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Ms Anthea Harris
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Dear Ms Harris

RENEWABLE ENERGY TARGET REVIEW – DISCUSSION PAPER

Macquarie Generation welcomes the opportunity to make a submission to the Climate Change Authority's *Renewable Energy Target Review Discussion Paper*, released publicly in October 2012.

Macquarie Generation owns and operates the Bayswater and Liddell Power Stations, two of Australia's largest capacity thermal power stations, with a combined generating capacity of 4,640 MW. The Corporation supplies approximately 12% of the electricity consumed in the National Electricity Market.

Macquarie Generation has long supported the current NEM energy only, gross pool auction market design. It has delivered workably competitive prices, a highly reliable supply and timely signals for new generation investment. Over the past 15 years, NEM jurisdictions have transformed the east coast electricity industry from a regulated, centrally planned utility service into a major commodity market with spot and contract prices sending dispatch and investment signals to market participants. The NEM is a hugely successful example of the benefits of the micro-economic reform initiatives of the 1990s.

The RET scheme is a separate legislative measure with a particular objective that impacts directly on production and investment decisions in the NEM. Macquarie Generation is concerned to ensure that efficient outcomes in the wholesale energy market are not compromised or weakened by the design of an external scheme that provides an ongoing subsidy for the mandated entry of an arbitrary level of zero emissions technologies.

The most important issue for the generation sector in this review is the setting of the annual and 2020 targets under the large scale renewable component of the scheme. Actual demand levels and independent demand forecasts show a fundamental and unprecedented shift downwards in the aggregate level of electricity use across Australia. Whereas the existing LRET targets were expected to drive renewable energy investment to match expected demand growth in the period 2010 to 2020, the remarkable fall in demand levels means that the targets now far exceed forecast demand growth over this period.

The Authority has made a judgement call in the Discussion Paper that existing targets for the LRET scheme should remain place. The basis for that decision is best captured by the following statement:

"The Authority considers that the projected resource cost savings to society overall that might be achieved by reducing the target would not be large enough to offset the damage to investor confidence that such a change would entail."[1]

Macquarie Generation strongly disagrees with this view. Claims about the possible effect of scheme changes on investor confidence are difficult to challenge if it is a subjective judgement. The Authority has made no attempt to measure this risk premium.

Macquarie Generation is of the view that there is a compelling case to moderate the LRET target to ensure that the scheme funds a "true 20%" by 2020, not substantially more. We put forward the following case for revising the LRET target in line with the 26 TWh estimate:

- $4.4 billion is a significant productive inefficiency cost for the Australian economy – there is an opportunity cost of mandating expenditure on renewable plant.

- Existing renewable investors are not left holding stranded assets – Large-scale Generation Certificate (LGC) prices would continue to rise from current levels and wholesale prices would improve – the net effect on existing renewable investments may be unchanged. Many existing renewable investors have been accruing benefits from the RET scheme since it was established in 2001 and will continue do so until 2030.

- Most renewable investments in recent years have been backed by power purchase agreements – they are not exposed to any financial risk from a change in the RET scheme target for the life of the PPA.

- Lowering the target to reflect a true 20% still requires substantial new renewable investment. Proponents who have invested in developing projects to date have not wasted their time and money – a target of 26 TWh would require another approximately 10 TWh of new renewables by 2020.

- The SKM modelling shows that the "true 20%" target delivers the same level of renewable investment by 2030 as the *status quo* 41 TWh target. Falling technology costs and rising carbon prices drive renewable investment in the longer term, not an artificial subsidy to encourage early entry. Delaying investment means that the resource cost of renewable projects is lower and the suite of available technologies which can be widely deployed is likely to extend beyond just wind and solar PV.

- The Authority's concern with "carbon lock-in" due to uncertainty about carbon pricing is exaggerated and misplaced. The SKM modelling shows no additional thermal generation under the "true 20%" target. No investor is seriously considering large scale coal or gas plant given uncertainty about carbon measures, rising gas costs, falling demand and competition from subsidised renewables.

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[1] Discussion Paper, page iv.

- The difference between the “true 20%” target and the 41 TWh target by 2020/21 is all new investment in windfarms, a total of 2,500 additional wind turbines – there is no “diversity”. The additional cost of this windfarm investment is approximately $12.7 billion. Given that more than 70% of windfarm project costs comprise the purchase of internationally manufactured wind turbines, Australia is spending an extra $8.9 billion on imported components. There is no wider benefit in encouraging technology improvement.

- Renewable proponents are eligible for significant public funding from other sources, including the Clean Energy Finance Corporation ($10 billion) and the range of grant programs administered by the Australian Renewable Energy Agency ($3.4 billion).

Macquarie Generation engaged Frontier Economics to review the impact of the RET 20% (Updated 20% target) and RET 26% (41 TWh target) on existing non-renewable generation businesses, which included a review and critique of the SKM modelling. The key points in the Frontier report include:

- The no RET scenario shows that the renewable scheme is likely to cause significant value loss to existing generators – in the order of $11.3 billion (“Updated 20% target”) to $17.3 billion (*status quo* 26%, Reference Case 1). The RET scheme alone is likely to cause an asset value reduction comparable to the loss caused by the entire carbon pricing scheme for coal-fired generators.

- For consumers, the burden of the RET in the Reference Case 1 (*status quo*) is $4.7 billion NPV (2013-2031) and in the Updated 20% target is $4.6 billion NPV – a relative difference of only $100 million. But this does not mean that the extra 6% or 15 TWh of new (windfarm) build is costless.

- The difference is that existing generators (mostly thermal but also hydro) bear almost the entire burden of the increase via lower wholesale prices in the modelling, ‘the merit order effect’ – some $6 billion in total.

- As a result existing generators bear 98% of the burden of the additional $6 billion cost of building the additional 15 TWh and consumers bear just 2%.

- However, SKM MMA results are highly dependent on the modelling assumptions, particularly in relation to how generators react. If generators retire/mothball units or bid more aggressively than the modelling assumes then the merit order effect will be less, wholesale prices will be higher and consumers will bear a greater share of the RET costs.

- Given that the collective losses to thermal generators are in the order of $11.3 to $17.3 billion NPV as a result of the RET, it would be surprising if generators did not revise their strategies. It would seem likely that the retirement of 1,600-2,000 MW of plant (around the size of a large thermal generator) or more aggressive bidding could largely reverse the merit order effect of renewable crowding out. The SKM modelling does not consider this scenario.

Macquarie Generation asks the question – would the Authority revisit its position if customers were to wear the full $6.1 billion burden of building the additional 15 TWh of renewable generation to meet the 26% target?

Macquarie Generation has suffered a severe reduction in business value as a consequence of the introduction of the carbon pricing mechanism – a $1 billion write down in asset value in December 2011. Unlike almost all other parts of the economy, the Federal Government failed to recognise this loss when designing compensation and transitional arrangements for the Clean Energy Future package. New South Wales taxpayers will bear this burden. If it is not modified, the RET scheme has the potential to erode our remaining business value substantially.

Macquarie Generation recognises calls for policy certainty from the beneficiaries of Government subsidy programs like the RET, but not if market fundamentals change as dramatically and unexpectedly as they have. We are not proposing the abolition of the RET scheme, rather a change to the LRET target so that it achieves 20% renewables by 2020. We believe that the benefits of a well-functioning National Electricity Market outweigh any second order concerns with investment perceptions for renewable proponents, especially when the claimed costs have not been quantified.

Macquarie Generation recommends that that the RET legislation should not include "hardwired" annual targets. LRET targets should be set in a legislative instrument which could be adjusted to ensure that the total 20% of renewables by 2020 objective is achieved. The Authority would provide advice to the Government on any necessary recalibration of these targets every two years after consulting with industry, AEMO and the WA IMO.

Macquarie Generation does not support the proposal to delay the Authority's next review of the RET until 2016. We note that the modelling indicates that the resource cost of a 20% target based on the "low demand" scenario is some $12.5 billion lower that than the *status quo* RET. Macquarie Generation is of the view that the AEMO 2012 National Electricity Forecast Report is a substantial improvement on past efforts, but still overly conservative on likely demand growth rates, particularly in the outer years. The recent falls in electricity demand may be exacerbated by further reductions in manufacturing output including possible aluminium smelter closures. A Review in 2014 would be able to take into account any policy changes from the Federal Election in 2013, outcomes from the COAG review of complementary measures and international developments with global climate change negotiations.

Macquarie Generation provides the attached submission and a briefing note from Frontier Economics detailing the reasons why we believe the Authority should recommend a moderation of the LRET scheme in line with a 26 TWh target by 2020.

Yours faithfully

RUSSELL SKELTON
CHIEF EXECUTIVE
AND MANAGING DIRECTOR

15 November 2012

RENEWABLE ENERGY TARGET REVIEW, DISCUSSION PAPER, 2012

Macquarie Generation has prepared the following submission to put forward the case for moderating the existing large scale RET scheme targets from the existing 41 TWh target to a target more in line with a "true 20%" by 2020. The Authority has estimated such a target at around 26 TWh by 2020. We believe that a moderation of the scheme parameters would reduce resource misallocation and more equitably share the scheme costs.

The Authority considered a reduction in the LRET target in the Discussion Paper and commissioned modelling of the likely impacts. The Authority made a judgement that it would not alter the existing LRET target based on the following assessment:

> *"It needs to be recognised that changes to policy can have considerable costs if the changes negatively influence the perception of regulatory risk. A strong and clear case needs to be made for any policy changes, including changes to the RET, with the benefits of such changes weighted against all likely costs, including the additional risk premium on investment and the impacts of lower innovation and lock-in of high emissions infrastructure due to perceived regulatory risk."*

Macquarie Generation is not aware of any analysis undertaken by the Authority to measure the extent of any "additional risk premium" relating to regulatory risk. While there are quotes from various submissions, there is no attempt to quantify the trade-offs between impact on existing renewable and non-renewable asset owners, the $4.4 billion resource cost and the incremental benefits of additional renewable generation.

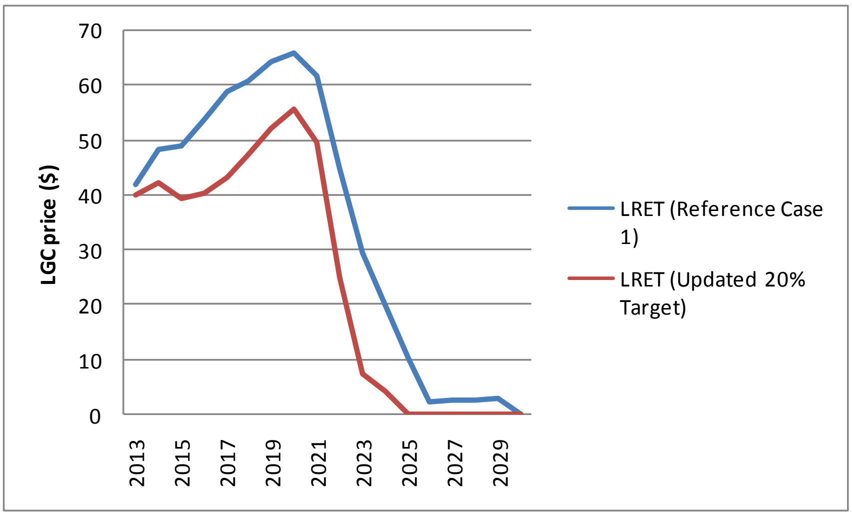
Macquarie Generation considers that the concern with the "perception of regulatory risk" is overstated and does not give due weight to the fact that a more moderate target will still deliver significant new renewable investment. At the same time, most existing renewable investments are unlikely to be materially affected.

Limited regulatory risk for existing renewable investors

Macquarie Generation questions the extent of any regulatory risk for those investors who have made existing investments in renewable projects in Australia.

The first point to note is that we are not proposing the abolition of the RET scheme. With a reduction in the target to a "true 20%", LRET certificate prices are lower but not markedly different – in the order of an average $10 per LGC over the next decade. Existing renewable investors with a market exposure to LGC prices, presumably the lowest cost projects that have been developed first, will continue to enjoy the benefit of a substantial RET subsidy. Once the current backlog of banked LRET certificates is cleared, the LGC price rises steadily over the course of the next decade (LGC prices rise in all modelled scenarios).

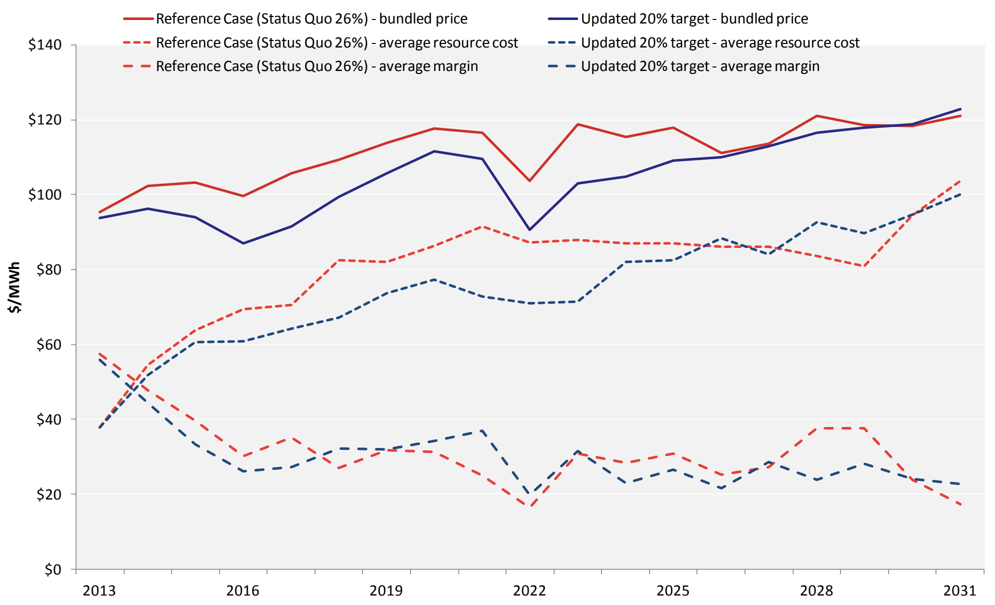
Figure x: LRET certificate price, status quo (Reference 1) and updated 20%



Analysis by Frontier Economics (attached, page 25) shows that in terms of cost and revenues to renewables in the scenarios, the bundled price (LGCs and wholesale price) is marginally lower in the Updated 20% target compared with the Reference Case (Figure 1). This reflects a lower LGC price for the lower target, though this is mostly offset by higher wholesale prices. However, the average resource cost associated with the lower target (Updated 20%) is also lower by a similar magnitude, which suggests average margins/returns are very similar either way. In NPV terms between 2013-2031, the comparison is:

- Bundled revenue (wholesale price plus LGC, for all LRET output): $31.9B in the Reference Case and $25B in the Updated 20% target, a reduction of $6.8B or 21% (mostly due to lower volumes). This is roughly estimated on the basis of wholesale prices plus LGCs multiplied by output from wind, geothermal and biothermal (not all renewable as hydro is assumed to be largely ineligible). This is generally less than the LRET target (row 85) due to the current surplus of LGCs;
- Resource cost (row 75): $23.1B in the Reference Case and $18B in the Updated 20% target, a reduction of $5.1B or 22%. This includes only new capital investments, not sunk capital costs of pre-existing LRET investments (though this would be the same in both cases).
- In other words, although revenues would be reduced by around 21% for a reduction in the target, costs would be reduced by the same proportion. Given that the difference between average and total revenue is similar to the difference in average and total costs between the scenarios, and that there is continued growth in investment and output (so it would affect future investment but not sunk investments), it is difficult to maintain that there would be significant investment uncertainty resulting from a change to the target from 2020-2030.

