Renewable Electricity in WA: the Economic Argument

Introduction

Four of the six coal-fuelled power stations in WA reach their end-of-design life by 2019 – so it is the right time to explore alternatives. This Briefing Note explains why the best option to replace these old, inefficient generators is with wind and solar photovoltaics (PV).

Over the next 15 years, WA can transition to a 100% renewable electricity (RE) grid, with RE shortfalls met by multi-fuelled, rapid-response gas turbines. Over time, these will be fuelled by biofuels from an emerging, sustainable oil-mallee biomass industry.

There are significantly more jobs in wind, solar PV and biomass than in coal (see SEN's "Jobs Revolution" Briefing Note).

Details

Volunteers for Sustainable Energy Now (SEN) have modelled various options for providing future electricity needs in WA's South West Interconnected System (SWIS). A comprehensive range of technologies was assessed, and the optimum scenario is to replace the aging coal plants with solar PV and wind energy.

SEN's research shows that the Muja ABCD and Collie power stations can be retired by 2021, and replaced by 1,800 MW of new wind generation and 1,400 MW of new solar PV (for a total of 4200 MW of RE, including existing facilities). See Fig. 1 for indicative locations.

Figure 2 shows a price comparison of various options. These prices assume *no* Federal Renewable Energy Target (RET). The 2014 cost of coal generation was a low $91/MWh, because capital costs had been written down. The cost of building new coal and gas capacity will be $124/MWh (dashed line).

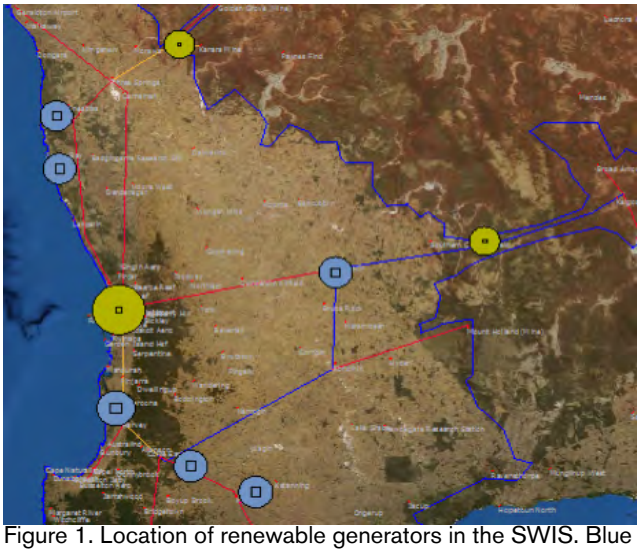

Figure 1. Location of renewable generators in the SWIS. Blue = wind, yellow = solar PV.

The green line shows a cost comparison with a staged transition to renewables, at current costs. Note that the 'business as usual' cost is estimated to rise to $98/MWh, including the refurbishment costs of the aging coal stations.

Replacing all coal generated electricity with renewables ($1.02/MWh) will be slightly more expensive than keeping the old coal stations running – 0.4c per kWh on the retail price (only 2% of the current 26c/kWh).

Other factors will see the price of electricity inevitably rise, even with 'business as usual'. This includes increasing gas prices, and the cost of buying Large-scale Generation Certificates for the RET.

Figure 3 illustrates the mix of electricity sources in a range of scenarios from the phasing out of coal to 100% RE, with various storage options (last 3 bars).

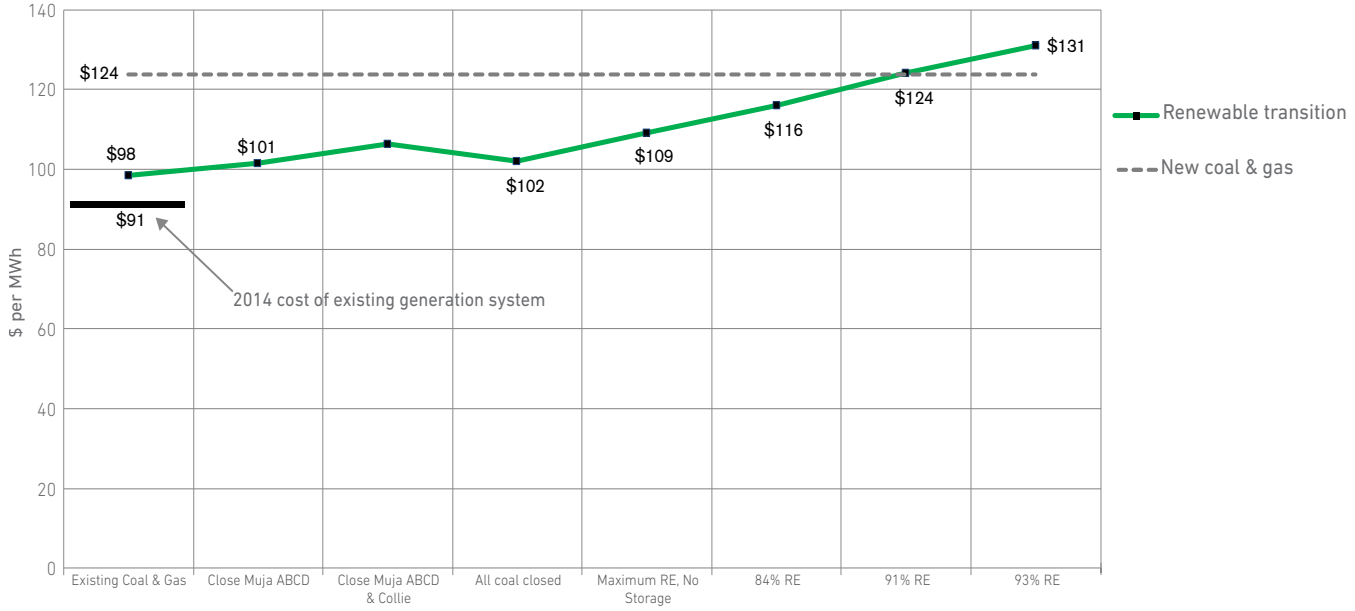

Figure 2. Price comparisons with a transition to renewables.

