

Overview of Australian sugar industry cogeneration

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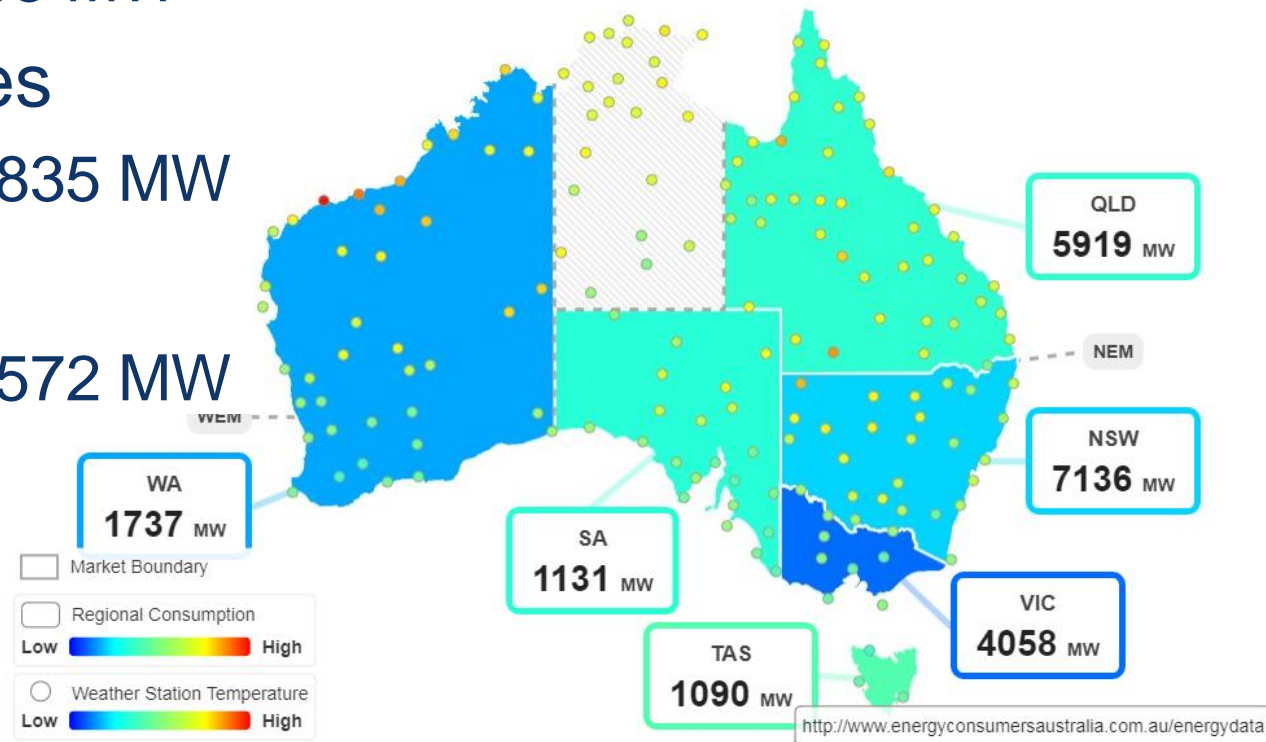
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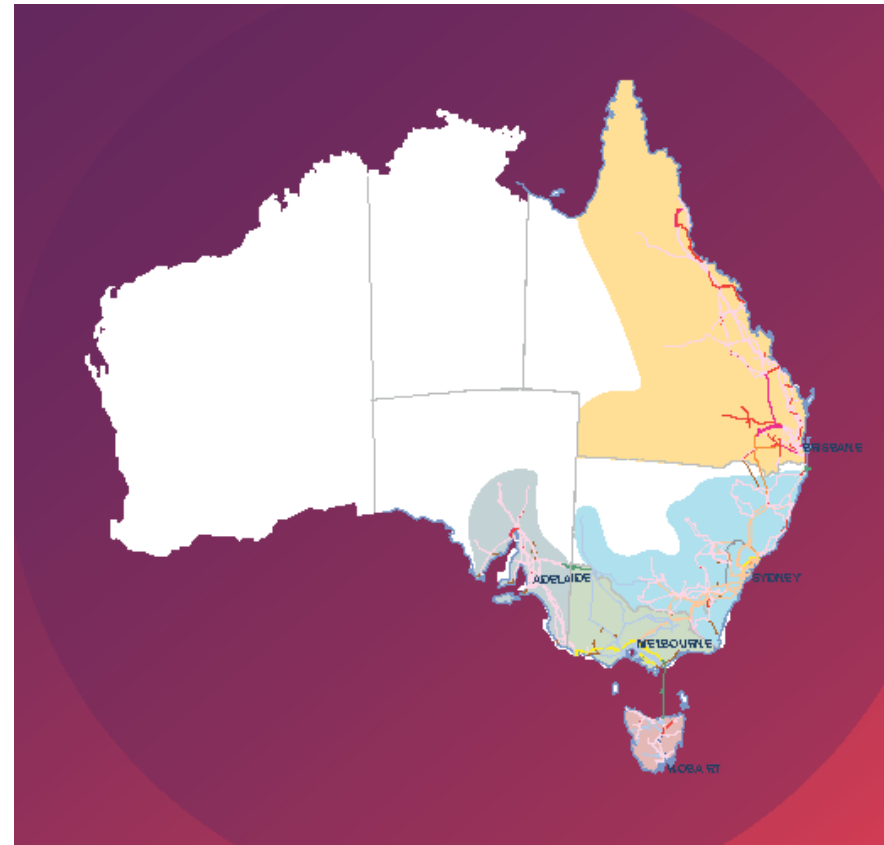
Australian electricity consumption

