6 June 2011 Issue 012

Will 20% of Australia's Electricity be Produced from Renewable Energy Sources by 2020 ?

By Stephen Weston and Yannick Godin

Introduction

The Renewable Energy Target (RET) has the objective that 20% of Australia's electricity be supplied from renewable energy sources by 2020. In this article we discuss the likelihood of meeting the renewable energy target and the adequacy of the scheme's current settings. In our view, the 2020 target will be difficult to achieve. We suggest and evaluate some potential changes to settings which based on our modelling of the scheme, might be required for the target to be met.

Background

It is appropriate first to review the main aspects of the RET scheme and its evolution since it was first introduced.

Under the RET the Government sets annual targets for renewable energy and requires liable parties (electricity retailers and large wholesale purchasers of electricity) to meet these targets. Compliance is demonstrated by surrendering Renewable Energy Certificates (RECs), where one REC is equivalent to one megawatt-hour (MWh) of electricity generated from renewable energy sources. Failure to surrender adequate RECs incurs a shortfall charge. The RET has undergone three phases of development :

- In 2000, The Renewable Energy Act brought into being the scheme known as the Mandatory Renewable Energy Target (MRET). This scheme adopted relatively modest interim targets increasing to 9,500 GWh of new renewable energy generation (2% of projected generation) by 2010. In 2004, the Tambling Report[i] recommended the scheme be extended by adopting a target of 20,000GWh renewable energy generation by 2020. However this recommendation was not taken up by the Government of the day.
- In 2010, following the election of a new Government, the scheme was expanded with a target increasing to 45,850 GWh by 2020 and remaining at 45,000 GWh until 2030. However the expanded scheme also provided for favourable treatment of small scale technologies in particular rooftop solar photovoltaic (PV) systems[ii]. As well as qualifying for RECs, these installations also benefitted from Government rebates and generous feed-in tariffs. The high rate of solar PV installations resulted in a high rate of REC production,

[i] Renewable Opportunities, A Review of the Operation of the Renewable Energy (Electricity) Act 2000, September 2003.
[ii] This technology was credited with upfront RECs equivalent to a multiple of lifetime electricity production.

Publisher

Intelligent Energy Systems ABN 51 002 572 090

Head Office – Sydney Level 2 10-12 Clarke Street Crows Nest NSW 2065 Australia PO Box 931 Crows Nest NSW 1585
Telephone 61 2 9436 2555 **Facsimile** 61 2 9436 1218 **Email** ies@iesys.com.au **Web** www.iesys.com.au
Melbourne Level 8 45 William Street Melbourne VIC 3000 Australia PO Box 405 Collins St West Melbourne Vic 3000
Telephone **61 3 9614 6200** Facsimile **61 3 9614 6255** Email **ies@iesys.com.au** Web **www.iesys.com.au**

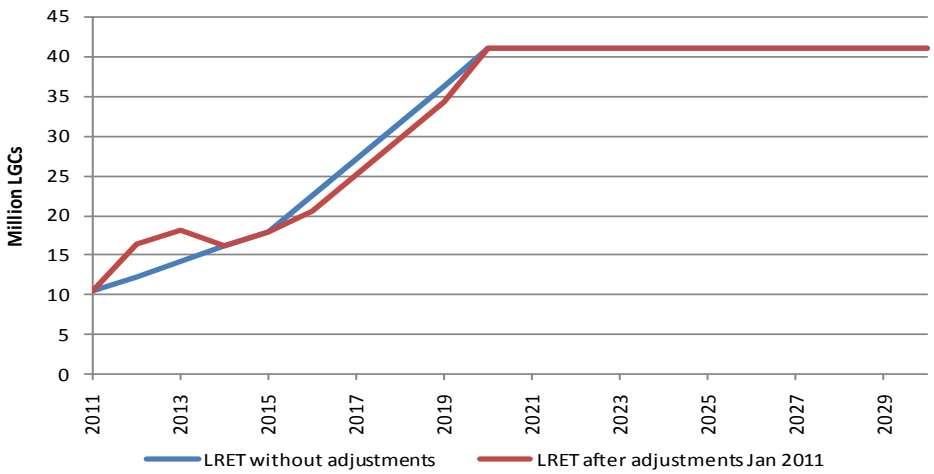
Insider

compromising, in the view of potential investors in large scale renewable generation (wind farms), the objectives of the scheme.

