Contact:
Bioenergy Australia (Forum) Pty Ltd
ABN 14 155 856 821
Renewables Innovation Hub
19/23 Moore street, Turner ACT 2612
Phone: 0439 555 764
Email: shahana@bioenergyaustralia.org.au

BIOENERGY AUSTRALIA SUBMISSION

Inquiry into Microgrids and Associated Technologies in WA

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The purpose of this submission from Bioenergy Australia is to highlight the role of bioenergy as a stabilising element in the renewable energy supply system.

About Bioenergy Australia

Bioenergy Australia was established in 1997 to foster and facilitate the development of biomass for heat, power, liquid fuels, and other value-added bio-based products. Bioenergy Australia is the non-profit Industry association supporting the bioenergy sector.

We are committed to accelerating Australia's bioeconomy. Our mission is to foster the bioenergy sector to generate jobs, secure investment, maximise the value of local resources, minimise waste and environmental impact, and develop and promote national bioenergy expertise into international markets.

Australia currently lags behind the world when it comes to bioenergy, and we aim to change that. We empower, share knowledge, and connect Australian bioenergy producers, investors, researchers, and users to make Australia's bioeconomy world-class.

Renewable energy sources for grid integration

Low carbon energy targets and policy are driving renewable energy to markets. With wind and solar playing a dominant role in the energy transition, the integration of these intermittent energy sources with the electricity supply grid places significant pressure on grid operation and management. While considering solutions and strategies in balancing the grid, bioenergy, in its various forms, can provide significant system support roles.

Intermittent and uncontrollable renewable energy supply system

The supply of electricity from the wind or sun cannot be controlled, reliably predicted or managed to meet peak demands for firming supply. Furthermore, the renewable electricity from wind or solar is often provided in times when demand is low and the electricity has to be stored or wasted. There is a growing market need to create solutions for industrial scale, cost effective electricity storage capacity. The energy market transformation to provide capacity optimized system is required when the share of intermittent or uncontrollable electricity becomes large. Despite the significant regional differences in solar and wind resources, the fast declining production costs of solar and wind power

will further drive and accelerate the need for transformation. In this kind of future energy system, energy will not be the limiting factor, but rather security of supply will be the critical requirement. Conventional dispatchable energy production will be pushed out of the market due to higher operating costs, thus being dispatched less frequently; and thereby, becoming even more unprofitable due to low operating hours. Price fluctuation will increase, and capacity-based market instruments will most probably be introduced to address security of supply.

Bioenergy as stabilising element in the renewable energy supply system

Bioenergy can be used to relieve the pressure on system level management of the grid by making the grid more stable. However, so far little attention has been paid to the possible role of bioenergy as an effective, low carbon and low-cost grid management and energy storage option.

According to the "Renewables 2017 Global Status Report", bioenergy is currently the major source of renewable energy (used for electricity, heating and biofuels) in the world, while wind, solar and geothermal are the fast-growing alternatives. The role of wind and solar in electricity production will increase more rapidly compared to other renewable sources. However, bioenergy, in its various forms, can contribute to balancing the electricity grid, including as one form of solar energy storage. Integration of bioenergy into the grid for balancing or storage will open completely new application areas for bioenergy ranging from operation during peak demand to other services needed to maintain a reliable and secure renewable power supply with low environmental impact.

Existing bioenergy assets for grid balancing

Bioenergy can play a role in balancing the grid through a wide range of possible technical options, including:

- Biogas

Biogas is of interest for grid balancing as it is used in gas engines and gas turbines which have a quick response time, are able to be cold-started and come to load within 10 minutes and endure ramp rates of up to 40%. The production of storable biogas for electricity generation to balance the grid using power to gas technologies is an important future technology that can be deployed in microgrids.

- Bioliquids

Liquid biofuels, such as biodiesel (FAME), vegetable oil (VO) and pyrolysis oil (PO), ethanol, methanol and FT diesel, etc. are of interest for grid balancing as they are storable and can be used as required, decoupled from their manufacture. Such fuels can in principle be used in both engines and gas turbines as well as in boilers for heating applications. However, such use is limited to FAME and VO in engines at present.

- Solid biomass

Solid biomass is mostly used in stationary heat and power generation and especially in relation to combined heat and power generation. Solid biomass can be used as co-feed along with other fuels or also in boilers capable of firing up to 100% biomass.

- Biomass in district heating and industrial CHP systems

In relation to the electricity grid, a district heating system typically is not served by a CHP plant alone. Generally, it also contains other production units that are used for base-load, such as waste incineration and industrial waste heat (if either is available). To complement such units, there are in addition heat-only boilers fired with fuels such as forest residues, wood pellets, bio-liquids and fossil oil, as well as heat pumps. These can be used for peaking in the winter period and for balancing the demand during the summer periods.

Successful examples around Australia

Bioenergy technologies are already commercially available and widely applied at various size ranges and locations as stabilising elements of the grid. A few examples relevant to microgrid application are described below.

