, and poses a significant challenge for mobilising 'no regrets' abatement opportunities associated with inefficient resource utilisation within the economy. 'No regrets' abatement opportunities are also opportunities to cut costs or increase profits and will result in a net private benefit to users. However, the 'baseline & credit' approach of the ERF combined with its reverse auction system is unlikely to significantly increase economy-wide incentives to identify and act on these kinds of emission reduction opportunities.

Its project based focus, high transaction costs and weak incentives for 'no regrets' abatement mean that the ERF is likely to be a high cost approach to achieving Australia's 2020 GHG emissions target. This is particularly the case if the 'Safeguards' dimension of the ERF - which imposes emission constraints on Australia's biggest emitters – is weak.

Analysis undertaken in this study, seeks to compare the abatement cost implications of the ERF with a theoretical 'Ideal' benchmark where abatement can be identified and undertaken with zero transaction costs, and a national emissions trading system (ETS) with a compliance structure and associated on-costs similar to those of the now-discarded Carbon Pricing Model (CPM). These approaches are compared using marginal abatement cost estimates for a range of activities depicted in bottom up models of the Australian economy – as popularised by McKinsey&Company, ClimateWorks and others.

The model is used to estimate the cost of delivering 126 MtCO2e of abatement in 2020. This is consistent with government's most recent published estimate of what will be required to deliver on Australia's 2020 GHG emissions target. A comparison of key outcomes under the different approaches is provided below.

4.1 Comparison of costs

The model demonstrates that policy measures with low transaction costs are likely to produce a lower cost abatement outcome.

Figure 4.1 shows the estimated marginal cost of abatement under Ideal, ERF and ETS approaches. Measures with higher participation costs face reduced access to low cost abatement and must draw on higher cost abatement in order to reach the 2020 target. The costs examined in this study are those faced by projects and owners wishing to participate in the ERF, and the voluntary component of an ETS (presumably focusing on land based emissions). We not that a mandatory approach such as a national ETS would involve minimal participation costs per se, and those with reporting and compliance obligations would be relatively few in number and not have their abatement incentives materially affected by those costs. The net cost to an individual of a carbon price would be a function of the abatement opportunities available to them and permit allocation arrangements under the ETS – which is a decision of government.

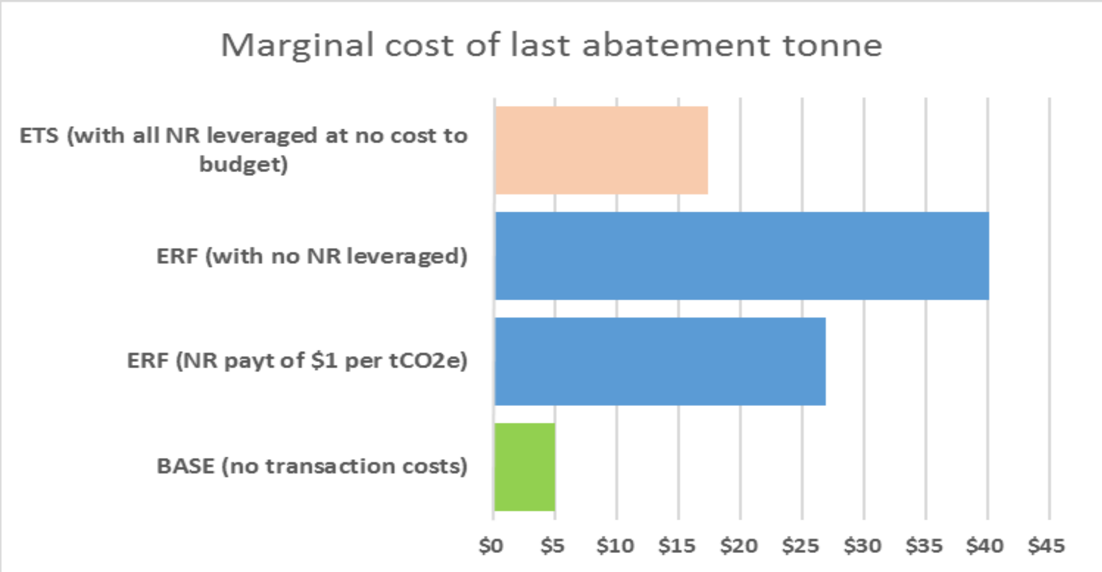
Costs to government in operating alternative abatement programs are also relevant to overall costs, but have not been estimated in this analysis.