Figure 1: Bundled price (wholesale price and LGC), average cost and margin



Bundled price is LGC plus average wholesale price. Average resource cost is the LRET resource cost divided by output from renewables output from wind, geothermal and biothermal (rows 51, 52, 53). This is an approximation that assumes that hydro and solar PV are not included in the LRET resource cost. Average margin is the difference.

Source: Frontier Economics

Macquarie Generation considers that the following factors specific to renewable investments should also feature in any assessment of regulatory risk:

- The Mandatory Renewable Energy Target commenced operation in 2001 with a fixed target of 9,500 GWh by 2010, remaining at that level until 2020. The expanded RET scheme not only dramatically increased the target but extended the scheme's operation by a further decade to the end of 2030. In the period 1 January 2001 to 30 June 2012, large scale projects received approximately $2.2 billion through the sale of certificates. All renewable plant that qualified under the original RET 9,500 GWh scheme has been grandfathered into the enhanced RET 20% scheme.

- A majority of recent renewable investments are supported by long-term power purchase agreements, not as standalone, merchant investments. Under a power purchase agreement, the investor receives a fixed bundled price from the off-take buyer. These projects are not exposed to any financial risk provided they deliver the agreed volume of renewable energy.

- Macquarie Generation notes that a significant number of the windfarm projects commissioned in the last few years have been backed by PPAs to supply recently constructed desalination plant. There is some publicly available information on the scale and tenor of these PPAs.

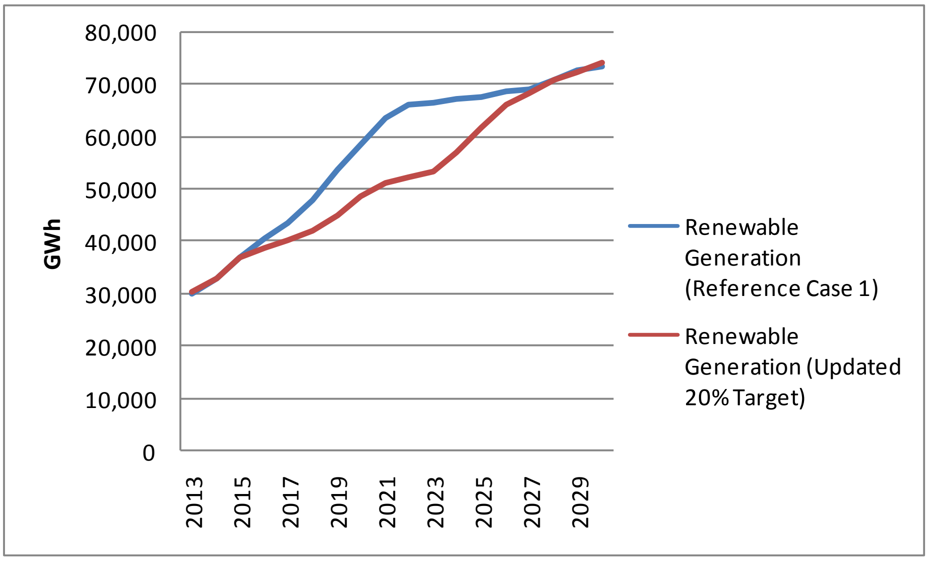
- Macquarie Generation collects data on new projects in the NEM. We estimate that at least 1,500 MW or 75% of all existing wind projects are backed by PPAs or developed by retailers with ongoing LRET liabilities. A list of these PPA projects is provided in attachment A.

- For those non-PPA projects, the Federal Government's carbon price mechanism has delivered a substantial uplift in wholesale prices for renewable plant.

Regulatory risk for new renewable project investors

A moderation of the LRET target does not mean a halt to new renewable investment. The SKM modelling shows the projected profile of new renewable generation over the period to 2030 (chart 1). The Updated 20% scenario shows the same level of total renewable investment as the *status quo* (Reference 1) scenario, driven by lower technology costs in the later years and a rising carbon price.

Chart 1: New renewable investment, status quo (Reference 1) and Updated 20%

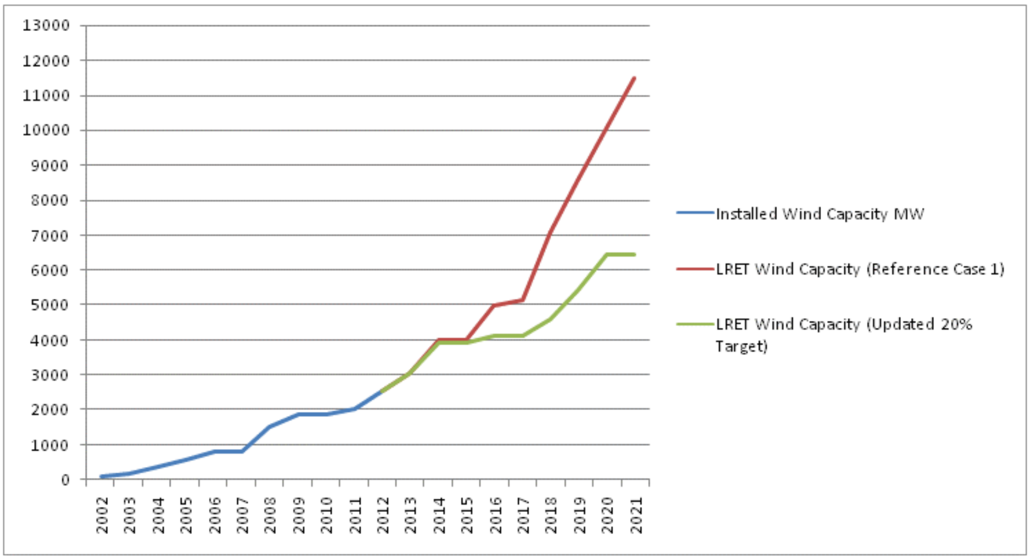


Given that the difference "Updated 20% target" and the Reference Case 1 (*status quo* 26%) is all windfarm investment, we have shown windfarm build rates in Chart 2. Achieving the 41 TWh target by 2020 would require a significant increase in the rate of windfarm commissioning over the next 8 years. This is likely to be difficult for a number of reasons:

- the projects with the best wind speeds and proximity to the grid will have already been commissioned;
- windfarm developers face significant planning and approval hurdles and there is growing opposition from some local community groups to new windfarm proposals;
- this also requires a much faster rate of negotiation of network connection agreements and construction of transmission extension assets.

The difference between the two scenarios is an additional 2,500 wind turbines by 2020.

Chart 2: Windfarm build rates, cumulative MW installed, status quo (Ref 1) and Update 20%



The SKM modelling report (Figure 72) shows the long run marginal cost curves for prospective renewable generation in 2012. The cost of additional renewable generation increases steadily as more expensive projects are undertaken. Macquarie Generation considers that the Authority's assessment of a change to "Updated 20% target" should separately measure the benefit of delaying some level of investment until technology costs improve or new technologies are developed. If the forecasts of renewable technology cost learning rates are accurate, the level of resource cost saving would be significant.

There is no new high-emissions infrastructure lock-in

The Discussion Paper makes a great deal out of the possible problem of "long-lived, high-carbon infrastructure lock-in" – a concern with new investment in emissions-intensive plant that becomes uneconomic at some point in the future due to carbon reduction measures.

The Paper recognises that projected slow growth in electricity demand means that "additional generation capacity will be limited". Macquarie Generation does not understand why the Authority did not take this analysis further. AEMO's Electricity Statement of Opportunity 2012 medium scenario shows no reserve deficit in any region during the current decade. Macquarie Generation is not aware of any investor seriously considering a large scale coal-fired or combined cycle gas project in the NEM. The likelihood of Government action to curtail emissions against a backdrop of falling demand is enough to stop financiers and banks from even contemplating such projects.

The SKM MMA modelling looks at new investment in all technology types. It shows there is virtually no difference in the level of thermal generation build between the current LRET target (Reference Case 1) and an "Updated 20% target". In Reference Case 1, Australia has 12,723 MW of open-cycle gas plant and 4,079 MW of combined-cycle gas plant by 2020. In the Updated 20% case by 2020, total open-cycle gas plant is 12,705 MW and combined cycle gas plant is 4,079 MW. There is no additional "carbon lock-in" under a "Updated 20% target".

Regulatory risk for investors in existing non-renewable assets is completely dismissed

The Climate Change Authority Act requires the Authority to consider a number of principles when conducting a review of the RET, including that *"any measure to respond to climate change should be equitable"*.

The Authority has placed an overriding emphasis on avoiding any perception of regulatory risk for investors in renewable energy projects. At the same time, the decision to recommend retaining the RET 41 TWh target knowing that electricity demand has fallen dramatically across Australia will expose all current investors in non-renewable generators to substantial asset value reductions.

Macquarie Generation considers that the Authority's assessment is incomplete and inadequate. We would have expected at least some commentary and discussion of the impact of its recommendations on all existing low cost non-renewable generation. The Authority makes no attempt at describing or quantifying the additional risk premiums that thermal generators will face on existing debt as borrowing periods expire in an environment of deteriorating wholesale prices.

Macquarie Generation engaged Frontier Economics to review the SKM modelling work, with a focus on the impact of the RET targets for existing generators. The following section summarises the key points made in the Frontier analysis (attached).

- The initial finding of the CCA was to leave the RET unchanged on the basis of "investment certainty". The irony is that although this provides certainty to renewables (15-25% of the market, depending on the basis of the measure), leaving the target unchanged provides significant uncertainty for existing thermal generators (75-85% of the market).

- Part of the confusion about who bears the burden of the RET arises from the difference between prices and costs, and the division of cost/transfers between renewables, consumers and existing generators. Based on the modelling conducted for the CCA (by SKM-MMA), the difference to consumers between the "Updated 20% target" and the "Reference Case" (*status quo*,~26%) is negligible. This is because the increased cost of more renewables is mostly offset by lower wholesale pool prices due to the "merit order effect". This means that thermal generators bear most of the burden as opposed to consumers. In NPV terms (2013-2031), consumers face a total RET burden of $4.7 billion in the Reference Case (status quo) versus a burden of $4.6 billion in the Updated 20% - a difference of just $100 million NPV over 19 years. But it would be incorrect to conclude that the additional 6% (15TWh) of renewables imposes no other burden. The difference is that existing generators (mostly thermal but also hydro) bear a burden well in excess of the resource costs of the scheme via lower wholesale prices in the modelling. This means that existing generators are unable to cover their capital costs and experience losses in value due to the merit order effect, which results in wholesale prices below long-run marginal cost.

- In the Reference Case (*status quo*), the existing generators bear a burden of $17.3 billion[2] between 2013-2031, out of the total RET burden of $20.3 billion[3]. This is 77% of the RET burden, which includes $15.6 billion for the LRET,[4] $4.5 billion for SRES, and administrative costs of $0.2 billion[5].

- In the Updated 20% scenario, existing generators bear a burden of $11.3B out of a total of RET burden of $14.2 billion[6]. This is 68% of the RET burden, which includes $9.5 billion for the LRET and $4.5 billion for SRES, and administrative costs of $0.2 billion.

- The relative difference between the Updated 20% target and the Reference Case (status quo - 26% target) is $6 billion of scheme cost faced by existing generators via lower prices. In other words, for the incremental effect of moving from 20% renewables to 26%, existing generators are bearing 98% of this cost and consumers just 2%. This highlights the extent of investment uncertainty being imposed on existing generators, despite the fact the investment certainty (for renewables) is the main argument put forward by the CCA.

Scenario where customers pay for the additional renewable build to achieve RET 26%

This division of burden between generators and consumers is based on the SKM MMA assumption that generators do not change their bidding behaviour from historical patterns, and do not retire any capacity. These assumptions should be tested given the significant changes to the market due to the carbon price, slow demand growth and rising RET capacity. The difference in value is caused by an effective difference in LRET target (between the two main scenarios: 20% and 26% targets) of around 15TWh, which is roughly the output of a large thermal generator.

On high level numbers, collective retirement or mothball of around 1600-2000MW thermal capacity could potentially avoid losses of around $6 billion to existing generators if it reduces the merit order effect. This is based on the assumption that closure of this amount of thermal capacity would lead to wholesale prices closer to the “Updated 20% target” rather than the lower wholesale prices in the Reference Case scenario. It would appear that this closure/mothballing is already taking place. If this is the case, this would mean that consumers would bear a much greater share of the incremental LRET burden.

It is worth noting that a number of generation businesses have made announcements in recent months to close plant or mothball units. This includes Tarong (700 MW), Munmorah (600 MW), Playford B (240 MW) and Yallourn (360 MW). The modelling accounts for Munmorah and Playford, but not the others.

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2 This is based on the product of average price (row 14) and output (row 43) in the SKM-MMA output spreadsheets, NPV at 7%, taking the difference between scenarios.

3 Although the RET burden is $20.3B, there also appears to be an increase in “other retail” costs of around $1.7B in the RET cases compared with the No RET in the SKM-MMA modelling –hence the generator burden plus the consumer burden exceeds the RET burden by this amount.

4 From row 86 in the SKM-MMA modelling output spreadsheets, NPV at 7%.

5 From row 92 in the SKM-MMA modelling output spreadsheets, NPV at 7%.

6 Although the RET burden is $14.2B, there also appears to be an increase in “other retail” costs of around $1.7B in the RET cases compared with the No RET in the SKM-MMA modelling – hence the generator burden plus the consumer burden exceeds the RET burden by this amount.

The interests of shareholders of existing businesses should be considered

The Federal Government's carbon pricing mechanism has had a significant impact on Macquarie Generation's business value. We did need not receive any compensation as part of the Clean Energy Future package. In the past year we have written down our book value by $1 billion as a result of the new carbon pricing arrangements. Given that we are NSW Government-owned business, NSW residents effectively wear this loss.

The RET scheme is an external scheme that subsidises a particular category of generation technologies. While it is a separate policy, the RET directly impacts on NEM investment and dispatch prices. Consequently, the Authority's recommendations will have a direct bearing on the level of value erosion we face if there is a mandated entry of new generation that exceeds demand growth in the NEM. A decision to retain the existing 41 TWh target is a decision that will lower our returns to the NSW Government and detrimentally affect all NSW taxpayers. We would have expected the Authority to at least provide some commentary on the effect of the RET scheme on existing non-renewable asset owners, instead of dismissing it entirely.

The additional renewable investment favours imported wind turbines

SKM modelling reported new renewable investment in different technologies over the next decade. Charts 3 and 4 show the profile of that investment in the Reference Case 1 (s*tatus quo*) and the Updated 20% target scenarios.