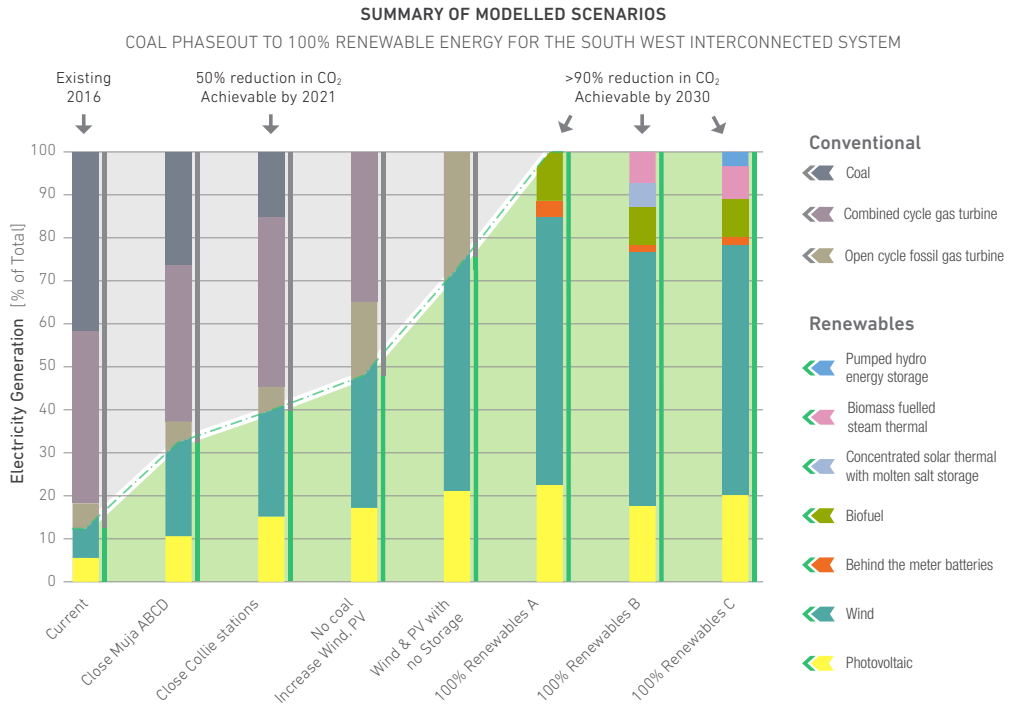

Figure 3. Summary of modelled renewable electricity scenarios.

Transition Plan

The key to an integrated and stable renewable electricity grid is a coordinated transition plan, with a complementary mix of generation and storage and supporting transmission infrastructure. The plan should enable the development of innovative business models for dispersed behind the meter generation and storage.

Energy Security will be Stronger

Renewable electricity alone can meet expected demand for most of the year. During lull periods, shortfalls in demand can be met by rapid-response, multi-fuelled gas turbines, coupled with storage such as batteries, pumped hydro and molten salt (see Fig. 3). The concept of base-load power no longer applies in a renewable electricity scenario.

With good planning, a wholly renewable grid can be more secure and respond more rapidly to grid instabilities. With many smaller wind and PV units, large reserve capacity (e.g. the existing standby coal units) is not needed. Loss of units due to failure is manageable, reducing cost of generation. Further details are provided in the “Energy Security” Briefing Note.

Government Actions

The Western Australian Government should:

* set a State Renewable Energy Target
* develop a Renewable Electricity Transition Plan
* re-establish the Office of Renewable Energy
* retain Western Power in government hands

Further details are provided in the “Role of Government” Briefing Note.

Conclusion

SEN’s modelling shows that Western Australia can transition from aging coal generation to a renewable electricity future, with benefits in employment, industry and a diversified economy, while meeting pollution emissions commitments.

The situation is like a family with an old, broken-down Holden Kingswood. They can buy a new Commodore, which is slightly less polluting, or they can buy a non-polluting, better-preforming Tesla electric car, which is actually cheaper. The choice is simple.

SEN’s Modelling

SEN’s Integrated Renewable Energy Network (SIREN) software was developed to model renewable power and storage technologies. SIREN uses NASA weather data, Geographical Information System data and the US Dept. of Energy technology models. SIREN accuracy has been verified against existing wind and solar PV generation on the SWIS.

A variety of scenarios were modelled using SIREN. These include the cost of new transmission lines. Conservative assumptions have been made about the costs of renewables, which are continually decreasing. Future changes in prices will influence the optimum mix of wind and solar PV.

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Sustainable Energy Now (SEN) is a voluntary group of some 200 members and associates, many of whom are professionals in the engineering, science, educational, business and IT fields. Its goal is to promote renewable energy in Western Australia.