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LEADERS AND LEGENDS: THOUSANDS OF CLEAN JOBS FOR QUEENSLANDERS

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Contents

Key Findings

1

As Queensland rebuilds its economy from the COVID-19 crisis, it should seize the opportunity to create jobs in renewable energy and the industries it will power.

- Queensland can harness renewable energy for long-term job creation and economic growth because it has excellent solar and wind resources, as well as a skilled industrial workforce.
- Queensland can accelerate the development of renewable energy zones (REZs) across the state, creating a long-term pipeline of jobs in construction and ongoing operations and maintenance jobs.
- The proposed REZs in the Darling Downs and Far North Queensland alone could create up to 2,000 jobs in each region by 2025.
- In the immediate term, the Climate Council's Clean Jobs Plan has found 15,000-20,000 jobs could be created in Queensland across 12 policy opportunities, including renewable energy.

2

Queensland has the potential to be a clean industrial superpower. Generations of Queenslanders could work in clean industries such as clean manufacturing, mining, minerals processing and hydrogen made from renewables.

- Increasing renewable energy generation brings down power prices, creating a global competitive advantage for Queensland in energy-intensive industries.
- Townsville could become a hub for lithium-ion battery manufacturing and metals processing, and central Queensland could become a clean steel powerhouse, creating 15,000 local jobs by 2050.
- Townsville, Gladstone and Mackay have the skilled workforce and established industrial infrastructure that makes them ideal cities to develop clean industries.
- Electricity prices in South East Queensland are projected to fall by 20% from 2019 to 2022, due in part to the recent boom in renewable energy projects.

3

CopperString 2.0 is a proposed transmission project connecting North West Queensland to the National Electricity Market (NEM), unlocking exceptional wind and solar resources and new opportunities in mining and minerals processing.

- CopperString 2.0 is expected to reduce electricity prices across the region by 40% by connecting North West Queensland to the NEM and enabling more renewable energy projects.
- The North West Minerals Province can become a superpower in new economy mining, providing minerals required for solar panels, wind turbines and batteries. The value of the new economy minerals deposits in the region exceeds $500 billion.
- Construction of CopperString 2.0 is expected to begin in 2021, creating 750 direct jobs over three years. Industrial opportunities unlocked by the project are expected to create an additional 3,560 full-time jobs from Mt Isa to Townsville while generating more than $6 billion in royalties for the Queensland Government to 2050.
- Expanding domestic mining and processing of critical minerals also increases Australia's self-reliance by protecting our supply chains from potential disruption.

4

Renewable energy not only creates jobs, it addresses long term challenges like climate change.

- Climate change is already taking a devastating toll on Queensland. This year saw another mass bleaching event on the Great Barrier Reef, the third in five years. Queenslanders have also suffered from both devastating drought and flooding.
- The 2019/20 fire season was so severe it saw areas of Wet Tropics World Heritage rainforest burn. Damage to the forest from climate change has been declared to be as bad as coral bleaching on the Reef.
- Harnessing renewable energy is essential if Australia is to reduce its greenhouse gas emissions and address the escalating dangers of climate change.

1. Introduction

As we rebuild our economy from the COVID-19 crisis, Queensland has enormous opportunities to create jobs in renewable energy and the clean industries it could power. The state could become a global leader in the clean industries of the future, with generations of Queenslanders working in industries such as clean manufacturing, mining, minerals processing, and hydrogen made from renewables.

The Climate Council's Clean Jobs Plan found that 15,000-20,000 new jobs could be created across Queensland within the next three years by investing in twelve clean policy opportunities (Climate Council 2020). Installing additional large-scale renewable energy, transmission,[1] and battery storage could be a job creator in regional Queensland, supporting up to 2,200 new jobs in the near term. The Clean Jobs Plan profiles immediate job creation opportunities that kickstart the economy while setting us up for the future. This latest state-specific report focuses on the long-term job opportunities for Queenslanders from expanding renewable energy and the clean industries it would enable.

Figure 1: Workers at the Coopers Gap Wind Farm near Cooranga North, Queensland. The state could become a global leader in renewable energy and clean industries.

1. Transmission refers to the poles and wires that transport electricity over long distances.

Generations of Queenslanders could work in clean industries such as manufacturing, mining, and hydrogen made from renewables.

Queensland has a competitive advantage in renewable energy. The state has excellent sun and wind resources, abundant space, and the skilled workforce needed to use renewable energy for job creation and economic growth. Development of these resources can be accelerated through renewable energy zones (REZs) – regions with high potential renewable energy resources, where development of renewable energy and storage can be coordinated with transmission to ensure secure, efficient and cheap electricity.

By increasing renewable energy generation and critical infrastructure such as transmission, Queensland will also have a global competitive advantage in energy-intensive industries such as new economy mining, manufacturing and renewable hydrogen, because renewable energy brings down power prices. More competitive industries mean more jobs for Queenslanders, especially in Central and North Queensland. Cheaper power will also help protect existing jobs in energy intensive industries, such as aluminium production. New clean industries are most likely to develop and succeed in regions with an existing industrial base, skilled workforce, and established infrastructure such as ports, transport, and energy. Queensland has several such regional cities well positioned for success, including Townsville, Gladstone, and Mackay.

Renewable energy not only creates jobs and supports new industries, it also addresses long-term challenges like climate change. Australia is one the most vulnerable developed countries in the world to the impacts of climate change, and Queensland is the most vulnerable state in Australia (Climate Council 2019a). Climate change is already taking a devastating toll on Queensland.

The Great Barrier Reef this year suffered its third major bleaching event in five years. Climate change is the greatest threat to the Great Barrier Reef. The Reef supports a huge variety of marine life and an estimated 69,000 Australian jobs (Deloitte Access Economics 2013), and provides $7 billion to the Australian economy every year (Jacobs 2016).

Although there is a lot of rainfall variability across different parts of Queensland, some important trends have been discerned over recent decades. Rainfall has been very low over parts of southern Australia during the cool season (April-October) over the past 20 years. This has affected parts of Southern and Central Queensland, including areas that derive more than 40% of their annual rainfall during the April-October period, such as the Darling Downs South West region and South East Queensland. By contrast, in Far North Queensland, rainfall has been above average over the past 20-year period (CSIRO and BoM 2018). As ocean temperatures increase, so too does the destructive power of tropical cyclones, with expected increases in both the maximum wind speed and amount of rainfall (Climate Council 2019a).

Almost half of Queensland's population is exposed to high or extreme risk of flooding (Deloitte 2017). Climate change is increasing the intensity of extreme downpours, leading to greater risk of floods. Meanwhile, annual temperatures in Queensland have been rising strongly since around the 1980s, with nine out of the ten hottest years on record occurring since 2002. There has also been a very marked increase in extreme heat in Queensland over recent decades (BoM 2019).

Tropical and sub-tropical Queensland are often associated with warm, humid conditions and moist vegetation not conducive to major bushfires. This is changing. More frequent heatwaves typified by hot, dry air masses coming from the interior drive higher temperatures and lower humidity. This increases evaporation and rapidly dries out fuels, even in rainforests, making conditions more conducive to major bushfires (Climate Council 2018).

Climate change is becoming the greatest long-term threat to Queensland's Wet Tropics World Heritage Area. Although the region represents only 0.12% of the total Australian landmass, it comprises the world's oldest living rainforests and the largest area of rainforest in Australia. It also supports the highest level of biodiversity of any region in Australia (Wet Tropics Management Authority 2019). The 2019/20 fire season was so severe it saw areas of this World Heritage rainforest burn (The Guardian 2019). The Wet Tropics Management Authority has previously declared that climate change damage to the forest is as bad as coral bleaching on the reef (Wet Tropics Management Authority 2019).