Chart 3: New large scale renewable investment, 41 TWh by 2020/21 (Reference case 1)

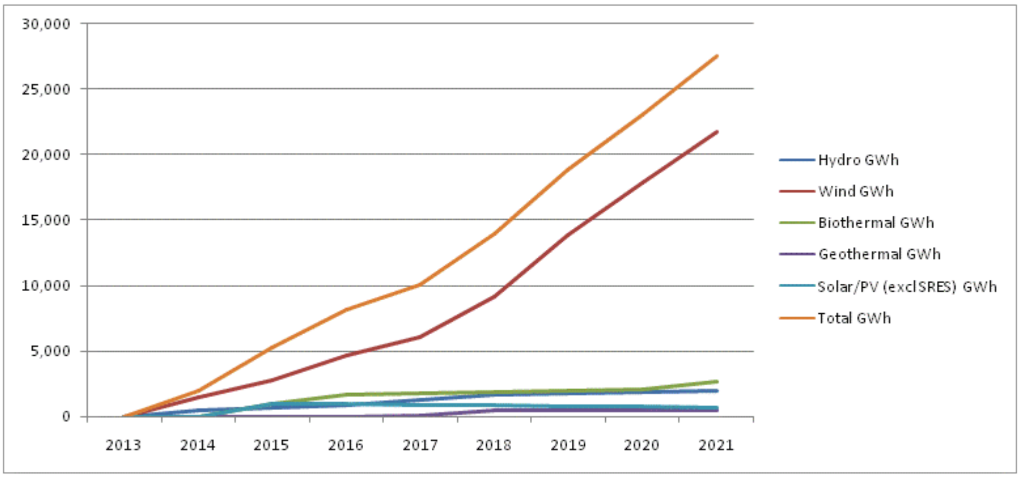
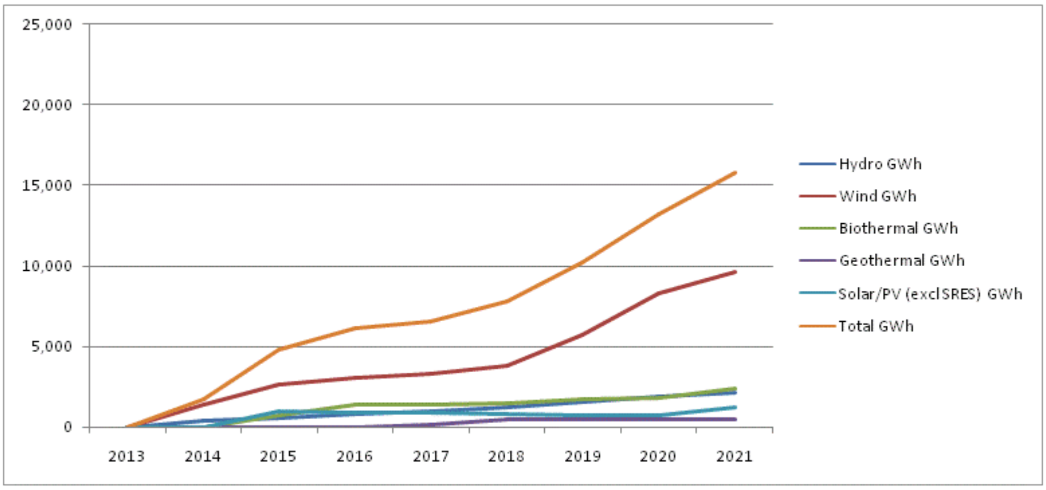


Chart 4: New large scale renewable investment, 26 TWh by 2020/21, (Updated 20%)

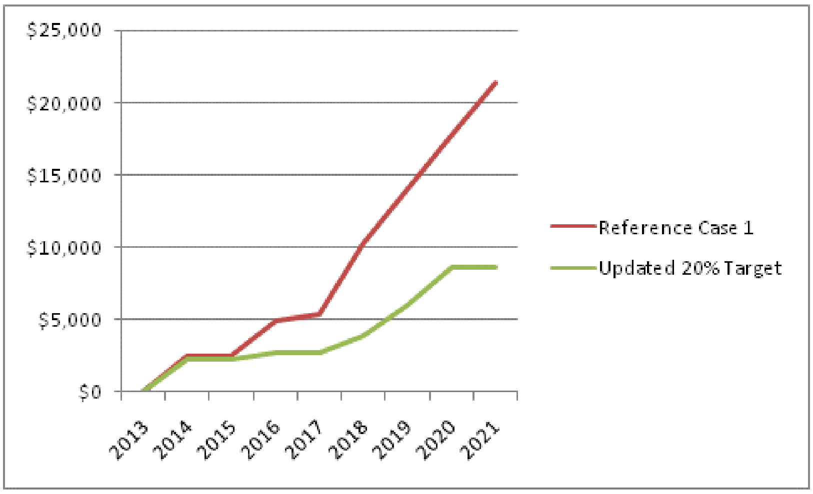


The SKM modelling results show that wind projects would deliver the majority of the new renewable investment. In the 41 TWh scenario, the SKM modelling spreadsheets report 21,773 GWh of new wind by 2020/21 out of a total of 27,576 GWh of total new large scale renewables – some 79% of all new investment. In the 26 TWh scenario, SKM reports 9,652 GWh of new wind in 2020/21 out of a total new renewable output of 15,772 GWh – some 61% of all new investment.

These figures show that there is an additional 11,804 GWh of new large scale renewable investment in *status quo* (Reference 1) scenario by 2020/21. The additional wind development in the *status quo* scenario is 12,121 GWh – some 103% of the increase. Wind is actually displacing some hydro and large scale solar in the *status quo* scenario relative to the Updated 20% scenario.

The Discussion Paper recognises that the wind industry relies on purchases of overseas manufactured wind turbines – 70% or more of all project costs. The Bureau of Resource and Energy Economics has estimated the capital cost of on-shore wind farms at AU$2.5 million per MW installed[7]. Using these figures, the difference in additional spending on wind projects between the Update 20% and Reference Case 26% is some $12.7 billion in 2020 (see Chart 5), of which at least $8.9 billion would be spent on importing wind turbines and possibly more on imported turbine towers.

Chart 5: Additional cost of wind project investment, status quo (Ref 1) and update 20%, $ million



[7] BREE, Australian Energy Technology Assessment, 2012, page 46.

Macquarie Generation agrees with the Authority that the additional investment in wind assets in Australia would not have an effect on the level of technical improvement by overseas wind manufacturers. Given that a stated rationale for the original MRET scheme was to *"contribute to the development of internationally competitive industries which could participate effectively in overseas markets"*, we question the value of a policy mechanism that is driving capital investment in a proven technology, with few if any spin-off benefits for local industry.

In terms of energy security, the Discussion Paper makes the point that renewable investment, given the zero fuel cost of such projects, reduces Australia's exposure to movements in international energy prices. We would make the point that relying on imported wind turbines increases the electricity sector's exposure to foreign exchange rate movements.

Efficiency of NEM operations

Unlike the NEM, the RET scheme is designed to deliver a policy objective based on a particular category of technologies and arbitrary choice of target. While the RET scheme is a market based mechanism, the market trades in certificates which are a function of market created entirely by legislation, unlike the NEM which trades a real commodity.

The RET scheme design has a major bearing on dispatch and investment signals in the NEM. We consider that the achievement of broader renewable energy outcomes should not come at the expense of efficient outcomes in primary electricity markets. Macquarie Generation is of the view that the costs of the RET extend beyond its direct and substantial compliance costs to a significant negative impact on the efficient functioning of the NEM.

Subsidies paid to wind generators create incentives for these generators to bid their output at low or negative prices, with corresponding effects on wholesale market price outcomes. This effect is particularly pronounced in NEM regions where the penetration of wind to date is highest, but affects all regions.

The increasing frequency of low and negative spot prices implies that generation from conventional sources, which accounts for 95 per cent of NEM generation and is crucial for meeting demand reliably, must operate below its marginal cost or even pay to be dispatched for increasing lengths of time.

While the RET scheme has brought about a significant increase in renewable energy generation, recent modelling undertaken on behalf of the Australian Energy Market Commission indicates that under both the LRET and SRES, renewable generation will often not displace the highest emitting plant in the NEM, but will instead displace low-emissions, gas-fired generation.

Artificially depressed spot prices reduce the revenues of existing generators and undermine investment incentives in the NEM with negative consequences for supply reliability. One of the key characteristics of generation from renewables, particularly from wind, is that it is intermittent and its output therefore unpredictable. Moreover, the evidence in the NEM to date is that wind generation contributes little to meeting peak demand[8]. An increasing share of wind in the generation mix will therefore require a similar increase in the amount of flexible stand-by capacity to compensate for the unpredictability of wind output.

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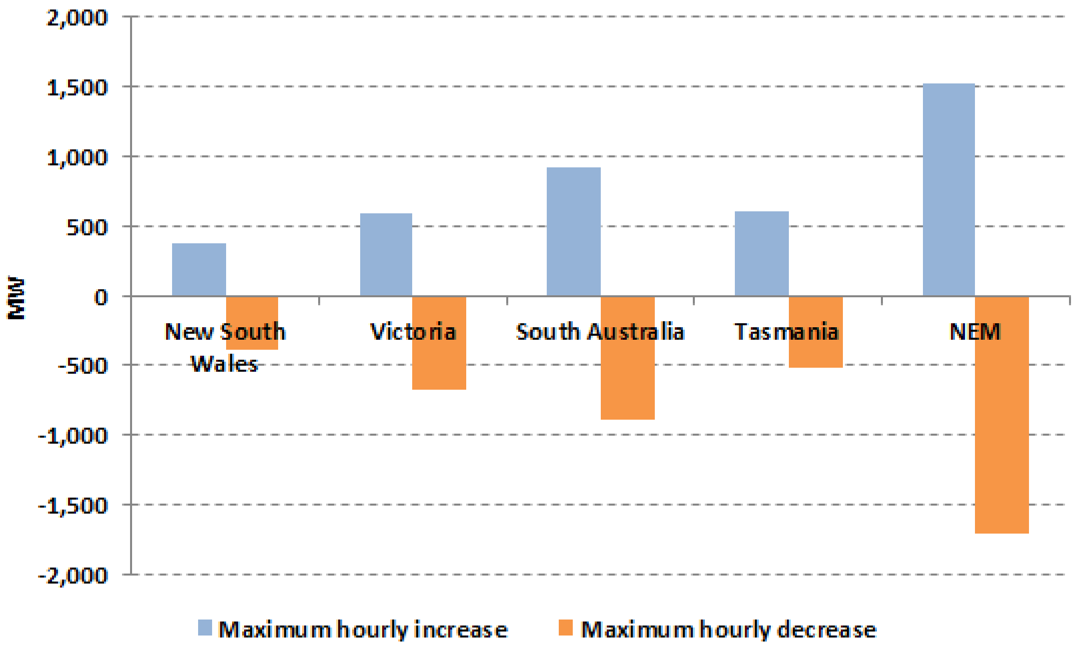
[8] AEMO, South Australian Wind Study Report, October 2012.

Going forward the variability of renewable generation and therefore the need for flexible conventional generation is projected to become more pronounced (Figure 2). However, while the output from flexible generation plant is vital to maintaining the stability and reliability of the system, there is a risk that these plant will not generally be able to operate for a sufficient number of hours to be viable.

The AEMC modelling highlights that the combination of depressed wholesale prices and limited running times for flexible plant due to the intermittency of wind generation reduces the profitability of conventional generation projects to the point where required investment will not occur. Irrespective of whether or not a carbon price is in place, unserved energy in excess of the reliability standard is therefore projected to become a problem from around 2015/16 onwards in the NEM[9].

Figure 2: Projected maximum hourly variability of wind, 2019–20 (MW)



Notes: By 2019-20, for instance, the maximum increase in wind generation output from one hour to the next in New South Wales is projected to be 375 MW, while the maximum decrease in output is projected to be 392 MW.
Source: AEMO, Wind Integration in Electricity Grids Work Package 5: Market Simulation Studies, January 2012. AEMO, Annual National Transmission Statement, 2011.

A high proportion of intermittent generation has a number of other implications for the secure operation of the power system. AEMO Annual National Transmission Statement(2011 identified a number of technical issues that will need to be resolved to accommodate an increasing share of wind. They include dealing with significantly varying fault levels, low power system inertia and reduced power system stabilisation, and will require a review of a number of technical aspects of NEM operations.

Avoiding regulatory failure

Imposing an artificial market on a well functioning NEM is always fraught with risk and the potential for unforeseen problems. In 2010 the Government was forced to separate the RET scheme into the SRES and LRET after problems emerged. This was little more than a year after the “enhanced” 20% target was set.

[9] AEMC, *Impact of the Enhance Renewable Target on Energy Markets, Final Report*, November 2011.

Macquarie Generation acknowledges the importance of policy certainty for all pre-existing investments. We are not proposing that the RET scheme be abolished or early phase out. We believe that in the interests of market stability and investment certainty in NEM, the Government should reducing the LRET target in line with the widely accepted policy intent of achieving 20% renewables by 2020, not a final mandated level in the range of 26% to 30% (low demand scenario).

The LRET scheme faces the real prospect that not enough wind projects would be built to achieve the current legislated targets. This is particularly the case if energy growth continues to follow recent trends and wholesale prices remain low. In such a scenario, retailers would pay the RET penalty to the Clean Energy Regulator, customers would be charged for non-existent renewable generation, and the scheme would be subject to further and probably more fundamental change. Macquarie Generation is of the view that it is better to make adjustments to the scheme now, well in advance of major new investment decisions, rather than redesign the scheme when obvious problems emerge.

Discussion paper – comments on specific recommendations

Lowering the SRES scheme threshold for solar photovoltaic (Draft Recommendation R.6)

Macquarie Generation supports the recommendation to reduce the threshold for small scale solar PV from 100 kW to 10 kW.

Falling costs for solar PV and rising retail electricity prices are likely to drive large scale up-take by commercial building owners. This change will reduce the risk the repeating another cost blow out under the SRES scheme.

Cost containment mechanisms (Draft Recommendations R.8 and R.9)

Macquarie Generation agrees with the recommendation (DR 8) to allow the Minister to set a multiplier below one SRES certificates.

Industry and independent analysts project that solar PV could become commercial viable without subsidy. The Discussion Paper notes that solar PV system costs fell 22% in the last year. Enabling the Minister to act promptly to reduce assistance by lowering or eliminating the multiplier is supported.

Macquarie Generation is of the view that there should be a single criterion for deciding whether to discount SRES certificates – whether the average payback period of a small-scale system has fallen below 10 years. It would be difficult to quantify net system costs if there were side deals between suppliers and purchasers to avoid triggering the net system cost criterion. Rising retail electricity prices, driven by networks and the carbon tax, mean that SRES costs may continue to rise in absolute terms without triggering this criterion.

Opt-in liability arrangements (Draft Recommendation R.12)

Macquarie Generation supports the recommendation to allow large electricity customers to opt-in to assume direct liability. We agree with the Authority that electricity retailers may not purchase least cost compliance if they are able to pass through costs directly.

Amendments to the EITE partial exemption framework (Draft Recommendation R.18)

Macquarie Generation supports this recommendation to PECs tradeable. We agree that enabling PECs to be tradeable with a wider market of buyers increases market efficiency.