- In 2011, acting on these concerns, the Government split the RET scheme into two separate schemes with large-scale technologies administered under the Large-scale Renewable Energy Target (LRET) and small scale technologies administered under the Small-scale Renewable Energy Scheme (SRES). The original RET target of 45,000GWh was allocated to LRET and SRES as targets of 41,000 GWh and 4,000 GWh respectively. Further, to address the large REC surplus that had already built up, additional modification was made to the interim LRET target, specifically :
  - An increase of 4 million Large-scale Generation Certificates (LGCs) annually in 2012 and 2013; and
  - A reduction of 2 million LGCs annually from 2016 to 2019.

The revised target is shown in Figure 1.

Figure 1 Revised LRET



Challenges in meeting the LRET

Achieving a 20% national share of electricity production for renewable energy sources by 2020 was always regarded as challenging. It was recognised that as wind generation was the only existing mature large scale renewable energy technology, it would be the predominant source of renewable energy production. The potential competitors to wind energy – large scale solar power (solar thermal and solar photovoltaics) and geothermal would require targeted incentives in addition to the RET. The Government has established a Solar Flagships Program[iii] to assist the development of large scale solar power however there is no equivalent scheme for geothermal[iv].

[iii] Under the Solar Flagships Program, the Government has committed $1.5billion to establish up to 1000MW of solar power generation capacity.
[iv] Funding available under the Emerging Renewables Program ($100M) and the Renewable Energy Venture Capital Fund ($100M) is significantly less than funding available under the Solar Flagships Program.

The Australian Geothermal Energy Association (AGEA) claims that investors are only prepared to bear part of the risk of proving the geothermal resource in each location in the early stage of the industry's development in Australia. It states that "government funding to date has not equated to a sufficient incentive to offset this risk"[v].

The AGEA has previously argued that a portion of the renewable energy target be set aside for "emerging technologies" including geothermal and has also argued for the inclusion of direct use of geothermal energy (for heating and cooling) under the LRET[vi].

The AGEA has referred to geothermal being available to meet the RET in South Australia from about 2014. While Petratherm is expected to deliver Australia's first commercial supplies of hot rock power from its Paralana project by the end of 2012, the development of the resource has been beset by geotechnical problems[vii].

The advantage of geothermal is that it is capable of providing a steady output and hence can perform a base-load role in the power system without the need to have additional dispatchable generation to manage its variable output. The resource however is concentrated at locations remote from major demand centres necessitating investment in transmission.

The probability that geothermal and solar will not make significant contributions before 2020, implies that as much as 10 to 11GW of wind installed capacity would have to be built over the next 9 years for the target to be met.

There are problems in integrating such large installed capacity of wind into the NEM's power systems. Aside from the technical issues of connection, inertia, and contingency reserve, there is the issue that has become evident in South Australia that as wind energy becomes a larger part of regional supply, the unit electricity spot market revenue earned by wind energy declines in relation to the average electricity spot price creating a disincentive for additional investment in wind generation[viii] and an incentive for investment in forms of generation with predictable or controllable generation profiles such as solar power and geothermal to the extent to which these technologies are ready for commercial deployment.

Apart from issues associated with wind energy's generation characteristics - principally intermittency and the possibility of extended lulls in aggregate regional wind generation, there is also the general issue of the quality of the wind resource. The price level required to support investment in wind generation differs from one location to another because of varying quality in the wind resource. Arguably, the better sites located near major urban areas will be developed first, but as more wind is built, either the remaining lower quality sites located near urban areas are developed but with higher capital costs[ix] or sites with good wind resource but remotely located are developed, albeit with increased costs of connecting to the shared transmission network.