In an ideal situation of zero transaction costs (eg. no contractual, monitoring, reporting or verification requirements), the modelling suggests that all the necessary abatement can be generated at a cost of no more than $5.00 per tonne CO2e.

The transaction costs associated with the ERF drive up the marginal abatement costs faced by participants under the program. If the ERF does not pay for or leverage any 'no regrets' abatement, it faces marginal abatement costs rising to just over $40 per tCO2e. If it can mobilise this abatement at a cost of around $1 per tonne, the final tonne of abatement needed to achieve the 2020 target is estimated to cost around $26.91.

These outcomes would be commensurate with an average price paid under the ERF auction program of between $13.46 and $23.98 per tCO2e, and average cost outcomes across all the abatement generated by the ERF of between -$5.20 and +$23.98. If the ERF could leverage 'no regrets' activity at no cost to the Budget, the average price paid by government per tonne of abatement would fall to about $20, and involve the purchase of 82.5 MtCO2e at a total cost of around $1, 651.7 million.

Figure 4.1 Marginal cost of delivering a 126Mt abatement outcome ($/tCO2e)



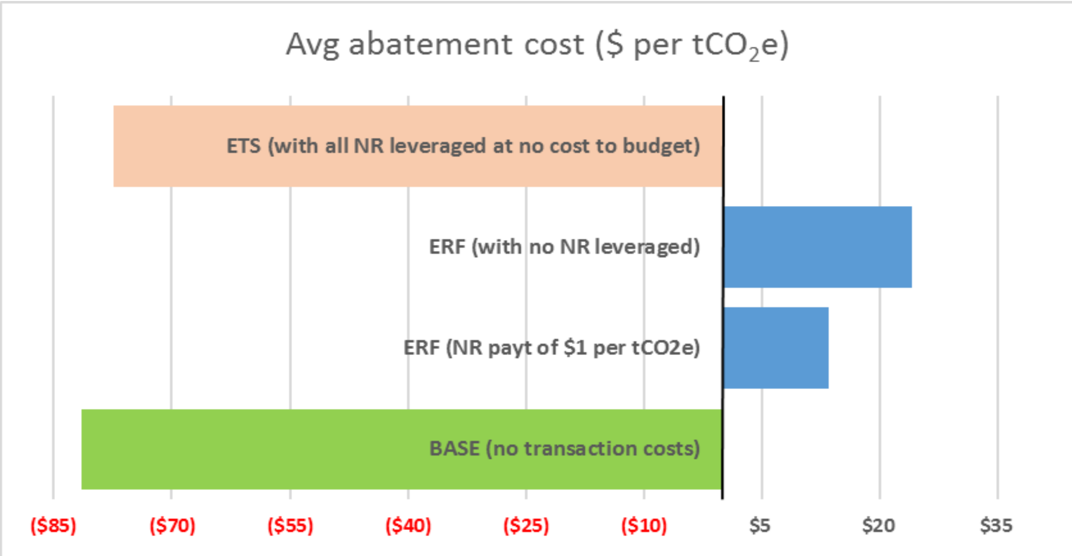
Lower project and entity level transaction costs lead to greater abatement activity under an ETS - which harnesses the incentives provided by a carbon price. It enhances the economic incentives for 'no regrets' abatement and imposes lower costs on those wishing to participate in carbon credit trading arrangements. The market price established under an ETS reflects the marginal cost of abatement, and this acts as both a cost incentive for emission reduction and a profit incentive for the sale of excess emission entitlements.

The modelling suggests that the marginal cost of delivering the 126 MtCO2e of abatement target under an ETS would be around $17.36. The average cost of abatement above the 'no regrets' level would be about $12.83, and involve the generation of 37.1 Mt of abatement.

These attributes are further exhibited in Figure 4.2. It shows the average cost per tonne of abatement action, taking into account the net cost of all abatement that contributes to achieving the target.

The analysis indicates that in theory, if all 'no regrets' abatement could be activated at no additional cost, Australia's 2020 GHG emissions could be reduced by 126 MtCO2e at negative average cost. That is, on average, each tonne of abatement would deliver a financial benefit to the project owner of $81.40 and a net benefit to the economy of around $10.3 billion. Although involving some level of transaction costs, the far reaching abatement incentives of an ETS could deliver an average cost outcome of around -$77.41. It too would be likely to support a net benefit, on average, across emitters, and drive a total net economic benefit (assuming full mobilisation of 'no regrets' action) valued at around $9.7 billion.