Waste coal mine gas under the LRET (Draft Recommendation R.22)

Macquarie Generation strongly opposes the current arrangement which expands the LRET if the 850 GWh of allowance for coal gas projects is not met. Waste coal mine gas is not renewable energy and has increased the cost of the RET. The provision that allows unutilised waste coal mine gas allowance to be added to the LRET target should be terminated.

Wood waste from native forests under the LRET (Draft Recommendation R.24)

Macquarie Generation supports the inclusion of wood waste in the RET scheme. We see this as a low cost form of renewable energy should a process be established to show that it would be "ecologically sustainable". Macquarie Generation has experience in co-firing with wood waste and considers that the potential for this form of renewable energy is greater the Discussion Paper indicates, without environmental detriment. A decision to postpone a further review of the RET until 2016, would risk locking out a low cost energy source.

Displacement technologies (Draft Recommendation R.27)

Macquarie Generation does not consider that solar hot water systems should be able to create SRES certificates as the RET scheme was designed to assist grid based renewable generation not displacement technologies. Given the uncapped nature of the SRES, as a cost containment measure a phase out of solar hot water and heat pumps should be implemented.

Attachment A
Wind Generation PPAs in NEM

Windfarm	Retailer	Commission Date	Capacity	Offtake
Waubra/Learmonth	Origin	Oct-09	192.0	
Capital Wind Farm	Sydney Desal	Nov-09	140.7	20Yrs
Hallett (#4) North Brown Hill	Origin	May-11	132.0	
Clare Valley Waterloo	Energy Australia	Oct-10	111.0	10Yrs
Hallett #1 Jamestown	AGL	Jun-08	94.5	
Wattle Point	AGL	Jun-05	91.0	Long-term
Lake Bonney - Stage 1	Origin	Feb-05	80.5	
Woolnorth Stage 3 Studland Bay	Aurora	May-07	75.0	14Yrs
Hallet Hill (#2)	AGL	Mar-10	71.0	
Cathedral Rocks	Energy Australia	Jan-07	66.0	10Yrs
Oaklands Hill	AGL	Aug-11	63.0	
Woolnorth Stage 2 Bluff Point	Energy Australia	May-04	54.0	
Challicum Hills	Origin	Jul-03	52.5	15yrs
Hallett (#5)	AGL	Sep-11	52.0	
Canunda -Lake Bonney	AGL	Nov-04	48.0	10Yrs
Gunning	Origin	May-11	46.5	2Yrs
Starfish Hill	AGL	May-03	34.5	
Portland (Yambuk)	Origin	Mar-07	30.0	
Cullerin (west of Goulburn)	Origin	Jul-09	30.0	
Toora	Origin	Aug-02	21.0	
Codrington	Origin	Jul-01	18.2	
Windy Hill	Origin	Sep-00	12.0	
Blayney	Origin	Oct-00	9.9	
Crookwell	Origin	Aug-98	4.8	
Hampton	Origin	Sep-01	1.3	
Total Offtake			**1,531.4**	

Commentary on the RET review and modelling

Overview

The Climate Change Authority (CCA) recently released a discussion paper reviewing the Renewable Energy Target (RET)[1]. This included modelling results for different RET scenarios. A significant issue for the CCA review has been whether to leave the LRET target unchanged at 41TWh from 2020-2030 given slower expected growth in energy demand. When the initial target was set, the TWh target was based on projected demand of around 300TWh by 2020. The combined LRET and SRES target of 45 TWh reflected 15% of 300TWh. When added to output from pre-existing hydro (~15TWh) this resulted in a renewable target of 20%. Recent energy demand projections are now substantially lower by 2020 (NEM and SWIS) due to a combination of rising electricity prices and successful measures to improve energy efficiency. With the LRET and SRES unchanged at current levels, this implies a total renewables share would be closer to around 26% (new and pre-existing renewables). Some thermal generators have argued for a reduction in the target to reflect a "true" 20% by 2020 (an LRET of 26TWh from 2020-30); renewable generators have argued for an unchanged target (status quo) to ensure investment certainty. The draft recommendation of the CCA was to leave the RET unchanged on the basis of maintaining "investment certainty" for renewables. The irony is that although this provides certainty to renewables (15-25% of the market, depending on the basis of the measure), leaving the target unchanged provides significant uncertainty for existing thermal generators (75-85% of the market).

Part of the confusion about who bears the burden of the RET arises from the difference between prices, costs, and the division of the burden/transfers between renewables, consumers and existing generators. Based on the modelling conducted for the CCA (by SKM-MMA), the difference to **consumers** between the "Updated 20% target" and the "Reference Case" (Status Quo,~26%) is relatively small. This is because the increased cost of more renewables is mostly offset by lower wholesale pool prices due to the "merit order effect" in the modelling[2]. This means that thermal generators are effectively required not only to bear most of the burden of the RET, but also to subsidise renewable generators and consumers. In NPV terms (2013-2031), consumers face a total

1 Available here http://climatechangeauthority.gov.au/ret

2 This refers to crowding out of existing generation, where growth in capacity exceeds demand growth, leading to surplus capacity and prices below long-run costs.

RET burden of $4.7B in the Reference Case (Status Quo - unchanged target) versus a burden of $4.6B in the Updated 20% - a difference of just $100m NPV over 19 years. But it would be incorrect to conclude that the additional 6% (15TWh) of renewables imposes no other burden. The difference is that existing generators (mostly thermal but also hydro) bear a burden well in excess of the resource costs of the scheme via lower wholesale prices in the modelling. The modelling does not include any capital costs from existing investments (which are sunk), so although this burden does not represent a “resource cost” (at least in the short term), the result is stranded investments. This means that existing generators are unable to cover their capital costs and experience losses in value due to the merit order effect, which results in wholesale prices below long-run marginal cost:

- In the Reference Case (Status Quo), the existing generators bear a burden of **$17.3B**[3] between 2013-2031, out of the total RET burden of $20.3B[4]. This is 77% of the RET burden, which includes $15.6B for the LRET,[5] $4.5B for SRES, and administrative costs of $0.2B[6].
- In the Updated 20% scenario, existing generators bear a burden of **$11.3B** out of a total of RET burden of $14.2B[7]. This is 68% of the RET burden, which includes $9.5B for the LRET and $4.5B for SRES, and administrative costs of $0.2B.
- The *relative* difference between the Updated 20% target and the Reference Case (Status Quo - 26% target) is $6B of scheme costs which are borne by existing generators via lower prices. In other words, for the incremental effect of moving from 20% renewables to 26% (or not adjusting the target), existing generators are bearing 98% of this burden and consumers just 2%.[8] This highlights the extent of investment uncertainty being inflicted on existing generators, despite the fact the investment certainty (for renewables) is the main argument put forward by the CCA

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3 This is based on the product of average price (row 14) and output (row 43) in the SKM-MMA output spreadsheets, NPV at 7%, taking the difference between scenarios.

4 Although the RET burden is $20.3B, there also appears to be an increase in “other retail” costs of around $1.7B in the RET cases compared with the No RET in the SKM-MMA modelling –hence the generator burden plus the consumer burden exceeds the RET burden by this amount.

5 From row 86 in the SKM-MMA modelling output spreadsheets, NPV at 7%.

6 From row 92 in the SKM-MMA modelling output spreadsheets, NPV at 7%.

7 Although the RET burden is $14.2B, there also appears to be an increase in “other retail” costs of around $1.7B in the RET cases compared with the No RET in the SKM-MMA modelling – hence the generator burden plus the consumer burden exceeds the RET burden by this amount.

8 98% being $6bn divided by a total scheme cost of $6.1bn ($6bn cost to existing generators due to lower wholesale price plus $0.1bn net cost to consumers due to higher retail price).

However, this result is highly dependent on the modelling assumptions, particularly in relation to how existing generators react. The main factor that determines who bears the cost of renewables (consumers or existing generators) is the size and longevity of the "merit order effect". This is influenced by:

- whether existing generators continue to operate as they have historically, even in the face of ongoing losses. If generators retire/mothball units and bid more aggressively (ie engage in more economic withholding) than the modelling assumes, then the merit order effect will be less, wholesale prices will be higher and consumers will bear a greater share of the RET burden; and
- the incremental *growth* in the renewable target relative to *growth* in total energy demand. If the former exceeds the later then there will be a strong "merit order effect" – wholesale prices will generally fall and thermal generators will generally bear the bulk of the burden (in the absence of behaviour changes outlined above). If the converse is true, consumers will bear a greater share of the renewable burden (there will be a negligible merit order effect and wholesale prices will not fall). Given the low energy growth projections between now and 2020, any renewable target above ~20% is "surplus" generation and likely leads to merit order effects/lower prices in the absence of a generator response.

The conflict is that leaving the RET unchanged greatly increases the losses and investment uncertainty to existing (predominantly thermal) plant relative to updating the target. Whether this is a desirable outcome is debateable. The risk is that maintaining the current target increasingly undermines the functioning of the wholesale energy market, as renewables typically sign longer-term bundled PPAs which reflect a pre-agreed price for renewable energy. The bundled price implicitly reflects the wholesale energy price and the LGC price, though they are largely indifferent as to the share of each (if the wholesale price drops the LGC price increases). Most existing renewable investments will have signed long-term PPAs and so would only be affected by changes to the RET at the margins.

The SKM-MMA modelling report on the RET considers different scenarios, including:

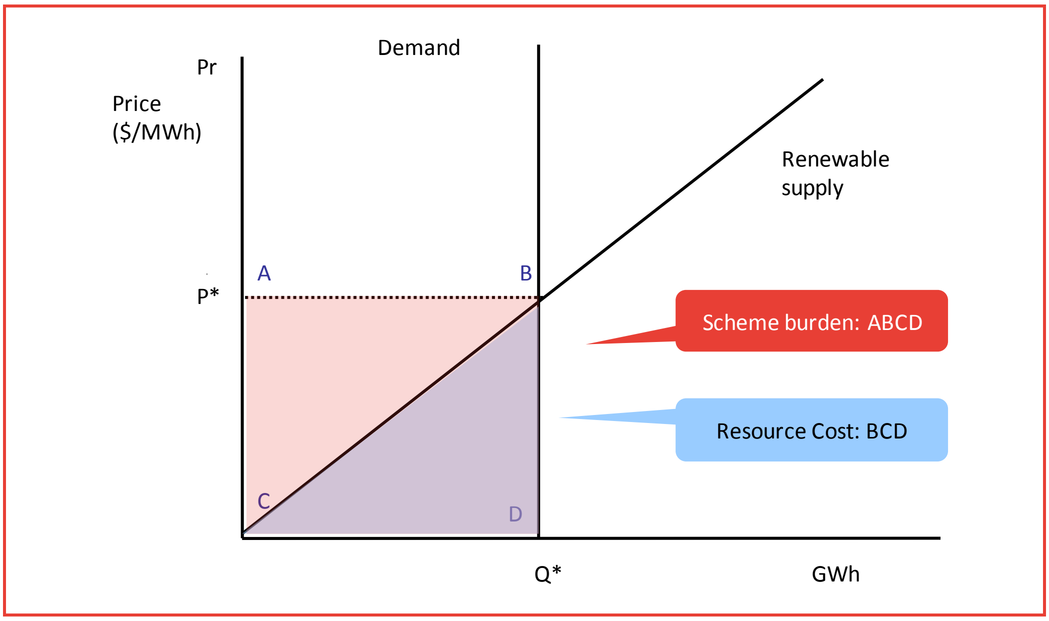
- Reference Case 1: this is essentially the status quo of a 41TWh LRET target by 2020-2030, which is effectively closer to 26% total renewables given slower demand growth
- No RET: the LRET is effectively removed (or reduced to 0TWh target)
- Updated 20% target: the LRET is reduced to 26TWh from 2020-2030, which is closer to a true 20% renewables given slower demand growth

Other scenarios are modelled but we focus on these in this analysis.

LRET

SKM-MMA report the **resource cost**, the cost to consumers (in $B NPV) and the impact on wholesale prices/certificate prices in terms of $/MWh/certificate of the various RET scenarios modelled. But resource costs do not reflect the total scheme burden of the LRET to consumers and generators: certificate prices are set by the marginal cost, not the average. This means that some renewable generators will earn a "producer surplus" which is not counted in the calculation of resource costs. This is the same as the thermal market, where the price (paid by consumers) is set by the marginal generator rather than the average[9]. The difference is illustrated in Figure 1. The blue area is the resource cost and the total square (ABCD) area is the scheme burden – the red area difference (ABC) is the 'producer surplus' or excess returns to renewable suppliers.

Figure 1: Stylised example of resource cost versus scheme burden



Source: Frontier Economics

Reference Case (Status Quo)

The resource cost of the LRET in the Reference Case (Status Quo 26%) is $7.8B NPV[10], though the total scheme burden is $20.3B ($15.6B for the LRET, $4.5B

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9 In the thermal market this is not all producer surplus, as generators will also require a return on capital. The SKM-MMA modelling doesn't include the sunk capital costs (and required returns) on existing generators, so it is not possible to differentiate between capital costs and "surplus" or excess returns. However it is likely that if "excess" returns were possible then this would attract new investment.

10 Resource cost is calculated as the difference between total resource costs in the different scenarios, which is the NPV of row 77. This does not include sunk capital costs of existing thermal investments as a resource cost, so stranding of assets is not included as a cost.

for the SRES[11]). Due to the merit order effect in the modelling (resulting in lower wholesale pool prices) consumers only face $4.7B of this burden in the form of higher retail prices[12]. Existing generation (mostly thermal but also hydro) bears the bulk of this burden ($17.3B) in the form of lower wholesale prices[13]. Though not a "resource cost", this is a transfer from existing generators to new renewables, and leads to under-recovery of capital cost. But this is also heavily dependent on the assumption that existing generation does not change bidding behaviour at all, or retire or mothball units. If existing generators retire units or reduce contracting or bid more aggressively, then the merit order effect will be much less. This will raise wholesale prices and shift the LRET burden from existing generators to consumers. This is already evident with mothballing or closures of units at Tarong (700MW), Munmorah (600MW), Playford B (240MW), Yallourn (360MW), and Northern entering a summer-only operating profile.. The modelling accounts for Munmorah and Playford but does not appear to account for other mothballing/closures; it is unclear whether the closure decision for existing generators suggested in the report considers capital or fixed maintenance costs or just fuel/variable costs. If this were to be accounted for it is likely that wholesale prices would be higher, the "merit order effect" reduced, and consumers would bear a greater share of the LRET burden. The argument is one of distribution: the total scheme cost is unchanged, but who bears the burden (consumers or existing generators) is determined by the strength and longevity of the "merit order effect".

Updated 20% target

The resource cost of the LRET in the Updated 20% target is $3.4B NPV, though the cost of implementing the scheme is $14.1B NPV ($9.5B for the LRET and $4.5B for the SRES[14]). Due to the merit order effect in the modelling (resulting in lower wholesale pool prices) consumers only face $4.6B of this burden in the

11 Scheme cost is calculated from Row 86 (LRET) and Row 92 (SRES) in the SKM-MMA output spreadsheets. This differs from the resource cost as (a) the capital cost of existing LRET investments are not included and (b) the marginal generator sets the LGC price, which will result in excess returns for cheaper renewable options.