- SA Water (SA)
  The first Australia's co-digestion facility was constructed in 2013 at the Glenelg Wastewater Treatment Plant in Adelaide, following the completion of a research program conducted by SA Water. Regular tanker loads of industrial waste are received at the plant to boost biogas production and hence power generation for use onsite. The implementation of co-digestion has been a success with an increase in the amount of power generated from an average 55% up to an average of 75%, without negatively impacting on the process. SA Water manages two more wastewater treatment plants at Bolivar and Christies Beach. The treatment plants across Adelaide capture enough methane to create 15 gigawatts per hour of power per year. That's about half of all of the energy needs for all three plants, leaving a decent amount of electricity available for grid integration.
- Sydney Water (NSW)
  Sydney Water is turning food waste into energy, producing additional energy onsite, across all its wastewater treatment facilities. The waste from local businesses is liquefied in a giant blender-like machine, before being trucked to the Cronulla wastewater treatment plant. The waste is converted to methane gas by anaerobic digestion. The gas is then fed to an engine which produces electricity. Sydney Water currently generates more than 20 per cent of its total energy needs across its network and also exports six gigawatt hours (GWh) to the electricity grid over a year. This method also makes a positive contribution to reducing facility operating costs and reduces greenhouse gas emissions.
- Yarra Valley Water (VIC)
  In an Australian first of its kind, Yarra Valley Water, has constructed a waste to energy facility linked to a sewage treatment plant. The facility provides an environmentally friendly disposal solution for commercial organic waste. The waste is delivered by trucks from commercial waste producers, such as markets and food manufacturing. As well as helping to keep organic waste out of landfill, it is also helping to make recycling commercial organic waste easier and more affordable for businesses. The waste to energy facility sits next to an existing sewage treatment plant in Aurora and is expected to generate enough biogas to run both sites with any surplus energy to be exported to the electricity grid.
- Portland (VIC)
  Portland has become a renewable energy hub with projects using the following alternative power generation technologies: wind, wave, geothermal, biomass, biochar and LNG. In relation to biomass from wood pellets the Glenelg Shire Council has approximately 25 per cent of the state's pine plantations. In addition, biochar from organic waste for cogeneration and liquid natural gas are alternative fuels.
- Richgro (WA)
  Richgro, with Biogass Renewables, has built an anaerobic digestion facility in Jandakot which takes in commercial waste and produces methane to drive electricity generation and products which can be used to enrich compost. It has the capacity to produce up to 2 megawatts of electricity and 2.2 megawatts in heat. That energy is now being harnessed by Richgro's operations to power equipment, with the surplus exported into the Western Australian electricity grid. Excess heat is channelled into the site's hothouses, where blueberries are grown, leading to a new revenue stream for the business. The digestate by-

product from the plant can be used as a raw material in Richgro's garden products. Over a 20-year lifespan, it's also expected to save 142,722 tonnes of carbon dioxide emissions.

As these examples are showing, bioenergy is a proven technology, able to balance the grid and which doesn't require further research. Therefore, WA has great opportunities to further develop this energy approach.

Opportunities in WA

The previous successful projects illustrate that anaerobic digestion and distributed bioenergy electricity generation systems has the potential to be a good complement to firm solar and wind particularly in isolated communities. All communities produce extensive amounts of waste and locally sourced biomass.

In evaluating the chances to succeed for a bioenergy project in a specific area, feedstock availability needs to be considered. Organic waste is already produced and readily available on a continuous and reliable basis. This may often need to be supplemented by use of other sources of biomass. The main potential supplementary bioenergy resources are cellulosic feedstocks including woody biomass energy crops (principally oil mallees); crop and livestock residues (straw, husks, stubble and manure) and sustainably harvested forestry residues, including plantation residues. Residues from food processing and waste water treatment plants are also important waste streams. Fortunately, WA is blessed with sustainable biomass resources, therefore the feedstock is guaranteed.

In some areas there will be adequate residual biomass available that it could be combusted to produce heat and electricity. This is done in Queensland where bagasse from the sugar industry is used as a fuel. Similar opportunities will occur throughout WA.

Collie could be a promising centre for biomass energy generation, being identified by the Australian Greens as one of five regional sites in Western Australia for renewable energy development. Specifically, coal fired power stations can be converted to biomass by replacing the pulverised-coal boilers with fluidised-bed boilers, which are suitable to burn both coal and woody biomass.

In a bid to become Australia's first city powered solely by renewable energy in the next eight to 10 years, the City of Albany is another example where bioenergy could play a role in the development of a self-sufficient energy network. Together with a wind farm at Sandpatch and wave energy technology, biomass represents a reliable renewable energy option, because there are offshoots from the timber industry in the area. A waste-to-energy plant could therefore form part of Albany's future grid. Dardanup and Bunbury areas are other great aggregators of woody residues that could host a bioenergy hub.

Finally, Westpork, WA's largest pork producer, is a good example of large energy users turning to wind, solar and storage to offset the soaring cost of (fossil-fuel dominated) grid power and be able to rely on 100% renewable energy sources. As already successfully operating in other piggeries in Australia, biogas could be a significant component of the project for energy storage.

These are just a few examples of real opportunities for bioenergy to play a significant role in grid integration in WA, and more can be found if steps are taken in this direction.

Conclusions

In the context of increased variable renewable electricity from wind and solar, biomass resources have the potential to play a major role in balancing the grid by diversifying energy sources, supplying additional energy during peak demand and, most importantly, storing energy excess. Bioenergy technologies should therefore be supported as stabilising element in the renewable energy supply system.

Yours sincerely

Shahana McKenzie
Chief Executive Officer
Bioenergy Australia