- Queensland
 - 4037 MW to 9605 MW
- New South Wales
 - 5114 MW to 14 835 MW
- Victoria
 - 3271 MW to 10 572 MW



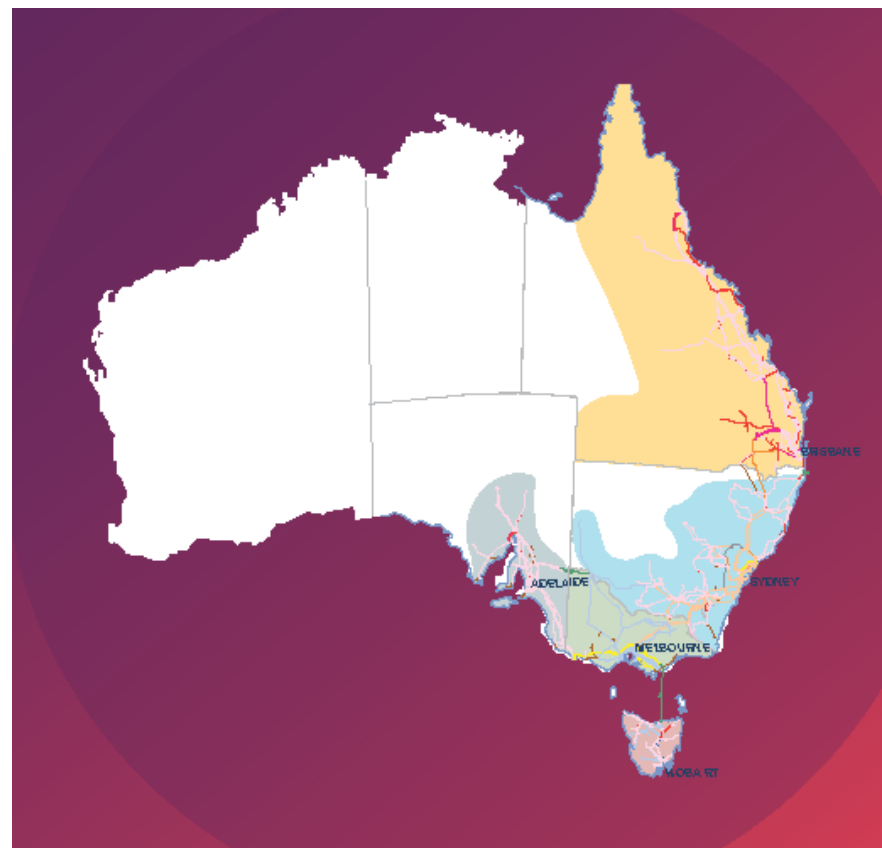
National Electricity Market (NEM)

