COPPERSTRING 2.0

Re-powering the Townsville & North West Minerals Province Industrial Economy

Economic benefits of future investments in minerals mining and industrial manufacturing linked to Queensland's North West Minerals Province

June 2020

In collaboration with

KPMG

DIF CAPITAL PARTNERS

neuchâtel partners

SOREN Consulting Pty Ltd
Strategy-Operations-Resources-Energy

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Important Notice

This document is prepared by CuString Pty Ltd (CuString) as a concise summary of the series of reports exploring the resource base, electricity supply situation and economic potential of the North West Minerals Province (NWMP) and the Northern Queensland minerals economy. The document highlights the significant economic potential of the region and its importance to Queensland and Australia, providing a high-level summary of the key findings of the underlying studies prepared by ACIL Allen Consulting, IZMIN Pty Ltd, Neuchatel Partners, Soren Consulting, and additional analysis undertaken by KPMG.

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All figures are in Australian dollars unless otherwise noted.

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Extending the national grid across North and North-west Queensland - key takeaways

North West Queensland holds one of the world's greatest mineral endowments and is ideally positioned to take advantage of demand from the technology revolution and clean energy transition

The North West Minerals Province (NWMP) hosts known resources with in-ground value of over $680 billion across commodities expected to experience strong global demand for coming decades. The size and quality of resources in the NWMP provides a strong case for long-term common-use infrastructure investments such as electricity networks to access competitive and flexible energy supplies which are forecast to deliver benefits and incentivise new industrial investment.

$680 Billion

Known in-ground resources contained in North West Queensland

Providing access to flexible and competitively-priced electricity via the National Electricity Market will be a major economic driver for the NWMP and is forecast to stimulate significant minerals-sector investment and new production in the short and long-term

Construction of the proposed CopperString 2.0 transmission network across Northern Queensland will be the largest geographic expansion of the NEM and is a major economic reform to incentivise the development of New Economy minerals and renewable energy for Queensland and Australia. Global competitiveness will increase production, exports and economic welfare for Northern Queensland.

$154 Billion

Cumulative increase in gross value of mine production over 25 years

Supporting the coordinated and efficient development of mining and minerals-processing in North Queensland will maximise the value to Queensland from its in-situ resources and deliver massive economic benefits

Integrating the NWMP to the NEM complements key economic objectives, including facilitating continued resources sector development and clean energy investment. It is forecast to contribute to macro-economic objectives of employment, regional development and export growth. On-going development of the Townsville-to-NWMP minerals corridors is foreseen as a unique and important economic opportunity for regional Queensland.

$54 Billion

Aggregated increase in Real Income for Australia

+3560 FTE

Additional Full Time Employees sustained over 30 years in Northern Queensland

High electricity prices constrain the Northern Queensland minerals sector putting at risk production, new investment, employment and economic development. Reduction in electricity prices is an essential reform.

Access to the national grid will reduce delivered prices in the NWMP by an average of 40%. The high cost of electricity and lack of a flexible and competitive electricity market creates a significant barrier to new investment resulting in a forecast decline in the minerals sector production, employment, export and economic benefits. Despite immense minerals endowment and strong global demand Northern Queensland's resource sector is at risk.

-40%

Average delivered electricity price reduction as a result of access to the national grid

A "Clean Minerals" investment expansion – the Townsville to NWMP region can lead Australia as a decarbonised minerals mining and industrial manufacturing economy through common-use transmission investment