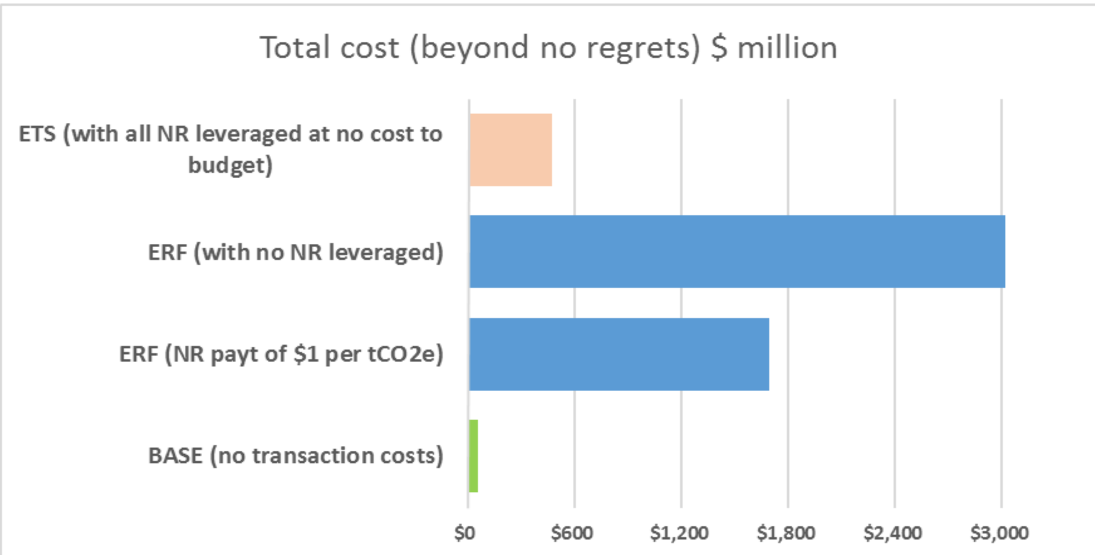
Figure 4.2 Average cost of delivering a 126Mt abatement outcome ($/tCO2e)



Both variants of the ERF approach (differentiated by the level of 'no regrets' abatement leveraged) return positive cost estimates. The high leverage variant (which effectively purchases 'no regrets' abatement at $1 per tonne) delivers an average cost for the abatement target of $13.46, commensurate with net cost of $1.7 billion. The low leverage variant (where minimal amounts of 'no regrets' abatement are leveraged or paid for by the ERF) delivers an average abatement cost of $23.98 per tCO2e, producing a total cost of about $3.0 billion.

As indicated by the comparison of marginal costs delivering 126 Mt of abatement will require some costly abatement to be undertaken, regardless of the approach. Even with zero transaction costs, there is not enough 'no regrets' abatement in the economy to fully meet the abatement target. Making up the shortfall will entail net costs for some. The total of these costs is reported in Figure 4.3.

Figure 4.3 Expenditure associated with 'net cost' abatement outcomes ($m)



Under ideal (and theoretical) conditions, the analysis suggests that delivery of the 126Mt target could be achieved by a net expenditure (after no regrets options are exhausted) of around $58.9 million. By comparison, and with the introduction of transaction costs, an ETS would require the expenditure of $475.9 million to achieve the target. Further, the market approach implicit in an ETS would see a total value of $643.9 million placed on this abatement, implying that over-compensation (ie. a 'producer surplus' or profit) of up to $168 million could be associated with the sale of this abatement by its owners at market prices.

The analysis suggests that the ERF would entail expenditures of at least 2.6 to 4.7 times that associated with an ETS. The expenditure estimate for the ERF, assuming purchase of 'no regrets' abatement at $1 per tonne, is $1,696.5 million and the expenditure estimate for the ERF approach if 'no regrets' options languish is $3,021.4 million.

It is noteworthy that the current ERF budget allocation of $2.55 billion lies just beyond the midpoint of these estimates. Further, with ERF purchases to date representing (on face value) about 40% of Australia's target requirement (for the period 2015 to 2020), the model prediction of the average price to emerge from the ERF auctions to date is $1.61 - if 'no regrets' action is coming forward and being funded, and $16.75. – if it is not. Of course, there is no guarantee that after only 2 auctions the ERF administrators are seeing an orderly transition up the national marginal abatement cost curve. Experience suggests that new and novel 'markets' can take a while to bed down.

