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BIOENERGY AUSTRALIA SUBMISSION

Northern Queensland Renewable Energy Zone

Bioenergy Australia is the national industry association 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.

The recent development of a national Bioenergy Roadmap by the Commonwealth Government is a critical achievement for the industry. Due for release later this year, the Bioenergy Roadmap clearly identifies the role that the bioenergy sector can play in accelerating Australia's clean energy transition, and the investment signifies the validity and potential value of the Australian bioenergy industry. It will highlight the significant opportunity presented by biomethane to decarbonise Australia's gas networks. We trust that when released, the Bioenergy Roadmap will be a valuable resource to inform the development of Queensland's renewable energy zones.

We thank the Queensland Government for this opportunity to respond to the development of the Northern Queensland Renewable Energy Zone (NQREZ). With its abundant feedstock for bioenergy, Queensland is in the enviable position to become an exemplar, demonstrating to the rest of the nation what is possible by driving a renewable energy economy. We are eager to support Queensland in this worthwhile endeavour.

The purpose of this submission from Bioenergy Australia is to highlight the substantial role bioenergy can play in Queensland's efforts to transition towards 50% renewable energy by 2030 and to explore the policy instruments required to activate bioenergy as part of Queensland's renewable electricity solution, including through contribution to the NQRZE.

In this submission we will examine:

1. The opportunity to firm up intermittent renewable power generation in the NQREZ using bioenergy
2. The role that NQREZ bioenergy hubs can play in promoting bioenergy fuels that can decarbonise electricity generation in remote areas
3. The benefits that bioenergy can provide to regional development, including income diversity for the North Queensland agricultural industry
4. Some of the barriers associated with bioenergy in QLD
5. Examples of bioenergy in action

We will then explore potential policy instruments required to activate a bioenergy industry in Queensland, including:

6. Grant funding support to establish bio hubs
7. Incentives for renewable 'firming' generation
8. Development of a QLD Green Gas Target
9. Removal of barriers to producing bioenergy

Firm-up renewables in the NQREZ using bio fuelled electricity generation

Bioenergy is typically produced from biomass residues and waste materials from primary and secondary production sectors. Bioenergy, in relation to electricity generation, includes electricity generation from biogas (landfill gas or biogas produced through anaerobic digestion) and the combustion of biomass residues such as sugarcane residues, agriculture waste, construction, or municipal wastes. With wind and solar playing a dominant role in the energy transition, the integration of these intermittent energy sources with the supply grid places significant pressure on grid operation and management. The supply of energy from the wind or sun cannot be controlled, reliably predicted, or managed to meet peak demands for firming supply. On the contrary, electricity produced from biogas or biomass is dispatchable, therefore strategic use of bioenergy can provide much-needed grid stability to enable further uptake of variable renewable generation to decarbonise the energy system.

Bioenergy projects include the production of biomethane, a renewable gas that is identical in chemical composition to natural gas, as well as biofuels, including ethanol, methanol and biodiesel. These clean energy fuels can be used in on-call power generation and be used to store renewable energy for utilisation in conventional thermal generation. This allows bioenergy to firm up intermittent, renewable generation with green, on-call, generation inside the NQREZ.

Utilisation of organic waste to produce energy can play a central role in the national transition to a circular, low carbon economy. The creation of biofuel from bioenergy, such as biomethane, bio-CNG, ethanol, methanol and renewable diesel can be used to displace a proportion of transportation fossil fuels. This activity not only helps to decarbonises the transportation sector, but could bolster national fuel security through local manufacturing of biofuels which can displace imported fossil fuels. In 2017, a Deloitte Access Economics report found that 371 PJ p.a. of bioenergy could be available from organic waste residues across Australia.[1] Hypothetically, if 25% of this resource were to be converted into a biofuel it could provide enough renewable fuel storage to firm-up 13 GW of renewable generation across the country.[2] This equates to approximately 25% of the total installed capacity in the National Electricity Market (NEM) and offers a sustainable energy solution when variable sources like wind and solar are not available.

Additionally, biomethane can play a key role in the decarbonisation of the gas network, as it can reduce carbon emissions in industries that rely heavily on natural gas for heating, reforming, refining and conventional gas-fired power generation.

Further, bioenergy has an important current and future role in delivering essential system services. Given that bioenergy is a renewable source of energy with a stable generation output, it is essential that the design of the NQREZ considers the role bioenergy can play.