12 This is reported by SKM-MMA, but also calculated as the total consumer spend, which is the product of retail prices (row 28) and demand/generation (row 43), NPV at 7%. In the No RET case this is $665.2B, and in the Reference Case 1 this is $669.9B. Typically generation would exceed demand due to transmission and distribution losses etc, but the calculation reconciles with the SKM-MMA reported figure.

13 This is calculated as the total reduction in wholesale spend, which is the product of wholesale prices (row 14) and generation (row 43), NPV at 7%. %. In the No RET case this is $204.8B, and in the Reference Case 1 this is $187.5B. The consumer cost ($4.7B) plus the generator cost ($17.3B) equals $22B. Although this exceeds the 'scheme cost' of $20.3B, the difference ($1.7B) is explained by an increase in "other retail" costs in the RET scenario.

14 Scheme cost is calculated from Row 86 (LRET) and Row 92 (SRES) in the SKM-MMA output spreadsheets. This includes a producer surplus to renewables investors

form of higher retail prices. Existing generation (mostly thermal but also hydro) bear the bulk of this burden ($11.3B) in the form of lower wholesale prices[15].

The incremental differences between the Updated 20% target and the Reference case (Status Quo) under the SKM-MMA modelling are:

- the resource cost is $4.3B higher under the higher LRET target (Reference Case versus the Updated 20% target). However, the increase in scheme cost (Reference Case versus an Updated 20% target) is $6.1B as the marginal generator sets the LGC price, not the average
- consumers face a higher cost of just $100m, as the higher RET cost is offset by lower wholesale pool prices (merit order effect).
- existing generators face a loss in value of $6B due to lower wholesale pool prices.

This division of burden between generators and consumers is based on the SKM-MMA assumption that generators do not change their bidding behaviour from historical patterns, and do not retire any capacity. These assumptions should be tested given the significant changes to the market due to the carbon price, slow demand growth and rising RET capacity. The difference in value is caused by an effective difference in LRET target (between the two main scenarios: 20% and 26% targets) of around 15TWh, which is roughly the output of a large thermal generator. On high level numbers, collective retirement or mothball of around 1600-2000MW thermal capacity could potentially avoid losses of around $6B to existing generators if it reduces the merit order effect. This is based on the assumption that closure of this amount of thermal capacity would lead to wholesale prices closer to the Updated 20% target rather than the lower wholesale prices in the Reference Case scenario. It would appear that this closure/mothballing is already taking place. If this is the case, this would mean that consumers would bear a much greater share of the incremental LRET burden.

SRES

The SRES output and resource cost is included in the No RET scenario modelled by SKM-MMA and is the same across all other scenarios: $22B[16] NPV. This means that there is no incremental resource cost attributed to the SRES in the modelling (resource costs are unchanged across all scenarios). However, the

15 This is calculated as the total reduction in wholesale spend, which is the product of wholesale prices (row 14) and generation (row 43), NPV at 7%. In the No RET case this is $204.8B, and in the Updated 20% target this is $193.5B. The consumer cost ($4.6B) plus the generator cost ($11.3B) equals $15.8B. Although this exceeds the 'scheme cost' of $14.1B, the difference ($1.7B) is explained by an increase in "other retail" costs in the RET scenario.

16 Row 76 in the SKM-MMA output spreadsheets.

SKM-MMA modelling also reports a "scheme cost" (row 92), which is separate to the resource cost (row 76). This scheme cost would reflect the value of certificates/subsidies provided under the scheme. In the No RET scenario the SRES **scheme** cost is zero - there is presumably no scheme assistance, even though there is the same level of SRES output and resource costs as in the other scenarios. In the RET scenarios, the scheme cost is $4.5B NPV. It is not clear why this is the case unless the modelling predicts that the same volume of small scale renewable will be deployed with or without the SRES scheme support (the removal of support does not seem to change the SRES output or resource costs). This implies that the $4.5B SRES cost is unnecessary and avoidable as small scale renewables are competitive in their own right. Otherwise, there should presumably be a difference in SRES resource costs that should be accounted for.

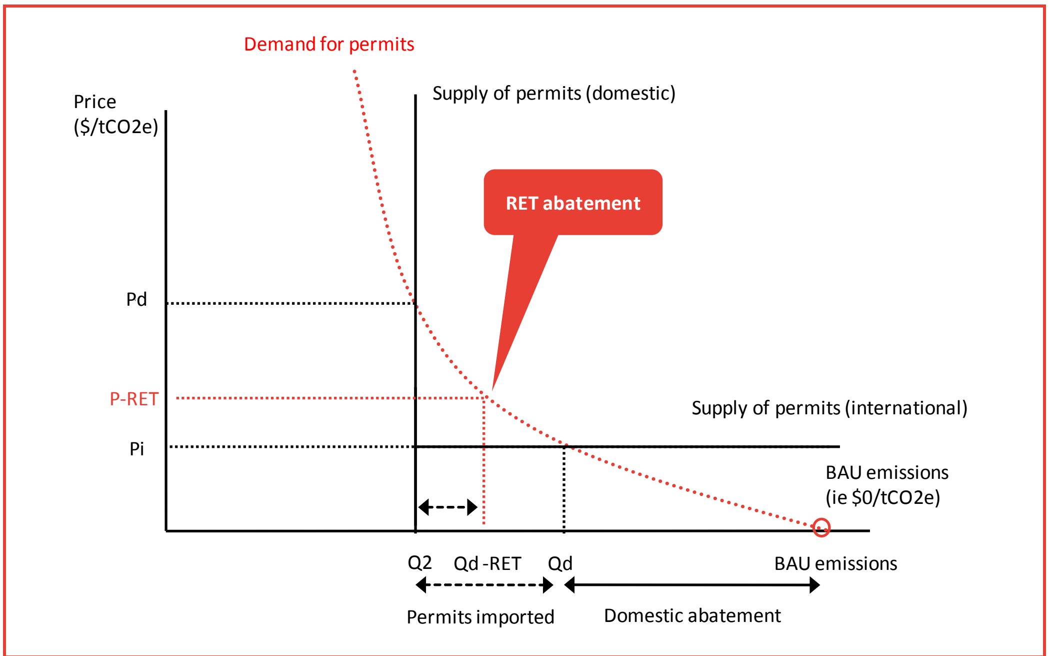
Abatement and abatement cost estimates

The abatement cost estimates in the SKM-MMA report should be treated with caution. The methodology used is to compare the change in total emissions against the change in aggregate resource cost in each scenario. This reflects the incremental cost of additional domestic abatement under the LRET. This is not directly comparable to the cost of abatement in the context of carbon pricing for two reasons:

- Firstly, this reflects the **average** cost, not the **marginal** cost. The carbon price will reflect the marginal cost, which will be higher than the average. When factoring in abatement costs, most policy assessments will consider the marginal cost (this will reflect the carbon tax);
- Secondly, this may increase *domestic* abatement but given that Australia has an emissions cap (fixed target) strictly speaking it would reduce the need for permit imports, which would reduce global abatement by the same amount. The net effect is that global emissions would be unchanged, though domestic emissions fall and international emissions rise; the LRET reflects the premium placed on domestic emissions from renewables.

What is being estimated in the SKM-MMA report is the *average* incremental cost of increasing domestic abatement. This is not the cost of abatement. The example is illustrated in Figure 2: emissions are reflected on the horizontal axis and cost per tonne on the vertical axis. The red dashed curve reflects demand for permits (which is also the cost of reducing emissions) – to reduce emissions from Business as Usual (BAU) requires moving up the curve, which means increasingly costly abatement. For a carbon price of Pi (with permit imports) emissions would fall to Qd, and Australia would import the remainder from overseas (Qd-Q2). This is because domestic abatement is more costly – the red line is above the international permit price. This is where renewables under the LRET lie, as the carbon price alone won't deliver it (on current estimates). The addition of the RET results in more costly abatement and lower domestic emissions (Qd-RET), but this also means lower permit imports to meet the overall emissions cap (Q2). The net effect on global emissions is essentially unchanged. The actual cost of abatement is P-RET, but the premium for this domestic abatement (as opposed to international abatement) is P-RET less the international carbon price (PI); this is the incremental cost over and above the carbon price. So a higher carbon price (Pi) would mean that the premium for domestic abatement under the RET is lower. But the actual cost of abatement is unchanged and higher than the carbon price if the LGC price is greater than zero (if the LGC price is positive, the cost of abatement from renewables must be greater than the carbon price).

Figure 2: Stylised example of RET abatement cost and ETS permit imports



Source: Frontier Economics

Costs and transfers associated with the LRET

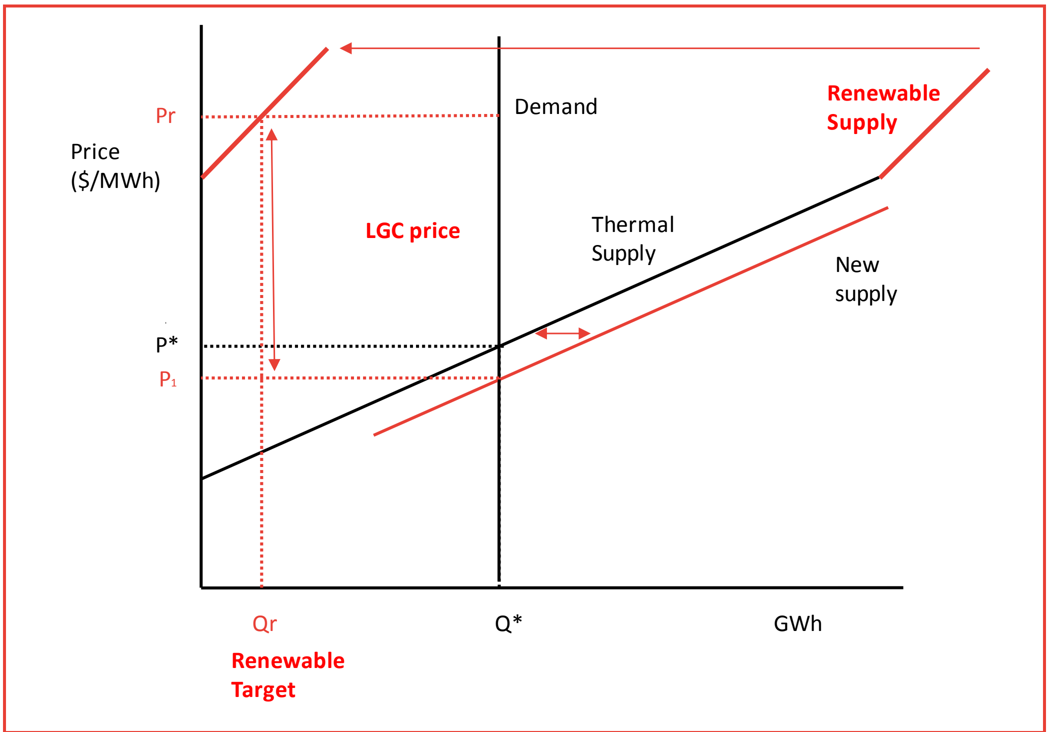
LGC prices and wholesale prices

This section explains the costs and transfers of the RET in more detail. An illustrative example of the LRET and interaction with the electricity market is shown in Figure 3. The horizontal axis shows energy (GWh) and the vertical axis shows cost/price ($/MWh). In this simple example, thermal supply is upward sloped (more supply is more costly), demand is inelastic (vertical), and renewables are more expensive than thermal. If this were not the case, renewable support such as the LRET would not be required. Equilibrium without the LRET is P*,Q*. When a renewable target of Qr is imposed, this shifts the residual supply curve (of thermal and existing hydro) to the right by the same amount. For an upward sloped supply curve, this means a fall in the wholesale pool price to P1. This is called the merit order effect. This merit order effect may only be short-term, as thermal supply in the longer-run should be more elastic (horizontal), hence additional renewables would generally delay new investment so long as demand was still growing.

This reduction in wholesale price is a **transfer** as opposed to a reduction in **costs**, as existing thermal generation receives a lower wholesale pool price; overall generation costs have increased because the cost of rewenables is Pr, which is greater than the cost of thermal generation displaced.

The renewable subsidy/LGC price should be approximately (Pr-P1), and the total subsidy to renewables is worth (Pr-P1) x Qr. The retail levy per MWh to fund this is (Pr-P1) x Qr / Q*. If there is a larger merit order effect, then the net increase in retail prices will be smaller. This means that thermal generators will bear a large share of the burden of the LRET and consumers will bear a smaller share. It does not reduce the cost of meeting the LRET however. If the merit order effect is very small then consumers will bear most of the LRET burden, as wholesale prices won't fall but retail prices will rise by the full cost of meeting the LRET.

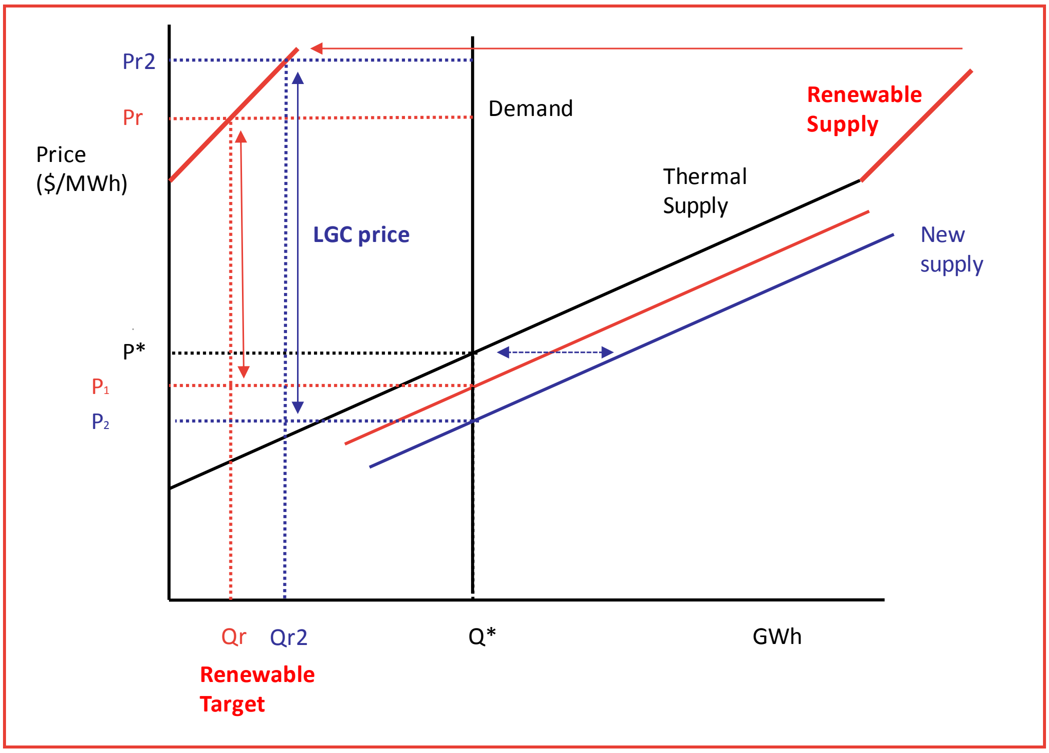
Figure 3: Illustration of the LRET: LGC price setting



Source: Frontier Economics

The impact of an *increase* in the LRET to QR2 is shown in Figure 4. This raises the LGC price, but there are two contributing factors. The first factor is the upward slope of the renewable supply curve (rising from Pr to Pr2). This could reflect the declining quality of wind sites, for example, as lower wind speeds and lower capacity factors contribute to progressively higher cost per MWh generated, though this diagram is illustrative only (larger, efficient turbines in the future might offset this and flatten the renewable supply curve). The second factor is if there is an increase in the merit order effect which contributes to lower wholesale pool prices (P1-P2). The relevance of the distinction is who bears the burden of the LRET. For the first factor (rising renewable costs) it is consumers who bear the burden. For the second factor (declining wholesale pool prices) it is existing thermal generation that bears the burden. Any estimate of the net impact on retail prices in isolation will only reflect the component borne by consumers, and will mask the cost borne by existing generation (and hence the overall cost).