'Who benefits' and' who pays' is also an important dimension of these policy options although it does not particularly affect overall cost and benefit outcomes. Under the ERF construct, abatement expenditures are made by government and funded from the Commonwealth budget. Under an ETS, abatement action is driven by an emission constraint that acts through normal market processes to produce a carbon price. The pattern of beneficiaries and those who bear net costs is driven by the pattern of permit allocation across the economy. If government were to sell or auction these permits the ETS would generate revenue, similar to a tax. Alternatively, it could distribute all emission permits and drive abatement through a carbon price while collecting no revenue at all.

4.2 Comparison of abatement sources

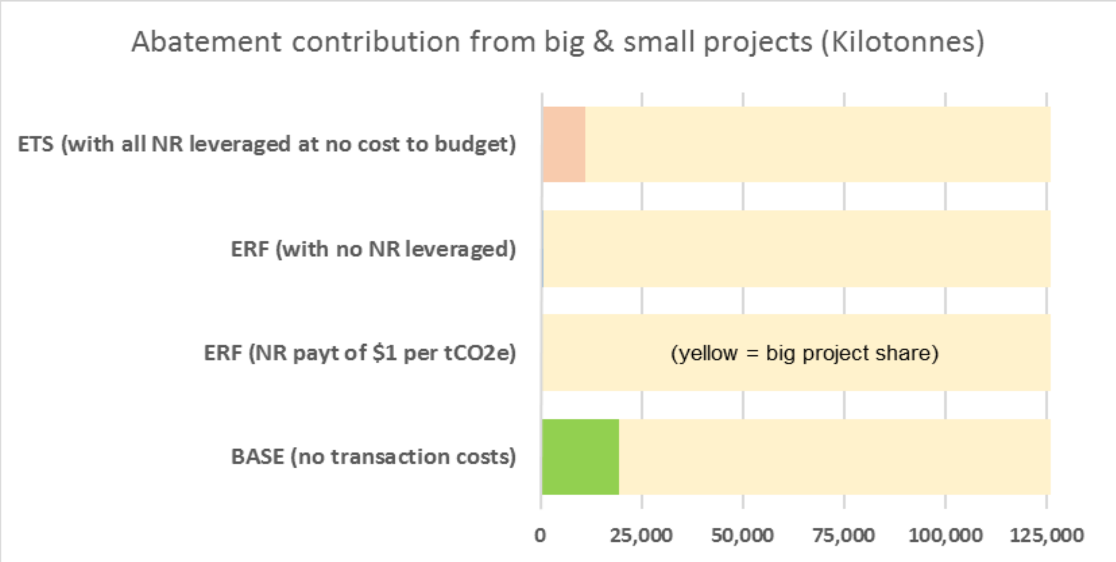
The different approaches drive different distributional consequences. Under the theoretical ideal, a wide range of abatement activities contribute to the national abatement target. Of the 48 activities identified, 29 contribute to a least cost abatement solution that delivers on the 126 Mt abatement objective. Activity is spread across big and small projects.

Project level transaction costs hit small projects hardest, and shifts the source of abatement into higher cost categories. Small projects, and activities in which they account for a higher abatement share, tend to make a diminishing contribution to the abatement task as transaction costs increase. The contribution of small projects to the national abatement target under the different policy settings is shown in Figure 4.4.

If zero transaction costs applied, small projects are estimated to contribute about 15.4% of the abatement needed to deliver a least cost outcome. In the presence of transaction costs associated with obligations under an ETS, small projects are estimated to contribute only 9.0% of abatement. Under the ERF, small projects are expected to contribute less than 1% of the abatement purchased by the scheme.

These results indicate that the ERF is likely to be an expensive way of achieving Australia's 2020 emissions target. The uncertainties and relatively high transaction costs involved inhibit participation by project owners, and it can struggle to incentivise 'no regrets' abatement action. Coupled with this, its focus on paying emitters to reduce their emissions below a notional 'baseline' immediately invites the interest of those wishing to misrepresent their future emissions, and be paid for not increasing them. Under the ERF it is completely feasible for a company to substantially increase its total emissions output while receiving government funding to cut emissions in one particular aspect of its operations. This is clearly incompatible with emission targets that require ongoing reductions in emissions output on an economy-wide level.

Figure 4.4 Contribution of big & small projects to the 126 Mt abatement task



Modelling suggests that the cost of achieving a 126 Mt emission reduction under the ERF will involve net expenditures (ie. spending not offset by financial benefits at a project level) of between $1.7 million and $3.0 billion. This is at least three and a half times the net expenditure likely to be associated with an ETS – which puts a price on GHG emissions across the economy, and encourages abatement via this mechanism. Those facing this price invest to reduce their emission levels. Under the ERF, it is the government that funds the investment and demands that those individual emission reductions are monitored.