While considering solutions and strategies in balancing the grid, bioenergy - in its various forms - can provide significant system support roles as it is unique in its ability to provide synchronous, baseload and dispatchable renewable electricity. Storable bioenergy (biomass and biofuel) can be considered a type of "green battery" with very high energy storage capacity, which is unaffected by temperature and indefinitely retains its charge.

Support regional development and diversify income streams of the agriculture industry

The development of a strong bioeconomy can provide skilled employment opportunities to regional areas and stimulate economic development through the delivery of revenue streams outside traditional agriculture, forestry, and waste sources. The CEFC report "The Australian bioenergy and energy from waste market" estimates that bioenergy has the potential to attract at a minimum $3.5-$5 billion investment, mostly in regional economies and the Infrastructure Partnerships Australia report "Putting

[1] Deloitte Access Economics, Decarbonising Australia's gas distribution networks, November 2017.
[2] Based on a heat rate of 8.0 GJ/MWh and capacity factor of 10%

waste to work" showed the investment opportunity in Energy from Waste (EfW) of $8.2 billion to $13.7 billion by 2030. As highlighted in the report "Bioenergy & Sustainability: bridging the gaps", bioenergy can play a key role in enhancing self-sufficiency in terms of fuel security, manufacturing, and grid stability. A 2019 IRENA report highlighted that bioenergy creates three times more ongoing jobs than conventional wind and solar. This highlights the importance of bioenergy to regional areas as it supports local jobs using equipment largely manufactured from local industries and provides ongoing employment to workers long after construction has been completed.[3] Waste residues used for bioenergy production attract royalties to local waste companies and agricultural industries. Given that 86% of the available bioenergy resource is derived from agriculture[4], these royalties can be passed onto Queensland farmers and agri-businesses that participate in bioenergy projects.

Bagasse, a biodegradable fibre that remains after sugar-cane stalks are crushed for juice, is readily available as a feedstock in Northern Queensland. Estimates show there is potential for 3.5 million megawatt hours of electricity to be generated from the more-efficient utilisation of existing bagasse ~~as a~~ feedstock – that's enough excess power to supply over 550,000 homes. Mechanisms to support ongoing and increasing utilisation of sugar waste as a base load and dispatchable form of bioenergy creation would serve to provide an additional income stream for Australia's sugarcane industry, creating a resilient buffer against the challenge of fluctuating sugar prices.

The Pentland Bioenergy Project between Charters Towers and Hughendon, having secured $3 million from ARENA, is understood to be nearing financial close, though the project has been in development a number of years.

The process of converting biomass to heat and/or power is compatible with existing infrastructure and energy system, therefore bioenergy is a fantastic option for transitioning to a renewable grid in a stable and managed way. For example, a significant level of co-firing of biomass can be achieved within existing coal-fired power stations with minimal infra-structure change. The process of converting biomass to biomethane for injection into the North Queensland gas pipeline, provides two opportunities for North Queensland. Firstly, it increases the availability of gas into the region which has largely been monopolised by a single producer of CSG in the Bowen Basin. Secondly it introduces renewable gas, which has the same composition as CSG, into the gas systems. This provides an opportunity to decarbonise the NQ gas system without imposing blending technical constraints (in contrast to the 10% H2 blending limit). This gives NQ gas industries, including industrial processes (i.e. ammonium nitrate) and power generation, opportunities to decarbonise and add green firming power

[3] IRENA, *Renewable Energy and Jobs. Annual Review,* 2019
[4] Deloitte Access Economic report, 2017

to the NEM (i.e. Yabulu Power Station). In the future, this region could supply green gas to southern and central QLD gas infrastructure, and potentially this bioenergy resource can be exported into international markets using QLD's existing LNG terminals.

The creation of bioenergy within the NQREZ will help facilitate these emerging opportunities. This bioenergy hub will create the foundation infrastructure that will help service diesel displacement opportunities in isolated power stations by utilising and transporting biofuel into remote power generation applications. Bio-CNG, biodiesel or biomethanol can be used to displace diesel powered electricity generation. These examples of co-benefits associated with the NQREZ biohub will ultimately support QLD in decarbonising its electricity, remote power, natural gas and heavy transport industries.