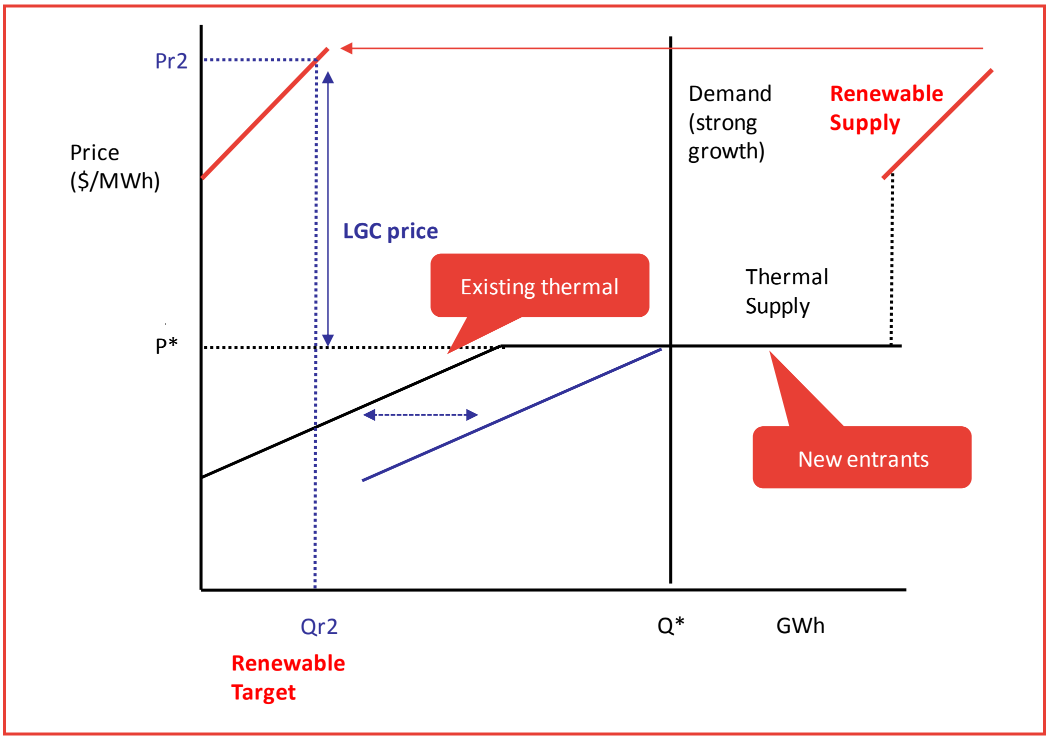
Figure 4: Illustration of the LRET: changes in the target



Source: Frontier Economics

The extent of any merit order effect in the longer-term will depend heavily on the growth in the LRET target relative to growth in energy demand. In the long-run, the thermal supply curve will be upward sloped for existing generation and relatively flat for new investments (at roughly the LRMC of new entrants). Where energy growth is very strong, a smaller increase in the LRET target will displace new entrant thermal plant, but this won't lead to substantially lower wholesale prices (as existing thermal plant is not displaced). This would mean a small or negligible merit order effect and consumers would face most of the incremental cost of the renewable (as wholesale prices would not be much lower than without the LRET). This is illustrated in Figure 5.

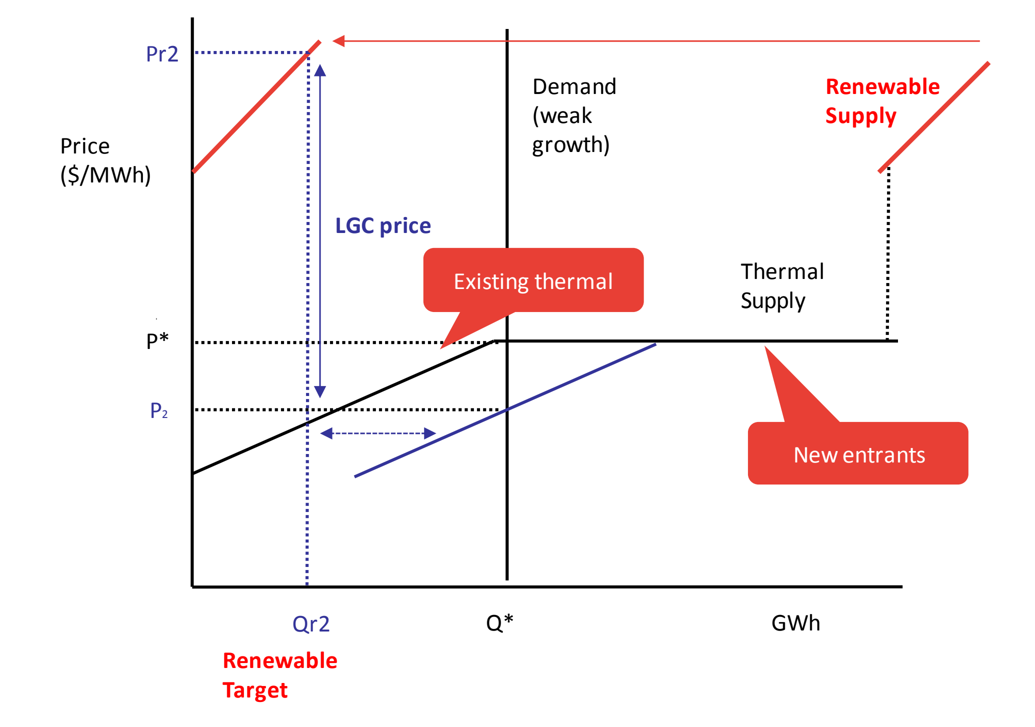
Figure 5: Illustration of the LRET: strong demand growth



Source: Frontier Economics

However, if the growth in the LRET target is large relative to the expected growth in energy demand then the renewables will be displacing existing thermal generation, wholesale prices will be lower than without the LRET, and existing generators will bear the burden of the LRET. This may create substantial investment uncertainty / instability in the thermal market, with prices below cost (LRMC). It may also increase the risk of an LRET shortfall where the RET penalty binds. The other key factor is whether existing generators continue to operate as normal, or whether they bid more aggressively and mothball/retire capacity. If generators do mothball capacity this will offset the merit order effect, reducing the dampening effect of the LRET on wholesale prices and shifted the cost back toward consumers.

Figure 6: Illustration of the LRET: weak demand growth



Source: Frontier Economics

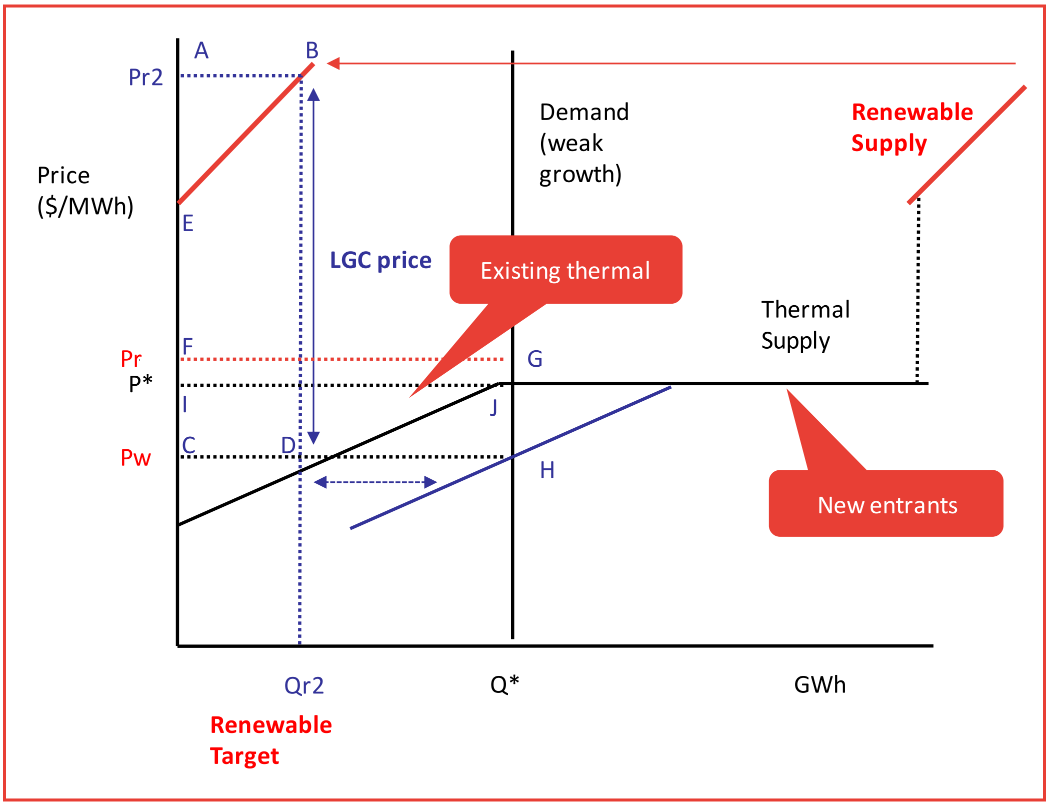
Retail prices and transfers

A stylised description of the operation of the LRET, including price effects, costs and transfers is as follows (Figure 7):

- P* is the wholesale price in the absence of the RET (and Q* is volume)
- QR2 is the renewable target. The remaining thermal supply curve shifts right by the same amount, displacing the more expensive thermal supply.
- The wholesale pool price falls to Pw due to the merit order effect. This is based on the assumption that the renewables displace *existing* thermal generation, as opposed to displacing the need for *new* generation (e.g. demand growth is assumed very weak or even zero).
- The LGC price is the difference between the new wholesale price (on average, Pw) and the marginal cost of the renewable generation (PR2).
- The total LGC subsidy is LGC price multiplied by the RET volume (QR2): ABCD (Figure 8)
- To fund the LGC cost a retail levy is imposed. This is equal to the total LGC cost (ABCD) but spread over energy consumed (Q*) (Figure 9) In this example, this is FGCH (which equals the area ABCD).

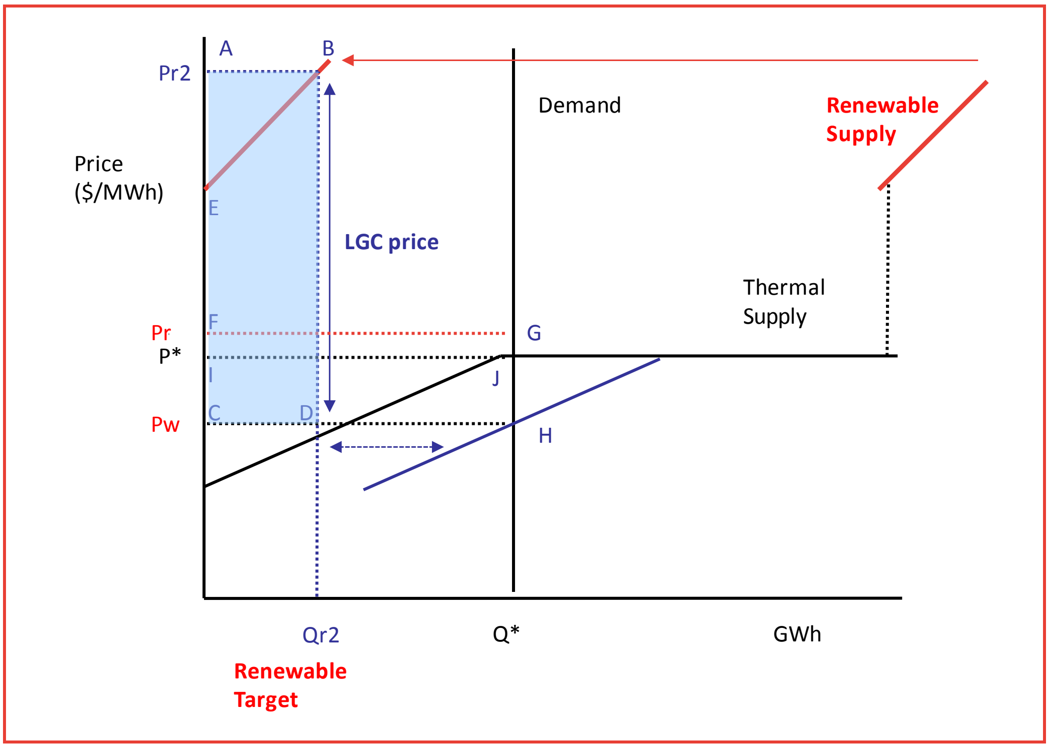
In this example the wholesale price is now below P* - this reflects the cost of the LRET borne by existing thermal and hydro generation. The retail price is now above P* in this example (once the LGC levy is accounted for): this reflects the share of LRET cost borne by consumers (Figure 10) The distribution of burden depends heavily on the extent of the merit order effect.