Taking all savings and expenditures into account, the modelling indicates that Australia could deliver 126Mt of abatement in 2020 at a net benefit to the economy. A high proportion of this abatement could be delivered through actions that enhance the bottom line of households and businesses. An ETS can magnify the incentives to undertake this abatement and help drive it. If successful in unlocking these profitable emission reductions, a national ETS could deliver Australia's 126 Mt abatement target while generating a net benefit to emitters that averages out at about $77 per tonne. In contrast, the ERF is likely to deliver this abatement outcome at a net cost, averaging out at somewhere between $13 and $24 per tonne.

4.3 Direct versus price-based economy-wide action

It is not clear that Australians fully realise that, based on our model estimates, they are paying a billion dollars or more (and perhaps several times that amount) to avoid the use of a price based mechanism to deliver on our 2020 emission target.

The ERF allows those wishing to undertake major emission reductions to bid for government funding, and others to go about their business as before. Rather than adopt an economy-wide approach that applies a price to a broad emissions base, as occurred under the CPM and would also be an outcome of a national ETS, the ERF encourages emitters to come forward and apply to be paid from the Commonwealth budget for the abatement that they are considering.

The voluntary and narrow focus of the ERF contrasts with the mandatory and broad focus on a national ETS. While the ERF is in the market to buy, on current estimates, around 236 Mt of abatement between now and 2020 (resulting in an emission reduction of 126Mt in the year 2020), an ETS could potentially apply to the entirety of the emissions target (adjusted for our carryover from the 2008-12 Kyoto Protocol period). Australia's current international GHG target commitment represents a quota of 4,457 MtCO2e over the period 2013 to 2020 – equal to about 557 MtCO2e per year.[9] Adding in the 129 Mt carryover Australia has from the first Kyoto commitment period, the annual average emissions quota rises to about 573 MtCO2e.

While the ERF is seeking to deliver an abatement outcome of around 236 MtCO2e between 2015 and 2020 through direct purchases and a 'Safeguards' mechanism to guard against excessive emissions growth elsewhere in the economy, an ETS could apply to around 3,438 MtCO2e over the same period (although the desirability of reliable and low cost reporting arrangements would probably result in slightly narrower ETS coverage).

Our modelling suggests that the ERF might need to spend up to $3 billion over this period to deliver on the emission target, and possibly allow up to a further $10 billion in efficiency savings to languish. An ETS, on the other hand, would put a price on emissions of around $17.36 and, in doing so, would value Australia's emission quota for the period (in the absence of international trading) at around $59.7 billion. This is the amount of revenue that could be raised if government chose to sell all the emission quota. The net expenditure associated with achieving the emissions target under an ETS approach would be about $0.64 billion and net efficiency gains worth about $9.7 billion would be likely to flow from that. This implies a potential net economic cost of up to $3 billion under the ERF approach versus a potential net gain of around $9 billion under a national ETS.

An ETS mobilises resources on an economy-wide basis and crystallises the value inherent in the ability to emit greenhouse gases into the atmosphere. The ERF goes to considerable lengths to avoid this mobilisation. Consideration of an economy-wide carbon price quickly raises issues of household impacts and international competitiveness. While much can be done to reduce these pressures (as demonstrated by the household and industry compensation and subsidy packages delivered under the CPM), they are an inherent aspect of increasing the cost of a scarce resource. However, history suggests that households and industry can readily adapt to these pressures, and seize opportunities associated with them. The strong uptake of energy efficiency and renewable energy technologies is a clear example of this adaptability and willingness to embrace low carbon approaches, as is the innovation associated with it.

The ERF is designed to avoid these pressures. And, as a consequence, also forestalls the economy-wide innovation and opportunities associated with it. Given the pool of low cost abatement that bottom-up models suggest is available in the Australian economy, the ERF might be viewed a modest policy response suited to a modest emissions target. However, the costs and uncertainties associated with the ERF are likely to be substantial. We have sought to bring these to the attention of policymakers. Efficient abatement mechanisms and policy frameworks are necessary to deliver Australia's best response to the prospect of deeper emission cuts in the future, and the economic challenges and opportunities that they bring.

[9] See Department of the Environment, "Australia's emissions projections 2014-15", Commonwealth of Australia, March 2015, p.10.