Bioenergy in action

There are great examples of bioenergy projects across Australia and internationally that illustrate the opportunities that are available from bioenergy. These proven technologies and existing models of bioenergy production could be deployed in the NQREZ.

Cape Byron Power is an example of 100% biomass to renewable electricity. It uses the following fuels that are 100% federally accredited renewable energy fuel sources that comply with Australia's United Nations' obligations under the Kyoto Protocol and Paris Accord:

- Bagasse – the plant fibre left over from the sugar cane harvest each year after the cane juice has been removed by the sugar mills.
- Energy Crops – such as the wood and plant fibre from purpose-grown crops (e.g., plantation forestry, sweet sorghum, desmanthus).
- Wood waste – waste timber from sawmill offcuts or from local weed removal (e.g., Prickly Acacia) that has no other economically beneficial use.
- Approved Clearance – the waste fibre left over from already approved infrastructure projects being undertaken in the local area such as new roads, dams, transmission lines and subdivisions that has no other economically beneficial use.

Cape Byron power stations in the Northern Rivers region of New South Wales (NSW), together generate enough renewable electricity to supply around 60,000 homes, which is roughly equivalent to the total numbers of homes in the Northern Rivers region. In the local area, Cape Byron Power lowers the risk of power blackouts for the local community and displaces the need to import large amounts of electricity into the local area from coal-fired power plants far away from the Northern Rivers, reducing the cost of excessive line losses.

In addition, the Tableland Green Energy Power Plant in Queensland (QLD) converts 100 per cent renewable sugarcane fibre into green energy. The power plant produces 24 megawatts of electricity – enough to power 26,280 homes – which is the entire population of the Tableland region.

MSF Sugar are developing blue agave plantings with a view to sugar and biomass being used for energy, as well as supplementing bagasse fuel supplies at their Tableland Green Energy Power Plant.[5]

In the Hunter region of NSW, the Redbank power station will be the largest biomass fired power plant in Australia once it is restarted. It has the capacity to generate a maximum of 151 MW gross power and is capable of supplying power to 250 000 homes. The feedstocks for this project include forestry and sawmill residues, uncontaminated wood waste from pre-consumer manufacturers, residues from cultivated burned forests, wood waste from approved clearings for infrastructure projects and other Environment Protection Authority (EPA) approved biomass from construction and demolition waste.

Redbank and its FiCirc Fluidised bed technology is an ideal base load station providing reliable power. Due to the large volumes of biomass required and distances involved for transportation of the fuel, it will be necessary to have incentives and rewards for dispatchability and reliability as a base load station, for its continued existence and grid support. Hunter Energy's ultimate goal is to develop Redbank into a green energy park where the existing biomass fired power plant will generate approximately 1 000 000 MW hours with net zero emissions and a saving of 943,023 GHG emissions (tCO2-e/y) by not burning coal tailings. This will be enhanced by a solar farm installation, gas turbines utilising waste mine gas and a battery storage system (electrical or thermal storage) to complete its portfolio. This will be a major establishment capable of supporting grid system stability and reliability that should be incentivised.

Development of biomass-to-power is well advanced worldwide, including in Brazil, China, India, Japan, and Canada, but is most developed in central and northern European countries. There, bioenergy including biopower is playing a major role in achieving national goals of transitioning towards 100% of consumed energy coming from renewable sources and achieving zero net greenhouse gas emissions.

Presently Finland is the leader in percentage of power from biomass, where it provides over 14% of electricity consumed, with much of this produced and used within the pulp and paper industry. Denmark, with 12% of power already from biomass, is increasing this share towards 15%, as the remaining large coal-fired plants are converted to being fired with biomass, and new biomass combined-heat-and-power (CHP) plants are built. Other EU leaders in biopower include Austria, the UK, Germany, Spain, and Sweden. Lithuania is an example of a country reliant on nuclear and imported

[5] https://www.msfsugar.com.au/tableland-green-energy-power-plant/

natural gas until about 2000, but that now is expanding generation from biomass towards supplying 12% of power demand (and 50% of heat needs) by 2030. Sweden is also lifting power from biomass capacity to help prevent shortfalls in supply as remaining nuclear plants are closed.

In Japan, Chugoku Electric is one of a number of companies building dedicated new coal / biomass fired power plants. The Chugoku plant has a capacity if 1000MW. 500MW of this will be generated from the combined coal / wood pellet plant.