In addition to the toll on Queenslanders' health and critical natural assets, climate change is a major threat to the state economy. Agriculture and tourism – two pillars of Queensland's economy – are highly sensitive to climate change and extreme weather (EY 2019). Queenslanders suffered 60% of the economic cost of extreme weather disasters in Australia in the decade from 2007 to 2016 (Deloitte 2017), despite having only around one fifth of the population. Harnessing renewable energy is essential for Australia to reduce greenhouse gas emissions and address accelerating climate change. It also presents tremendous economic opportunities for Queensland.

This report shows that Queensland can build a resilient, thriving economy by using renewable energy for job creation. Thousands of Queenslanders could work in clean industries including manufacturing, mining, minerals processing, and renewable hydrogen. By embracing its renewable energy potential, Queensland could be a clean industry superpower for generations to come.

Townsville, Gladstone and Mackay have the workforce and infrastructure necessary to be leaders in the clean industries of the future.

2. Renewable Energy Zones

A renewable energy zone (REZ) is a region with high potential renewable energy resources, such as wind, solar, and pumped hydro, where the development of new renewable energy and storage projects can be coordinated with demand and investment in transmission.

A REZ is a planning and development tool that allows governments to prioritise the construction and upgrading of essential infrastructure to ensure the supply of electricity is secure, stable, efficient and lowest-cost (AEMO 2020). Across the National Electricity Market (NEM),[2] 35 potential REZs have been identified by the Australian Energy Market Operator (AEMO) in its Integrated System Plan (ISP), a roadmap for the efficient development of the NEM over the next 20 years (AEMO 2020).

Queensland is rapidly transitioning to an electricity grid powered by renewable energy and storage, in line with the state's renewable energy target of 50% by 2030 (Queensland Government 2020g). To ensure that this transition is as smooth as possible, it is important that new wind, solar and storage projects are built in areas where there are high quality renewable energy resources, close proximity to transmission, and strong connections to large users of electricity such as cities and major industries. REZs are a key tool for ensuring that renewable energy is integrated into the grid efficiently and at lowest cost.

2 The National Electricity Market (NEM) is a series of interconnected grids connecting the eastern states of Australia (Queensland, New South Wales, Victoria and Tasmania) as well as South Australia and the Australian Capital Territory.

Figure 2: Kidston Solar Project in Far North Queensland. The state is rapidly transitioning to an electricity grid powered by renewable energy and storage. REZs ensure that development is coordinated, efficient and least-cost.

Renewable energy zones are regions with excellent wind and solar resources where development of renewables can be coordinated with transmission and demand.

2.1 Benefits of renewable energy zones

In recent years, there has been a surge in new wind and solar farms being built and connected to the grid across Australia. The lack of coordination when rolling out new renewable projects has led to problems such as overloaded transmission lines, system security issues and constraints on renewable energy generation (ARENA 2020a; RenewEconomy 2020a). While these issues have been manageable with current levels of development, should this continue without sufficient planning for the future, the problems will multiply.

REZs help to address these problems and are key to planning the transition to a modern, efficient and reliable electricity system. REZs enable the coordinated, least cost development of new infrastructure, such as transmission, to ensure efficient connection of renewable energy and storage projects. This planned approach also allows potential grid security problems, such as issues of system strength,[3] to be identified and resolved before projects are built (ARENA 2020b).

In Queensland, the electricity network is currently configured to transport electricity from coal power stations to households and businesses, primarily in South East Queensland. Many wind and solar farms are not located in the same location as coal power stations and many of the best areas for industry expansion are in Central and Northern Queensland. This requires a reconfiguration of the power grid in Queensland to get electricity where it needs to go – that is, new and coordinated investment in and development of the transmission network. REZs provide this coordinated approach.

Renewable energy zones enable coordinated, efficient and least cost development of renewable energy, storage and transmission.

3 System strength is a commonly used term that refers to a loose collection of issues related to ensuring the secure operation of a power system, including the ability of the power system to maintain and control voltage. This is important because it means that if there is a disruption to the grid, such as a coal-fired power station tripping or power lines coming down, the voltage can recover quickly, minimising impacts for electricity consumers.

2.2 Renewable energy zones in Australia and overseas

REZs have proven successful internationally and have been gaining traction around Australia. Internationally, the US state of Texas completed its Competitive Renewable Energy Zones (CREZ) project in 2013, building a transmission network to connect the excellent wind resources in the state to the major population and industry centres (Powering Texas 2018). The CREZ project was successful in ensuring efficient construction of transmission, unlocking more than 19,000MW of wind generation, and contributing to reduced power prices (ERCOT 2017).

The Queensland Government recently announced it would invest $145 million to establish three REZ corridors to create jobs and ensure continued investment in large-scale renewable energy projects across the state (Queensland Government 2020d). This was followed by the announcement of $500 million for a new Renewable Energy Fund to support Queensland's state-owned energy corporations to accelerate the development of renewable projects (Queensland Government 2020e).

Earlier this year, the New South Wales Government also announced support for the development of REZs in that state (NSW Government 2020). In New South Wales, the expression of interest process for the Central-West Orana REZ – the first REZ to be announced – attracted huge interest from renewable energy developers. The government targeted 3,000MW of new renewable energy and storage projects and received proposals for 27,000MW, representing $38 billion of potential private investment (NSW Government 2020).

Figure 3: A wind farm in the US state of Texas. Renewable energy zones have proven successful in Texas and are gaining traction around Australia.

3. Renewable Energy Zones in Queensland

Of the 35 potential REZs identified across the NEM (see Section 2), eight are in Queensland. Four have been identified by AEMO as particularly important for development over the next decade. These are located in the regions surrounding Cairns, Mackay, Rockhampton and Gladstone, and the Darling Downs. These REZs are profiled in boxes 1 to 4 below.

A further four possible zones could be developed in Townsville, Western Queensland, Wide Bay-Burnett and Barcaldine in the longer term, or with increased demand from major industry or commitment of new infrastructure (such as CopperString 2.0, see Section 5).

Developing REZs will involve not only new renewable energy and storage projects, but also new and upgraded electricity network infrastructure to handle these new wind, solar, battery and pumped hydro projects. As noted in Section 2, the main purpose of REZs is to plan for the needs of the future grid. This includes planning for new and upgraded transmission links and other infrastructure, such as inverters or synchronous condensers.[4]

Queensland has eight potential renewable energy zones.