Appendixes ....

Appendix 1 2020 abatement activities, costs and distributions in the MACtrax model

S/B code	Abatement activity	avg $ per tonne	Mt CO2e available (2020)	No. of entities	Abatement % Small	Abatement % Big	Notes
1	Commercial energy efficiency improvement	-140	5	1,048,198	3.5%	96.5%	
2	Other industrial energy efficiency	-130	20	83,792	0.8%	99.2%	
3	Commercial retrofit - HVAC	-125	4	1,048,198	3.5%	96.5%	
4	Upgrade of residential appliances & electronics	-120	2	1	0.0%	100.0%	MEPS
5	Mining energy efficiency improvements	-115	3.5	3,332	0.1%	99.9%	
6	Residential lighting improvements	-100	0.8	8,737,962	100.0%	0.0%	
7	Residential new construction efficiency	-100	4	164,474	100.0%	0.0%	
8	Commercial retrofit lighting	-100	3	1,048,198	3.5%	96.5%	
9	Commercial elevators and appliance efficiency	-100	6	1	0.0%	100.0%	MEPS
10	Improvements to existing gas plant efficiency	-100	1	90	0.0%	100.0%	Assume all opps big
11	Diesel car & LCV efficiency improvement	-90	2	288,382	90.0%	10.0%	
12	Reduced cropland soil emissions	-90	1	20,482	11.4%	88.6%	
13	Petrol car & LCV efficiency improvement	-80	3	13,130,855	90.0%	10.0%	
14	Commercial new construction efficiency	-80	3	20,964	0.0%	100.0%	
15	Commercial retrofit of insulation	-60	3	1,048,198	3.5%	96.5%	
16	Commercial retrofit efficient water heaters	-50	0.8	1,048,198	3.5%	96.5%	
17	Cogeneration opportunities	-50	6	52,410	0.0%	100.0%	
18	Improved petroleum & gas maintenance	-40	1	254	0.0%	100.0%	
19	Reduced elect transmission & distribution losses	-40	2	92	0.0%	100.0%	
20	Efficiency improvements existing coal generators	-30	2	25	0%	100.0%	Assume all opps big
21	Livestock & feeding – methane reduction	-10	2	91,442	11.4%	88.6%	
22	Reforestation of marginal land with plantation	-10	4	91,442	11.4%	88.6%	
23	Oxidation of vented coal mine methane	0.5	4	30	0.0%	100.0%	Assume all opps big
24	Aluminium production energy efficiency	0.5	4	19	0.0%	100.0%	Assume all opps big
25	Improved pasture and grassland management	10	30	91,442	11.4%	88.6%	

26	Anti - methanogen livestock treatments	15	3	91,442	11.4%	88.6%	
27	Cement clinker substitution	15	3	48	0.0%	100.0%	
28	Reduced deforestation & clearing	18	30	91,442	11.4%	88.6%	
29	Cropland carbon sequestration	20	2	20,482	11.4%	88.6%	
30	Reforestation marginal land with enviro forest	20	40	91,442	11.4%	88.6%	
31	Strategic reforestation of non-marginal land	20	30	91,442	11.4%	88.6%	
32	Chemical processes & fuel substitution	25	5	205	0.8%	99.2%	
33	Wind power - best onshore sites	27	5	20	0.0%	100.0%	
34	Electricity - coal to gas shift (gas new build)	32	20	20	0.0%	100.0%	
35	Biomass/ biogas	35	8	1,390	10.0%	90.0%	
36	Improved forest management	38	4	6,498	6.9%	93.1%	
37	Electricity - geothermal	38	3	20	0.0%	100.0%	
38	Coal to gas shift (increased gas utilisation)	40	12	10	0.0%	100.0%	Assume all opps big
39	Biomass co-firing	42	1	115	0.0%	100.0%	
40	Wind power – second tier onshore sites	42	6	20	0.0%	100.0%	
41	Gas plant efficiency improvement	45	2	90	0.0%	100.0%	Assume all opps big
42	Coal CCS - new build with OER	47	1.5	20	0%	100%	
43	Solar thermal	55	10	20	0.0%	100.0%	
44	Degraded farmland restoration	60	8	91,442	11.4%	88.6%	
45	Wind power – offshore sites	65	1	20	0.0%	100.0%	
46	Coal CCS new builds	65	10	20	0.0%	100.0%	
47	Solar PV - centralised	68	1	20	0.0%	100.0%	
48	Gas CCS - new builds	70	1	20	0.0%	100.0%	