There may be an opportunity to explore the transition of coal-fired power to biomass and/or co-firing with biomass with progressively increasing proportions of biofuel (wood pellets, cane pellets etc) in Queensland. There are a number of biomass pellet production projects either proposed or operation throughout Queensland, with renewed focus on sustainable sourcing of biomass pellets to supply demand in Japan and other overseas markets, reducing the carbon footprint of their existing power stations. Mt Isa Townsville Economic Development Zone (MITEZ), with funding from Qeensland Department of State Development, commissioned a high level scoping study in 2019 that investigated removal of Prickly Acacia (a woody weed) and establishment of irrigated biomass energy crops in the MITEZ region, to produce biomass fuel pellets for export from Townsville. A number of parties have since been exploring viability of removing Prickly Acacia in the Flinders region, with a view to pelletising the harvested biomass for biofuel (wood pellet) production.

A significant percentage of power is also being produced in many countries by anaerobic digestion of putrescible wastes, with the biogas produced fuelling gas engine-driven generators. Germany sources over 5% of its power from this source, and France, the UK, South Korea, China, and Qatar are among the many other countries that have developed this technology at scale. While putrescible waste is largely diverted from entering landfill in most EU countries the extraction of landfill gas to produce power continues in countries, including Denmark and Sweden, where landfilling waste has effectively now ceased.

In Australia, the Malabar biomethane injection project will demonstrate the process of upgrading biogas to biomethane for injection into the Jemena gas distribution network. The biogas produced from the anaerobic digestion process at Sydney Water's Malabar wastewater treatment plant uses its existing infrastructure and then goes on to utilise the new gas cleaning and upgrading equipment prior to injection into the distribution network. The project investment is $14 million, with $5.9 million of this funded on behalf of the Australian Government by the Australian Renewable Energy Agency (ARENA).

These examples demonstrate the potential opportunities that existing and proven technologies and industries can provide the NQREZ. Emerging technologies in overseas markets, such as biofuel and biomethane production, can be deployed in Australia and this may provide dispatchable electricity generation using bioenergy resources. These foundation projects can be utilised for the benefit of the NQREZ, and leveraged to co-benefit other energy sectors, including remote power, transport and NQ natural gas system. In addition, regional employment will benefit as traditional coal-based jobs are afforded opportunities to work within the bioenergy supply chain. In 2018, 11 million people were employed globally in the renewable energy industry. Bioenergy represented the second largest employer with approx. 3.2 million people working in the bioenergy supply chain.[6]

Support mechanisms to maximise Queensland's green energy potential:

Fund the development of regional biohubs

Bioenergy Australia encourage the Queensland Government to implement a grants program to support feasibility studies for the development of biohubs.

A biohub is a facility where organic waste industries and bioenergy producers cooperate to create scale and generate the highest value form of bioenergy from available resources. In some cases, critical infrastructure is needed to establish a bio-hub, including supply chain logistics, electricity connection capacity, and gas pipeline infrastructure.

Inputs can come from waste-water treatment plants, agribusiness, and organic and municipal waste. Biohubs support recycling waste into higher value uses and facilitate:

- A diversion of waste from landfill
- Generation of reliable and dispatchable renewable energy
- Production of non-fossil based fuels, including biomethane, and bio-products such as chemicals, plastics and fertilisers
- Regional economic development and job creation.

In accordance with the waste hierarchy, waste should be recovered for its highest order use wherever it is economically feasible to do so. Biohubs provide an opportunity for increased scale that is required to ensure projects can be financially sustainable. Policy interventions, such as an increase in the waste disposal levy to align with most other states at $150/t, would encourage diversion of landfill organic

[6] World Bioenergy Association, *Global Bioenergy Statistics*, 2019.

waste to biohubs. Similarly, providing incentives to agri-businesses and farmers to divert organic waste into bio-hubs would greatly increase the availability of organic waste for bioenergy production.

The South Australian Government has led the way on these types of grants that have proven to be highly successful.

A report was commissioned by Jacobs in 2015 to examine the full suite of bio-organic energy use across the state.[7] The report concluded that the uptake was low. The limited number of facilities in SA appear to be harvesting methane from animal waste where the energy density is quite high, and combustion of waste wood from the timber industry.