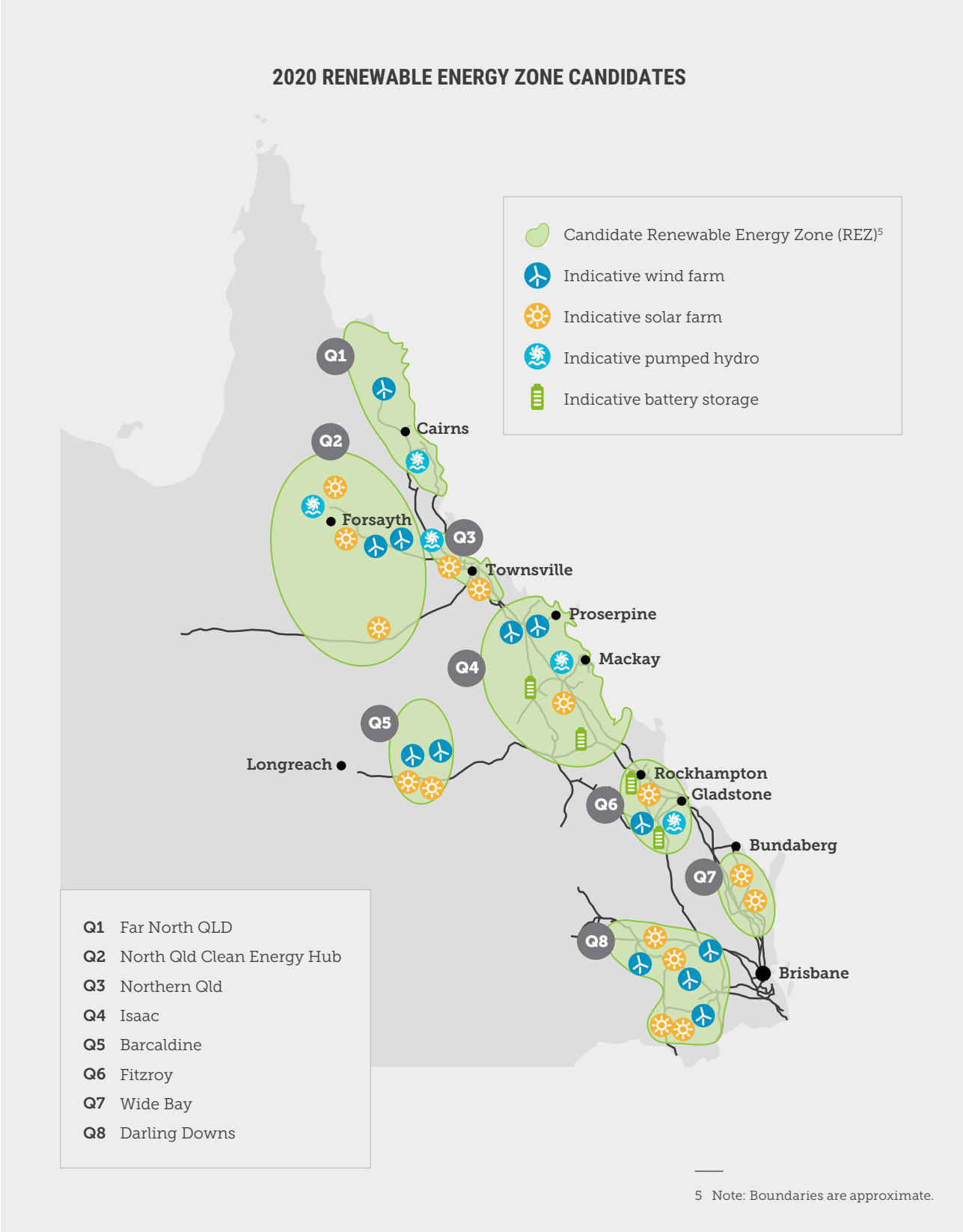
4 A synchronous condenser is essentially a large spinning machine connected to the grid, similar in function to a free spinning motor. Synchronous condensers are one solution to ensuring a stable supply of electricity through the network. While there are other means to achieve this in grids with a high share of renewables, synchronous condensers are one important solution. Other options, such as inverters, are able to play a similar role.

Often, there are opportunities to build significant new renewable energy generation before these infrastructure upgrades are required. Queensland's REZs vary considerably in this regard. The southernmost zones (see Figure 5 below for map), such as the Darling Downs, with strong links to the rest of the NEM, have more existing capacity. Once the required upgrades occur in the northern zones, the opportunities are enormous.

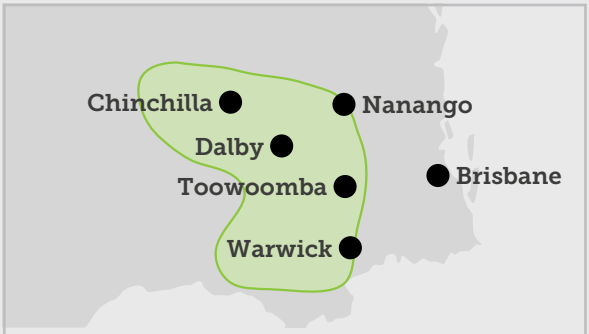
As noted in Section 2.2, the Queensland Government has announced it will invest $145 million to establish three REZ corridors in southern, central and northern Queensland, overlapping with the eight REZs identified by AEMO (Queensland Government 2020d). In September 2020, the state government announced it was opening an expression of interest process for renewable energy and storage projects across these areas (Queensland Government 2020c). This process will help guide the initial planning of REZs, including their size, location and timing for development.

Figure 4: REZs will help drive down power bills and spur job creation throughout Queensland. (Pictured: Ross River Solar Farm near Townsville).

Figure 5: Renewable energy zones in Queensland. **Source:** AEMO (2020).



BOX 1: DARLING DOWNS (TOOWOOMBA) RENEWABLE ENERGY ZONE (REZ)



Proposed Darling Downs REZ

Location:
This REZ encompasses the Darling Downs west of Brisbane, including Warwick, Toowoomba, Dalby, Nanango and Chinchilla.

New renewable energy capacity by 2030:
2,800MW of renewable energy (equivalent to more than the power generated by Queensland's Stanwell coal-fired power station) and 250MW of energy storage (AEMO 2020).

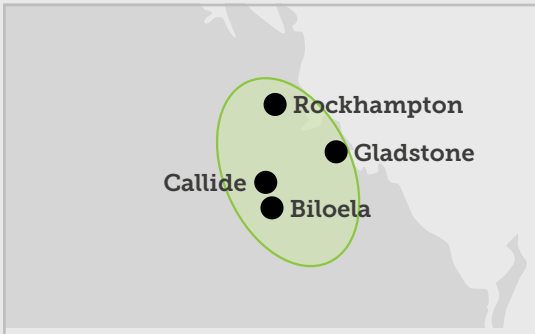
Key benefits:
- This region is perfectly placed to export electricity south to New South Wales and east to Brisbane.

The Darling Downs REZ has good solar and wind resources, with already 840MW of wind and solar projects existing or committed to construction.

The existing transmission lines can support 3,000MW of new renewable energy projects beyond those that are already committed. An expansion of the interconnector from Queensland to New South Wales would increase capacity for renewable energy projects in this REZ even further.

A large expansion of renewable energy in the area will require four synchronous condensers or other technologies to maintain system strength by 2030. This region is perfectly placed to export electricity south to New South Wales and east to Brisbane.

BOX 2: FITZROY (ROCKHAMPTON & GLADSTONE) RENEWABLE ENERGY ZONE (REZ)



Proposed Fitzroy (Rockhampton & Gladstone) REZ

Location:
This REZ is centred on the cities of Rockhampton and Gladstone, running inland to Biloela and Callide.

New renewable energy capacity by 2030:
900MW of renewable energy (roughly equivalent to three-quarters of the power generated by Queensland's Callide B coal-fired power station) and 400MW of energy storage (AEMO 2020).

