

# Renewable Electricity in WA: A Jobs Revolution

## Introduction

There are significant employment benefits for the State from a transition to renewable electricity (RE): initially with wind and solar PV generation, and subsequently from the development of a biomass/ biofuel industry.

The Collie region in particular has a unique opportunity to prosper and grow by expanding into the broader energy industry including RE, rather than remaining focussed on the coal industry.

WA can transition towards 100% renewable electricity at about the same price as current coal-fired generation. This is significantly less expensive than replacing WA's aging coal-fired generators. For more details, see SEN's "Economic Argument" Briefing Note.

## New Investment and Jobs

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

SEN's research shows that the Muja ABCD and Collie power stations can be retired by 2021, with generation capacity replaced by 1,800 MW of new wind energy, 1,400 MW of new solar PV and 400 MW of biomass generation (for a total of 4,600 MW of RE, including existing facilities). Details of the predicted jobs for each technology are shown in Table 1.

Development of this new infrastructure would provide enormous, ongoing economic benefits for the WA economy (see Table 1):

- \* 37,000 job-years in construction and 6,000 job-years in manufacturing over 5 years, plus 1,400 additional Operations and Maintenance jobs.
- \* \$7.1 billion of private investment in wind and PV plus \$1 billion in new transmission lines.

## The Collie Region

The Collie community will be directly affected by the phase out of coal-fired generation. However, it can grow and prosper if some of the new RE generation is directed to the region. It is essential that this transition be done in a carefully planned way, to minimise disruption to that community.

This can be achieved through, for example:

- \* Installing 1,000 MW of wind farms, 200 MW of utility scale solar PV east and west of Collie (see blue outlines on Fig. 1), and 400 MW of biomass
- \* Creating permanent renewable electricity jobs for the community, plus initial construction and other supporting jobs
- \* Establishing local manufacturing industry for wind turbine pylons and blades, and solar panel support structures, etc.

- \* Developing a sustainable biomass/ biofuel industry

Retiring the Muja and Collie power stations and replacing them with renewable electricity would provide thousands of new jobs for the Collie region:

- \* About 400 more permanent jobs than currently in coal-fired generation
- \* Approximately 2,500 construction and 500 manufacturing jobs for 5 years

## Biomass/ Biofuel

Biomass resources, such as plantation timber waste, oil mallee timber and wheat stubble can be converted into biofuel to run rapid-response gas turbines during periods of low solar and wind activity.

Oil Mallee trees grown in the southern agricultural region (with rainfall of 400- 600 mm) do not require supplemental water and would produce a reliable cash crop for farmers. To capture these biomass resources, rail transport would need to be built between Collie and Wagin or Katanning.

An Integrated Wood Processing 1MW biomass generation demonstration plant exists in Narrogin. This showed the potential for Oil Mallee, grown on wheatbelt farms, for electricity generation, with added benefits:

- \* eucalyptus oil production
- \* biochar production
- \* potential to reduce groundwater salinity

A biomass agricultural, and related transport industry, in Collie would offer an attractive transition from coal mining, and provide a significant number of permanent jobs.

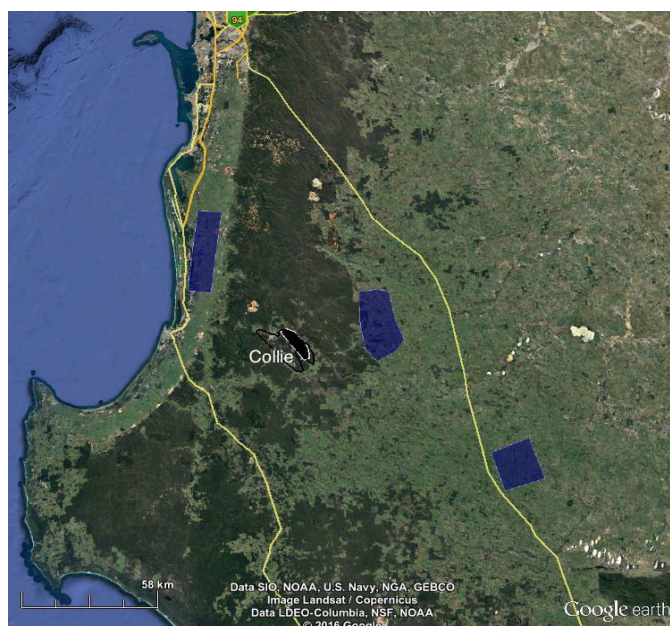


Figure 1. Proposed renewable generation locations in the Collie region (shown in blue).

**Table 1. NEW JOBS FOR WESTERN AUSTRALIA**

Technology	Capacity (MW)	Job years/MW			Total job years		
		C & I <sup>1</sup>	Manuf <sup>2</sup>	O & M. <sup>3</sup>	C & I	Manuf.	O & M
Roof-top PV	900	13	6.7	0.7	11,700	6,030	630
Utility-scale Solar PV	500	13	6.7	0.7	6,500	3,350	350
Wind Farm	1,800	3.2	4.7	0.3	5,760	8,460	540
Biomass Facility		14	2.9	1.5	5,600	1,160	600
Transmission <sup>4</sup>					7,300		
		<b>Total new jobs</b>			<b>36,860</b>	<b>19,000</b>	<b>2,120</b>
		<b>Total new jobs in WA</b>			<b>36,860</b>	<b>6,333<sup>6</sup></b>	<b>2,120</b>
Coal jobs lost <sup>5</sup>	-1,300	n/a	0.14	n/a	n/a	n/a	-672
		<b>Net full-time jobs</b>			<b>7,372<sup>7</sup></b>	<b>1,267<sup>7</sup></b>	<b>1448<sup>8</sup></b>

- <sup>1</sup> Construction and Installation (Job years/MW)
- <sup>2</sup> Manufacturing (job years/MW)
- <sup>3</sup> Operations and Maintenance (job years/MW)
- <sup>4</sup> Transmission (734 km, \$0.95 billion) – derived from: [http://www.ieso.ca/Documents/Regional-Planning/Northwest\\_Ontario/Greenstone\\_Marathon/Attachment-Transmission-Unit-Cost-Study-SNC-Lavalin.pdf](http://www.ieso.ca/Documents/Regional-Planning/Northwest_Ontario/Greenstone_Marathon/Attachment-Transmission-Unit-Cost-Study-SNC-Lavalin.pdf)
- <sup>5</sup> Pro-rata Hazelwood, 800 jobs for 1600 MW. <https://www.theguardian.com/australia-news/2016/nov/03/hazelwood-coal-power-station-to-close-with-loss-of-800-jobs>
- <sup>6</sup> Assume only one third of manufacturing jobs are local to WA
- <sup>7</sup> Per annum over 5 years - estimate of jobs in WA
- <sup>8</sup> Permanent extra jobs

## Transition Plan

The key to a just transition towards renewable electricity in WA is to develop a coordinated transition plan which addresses employment and retraining issues in advance.

Of course, the transition plan also needs to consider technical issues, to ensure a complementary mix of generation and storage and supporting transmission infrastructure that can lead to an integrated and stable renewable electricity-powered grid.

## 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.

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

Over a 15 year time scale, a transition towards 100% renewable electricity will cost less than installing new coal or gas capacity. Change in the electricity generation and supply market is inevitable.

This will provide thousands of construction and manufacturing jobs, and 1,400 ongoing operations and maintenance jobs. Electricity costs into the future will remain low, because they won't be subject to fuel price fluctuations.

SEN's research provides a roadmap to transition the Collie community away from coal-fired electricity production, while building new industry in the region.

## 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.

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.