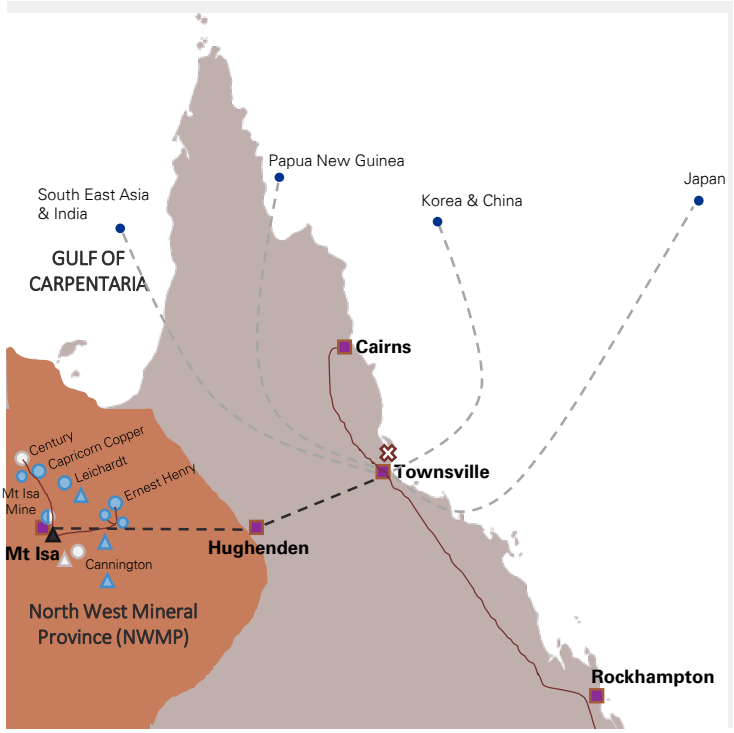
Northern Queensland has the best co-located wind and solar resources in Australia. When integrated with the national grid and existing gas generation fleet the NWMP this region can achieve significant cost and emissions-intensity reduction for electricity supply to the minerals mining and processing sector. This electricity advantage can power the extraction, processing and export of critical "new economy" minerals that are essential for new technology such as battery storage and the clean energy transition.

-58%

Emissions reduction related to energy supply to the NWMP as a result of CopperString 2.0 and connected clean energy

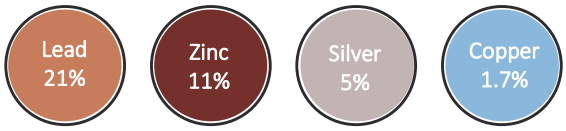
Contents

North West Queensland Minerals Province, A world-class mineral belt



% of Global Resources in the NWMP

The current resources zinc-lead-silver rank it in the top 3 largest ore bodies in world (Whitnall & Cranfield, DNRME, 2013)



- Export Hub and international routes
- Refineries and Port Operations
- Greenfield Copper project
- Operating Copper mine
- Greenfield Lead and/or Zinc project
- Operating Lead and/or Zinc mine
- East coast transmission line
- New transmission line providing access to the NEM
- City / Town
- Local Power Stations

The North West Mineral Province can deliver jobs and economic prosperity for generations to come

From recent studies conducted by IZMIN and Soren Consulting, A$680 billion of known resources remain in the NWMP. Over A$500 billion of these resources are "New Economy" minerals for which there is high demand for new technologies such as batteries and clean energy projects

The NWMP is internationally renowned as a highly prospective region for metals and minerals mining. After more than a century of significant mining activity, the province still holds over 70% of Queensland's base metal mineral endowment including copper, zinc, lead and silver as well as major phosphate deposits.

A group of consultants and subject-matter-experts have recently undertaken a comprehensive resource economics study of North West Minerals Province which quantifies the enormous potential of this region for minerals mining, processing and export.

Aside from New Economy minerals such as Copper, Cobalt, Gold, Graphite and Zinc, the province is also becoming increasingly recognised for its endowment of rare earth elements, including Molybdenum, Dysprosium, Rhenium, Holmium, etc. as global demand grows for the use of these materials in advanced technologies and clean energy infrastructure. More recently, the Queensland Government has highlighted the important role the minerals endowment in the NWMP could play in the development of a strategically important battery manufacturing sector, ideally value-adding such minerals locally rather than abroad.

The International Energy Agency has recently emphasised the critical role minerals play in the rapid development of many of the clean energy technologies. Queensland has the opportunity to ensure these and other key technologies can be adequately supplied with critical minerals to support the acceleration of energy transitions around the world, but production requires competitive operating conditions including electricity prices.