[v] AGEA, Rationale for Continued Funding Support from Government.
[vi] AGEA response to Enhancing the Renewable Energy Target (RET) Discussion Paper, 14 April 2010,
[vii] Sydney Morning Herald, Geothermal Industry Defends its Record, 20 May 2011.
[viii] See IES Insider Article on Wind Penetration:
http://www.iesys.com/LinkClick.aspx?fileticket=dvQRguUt6i4%3d&tabid=72
[ix] The increase in cost is associated with the need for higher towers, wind turbines tailored to make efficient use of lower wind speeds, and more stringent generation licensing requirements imposed to address developing power system issues..

Either way, as wind penetration increases, incremental wind farm development becomes less economic. Consequently, although some level of electricity spot prices and LGC prices may allow the financing of good wind sites, prices may never reach the levels required to support the development of the more expensive low quality or remote sites.

Somewhat perversely, the very possibility that the target might be met, poses a risk to future renewable generation revenues because of the non-increasing nature of the liabilities from 2020. Should it become apparent that the target is likely to be met, the LGC spot price can be expected to become very sensitive to forward positions and could be priced anywhere between zero and the shortfall penalty. This dynamic rewards early entrants but deters further development in wind generation late in the scheme unless electricity spot prices are high enough themselves to support the investment.

In our view, without additional direct targeted assistance, it is doubtful that solar power or geothermal will be contributing significantly to the RET prior to 2020. Consequently the achievement of the 2020 target will depend on a substantial ongoing investment in wind energy. Investors in wind energy face a number of concerns including the prospect of a step down in revenue sometime after 2020 when the RET is either terminated or fully subscribed and a carbon price is either not in place or not sufficiently high to replace the loss of LGC value, and a reduction in electricity revenue as the penetration of wind in the region increases.

Conditions for meeting the 20% target by 2020

For the 20% target to be met by 2020, LGC and electricity spot prices need to be high enough prospectively to support the development of lower quality wind sites amid growing wind penetration. Options for achieving this include :

- Option 1 – sufficiently high carbon prices and no other changes to scheme settings;
- Option 2 – removal of the LGC surplus and a higher shortfall penalty price (in the absence of a carbon price); and
- Option 3 – increasing liabilities post 2020 in conjunction with some level of carbon pricing.

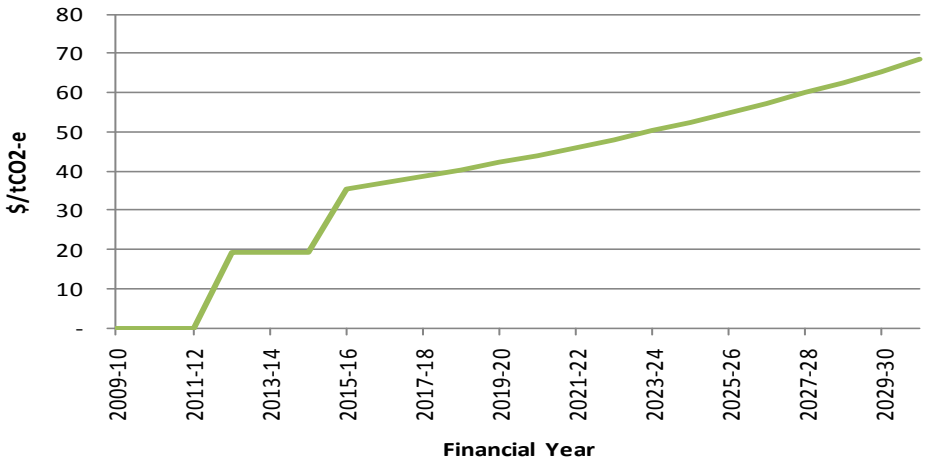
IES has undertaken modelling of each of these options using its Australian Integrated Energy Model which is based on the MARKAL modelling framework. In this model, LGC prices are determined through the (whole of life) revenue needs of the marginal renewable energy generator required for the LRET to be met, and if the target is not met the (tax adjusted) shortfall penalty price. The key factors are the cost of renewable technologies, the revenue available in the relevant electricity markets, and the LRET settings (shortfall penalty price, target, and expiry date of the LRET).