- Operates on one of world's longest interconnected power systems
- 5000 km
- 5 interconnected regions (states)



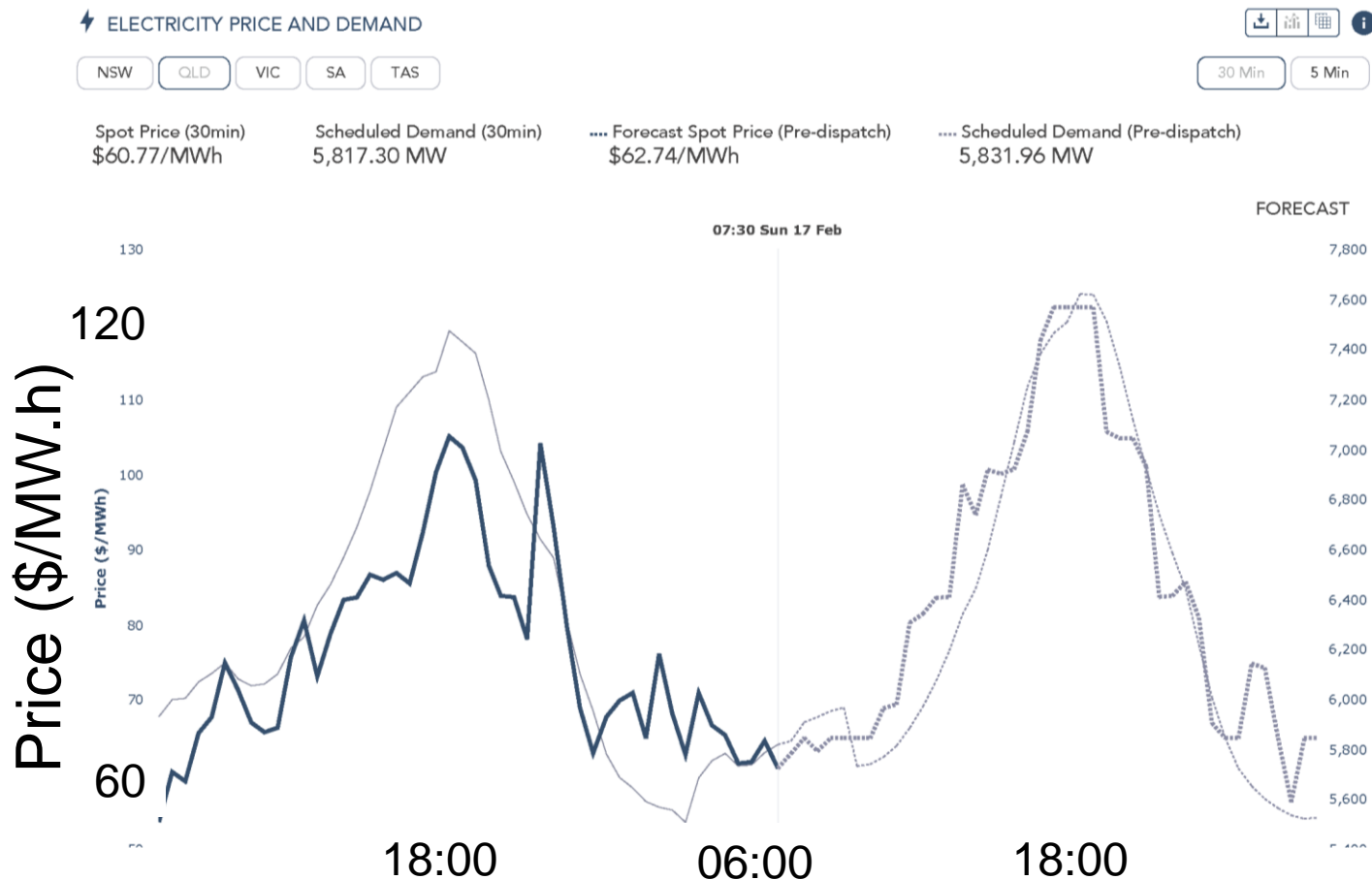
National Electricity Market

- 40 000 km of transmission lines
- 9 million customers
- Generating capacity 54 421 MW (December 2017)