Figure 7: Illustration of the LRET: retail price impacts



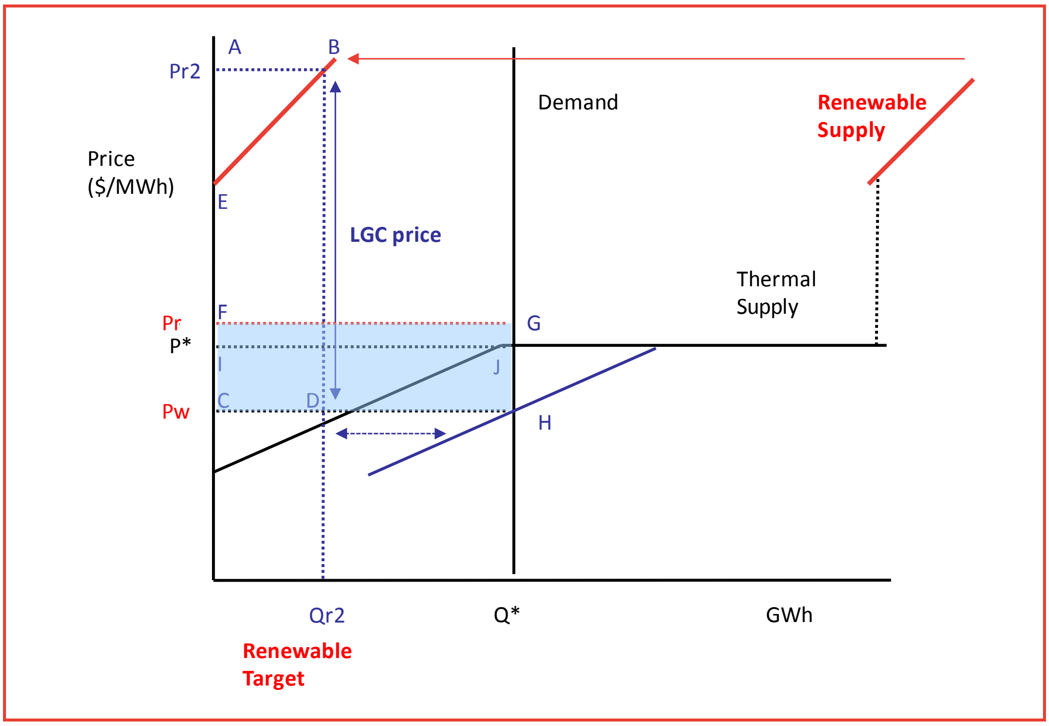
Source: Frontier Economics

Figure 8: Illustration of the LRET: scheme cost



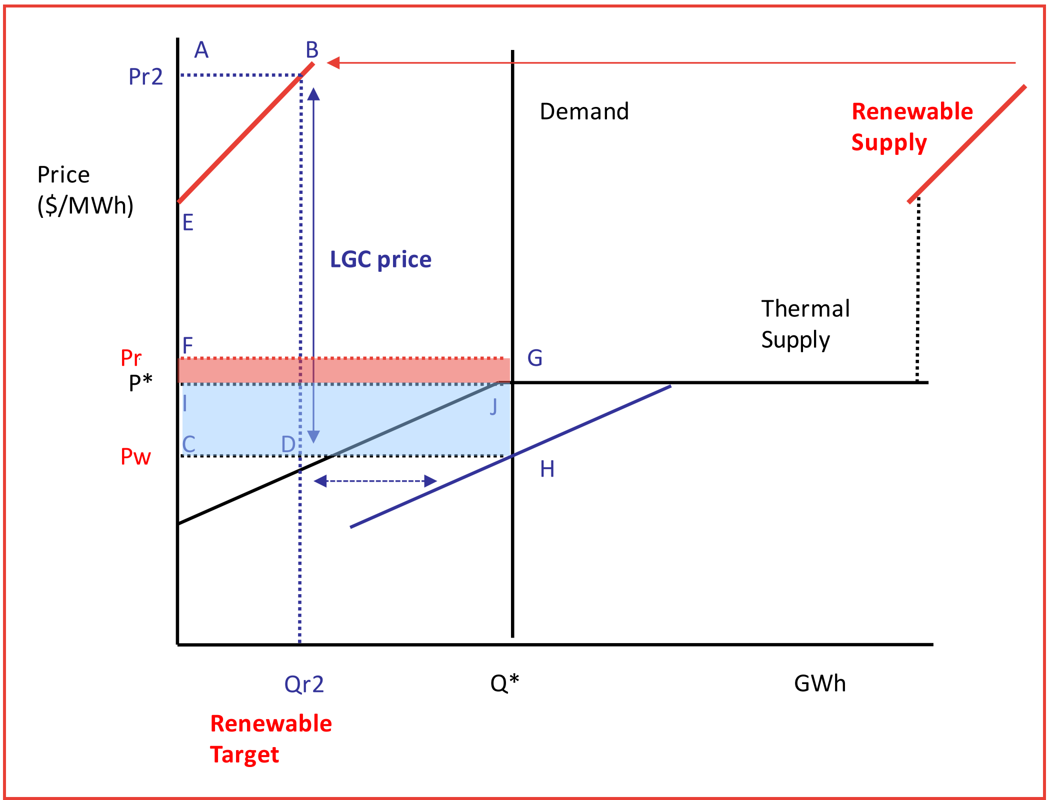
Source: Frontier Economics

Figure 9: Illustration of the LRET: retail levy



Source: Frontier Economics

Figure 10: Illustration of the LRET: distribution of burden

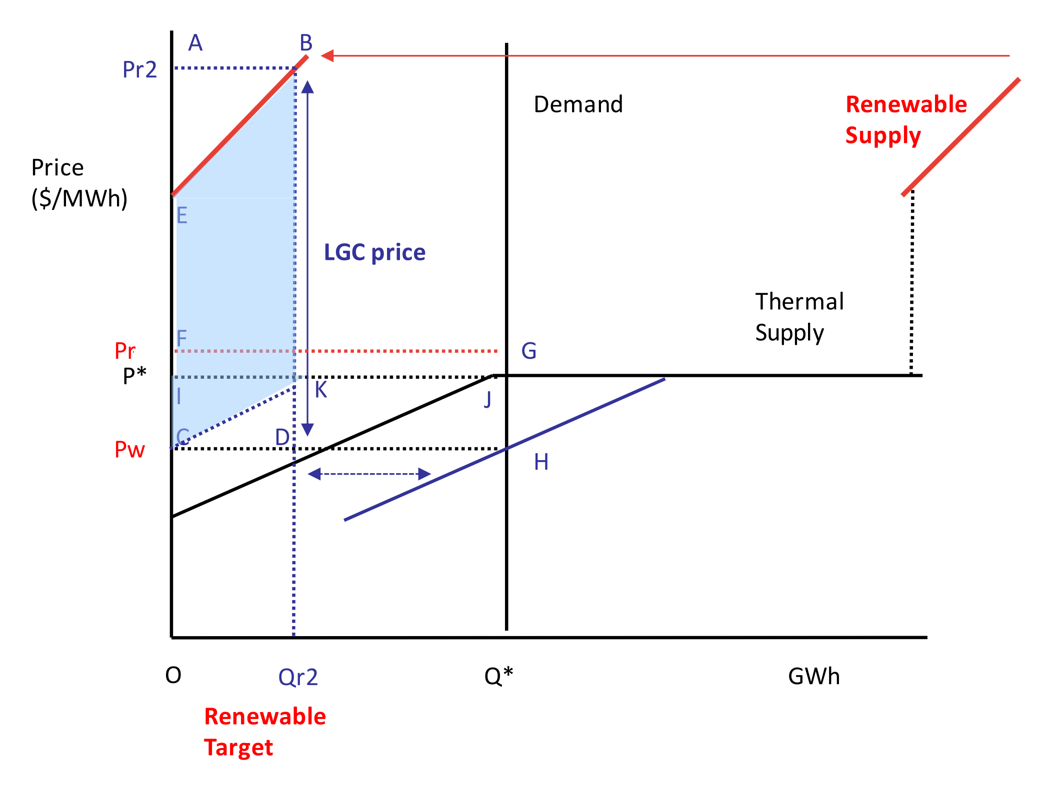


Source: Frontier Economics

SKM-MMA report on the "resource cost" of the LRET (Figure 11) based on area EBCK. This is the resource cost of the renewables (E-B-O-Qr2) less the cost of the thermal generation displaced (C-K-O-Qr2). SKM-MMA estimates this cost as $7.7B NPV for the Reference Case 1 (Status Quo[17]) compared with the No RET scenario, and $3.4B for the Updated 20% target compared with the No RET. This results in an incremental resource cost – comparing the 20% target with 26% - of $3.3B NPV.

17 This is the total change in the NPV of the resource cost for each scenario (in Row 77).

Figure 11: Illustration of the LRET: resource cost of LRET



Source: Frontier Economics

In this instance, focusing on cost (EBCK) ignores the full burden of the scheme operation, since marginal generators set the LGC price and some renewables earn prices above cost. If the LGC price is factored in, some "rents" (ABE) will go to renewables investors, which will impose a greater burden on either consumers or existing thermal generation. Looking at the scheme costs:

- The LRET cost is reported in row 86 of the SKM-MMA modelling:
  - Reference Case 1 (Status Quo 26%) NPV at 7% is $15.6B.
  - Updated 20% target: $9.5B.
  - The incremental cost of not reviewing/changing the target is an increase in scheme burden of $6.1B.

The consumer share of this burden is FGJI: the retail levy is mostly offset by the merit order effect in the modelling. When the wholesale price drop is considered, consumers only face a burden of[18]:

18 This is reported by SKM-MMA, but also calculated as the total consumer spend, which is the product of retail prices (row 28) and demand/generation (row 43), NPV at 7%. In the No RET case this is $665.2B, and in the Reference Case 1 this is $669.9B. The difference is $4.7B)

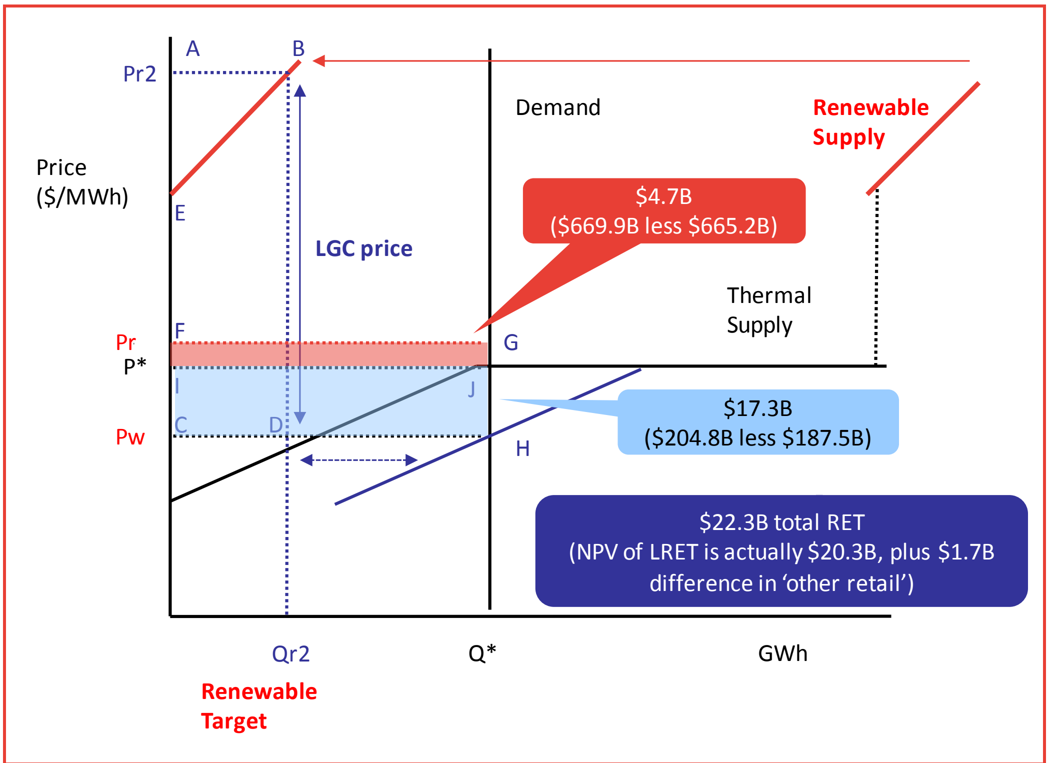
- Reference Case 1 (Status Quo 26%): $4.7B NPV (Figure 12)
- Updated 20% target: $4.6B NPV (Figure 13)

The increase to consumers is only $100m for the relatively higher target. This is due to a strong merit order effect in the modelling, which means that existing generators with sunk capital costs bear a total burden of:

- Reference Case 1 (Status Quo -26%): $17.3B NPV
- Updated 20% target: $ 11.3B NPV

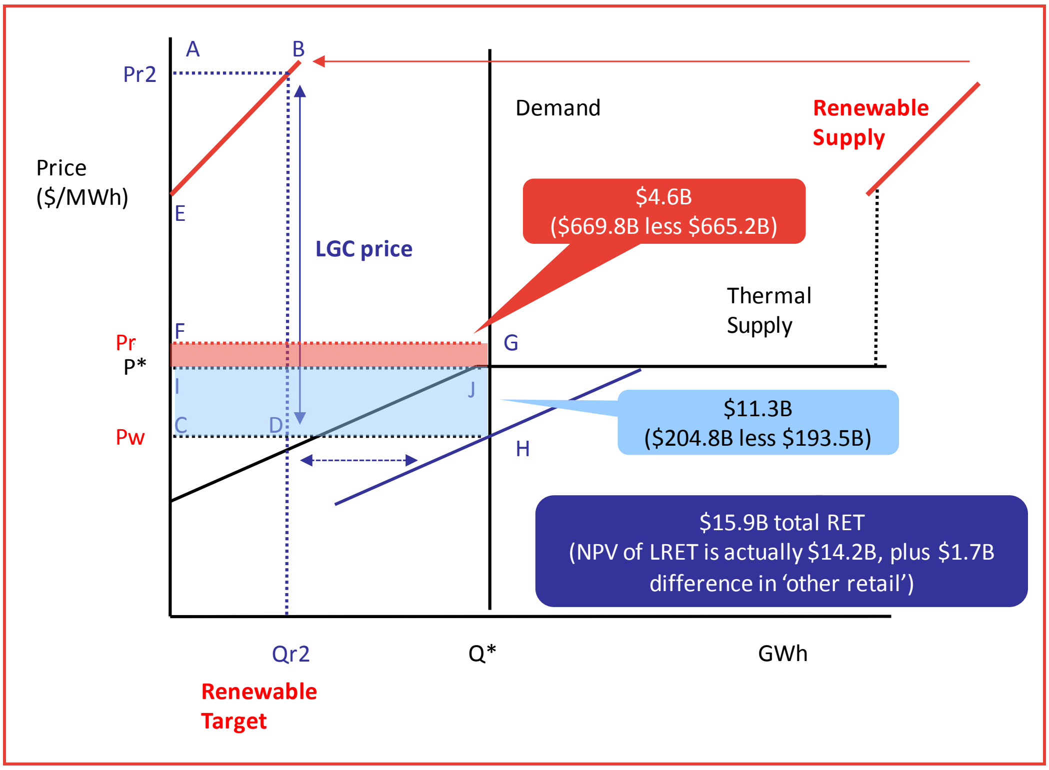
The net *increase* in burden to existing generators is $6B out of the $6.1B total increase in the burden. So existing thermal generators bear 98% of the increase in the RET from a true 20% target to 26%. It also reflects that the full burden of implementing the RET is $20.3B in the Reference Case (Status quo 26%) compared with $14.3B in the Updated 20% target. This includes an SRES cost of $4.5B in both scenarios.

Figure 12: Illustration of the LRET – Reference Case 1 (26%) versus No RET



Source: Frontier Economics

Figure 13: Illustration of the LRET – Updated 20% target versus No RET



Source: Frontier Economics

Several key points follow from this:

- It results in loss of value to existing generators in the order of $11.3-17.3B, which is likely to be a greater impact than the carbon tax (which provided compensation for losses).
- Leaving the target unchanged results in substantial investment uncertainty for around 80% of the electricity market, which is the main justification provided by the CCA for supporting an unchanged LRET target.
- The volumes of renewable generation all converge on around 70TWh with or without a change in the LRET target (Figure 15); the only difference is an earlier increase in renewables in the Reference Case 1 (Status Quo 26%). Even the No RET results in almost the same level of renewables output by 2031, which is a result of increasing competitiveness of renewables (ie with a carbon price, additional RET support becomes increasingly redundant).
- The results should be studied more closely as it substantially undermines the functioning and operation of the thermal market. Renewables will frequently enter bundled PPAs and will remain largely indifferent to low wholesale prices; existing thermal generators will not be indifferent to this however.