Option 1 - Meeting the LRET with a carbon price

On the basis of our modelling, relatively high carbon prices are required if the 20% target is to be met by 2020. This is in part a consequence of our view that solar power and geothermal are unlikely to contribute significantly within this timeframe. Under the LRET's existing settings, modelling suggests that a carbon price increasing to at least $40/tCO2-e (real Jul 2010) by 2020 is required for the target

to be met. The carbon price needs to be high enough at the start to motivate early development of wind farms ($20/tCO2-e), but also high enough after 2020 (greater than 60$MWh) to help support investment after the level of the LGC price falls away. A viable carbon price trajectory for meeting the LRET is shown in Figure 2. Importantly, investors will require a high degree of certainty that the carbon price will increase from a level of between $10-$30/tCO2-e when introduced in July 2012 to more than $60/tCO2-e (in real terms) by 2030.

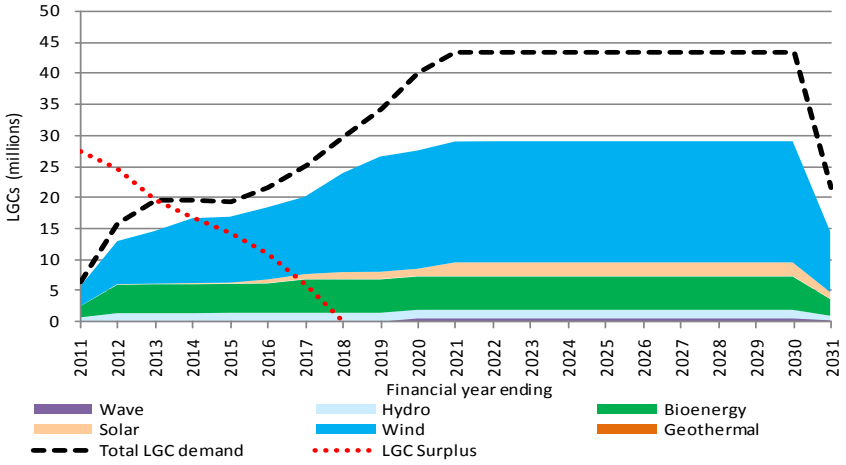
Figure 2 Carbon Price Trajectory ($/tCO2-e) (Real Jul 2010)



Option 2 - Meeting the LRET without a carbon price

Our modelling shows that with the existing LRET settings, the target cannot be met without a carbon price. As shown in Figure 3, renewable generation by 2020 would fall well short of the target. Under this scenario, the Government would be left with the choice of either leaving the scheme as it is or adjusting settings. With the split of the small and large scale renewable technologies, Government has already shown a willingness to make significant changes to facilitate meeting the target. In this discussion, we speculate as to what those changes could be.

Figure 3 LGC Creation under a no carbon price scenario



Option 2 consists of removing the LGC surplus[x] and increasing the shortfall penalty charge by adjusting it for inflation annually. The removal of the surplus is required to help drive LGC prices to the penalty quickly and spur early wind farm development. Modelling shows that with a penalty charge of $90 ($65 adjusted by the company tax rate of 30%)[xi] staying constant in real terms, just over 39 million LGCs are projected to be created in financial year 2020/21 with the target of 41 million being met the year after. Results are shown in Figure 4 and Figure 5. The outcome of the modelling shows that the LGC price remains at the penalty for most of the modelling period.

Figure 4 **LGC surplus removed - shortfall penalty charge adjusted for inflation**