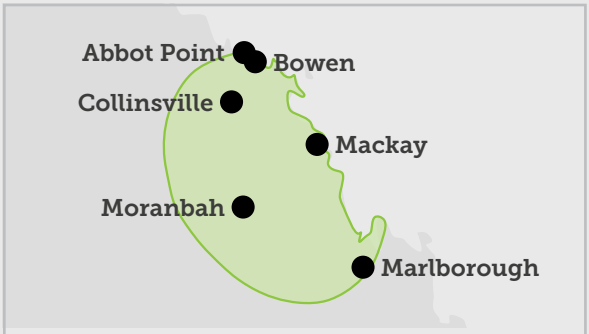
Key benefits:
- Close to existing industry in Central Queensland.
- Creates new opportunities for manufacturing in the region.

The Fitzroy REZ has good solar and wind resources, although there are currently no existing or committed renewable energy projects in this region.

The existing transmission lines in Central Queensland can support 2,000-2,500MW of new renewable energy projects but this capacity is shared with the Isaac REZ to the north. The build out of this renewable energy zone and others in central Queensland will require transmission upgrades to take advantage of the excellent renewable energy opportunities in the area.

System strength is relatively good in the area, with one synchronous condenser or similar to be installed by 2030 to maintain system strength. This region is located close to existing heavy industry in Central Queensland centred around Rockhampton and Gladstone, including the aluminium and cement production industries. Building out this renewable energy zone could facilitate an expansion of manufacturing in the area by supplying clean and affordable power.

BOX 3: ISAAC (MACKAY) RENEWABLE ENERGY ZONE (REZ)



Proposed Isaac (Mackay) REZ

Location:
This REZ includes a large part of Central and North Queensland, running along the coast north from Marlborough up to Bowen and Abbot Point via Mackay. The REZ also runs inland through Collinsville and Moranbah.

New renewable energy capacity by 2030:
1,350MW of renewable energy development (roughly equivalent to the power generated by Queensland's Callide B coal-fired power station) and 800MW of energy storage (AEMO 2020).

Key benefits:

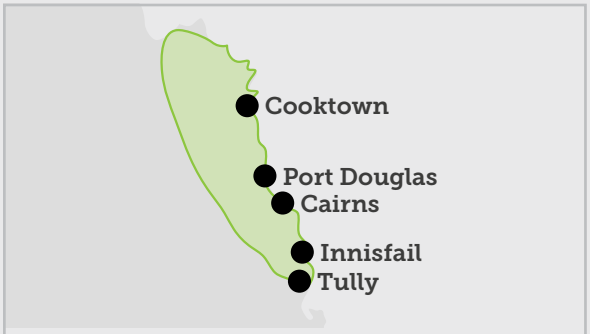
- Close to existing industry in Central and North Queensland.
- Creates new opportunities for manufacturing in the region.

The Isaac REZ has good solar and wind resources, with a large number of solar farms already operating in the region.

The existing transmission lines in Central Queensland have spare capacity of 2,000-2,500MW for new renewable energy projects but this capacity is shared with the Fitzroy REZ to the south. The Isaac REZ will require upgrades to transmission to enable an expansion of renewable energy.

System strength in the area is good and, as with the Fitzroy REZ, this region is located close to existing industry in Central and North Queensland, in this case centred around Mackay. There is a great opportunity to expand manufacturing in the region by building out this REZ.

BOX 4: FAR NORTH QUEENSLAND (CAIRNS) RENEWABLE ENERGY ZONE (REZ)



Proposed Far North Queensland (Cairns) REZ

Location:
This REZ hugs the coast of Far North Queensland, beginning in Tully and Innisfail in the south, running north through Cairns and Port Douglas up to Cooktown.

New renewable energy capacity by 2030:
950MW of renewable energy (roughly equivalent to the power generated by Queensland's Callide B coal-fired power station) (AEMO 2020).

Key benefits:

- Some of Australia's best wind resources, which tend to be available at different times to the wind resources in other states, providing a complementary source of electricity.

The Far North Queensland REZ has excellent wind resources and good solar resources. The region has four existing renewable energy projects, including wind, solar and hydro.

The existing transmission line can support an additional 700MW of new renewable energy. A range of transmission upgrades are proposed by 2030 but these are partly contingent on further upgrades in Central and North Queensland to enable the transfer of electricity south.

Two synchronous condensers or equivalent will be required by 2030 to maintain system strength. Far North Queensland has some of Australia's best wind resources, which tend to be available at different times to the wind resources in other states, providing a complementary source of electricity (AEMO 2020).

4. Jobs for Queenslanders in Renewable Energy Zones

Thousands of jobs can be created throughout regional Queensland in a range of different industries in the construction and ongoing operations and maintenance of REZs.

The Climate Council's Clean Jobs Plan found that an estimated 15,000 – 20,000 direct jobs could be created across the state within the next three years by investing in twelve clean economic recovery policy opportunities (Climate Council 2020). Installing additional large-scale renewable energy, transmission and battery storage could be a significant job creator in regional Queensland, supporting 1,800 – 2,200 new direct jobs in the near term, while rebooting the economy and tackling long term challenges like climate change at the same time (Climate Council 2020).

Recent jobs modelling by other organisations has also found job creation opportunities in renewable energy. The Clean Energy Council has found that the renewable energy industry already supports at least 6,000 direct and indirect jobs in Queensland (Clean Energy Council 2020). This could double to more than 11,000 jobs within a few years with strong policy support. Without policy support the sector could lose almost 3,000 existing jobs (Clean Energy Council 2020).

The Clean Jobs Plan found that 15,000 – 20,000 new jobs could be created across Queensland within the next three years.

Figure 6: Workers install the Kidston Solar Project in Far North Queensland. The renewable energy industry could support more than 11,000 jobs in Queensland by 2025 with strong policy support.

The proposed REZs in the Darling Downs and Far North Queensland could create up to 2,000 jobs in each region by 2025.

While the development of REZs would establish a long-term pipeline of construction jobs, half of these jobs could be in ongoing operations and maintenance roles by 2035, creating long-term, skilled jobs for Queenslanders. Up to 75% of these jobs would be located outside of Brisbane. The proposed REZs in the Darling Downs and Far North Queensland alone could create up to 2,000 jobs in each region by 2025 (Clean Energy Council 2020). Further jobs would be created in the installation and upgrading of transmission necessary to support these REZs.

Once established, the low-cost renewable electricity generation from the REZs will become a key competitive advantage for energy-intensive Queensland industries enabling sustainable long-term job creation – Section 6 looks at these opportunities in more detail.

These jobs in new renewable energy projects would include direct jobs across a wide range of occupations, including:

- Electricians
- Electrical trade assistants
- Drivers
- Roofers
- Office managers and administrative staff
- Construction and project managers
- Site managers and supervisors
- Mechanical trades and technicians

Source: Clean Energy Council (2020).

Figure 7: Renewable energy projects create jobs across a wide range of occupations including electricians, drivers, construction and mechanical trades. (Pictured: Transport of components for Queensland's Coopers Gap Wind Farm).

Increasing renewable energy generation will lower energy bills, which can help create new manufacturing jobs throughout Queensland. Manufacturing hubs have already been set up in both Gladstone and Rockhampton, providing centres for training and advice on advanced manufacturing (Manufacturers' Monthly 2020). Expanding renewable energy in the nearby REZs would help to ensure affordable power is supplied to the region, enabling a further expansion of existing manufacturing, as covered in more detail in Section 6.

Renewable energy zones would help unlock further manufacturing opportunities throughout Queensland.

5. CopperString 2.0

The CopperString 2.0 project offers another opportunity to use renewable energy to create jobs and support industries such as mining and minerals processing in Queensland.