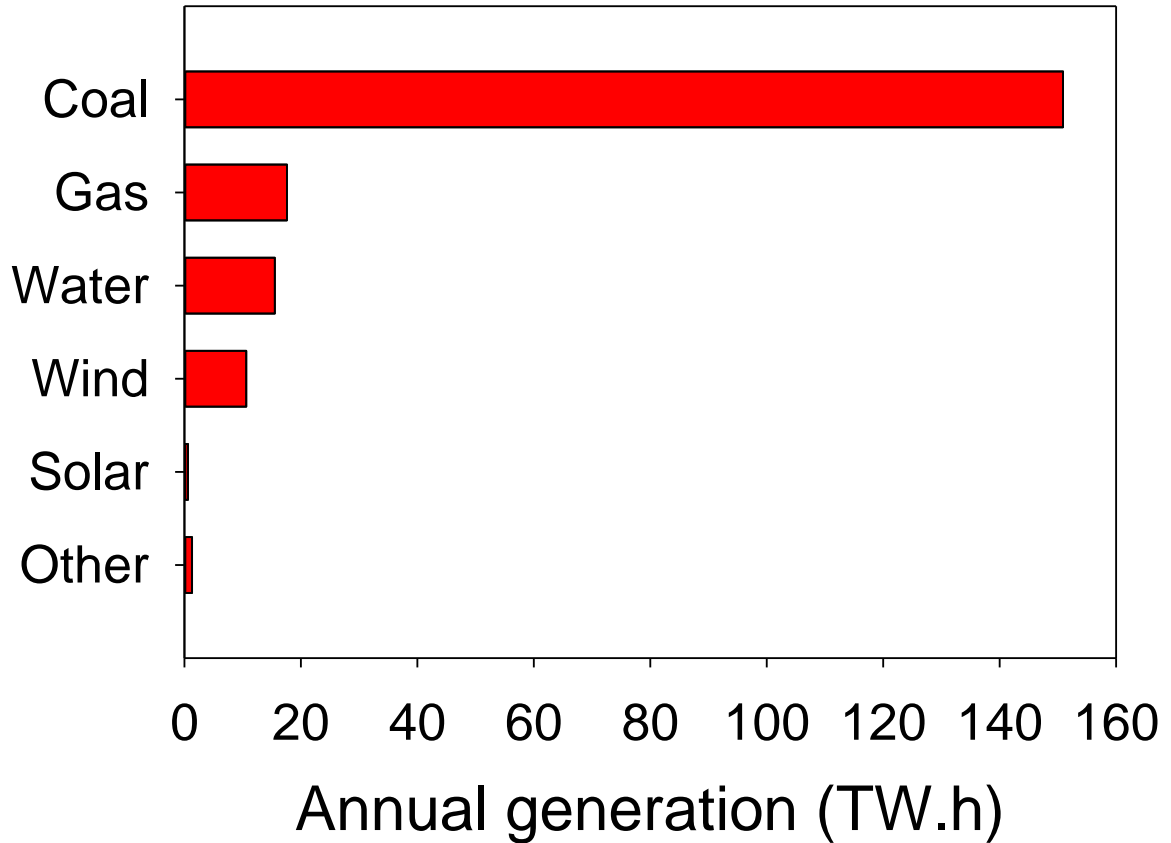
Selling electricity to the market

- Generators can obtain spot price from market



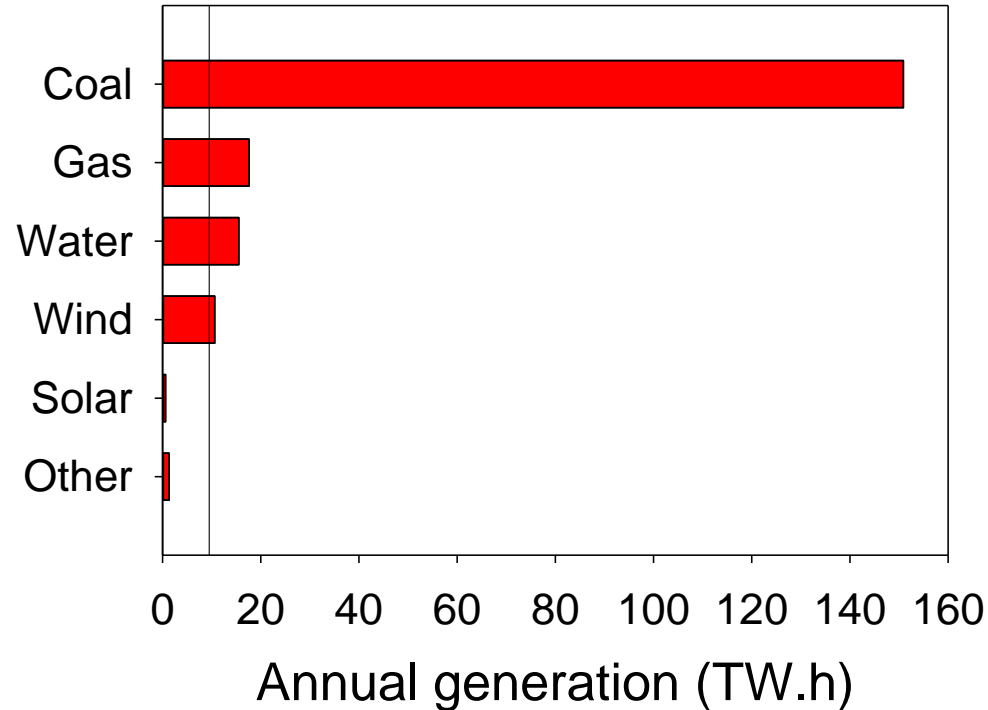
Annual generation by fuel type

- Generation from bagasse included in Other
 - 0.5 TW.h
 - About 0.3%



Renewable energy

- Australia in 2000 introduced Mandated Renewable Energy Target (MRET) of 2%
- 9.5 TW.h per annum to be generated from renewable sources from 2010 to 2020



How the scheme worked

- Renewable generators awarded Renewable Energy Certificates (RECs)
- Retailers needed to purchase RECs to meet MRET obligations
- RECs provided income in addition to electricity price
- Price of RECs varied with demand

Revenue for renewable generator

Power Purchase Agreement

REC income
1 MWh = 1 REC

Generator
income
=
\$ from NEM

Total Renewable Energy
Generator income

Rooftop solar

- In 2007, the Australian Government introduced subsidies to householders to encourage rooftop solar
 - Highly successful with over 2 million systems now installed
 - Typical size 5 kW



Rooftop solar and RECs

- Created a lot of very small renewable energy generators
- Too much administration for the existing REC system
- To simplify, rooftop solar owners were paid a lifetime of RECs on installation

The rooftop solar problem for large-scale generators

- Because of the popularity of the scheme, a lot of RECs were awarded
 - Now generate about 5 TW.h per year
- Because a lot of RECs were available, the price of RECs dropped
- As a result, large scale generation of electricity became less profitable
- Removed incentive to invest in cogeneration