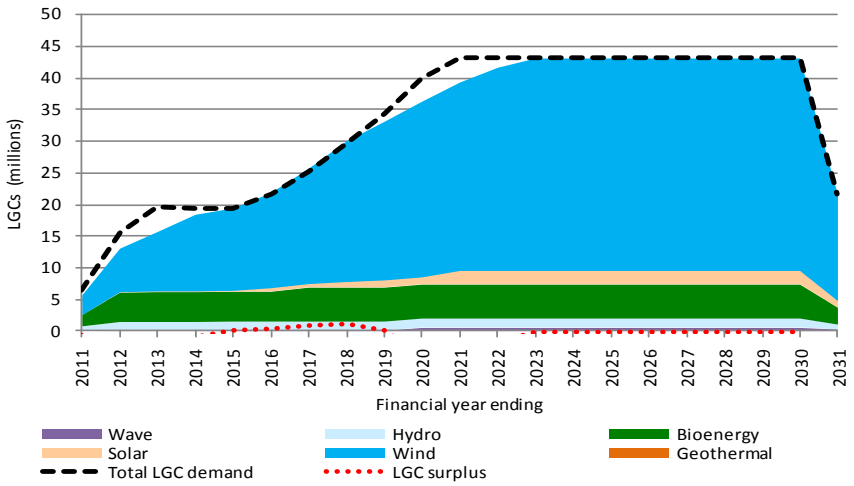
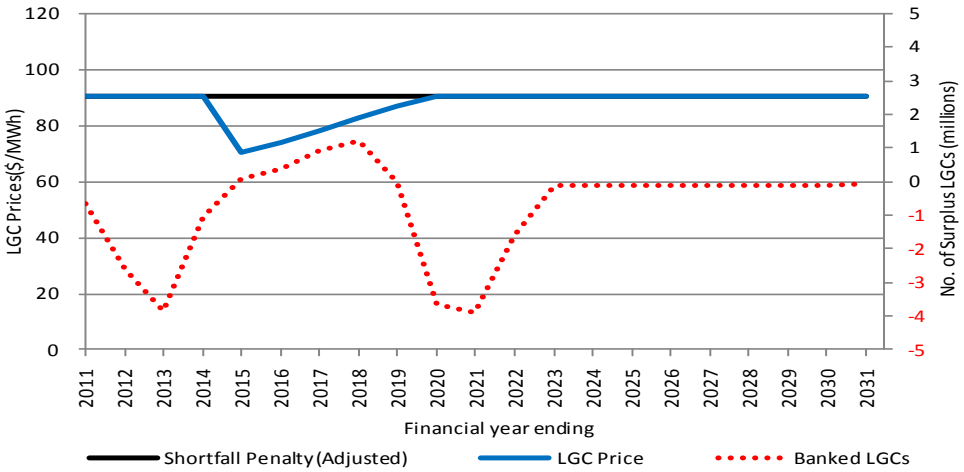


Figure 5 **LGC surplus removed - shortfall penalty charge adjusted for inflation. ($ real Jul 2010)**



[x] At the beginning of 2011, the Office of the Renewable Energy Regulator Registry showed there was a surplus of around 28 million LGCs. Most of this surplus is attributable to a large uptake of PV systems and solar water heaters..

[xi] Failing to surrender a LGC incurs a penalty of $65 per LGC. Being a penalty, this is not tax deductible business expense. In our modelling, we adjust the shortfall penalty charge by the company tax rate in order to calculate the cost to the liable party of not surrendering a LGC.

Option 3 - Increasing LRET liabilities post 2020

One of the issues raised earlier is the non increasing nature of the liabilities after 2020. Should the target be considered likely to be met, the LGC price may become volatile and could experience a substantial drop in its level. This possibility threatens revenues for wind farm developers in the back end of the scheme. In our view, this poses a significant risk to developers and makes it difficult on their part to secure long term Power Purchase Agreements (PPAs). More certainty can be provided by increasing liabilities over the period 2020 to 2030. Importantly, the liability for 2030 should not be interpreted as a new renewable energy target. In all likelihood, this 2030 liability would not be met. Rather the objective *is* to create a shortfall thus maintaining the LGC price at the shortfall penalty price after 2020 and thereby increasing the likelihood that the 2020 target will be achieved.

In our modelling we have assumed a LGC liability increasing up to 81 million MWh in 2030. This is equivalent to 30% renewable energy penetration, assuming a national electricity consumption of 270 TWh. Results show that without a carbon price, increasing the liability between 2020 and 2030 has little impact overall on renewable energy development. This is simply because without a carbon price the LGC price is at the penalty anyway from 2019 onwards. Results are shown in Figure 6 and Figure 7 below.