CopperString 2.0[6] is a proposal to build a transmission link from Mt Isa to Townsville. North West Queensland is not connected to the National Electricity Market (NEM) and the region, including industry in the North West Minerals Province (see Box 5 below), currently relies on two expensive gas-fired power stations near Mt Isa. Electricity prices in the region tend to be more than double the price paid for electricity in Townsville, creating a major disadvantage for local industry (AFR 2019).

CopperString 2.0 would connect the North West Minerals Province to the NEM, significantly lowering electricity prices (Queensland Government 2020a). The proposed high voltage AC transmission line would stretch for roughly 1,000 km (see Figure 8 below for the map) (CopperString 2.0 2019). CopperString 2.0 would also unlock new renewable energy generation. This region has some of the best solar and wind resources in Australia, and CopperString 2.0 could provide the transmission necessary to develop these resources and connect them to the NEM (Queensland Government 2020a). On average, this is expected to reduce electricity prices in the region by 40% (CopperString 2.0 2020).[7]

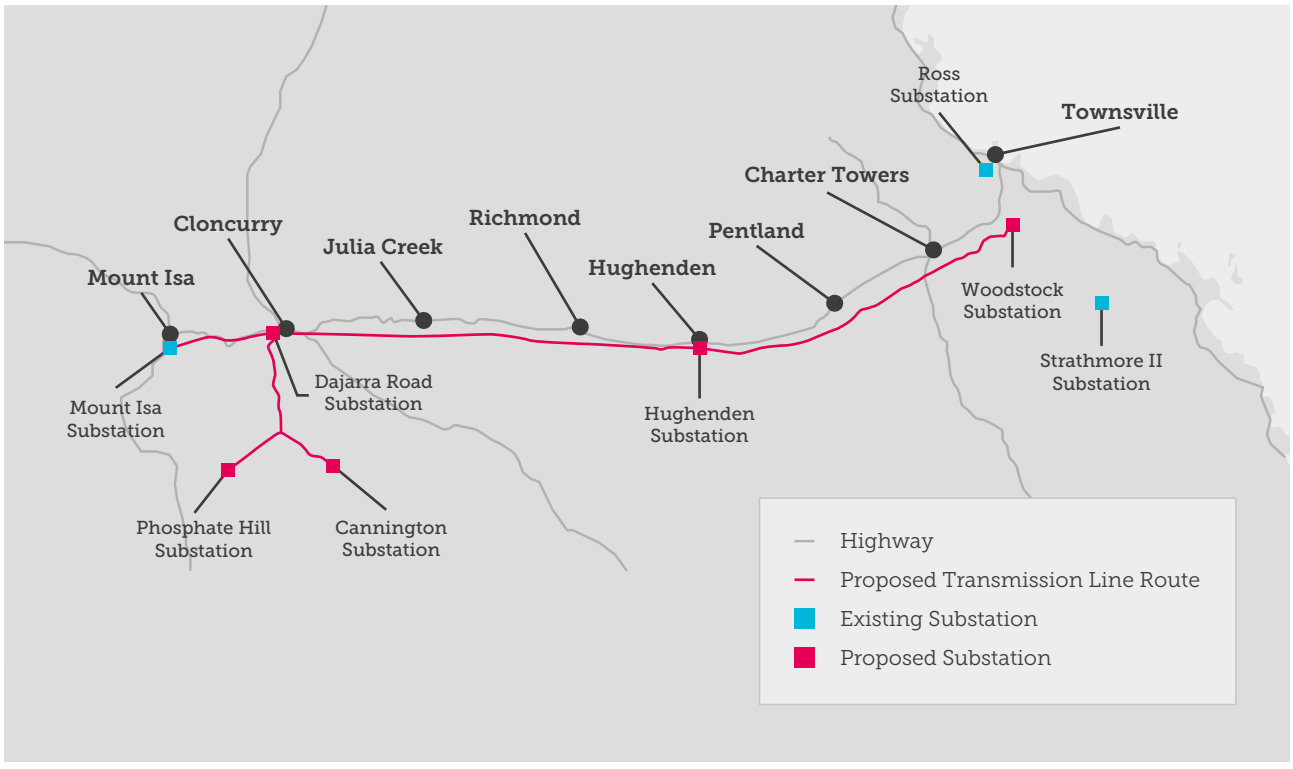
CopperString 2.0 is expected to reduce electricity prices in North West Queensland by 40%.

6 The project is referred to as CopperString 2.0 because this is the second time the project has been proposed, after the previous plan was not supported by the previous state government.

7 This report from CopperString 2.0 is a summary of studies from ACIL Allen Consulting, IZMIN Pty Ltd, Neuchatel Partners, Soren Consulting, and analysis from KPMG.

The development of CopperString 2.0 has received support from both the State and Federal Governments. In May 2020, the Queensland Government announced $14.8 million to support the development of CopperString 2.0 as part of the state's COVID-19 economic recovery plan. While the funding is conditional on project milestones and subject to approvals, the aim is for construction to begin in the first half of 2021. This funding is additional to $1.18 million provided by the Queensland Government in August 2019 to help the proponents of CopperString 2.0 develop their business case (Queensland Government 2020a). The Federal Government also provided $4.7 million in 2019 to help with early works (AFR 2019).

Figure 8: Map of Proposed Copperstring 2.0 transmission line. **Source:** CopperString 2.0 (2019).



BOX 5: THE NORTH WEST MINERALS PROVINCE

The North West Minerals Province, centred around Mt Isa and Cloncurry, extends from the Northern Territory border up to the Gulf of Carpentaria and is home to some of the world's richest mineral deposits. Minerals and metals found in the area include copper, lead, zinc, and silver, as well as phosphate deposits and rare earth elements (Queensland Government 2017).

The value of the known resources in the North West Minerals Province is estimated at more than $680 billion, with 'new economy minerals' accounting for more than $500 billion (CopperString 2.0 2020). 'New economy minerals' refer to metals and mineral elements required for advanced and emerging technologies such as electric vehicles, consumer electronics, solar panels, and wind turbines. These are expected to experience strong and growing global demand over the coming decades (Queensland Government 2020b). (See Section 6 for more information on the industrial opportunities from new economy minerals.) New economy minerals found in the North West Minerals Province include copper, cobalt, gold, graphite, zinc, molybdenum, rhenium, and rare earth elements including dysprosium and holmium (CopperString 2.0 2020).

The Province is already one of the world's largest mining regions and mining and minerals processing is a major employer in North West Queensland. The region has faced challenges in recent years with some operations closing and activity impacted by lower commodity prices (Queensland Government 2017). As discussed below and in Section 6, the CopperString 2.0 project and new renewable energy generation could increase the competitiveness of these local industries and unlock Queensland's potential as a global leader in new economy minerals.

Figure 9: Mt Isa is at the heart of the North West Minerals Province. CopperString 2.0 could support and unlock new jobs and industries for communities from Mt Isa to Townsville.

5.1 Economic opportunities unlocked by CopperString 2.0

Construction of the CopperString 2.0 transmission line is expected to create 750 new full-time jobs over three years, and the project will support 30 ongoing jobs in operations and maintenance (CopperString 2.0 2019).

The more significant job creation opportunity, however, comes from the industries that CopperString 2.0 could support and unlock for communities from Mt Isa to Townsville. Access to cheaper electricity will increase the global competitiveness of local industries such as mining and minerals processing, industrial manufacturing and agriculture, and create new export opportunities for the Port of Townsville (CopperString 2.0 2020).