> An electric car uses five times more minerals than a conventional car and an onshore wind plant requires eight times more minerals than a gas-fired plant of the same capacity (IEA, May 6 2020)

Townsville & the NWMP is an integrated nationally-significant industrial economic zone

The Townsville-NWMP minerals mining, processing and industrial-manufacturing ecosystem is the most strategically important export supply chain in Northern Australia. Maximising the potential of the population, infrastructure and skills capability in Townsville is vital to a prosperous Queensland economy and the NWMP plays a crucial role in attaining this objective.

The Townsville economy is closely linked to the success or decline of the NWMP, **close to 15% of the local economy is directly related to the resources sector and over 8 000 jobs are directly or indirectly supported by the mining activity.**

The NWMP directly provides circa 20% of Northern Queensland's Gross Regional Product, equivalent to A$2.0 bn per annum.

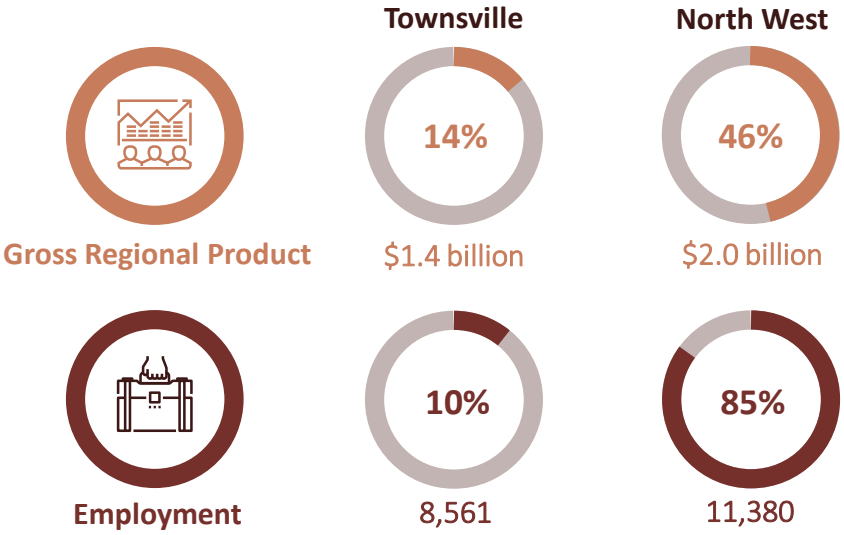
Investing in common use infrastructure that increases production in the NWMP directly benefits Queensland's economy through stable employment, high wages, local spending, royalties and supporting business development.

The increased production in the NWMP supported by providing access to the NEM via CopperString 2.0 is estimated by **ACIL Allen forecasts to sustain an average of 3,560 full-time equivalent jobs for at least 25 years across the Townsville to NWMP corridor.**

The future of Townsville and the region can be secured as the value add hub for the natural resources flowing from the west, both mineral and renewable energy. New industries from "New Economy" minerals processing through to manufacture of storage batteries and clean Hydrogen production could be developed.

> 14% of Townsville's economy (total GRP) is directly supported by the resources sector. Investments will strengthen communities and secure future economic growth.
>
> *Source – QRC (2019)*

What are resources worth for the regions?



Source – Queensland Resources Council (2019)
https://www.qrc.org.au/contributiontoqueensland

Barriers and risks to sustainable development in the NWMP

Competitive market driven by supply and optimized operating costs

Minerals mining and processing businesses in the NWMP compete in global markets and their ability to secure capital for on-going operations and investment is directly related to costs relative to other regions around the world. Among the key cost elements for minerals businesses in North West Queensland, electricity is clearly uncompetitive and a great opportunity exists to reduce this barrier and attract new investments. As an example to highlight the importance of electricity, the cost profile for the Little Eva Mine project near Cloncurry has been extracted from the 2018 Feasibility Report published by Copper Mountain Mining.