The report suggested that vast areas of land could be used to grow bio-organics and harvest them. When compared to the tropical wet areas, where the is a surplus of biowaste from crops that have already provided an economic return, it may be assumed that the Queensland biomass wastes could be less expensive than in SA – where uptake has been low.

Projects include:

- Yorke Biomass Energy - $476,000 renewable technology fund grant towards a feasibility study for a straw-fuelled power plant
- Delorean Energy - $1 million state government grant and a $5m loan from the renewable technology fund for a $66.7 million, 15mw anaerobic digestion plant
- 1414 Degrees - $1.6 million grant towards a $3.2 million thermal storage project at the Glenelg waste water treatment plant
- Veolia – Energy-from-Waste facility will be built at Gillman under new five-year deal with State government, which will deliver $2 million of infrastructure
- Regional Development Australia Limestone Coast (RDALC) to become a bioenergy hotspot.

Incentives for renewable "firming" generation

The development of a financial incentive to support renewable firming generation during times when the wind isn't blowing or the sun isn't shining, will encourage the production of dispatchable bioelectricity with the NQREZ. This will allow a greater supply of renewable energy into the NQREZ and policy mechanisms may include a state based renewable electricity capacity target, up-front grants to support investment, network support agreements, and government support to facilitate electrical connection in strategic grid locations (i.e. NQREZ).

[7] a-bioenergy-roadmap-for-south-australia-report-version-1.pdf (renewablessa.sa.gov.au)

Implementation of a Green Gas Target and certification scheme

Bioenergy Australia is calling on the Queensland Government to consider state-based targets for renewable gas, green injection tariffs and an accreditation program for purchase of renewable gas.

The development and use of a Green Gas Target would act to incentivise supply chain participants to generate biomethane and increase the availability of supply in the market. This will facilitate decarbonisation of the gas grid – similar to the function of the Renewable Energy Target (RET) and the former QLD Gas Electricity Contribution (GEC). This would rapidly build scale and bring down renewable gas costs. Similar schemes have been established in a number of countries around the world including the Renewable Heat Incentive in the UK, the Renewable Fuel Standard in the US, the Low Carbon Fuel Standard (LCFS) in California, and various feed-in tariff programs that have been implemented through Europe.

A Queensland Green Gas Target could provide a biomethane producer with a Green Gas certificate for biomethane produced. This certificate can be sold to liable entities that are required to purchase a mandated amount of green gas (i.e. producers of fossil natural gas). This allows the QLD gas industry to meet decarbonisation objectives which will support the injection and use of green gas. This green gas will then be available as a fuel for dispatchable gas-fired electricity generation.

We would welcome an opportunity to collaborate with members and industry participants on the creation of such a scheme.

Remove barriers to bioenergy development

With new and proven biomethane technology entering the Australian market, we need supportive, clear and fair regulation that supports the adoption of biomethane technology, including anaerobic digestates which are a by-product of the anaerobic digestion (or biomethane) process. The regulation of digestates and other organic waste reprocessing outputs (eg aerobic compost) should be risk-based and equivalent (i.e., technology-agnostic).

Gas injection standards and regulatory guidelines for pipelines should be reviewed to enable renewable gas to be injected into the system. Further, carbon benefits from the use of renewable gas need to be passed onto those users who purchase the gas. We understand that changes to the national carbon emission reporting framework may be required to accommodate this.

Alongside this, biogas generators, especially landfill operators, could greatly benefit from waste policies that incentivise the maximised capture and use of biogas, in a manner that effectively complements carbon abatement mechanisms.

Other enabling initiatives and projects

Bioenergy opportunities could play a significant role in assisting agricultural enterprises in Northern Queensland to adapt to a changing climate, and increasing rural community resilience. Development and establishment of drought and heat tolerant forage and biomass crops that support cattle production and reduce methane emissions when part of the feed ration is a key focus for the Queensland agri-business sector. Examples include deep rooted perennial legumes such as desmanthus and leucaena, with research continuing into development of new and improved varieties.

We thank the Queensland Government for the opportunity to provide input into the development of the Northern Queensland Renewable Energy Zone (NQREZ) and we look forward to sharing the Commonwealth Bioenergy Roadmap upon its release. Please do not hesitate to contact Georgina Greenland via georgina@bioenergyaustralia.org.au if there is any other way we can be of assistance.

Sincerely,

Shahana McKenzie, CEO Bioenergy Australia