Figure 6 Increasing liabilities to 2030 - no carbon price

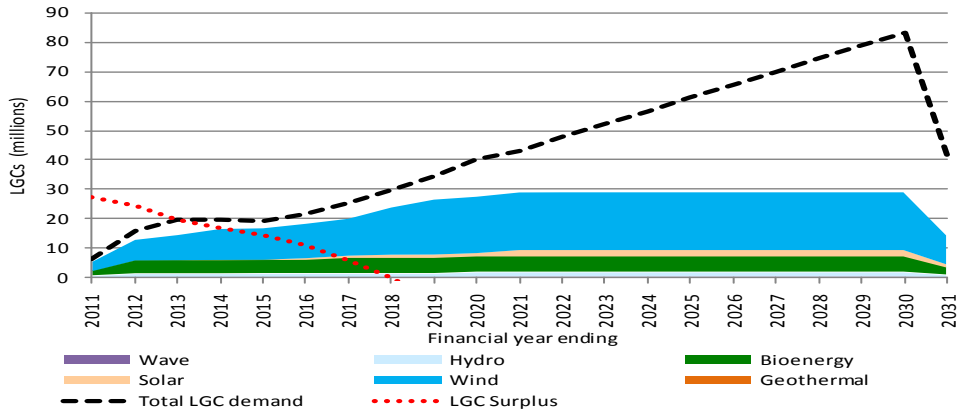
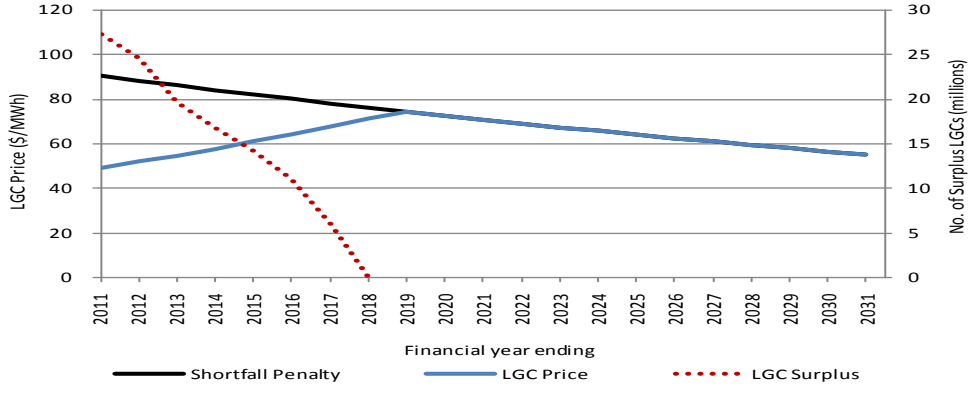
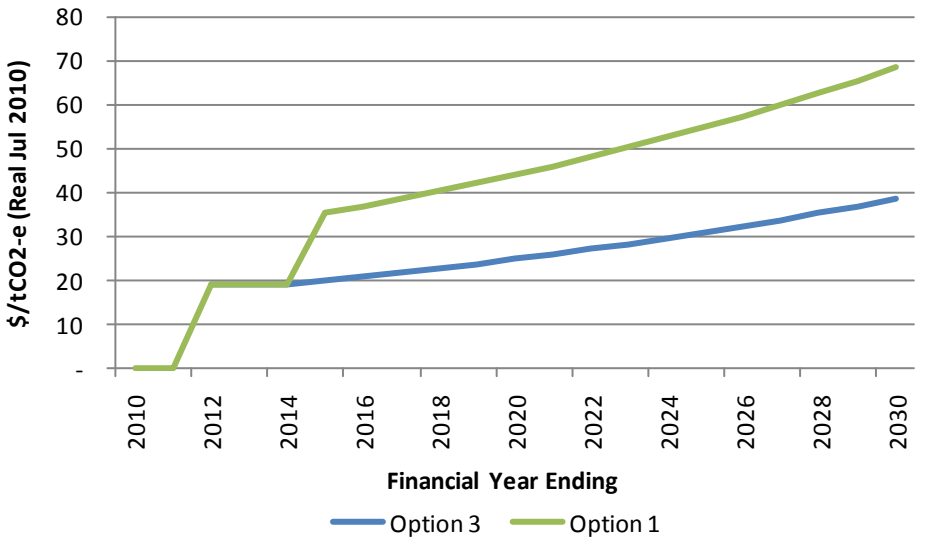