More competitive industries mean more jobs for Queensland. According to ACIL Allen Consulting, industrial opportunities unlocked by CopperString 2.0 are expected to create an additional 3,560 full-time jobs sustained over thirty years in the North West Minerals Province (CopperString 2.0 2020). Initial modelling from ACIL Allen and Soren Consulting also suggests that the project could add more than $139 billion to Queensland's Gross State Product over the period to 2050 and generate more than $6 billion in additional royalty revenue for the Queensland Government (CopperString 2.0 2020).

As discussed in the next section, importantly, these opportunities go beyond mining. Regional centres such as Townsville have the potential to become 'value add hubs' for the resources mined locally, supporting industries such as minerals processing and battery manufacturing (Queensland Government 2020a).

CopperString 2.0 could unlock an additional 3,560 full time jobs in the North West Minerals Province.

6. Queensland, the Clean Industrial Superpower

Installation of significant large-scale renewable energy, enabled through REZs, will bring down power prices and set Queensland up to be a leader in clean industries of the future, such as manufacturing, mining, minerals processing, and renewable hydrogen. Generations of Queenslanders will gain long-term, skilled jobs in high demand global industries if the state seizes the opportunities presented by renewable energy.

These new clean industries are some of the most promising opportunities for leading the economic recovery in Queensland. They also emerged as some of the most popular opportunities discussed in a recent series of industry and community consultations in Cairns, Townsville, Toowoomba, South Burnett, Gladstone, and Rockhampton (The Next Economy 2020). In addition to enjoying broad public support and creating good, long-term jobs in regional Queensland, industries such as renewable energy and clean manufacturing help to boost and diversify local economies and reduce greenhouse gas emissions, improving resilience of local communities (The Next Economy 2020).

Generations of Queenslanders could work in global industries of the future, such as clean manufacturing, mining and renewable hydrogen.

6.1 More renewable energy means more jobs for Queenslanders

Australia has a competitive advantage in renewable energy: we are the sunniest and one of the windiest countries in the world and have the abundant space and technical expertise available to make use of these resources (Garnaut 2019). Queensland – and Central and North Queensland in particular – has everything it needs to lead in harnessing renewable energy for job creation and economic growth. The state is endowed with excellent renewable resources and a skilled workforce. In addition, new clean industries are most likely to develop in regions with an existing industrial base and established infrastructure such as ports, transport, energy, and training infrastructure. Queensland has several such regional cities, including Townsville, Gladstone, and Mackay (Garnaut 2019).

Townsville, Gladstone and Mackay are well positioned to lead the development of new clean industries.

Figure 10: Queensland has a competitive advantage in renewable energy and can lead in harnessing renewable energy for job creation and economic growth. (Pictured: Workers at Kidston Solar Project in Far North Queensland).

Increasing renewable energy brings down power prices. Wind and solar are now the cheapest forms of new energy generation in Australia, even when backed by storage technologies such as batteries and pumped hydro (CSIRO 2018). The transition to renewable energy is already lowering electricity prices in Australia, with retail prices projected to fall by more than 7% from 2019 to 2022, due in part to an increase in renewable energy generation. South East Queensland is projected to enjoy the largest fall (20%) in prices, due in part to the recent boom in renewable energy projects in the state (AEMC 2019).

The combination of a competitive advantage in renewable energy resources and the fact that renewable energy is now the lowest cost form of electricity means that Queensland could create a long-term competitive advantage in energy-intensive industries. Coupling that low-cost electricity with top quality mineral resources will create sustainable long-term jobs in globally competitive processing and value-adding industries. All industries in Queensland, including traditional industries such as agriculture, stand to benefit from lower power prices. This enables enormous potential for job creation, bolstering existing industries and enabling the creation of new ones. The following sections outline opportunities for Queensland in industries such as clean manufacturing, mining and minerals processing, and renewable hydrogen.

Renewable energy brings down power prices, creating a competitive advantage in energy-intensive industries.

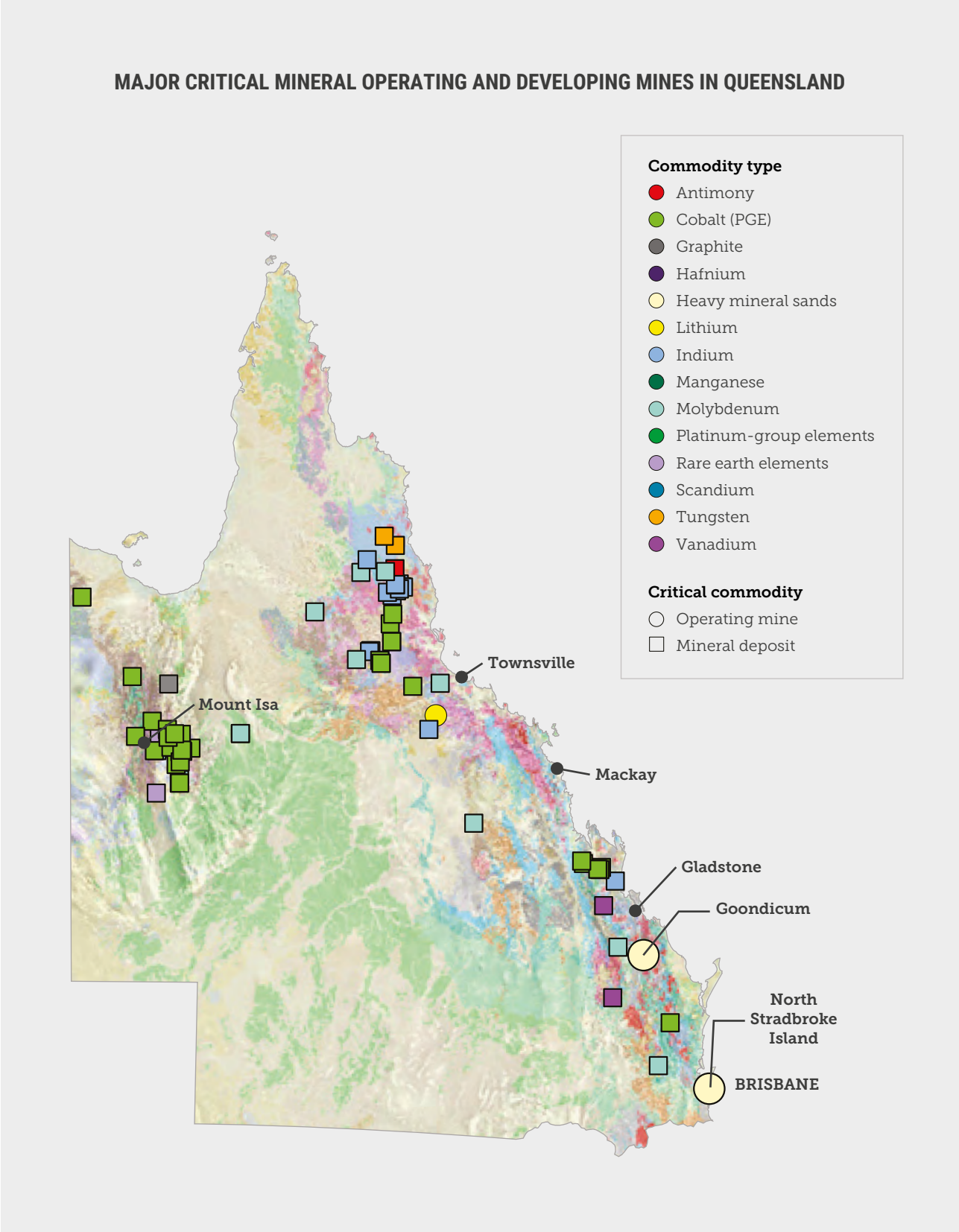
6.2 New economy mining and minerals processing

Developing REZs and key transmission infrastructure such as CopperString 2.0 would unlock significant new job creation in mining and minerals processing, especially in North and North West Queensland (see Section 5). Mining is already a major employer in the region and Queensland has untapped deposits of many critical and new economy minerals (see Figure 11 below). Energy is the largest cost for the minerals processing industry, so access to low cost energy would increase global competitiveness (Centre for Future Work 2020), enabling expansion of these industries in Queensland.