Electricity costs are extremely high in the NWMP compared to domestic and international competition

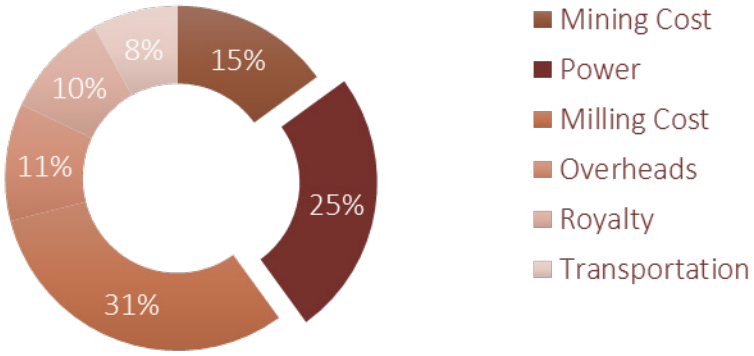
The competitiveness of the region's resources is heavily impacted by high energy costs.

The connection of the NWMP to the NEM would provide the NWMP industries access to reliable, flexible and competitive market driven electricity supply. The tables to the right illustrate the competitive disadvantage of the NWMP electricity supply compared to coastal Queensland and with international competitors. This translates to reduced profitability and lower incentives for greenfield investments.

Current NWMP electricity supply has minimal competition, is based on high wholesale gas prices and contracts for supply are on bilateral 'Take-or-Pay' style arrangements. These are generally inflexible and oblige users to commit to long term agreements on capacity delivery.

ACIL Allen forecast that access to the NEM has the potential to reduce the average wholesale price in the NWMP by circa 50%.

Little Eva Mine – Operating Cost Break-down



Source – IZMIN Consulting – NWMP Resources Study (April 2020)

Global energy cost comparative analysis

Copper	Average energy cost ($ct/lb)
Mt Isa Copper	45
Australia	22
DRC	34
Zambia	29
Chile	27
Peru	24
USA	24
Russia	18

Source – S&P Global Market Intelligence, 2019 (real - USD)

X2

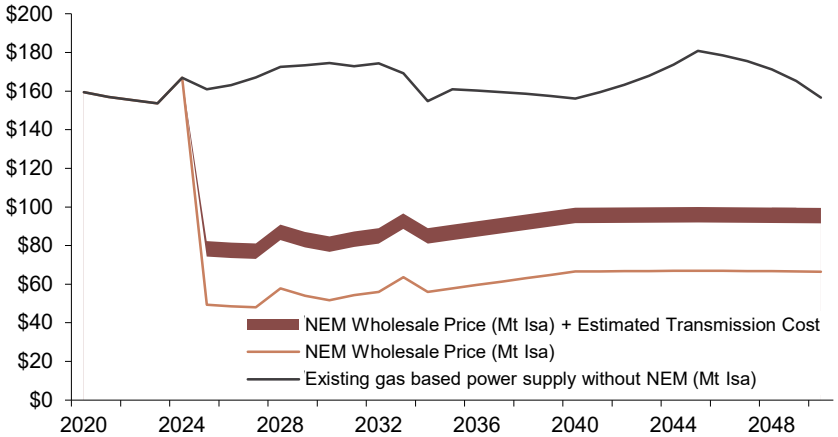
Average price in Mt Isa is twice as expensive as in other key competing countries

Electricity prices in the NWMP versus the NEM (A$/MWh – real)

	NEM Prices (delivered)	Existing NWMP (Gas)
Cost structure	Flexible procurement via retail or offtake arrangements	Bilateral, long-term take-or-pay structure
Delivered electricity Prices ($/MWh)	75-90	152-180

Source – Soren Consulting and KPMG analysis

NWMP Wholesale electricity price forecasts (A$/MWh - real)



Source – ACIL Allen Consulting & KPMG Analysis on transmission costs (May 2020)

Lower electricity prices

Critical to sustaining minerals production, exports, economic growth and jobs

Access to the national transmission grid

Access to the national transmission grid and the NEM will reduce the delivered cost of electricity in the NWMP by approximately

-40%

1

Lower energy costs and operating costs

Lower energy costs significantly lower the overall operating costs on mine sites estimated by up to

-10%

...increasing the incentive for new investment

2

Lower cut-off grade

Additional minerals become economic to mine at projected long-term commodity prices because the cut-off grade reduces as operating costs reduce

3

Higher production levels

The impact of these reduced cut-off grades is that substantially more ore becomes economic increasing production for minerals/metals, and extending mine lives for both existing and new mines

4

+$139Bn[1]