Figure 7 Increasing liabilities to 2030 - no carbon price ($ real Jul 2010)



Increasing the liabilities between 2020 and 2030 does however allow the 2020 target to be met with a lower carbon price than otherwise. Figure 8 shows the carbon price trajectories required to meet the 2020 target under the current settings (green line) by increasing liability between 2020 and 2030 target (blue line).

Figure 8 Carbon price trajectories – Option 1 and Option 3



Results based on the lower carbon price trajectory are shown in Figure 9 and Figure 10.

Figure 9 Liabilities extended to 2030 - lower carbon price

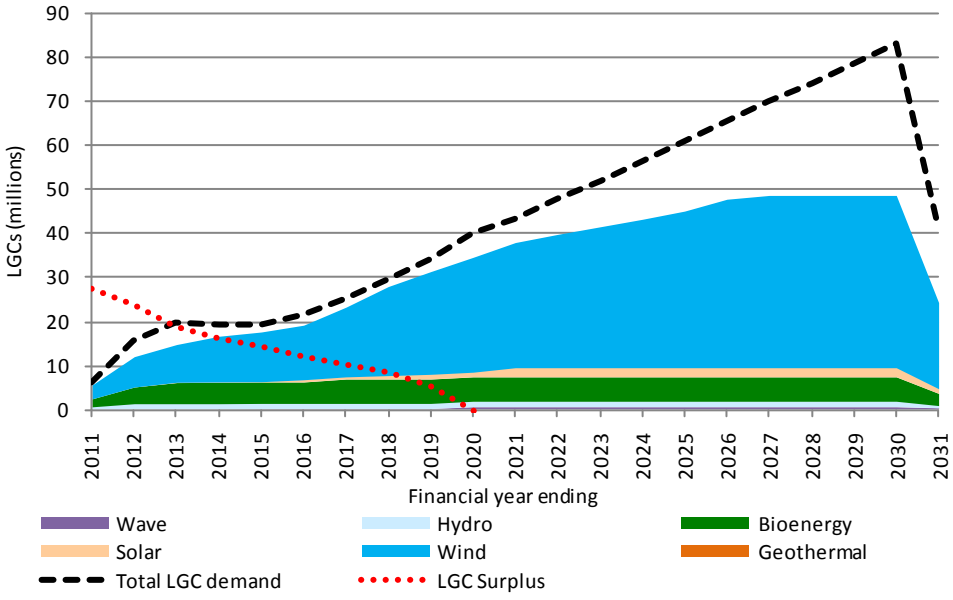
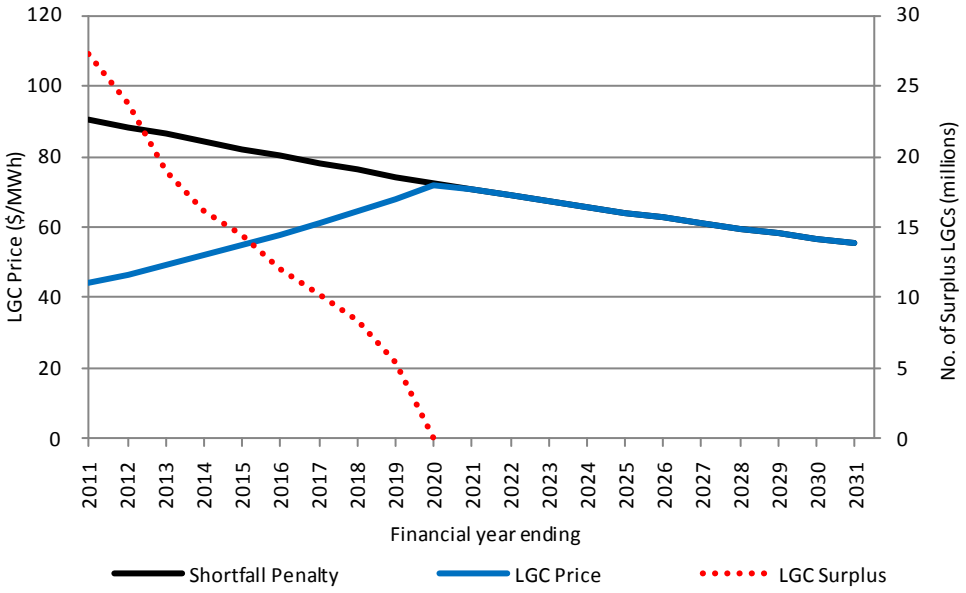