International demand for new economy minerals, such as those found in Queensland's North West Minerals Province (see Section 5) is growing and set to boom in the future. Demand is projected to increase – in most cases dramatically – for metals including aluminium, cobalt, copper, lead, lithium, nickel, manganese, steel, titanium, zinc, cadmium, molybdenum and rare earth elements (World Bank 2017). For example, production of an electric car uses roughly five times more of these new economy minerals than a conventional petrol car (IEA 2020). Many of these metals are found in Queensland (Geoscience Australia 2019). Several are currently refined and processed in Queensland, such as aluminium and zinc, and there are opportunities to develop new mining, processing and value-adding industries powered by renewable energy.

Queensland can use its natural resources – both minerals and renewable energy – to become a superpower in the fast-growing new economy minerals industry.

Figure 11: Mineral deposits in Queensland. **Source:** Commonwealth of Australia (2019a).



In addition to export opportunities, there are also strategic advantages to developing domestic mining and processing of new economy minerals. This increases self-reliance by helping to protect Australia's minerals supply from potential market disruption, such as political instability overseas, regulatory changes or trade restrictions. For example, China is currently dominant in many of these markets, including rare earth elements, where it is responsible for over 80% of global production (Commonwealth of Australia 2019a). In 2010, China attempted to limit its export of rare earths, creating significant market disruption. In 2018, the Democratic Republic of the Congo nearly tripled the royalty rate on its cobalt, and Indonesia banned nickel ore exports beginning in 2020, similarly demonstrating the vulnerability of these global critical minerals markets to disruption (IEA 2020).

Queensland has a huge opportunity to use its natural resources – both minerals and renewable energy – to become a critical player in the fast-growing new economy minerals industry. If Queensland can supply the raw materials for the technologies that will reduce global emissions, such as batteries, solar panels and wind turbines, and power the mining and processing of these materials with renewable energy, Queensland could truly establish itself as a zero-emissions industry powerhouse.

BOX 6: ENSURING A SUSTAINABLE MINING INDUSTRY

While a booming new economy minerals industry presents many opportunities for North West Queensland, a concerted effort will be needed to reduce any environmental, health and social risks that may be associated with these projects. For example, health outcomes will need to be prioritised in Mt Isa and surrounding regions to ensure that communities are not exposed to the effects of lead or other heavy metals (Climate Council 2019a).

To manage the health risks of lead mining and smelting in Mount Isa, it is important to fund universal blood lead level testing, follow up and intervention for anyone with unsafe blood lead levels. Specific outreach programs are needed for Indigenous communities, as Indigenous children have been found to have higher blood lead levels than non-Indigenous children. Remediation of existing contaminated areas should also be prioritised (Climate Council 2019a).

Environmental damage can also be mitigated by designing more efficient mining and processing methods, and rigorous environmental impact assessments, protections, and continual monitoring. This includes smarter design and less wasteful manufacturing processes, extending product-life, and more reuse, recycling, and repairing (Energy Transition Hub 2019). Powering all mining and minerals processing operations with renewable energy will also help to reduce the environmental impacts of these industries.

Maximising social goods from new mining industries, and minimising the chance of any negative impacts, means ensuring that the benefits flow first and foremost to Traditional Owners and others in the local community. Companies must adhere to the best practices in responsible mining, in particular the principle of free, prior and informed consent, and always ensuring protection of Indigenous heritage.

6.3 Renewable hydrogen

Renewable hydrogen – that is, hydrogen produced from renewable energy – is likely to play a key role in the clean economy of the future, offering a solution for reducing emissions in industries such as steel-making and long-range and heavy haulage transport. Renewable hydrogen, sometimes called green hydrogen, is set to become a major global market, expected to grow twelve-fold from 2020 to 2025 (Wood Mackenzie 2019). This is due in part to strong hydrogen targets from countries in our region such as Japan and South Korea. With a rapid expansion of renewable energy, Queensland has the potential to develop a strong renewable hydrogen industry (Commonwealth of Australia 2019b).

States and territories around Australia, and countries around the world, are currently developing plans to build their renewable hydrogen industries (Climate Council 2019b). Last year, the Queensland Government released the Queensland Hydrogen Industry Strategy 2019-2024, outlining the state's vision to be a leader in renewable hydrogen production by 2030, and established the $15 million Hydrogen Industry Development Fund (Climate Council 2019b). The state already has a range of renewable hydrogen pilot projects (Queensland Government 2020f).

The potential corridor of renewable energy projects enabled by the Copperstring 2.0 transmission line could create opportunities for renewable hydrogen production. Due to Townsville's existing port infrastructure, the region would be particularly appropriate for the development of a renewable hydrogen export industry (CopperString 2.0 2020). If 15,000MW of new renewable energy was installed and dedicated to the production of hydrogen in this region, it could bring an estimated export value of $4.4 billion through the Port of Townsville (CopperString 2.0 2020).

Gladstone is already a major industrial hub, and its proximity to the Fitzroy REZ means it has the potential to be a key centre for the renewable hydrogen industry (Queensland Government 2019). There are already several major hydrogen projects in the planning stages in Gladstone, such as the Austrom Hydrogen project targeting the export market and the Hydrogen Utility project aiming to produce hydrogen and ammonia (IEEFA 2020). Also in the region, the Central Queensland Power project is a plan to develop 2,000MW of new wind, solar and storage and supporting transmission infrastructure over the next ten years, aiming to contribute to new clean industries such as renewable hydrogen (Energy Estate 2020).

In addition to creating local jobs in production, renewable hydrogen creates a range of industrial opportunities for Queensland. Renewable hydrogen could become a new export commodity. Alternatively (or, more likely, in addition), renewable hydrogen could become an input to domestic manufacturing and industrial processes. This would support new value-adding industries, developing clean (zero emissions) manufactured goods locally, which could become a high-value export industry. Queensland's opportunities for clean manufacturing are discussed in the following section.

Queensland has the potential to develop a strong renewable hydrogen industry.

6.4 Clean manufacturing

Manufacturing is one highly energy-intensive sector that could grow significantly in Queensland from increased renewable energy generation. Almost all advanced manufacturing processes can use renewable energy as an input, and energy is the largest cost for many types of manufacturing (Centre for Future Work 2020). Transitioning to renewable energy could save the existing Australian manufacturing sector 23% on their power bills, increasing to 33% by 2050 as the cost of renewable energy production continues to fall (Centre for Future Work 2020). The faster Queensland moves on installing large-scale renewable energy, the greater the potential savings for the manufacturing sector.

There is strong support across regional communities, such as Cairns, Townsville and Gladstone, to build Queensland's manufacturing industry to create jobs as well as to increase self-sufficiency and diversify export industries (The Next Economy 2020). This section looks particularly at the opportunities in battery manufacturing and clean metals.