REC changes

- Scheme split in two
 - Small-scale technology certificates (STCs)
 - Large-scale generation certificates (LGCs) to encourage investment in large-scale generation
- Large-scale generation target is now 33 TW.h by 2020

Other relevant target

- Queensland Government has a target of 50% renewables by 2030
 - Most of sugar industry in Queensland
- Queensland consumption now 4037 MW to 9605 MW
- Queensland renewable energy generation now 484 MW
- Potential opportunity for the sugar industry

The Australian sugar industry

- Located on the east coast of Australia
- Well placed to supply the Queensland and New South Wales markets



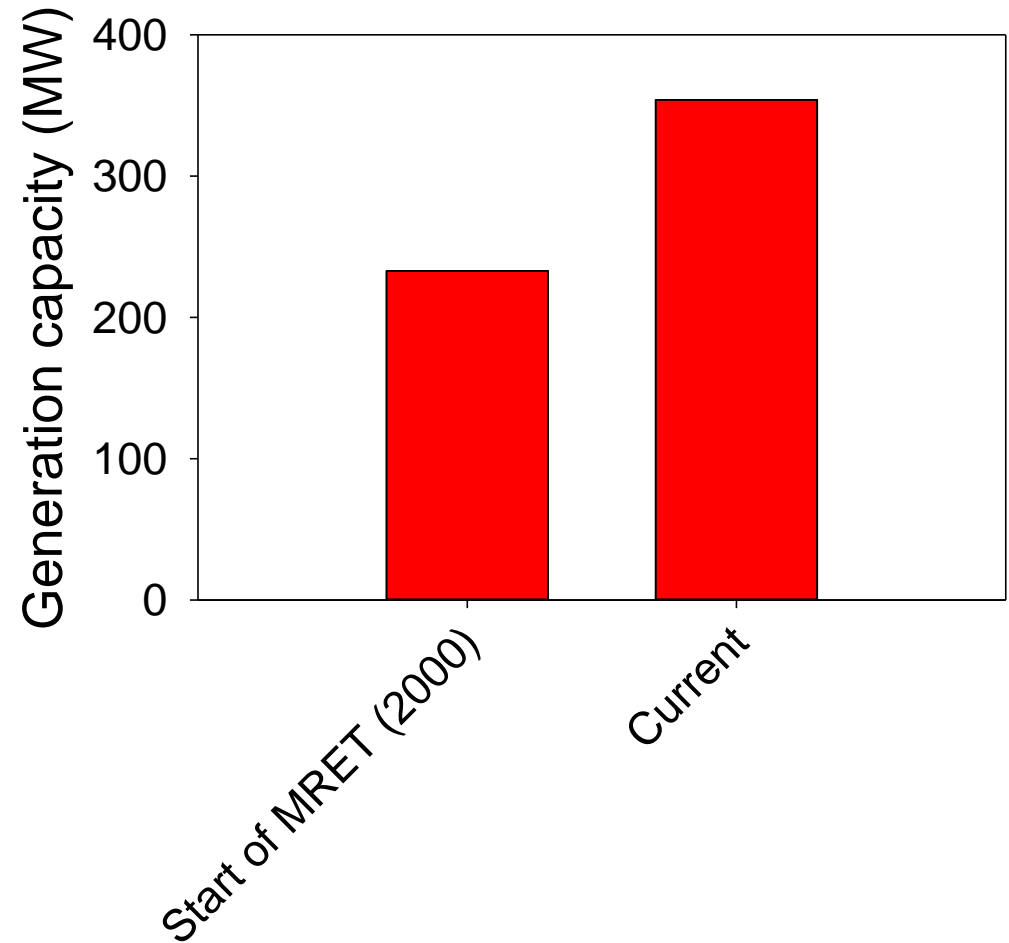
Sugar industry generation

- Australia's sugar mills generate electricity for their own use and export to the National Electricity Market