Figure 10 Liabilities extended to 2030 - lower carbon price ($ real Jul 2010)



With 38 million LGCs created in financial year 2020/21, the target is almost met, but with a carbon price $20/tCo2-e lower.

Conclusion

The target of sourcing 20% of Australia's electricity from renewable energy sources by 2010 was always going to be challenging. The existing early stage of development of Australia's solar power and geothermal industries suggests that notwithstanding some early activity, particularly in the case of geothermal, and the allocation of some Government funding, if the target is to be met it will be largely as a consequence of wind energy development.

The principal impediment to investment in wind energy, and private investment in the development of other renewable energy technologies is concern that future electricity prices will not provide projects with revenue adequacy. While the introduction of a carbon price can be expected to assist in alleviating this concern, under current LRET settings, project developers would require a large degree of certainty that the carbon price would increase in real terms from whatever is its introductory level.

In lieu of a carbon price adequately uplifting electricity prices, Government might consider adjusting one or more of the LRET settings – increasing the shortfall penalty, purchasing surplus RECs or increasing participant liabilities between 2020 and 2030 in order that the renewable energy target might be achieved.

Services provided by IES

Advisory Services – Market Reports

IES undertakes detailed electricity market studies to support our clients in projecting revenue and making generation investment decisions. IES also provides advice and analytical/modelling services in relation to environmental schemes including renewable generation, pricing carbon emissions and energy efficiency schemes.

IES has recently completed two detailed market studies :

Projections of Regional Electricity and Renewable Energy Prices

STC Creation under the SRES : A Five Year Outlook

These reports are available for purchase from IES together or separately.

Advisory Services – Seminars and Training

IES provides tailored training courses and seminars. Utilising our working knowledge of the subject matter we deliver insightful and meaningful presentations on a range of topics to a range of audiences.

Forthcoming Seminars – Transmission constraints and interregional generation reserve

Due to a number of factors the IES seminar day originally planned for 21st June 2011 in Sydney has been delayed. In its place will be a seminar day on 16th August 2011 and another on 14th September 2011. Both of these will be in Sydney.

The morning session of the August seminar day will have presentations on transmission (intra and interregional) constraints in the NEM. It will address what they are, how they work, how they are and can be monitored, and how the increasing level of intermittent generation may increase the number of constraints observed.

The afternoon session of the August seminar day will have presentations on interregional generation reserve. It will address what this is and how it works, how much there is and is likely to be in the future, and how the increasing level of intermittent generation may influence the level of reserve that can be relied upon.

The 14th September seminar day may best be described as a workshop in new approaches to better represent and model security constraints and reserves across interconnectors.

Training – Introduction to Australia's electricity markets and related environmental schemes

IES has developed a two day training course taking in Australia's electricity markets – the NEM (Eastern Australia) and the WEM (Western Australia) and related environmental schemes. Topics include industry and market reform history, market design and design philosophy, market operations and outcomes. If you have a requirement for training in these markets we will be happy to discuss your requirements with you.

Energy Market Software

IES develops and sells energy market software including our electricity market modelling tool PROPHET and our market data viewing and analysis tool NEO.

For more information on our capabilities, products and services please visit us at

Iesys.com.au

Email enquiries can be directed to us at ies@iesys.com.au

Disclaimer

Please note that the articles that appear in Insider are generally written by individuals at IES and that the views expressed are the views of the individual authors and do not necessarily represent the views of IES or of other individuals at IES.