- The modelling appears to rely heavily on the assumption that existing thermal generation will not exit the market or bid more aggressively into the market in an effort to stem losses and recover total costs. The modelling methodology (which is unclear) appears to assume a static bid curve based roughly on historical behaviour (ie thermal generators bid a fixed % at SRMC – perhaps 80% - then progressively increase prices for the remaining capacity, and demand sets the clearing %). This does not necessarily reflect reality given a fundamental shift in the market, such as very low demand growth coupled with substantial renewable entry and the introduction of carbon pricing (which reduces margins on volumes). In this instance with substantial excess capacity, this results in sustained prices well below the LRMC of new entrants. Given that the collective losses to thermal generators are in the order of $11.3-17.3B NPV as a result of the RET, it would be surprising if generators did not revise their strategies. This could include reduced contracting or bidding more aggressively or retiring / mothballing units. This is already evident in Playford (240MW), Munmorah (600MW), Yallourn (360MW) and Tarong (700MW) mothballing units and Northern entering a summer-only operating profile. Given that the difference in value to generators between the 20% and the 26% targets (for around 15TWh of renewable output, or around the size of a large generator), it would seem likely that the collective closure of around 1600-2000MW of plant (or more aggressive bidding) could largely reverse the merit order effect of the renewable crowding out. If collective closure of capacity of this amount could obtain higher wholesale prices worth around $6B by pushing prices closer to LRMC of new entry (though still below) then it would seem increasingly likely that this should be considered. If this were to eventuate then this could shift the burden of the LRET from existing generators to consumers.

A summary of the differences between scenarios is provided in Table 1

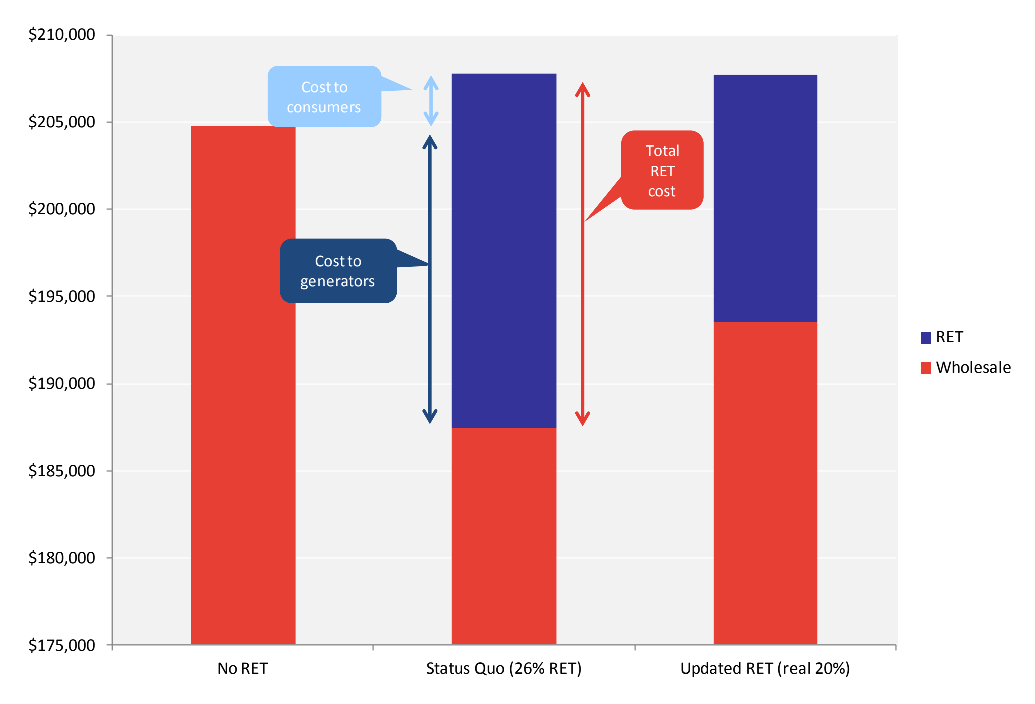
Table 1: Summary of prices and costs by scenario

	Reference Case 1 (Status Quo 26% RET)	No RET	Updated 20% target
Wholesale price 2020 ($/MWh)	$52	$64	$56
Retail price 2020 ($/MWh)	$241	$243	$241
NPV wholesale spend (2013-2031, wholesale price x generation) $B	$187.5	$204.8	$193.5
Difference in NPV wholesale versus No RET $B (generator share of RET burden)	*$17.3*		*$11.3*
NPV of retail spend (2013-2031, retail price x generation) $B	$669.9	$665.2	$669.8
Difference in NPV retail spend versus No RET, NPV $B (consumer share of RET burden)	*$4.7*		*$4.6*
NPV of RET scheme burden, $B (Includes $4.5B of SRES)	*$20.3*		*$14.2*
Difference in NPV $B (increase in "other retail" costs in SKM-MMA results)	*$1.7*		*$1.7*

Source: Frontier Economics analysis of SKM-MMA modelling for CCA RET review

The change in wholesale prices (in NPV) and RET costs is illustrated in Figure 14. This excludes "other retail" costs. The wholesale cost is based on the average wholesale pool price multiplied by output; the RET cost includes the LRET and SRES costs. This demonstrated graphically how a fall in wholesale prices largely offsets the overall RET cost, and leaves existing generators to bear the burden in the form of lower wholesale pool prices.

Figure 14: NPV by scenario – wholesale and RET only (2013-2031), $b

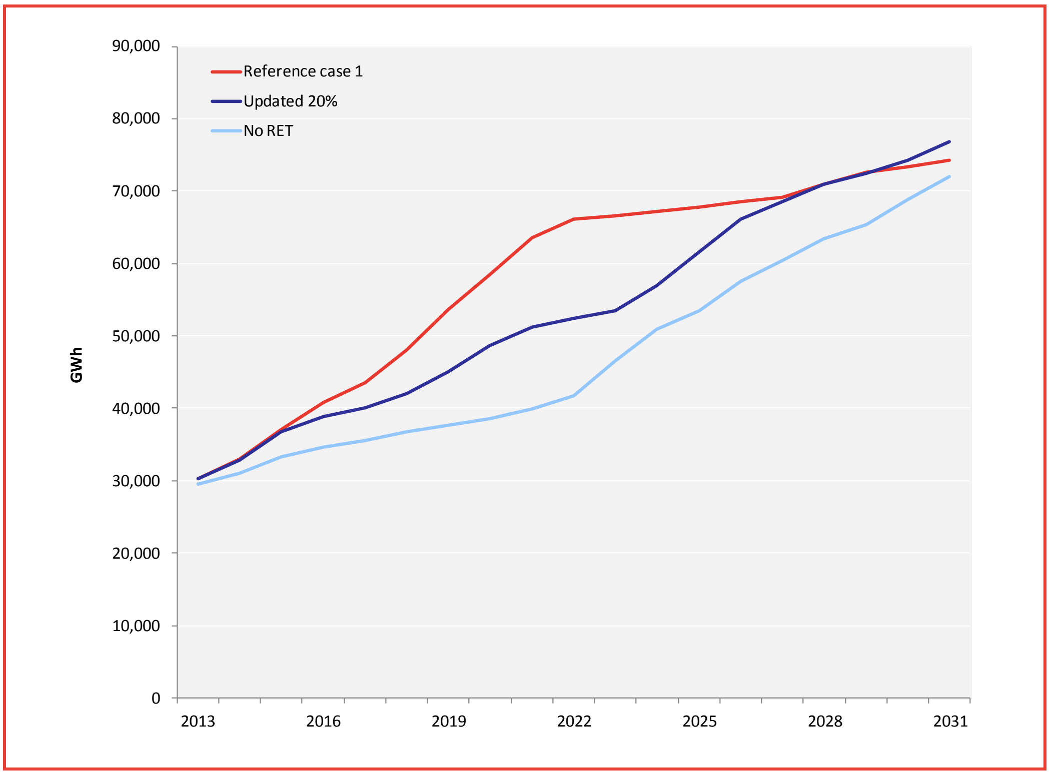


Source: SKM-MMA. Status Quo refers to "Reference Case1", Updated RET refers to an adjusted target to reflect 20% of demand.

Renewables and investment uncertainty

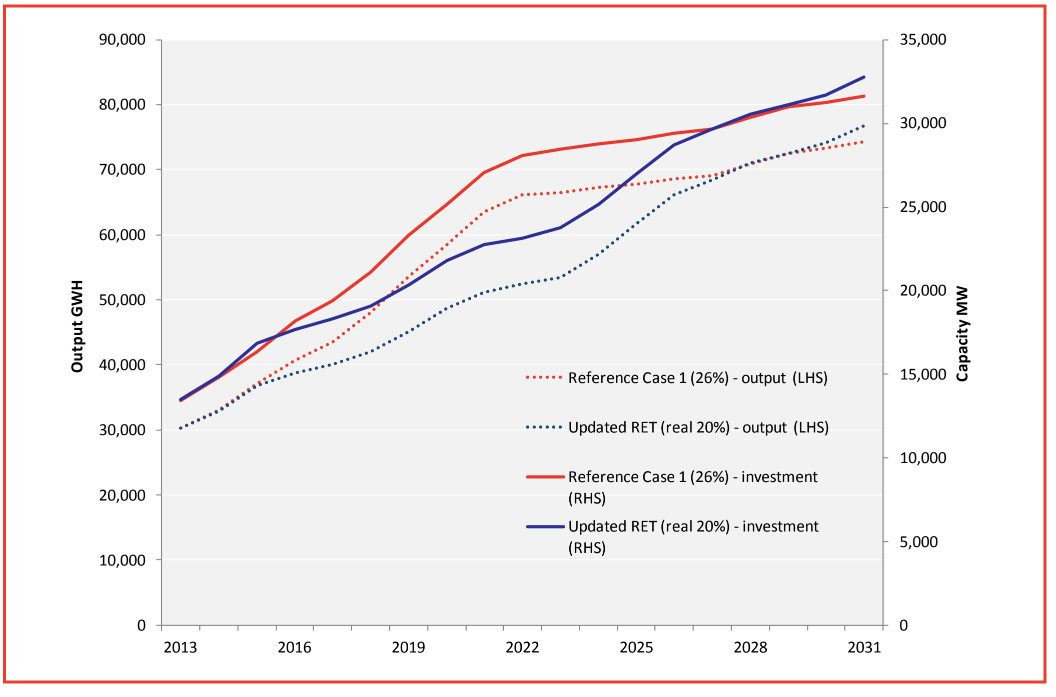
A key justification of the CCA in leaving the target unchanged is to provide investment certainty to renewables. However the modelling results show almost no difference in renewables output or investment from 2027 onwards (Figure 15). The difference is mostly between 2016-2025 as the RET brings forward future investment that would occur in both scenarios. Renewables output and investment also continues to grow from current levels, which suggests that existing investments face minimal risk of 'stranding' if the target were to be revised (Figure 16).

Figure 15: Renewables generation in the different modelling scenarios



Source: Frontier Economics analysis of SKM-MMA

Figure 16: Renewables investment in the different modelling scenarios



Source: Frontier Economics analysis of SKM-MMA

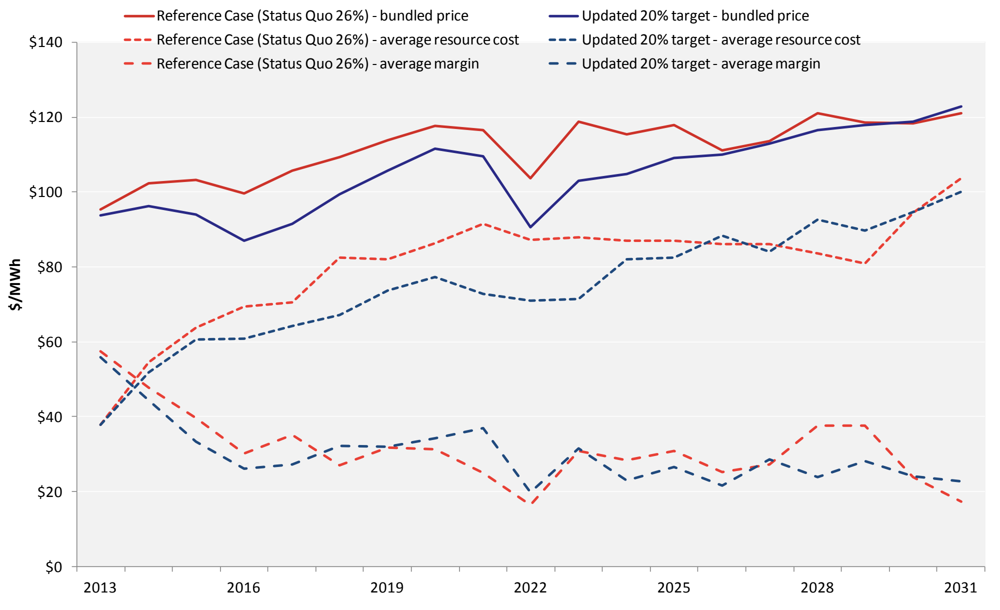
Commentary on the RET review and modelling

In terms of cost and revenues to renewables in the scenarios, the bundled price is marginally lower in the Updated 20% target compared with the Reference Case: Figure 17. This reflects a lower LGC price for the lower target, though this is mostly offset by higher wholesale prices. However, the average resource cost associated with the lower target (Updated 20%) is also lower by a similar magnitude, which suggests average margins/returns are very similar either way. In NPV terms between 2013-2031, the comparison is:

- Bundled revenue (wholesale price plus LGC, for all LRET output): $31.9B in the Reference Case and $25B in the Updated 20% target, a reduction of $6.8B or 21% (mostly due to lower volumes). This is roughly estimated on the basis of wholesale prices plus LGCs multiplied by output from wind, geothermal and biothermal (not all renewable as hydro is assumed to be largely ineligible). This is generally less than the LRET target (row 85) due to the current surplus of LGCs;
- Resource cost (row 75): $23.1B in the Reference Case and $18B in the Updated 20% target, a reduction of $5.1B or 22%. This includes only new capital investments, not sunk capital costs of pre-existing LRET investments (though this would be the same in both cases).

In other words, although revenues would be reduced by around 21% for a reduction in the target, costs would be reduced by the same proportion. Given that the difference between average and total revenue is similar to the difference in average and total costs between the scenarios, and that there is continued growth in investment and output (so it would affect future investment but not sunk investments), it is difficult to maintain that there would be significant investment uncertainty resulting from a change to the target from 2020-2030.

Figure 17: Bundled price (wholesale price and LGC), average cost and margin



Bundled price is LGC plus average wholesale price. Average resource cost is the LRET resource cost divided by output from renewables output from wind, geothermal and biothermal (rows 51, 52, 53). This is an approximation that assumes that hydro and solar PV are not included in the LRET resource cost. Average margin is the difference.

Source: Frontier Economics