6.4.1 BATTERY MANUFACTURING

Queensland could become a leader in advanced manufacturing that will be at the centre of the global clean economy for decades to come. One such opportunity is manufacturing lithium-ion batteries, which are used in a range of applications including electric vehicles, energy storage, and consumer electronics. This is a fast-growing global market, projected to grow to more than US$100 billion by 2025 from US$30 billion in 2017 (Centre for Future Work 2020).

Australia is the world's largest producer of lithium, with much of this coming from Western Australia (Commonwealth of Australia 2019a). Queensland is a major producer of some of the other nine elements required to produce a lithium-ion battery, including copper, nickel, cobalt, phosphate, and aluminium (Commonwealth of Australia 2018). Townsville has been identified as a promising location for lithium-ion battery manufacturing, due to its proximity to the North West Minerals Province and its established industrial base and expertise (Commonwealth of Australia 2018).

Queensland could grow its advanced manufacturing sector with low cost renewable energy.

There are already plans for a lithium-ion battery cell gigafactory in Townsville, proposed by the Imperium3 consortium (PV Magazine 2020). The Queensland Government provided $3.1 million for a feasibility study in 2018 and approved the study in August 2020, allowing the project to proceed with financing. The project aims to begin construction in 2022 and operations by the beginning of 2024 (AuManufacturing 2020). As discussed in Section 5, CopperString 2.0 could further increase the competitiveness of Townsville as a hub for battery manufacturing by decreasing electricity prices and allowing the expansion of the new economy minerals industry across the region.

There are also proposals to develop nickel and cobalt refineries in Townsville for use in lithium-ion batteries. Pure Battery Technologies is looking to develop a $100 million battery metals refinery to commercialise technology developed by the University of Queensland. It estimates the facility would create about 100 jobs in Townsville (Townsville Bulletin 2020). Queensland Pacific Metals has plans to develop the Townsville Energy Chemicals Hub (TECH), focused on value-adding battery metals processing, including nickel, cobalt and high purity alumina (Pure Minerals Limited 2020). Both companies have identified Townsville as an ideal location due to its skilled workforce and established infrastructure, especially its port.

6.4.2 CLEAN METALS

The combination of abundant renewable energy resources and a local mining and minerals processing industry means Central and North Queensland could develop a thriving clean metals industry. Demand for products manufactured with renewable energy is already growing and this will only accelerate as governments around the world seek to reduce their greenhouse gas emissions in line with their Paris Agreement commitments of limiting global temperature rise to well below 2°C. Businesses are also looking for opportunities to contribute and to manage their risks, and shareholders are increasingly demanding climate action (Energy Transition Hub 2019; EY 2019). This is particularly the case for clean metals, because metal production is responsible for roughly 9% of all global greenhouse gas emissions, with steel alone responsible for 7% of emissions (Energy Transition Hub 2019).

For example, the European Commission is considering introducing a Carbon Border Adjustment Mechanism, as part of the European Union's efforts to achieve net zero emissions by 2050 (European Commission 2020). This would effectively impose a tax on imported goods such as steel to reflect the 'embodied' emissions within that product (BCG 2020), providing an immediate competitive advantage to goods produced using renewable energy. This creates both opportunities for those who move quickly to expand renewable energy and develop clean manufacturing, and risks for those who do not.

Townsville could become a hub for battery manufacturing.

Queenslanders are already expressing concern for the long-term prospects of major employers, such as the Boyne Island aluminium smelter in Gladstone, if it does not transition to zero emissions operations (The Next Economy 2020). The Boyne smelter directly employs 1,000 people and is a major energy user, representing approximately 13% of Queensland's total electricity demand (IEEFA 2020). There are roughly 4,500 jobs in energy-intensive industries more broadly in the Gladstone region, such as cement and alumina refining (IEEFA 2020). Cheap electricity is a major factor in global competitiveness. The smelter currently runs at a loss, with electricity accounting for roughly one third of production costs (IEEFA 2020). In addition, clean aluminium is a fast-growing international market, with companies, such as Apple, increasingly committing to buying only low carbon aluminium (IEEFA 2020). Boyne and other Australian aluminium smelters must be powered by cheap, renewable electricity to compete in this market.

Townsville is already leading the way in using renewable energy to power metals processing. Sun Metals zinc refinery near Townsville is one of the largest energy consumers in Queensland and in 2018 installed a 116MW solar farm to reduce costs and supply up to one-third of its electricity needs (Climate Council 2019a). While generation from the solar farm has faced constraints recently due to system strength issues in the local grid, Sun Metals continues to be a pioneer in renewable industries. In June 2020, Sun Metals announced it was building a renewable hydrogen production facility onsite at its zinc refinery, supported by a $5 million grant from the Queensland Government (RenewEconomy 2020c).

Figure 12: Sun Metals zinc refinery near Townsville installed a solar farm (pictured) to reduce costs and is now building a renewable hydrogen production facility onsite.

Clean steel (sometimes called green steel or zero emissions steel), uses renewable hydrogen to replace metallurgical, or coking, coal in the steel production process. Iron ore, the key ingredient in steel, is Australia's largest export commodity and Australia is the world's largest exporter of iron ore (Energy Transition Hub 2019). While Australia does produce steel domestically, this high export quantity of iron ore means Australia is missing the opportunity to do more of the value-adding – and job-intensive – step of refining this iron ore into steel. This steel could then be used as an input for domestic manufacturing or exported at a higher premium (Centre for Future Work 2020).

Other countries are already moving to establish clean steel industries. For example, the world's first zero emissions steel pilot plant, known as the HYBRIT project, was recently completed in Sweden. The project is a partnership between steel manufacturer SSAB, iron ore producer LKAB, and electricity company Vattenfall, and the group aims to lead the global market by producing the world's first zero emissions steel (RenewEconomy 2020b). The project has the backing of the Swedish Government, which aims to move the entire Swedish steel industry to clean steel within the next 20 years (RenewEconomy 2020b).

Demand for clean manufacturing is growing and Queensland could lead in this industry.

Figure 13: The HYBRIT project in Sweden is the world's first zero emissions steel pilot plant. Gladstone could be a key global player in clean steel manufacturing.

Queensland's renewable resources create a competitive advantage in the production of hydrogen and clean steel. Although most of Australia's iron ore is mined in Western Australia, central Queensland is one of the most promising locations for the production of clean steel (Grattan Institute 2020). Even when including the cost of transporting the iron ore from Western Australia, Central Queensland's existing infrastructure, such as ports and energy, workforce, and high-quality wind and solar resources, make it one of two stand out regions (alongside the Hunter Valley in New South Wales) to develop this key industry of the future (Grattan Institute 2020). In particular, producing clean steel at global export scale will require a large industrial workforce. Central Queensland's existing skilled workforce makes it one of the most cost-effective regions for zero emissions steel production. Clean steel manufacturing could create 15,000 jobs in central Queensland by 2050 and these would be long-term, skilled, well-paying jobs (Grattan Institute 2020).

Clean steel could create 15,000 jobs in central Queensland.

7. Conclusion: Seize the Opportunity

Queensland has the natural resources, skilled workforce and existing industrial base needed to become a renewable energy and clean industrial superpower. If Queensland embraces its natural advantage in renewable energy, the state could lead in clean industries that will be at the centre of the global economy for decades to come. Generations of Queenslanders could gain jobs in industries such as clean manufacturing, new economy mining, and renewable hydrogen. Queensland has natural competitive advantages in these industries but in order to lead it must seize the opportunity now, setting the state up for the future, while tackling climate change.

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