Sugar industry cogeneration growth

- 52% growth under MRET





FAR NORTH QLD

Existing capacity - **71MW** (installed) **31.5MW** (export)



NORTH QLD – HERBERT / BURDEKIN:

Existing capacity - **180MW** (installed) **120MW** (export)



MACKAY / PROSERPINE – CENTRAL REGION

Existing capacity - **110MW** (installed) **53MW** (export)



WIDE BAY BURNETT – SOUTHERN REGION

Existing capacity - **60MW** (installed) **30MW** (export)



NORTHERN NSW

Existing capacity - **75.5MW** (installed) **54MW** (export)

Recent capacity



FAR NORTH QLD

Tableland 24 MW (2019)

Powers all of Tableland region

CENTRAL REGION

Racecourse 38 MW (2013)

Powers 30% of Mackay



Recent cogeneration plants

- Racecourse (\$120 million)
 - 150 t/h, 80 bar boiler
 - 38 MW condensing/extraction turbine
 - Using coal as supplementary fuel
- Tableland (\$75 million)
 - 87 bar boiler
 - 24 MW turbine
 - Examining agave as supplementary fuel



Racecourse





Mackay
Sugar

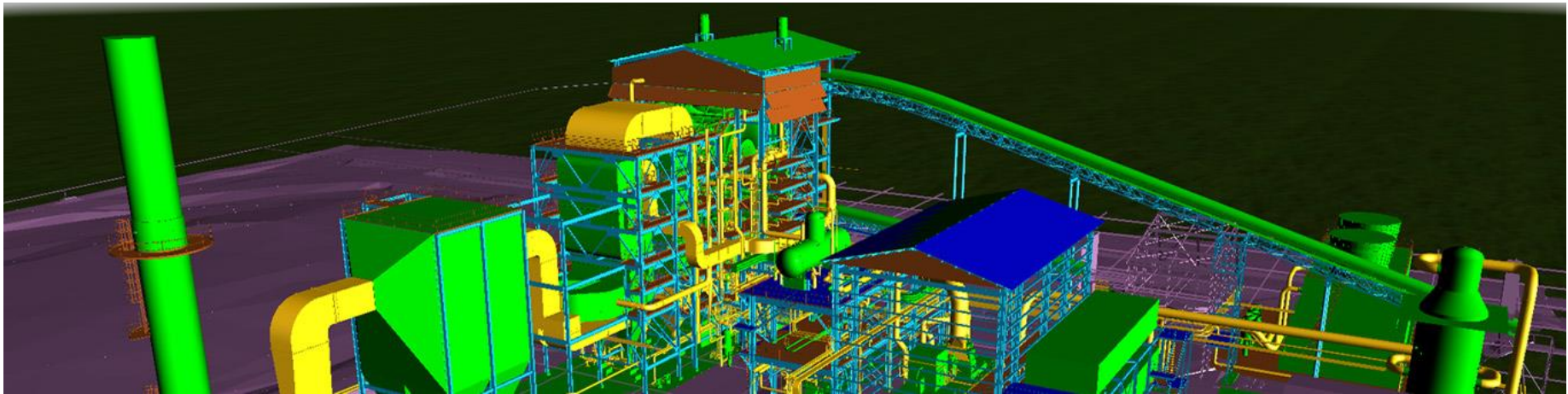
Racecourse bagasse storage

- 130,000 t stored for 13 weeks in off-season



Tableland

- Currently being commissioned



Cogeneration efficiency

- Average 0.20 MW.h/t cane
- Industry best practice 0.57 MW.h/t cane
- Efficiency largely a function of boiler pressure

Current prices

- Average spot price \$82 / MW.h
- Average LGC price \$36 / MW.h
- Not enough to encourage new investment

Final remarks

- The growth of sugar industry cogeneration in Australia is very dependent on Government policy
- Support for renewable energy is expected to grow
 - Solar and wind energy appear to be favoured
- It remains difficult to justify expansion in sugar mill cogeneration