Increase in Real Economic Output

The aggregate increase in Gross State Product (real economic output) over the period to 2050 in Queensland as a result of increased minerals production is nationally significant, and strategically valuable

5

+3,560 Jobs[2]

Additional employment

Increased production in the NWMP resulting from access to the NEM sustains an average of 3,560 additional FTE jobs over the period to 2050

6

+$6.4Bn[3]

Additional Government royalty revenue

The estimated additional royalty revenue for the Queensland Government generated over the next thirty years from increase minerals production enabled by NEM connection

7

[1] Total over the 2020-2030 period / Source: ACIL Allen Consulting

[2] Average annual FTE in the NWMP / Source: ACIL Allen Consulting

[3] Soren Consulting – Demand Forecast for NWMP (April 2020)

New Economy minerals and large scale manufacturing opportunities

Mineral and renewable energy resources, existing industrial infrastructure and a skilled workforce create a platform for significant investment, economic growth and strategically significant export supply chains.

The economic and strategic value of developing Northern Australia is growing, particularly with respect to "New Economy" minerals and clean energy. Townsville is the largest population centre in Northern Australia, a major minerals trading gateway and key military centre. Despite the globally-significant endowment of high-value minerals and high-quality clean energy resources there is no transmission grid access fully develop this potential. Providing access to the NEM via common use transmission infrastructure proposed by CopperString 2.0 will remove a key barrier to major industrial and energy investment.

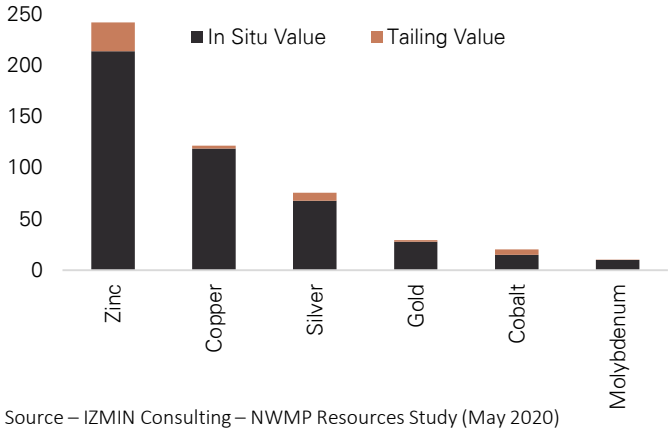
Advanced industrial manufacturing

Townsville has the potential to become a hub for advanced minerals processing, related product manufacture and export in addition to the refining of zinc and copper undertaken today. There is strong strategic, geo-political and economic drivers for the Queensland and Commonwealth Governments to pursue this opportunity.

In May 2020 the International Energy Agency noted the strong long-term demand for critical minerals and the importance of supply-chain security for economic and energy-transition reasons. Townsville and the North West Minerals Province can take advantage of this opportunity, and numerous projects are already being considered including nickel and cobalt processing as well as Li Ion battery manufacturing.

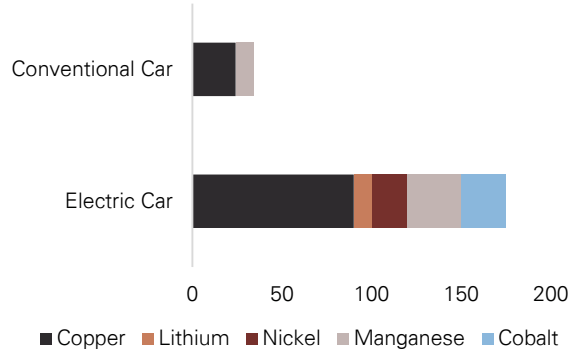
> "Rising deployment of clean energy technologies is set to supercharge demand for critical minerals (IEA, May 2020)

In-ground and tailing resources (A$ billion)



Source – IZMIN Consulting – NWMP Resources Study (May 2020)

Minerals used in selected transport technologies (kg/car)



Source – International Energy Agency – COVID 19 Report (2020)

Downstream impacts on the wider North West Queensland

Large-scale renewable and clean energy

AEMO identified the corridor due west of Townsville to the North West Minerals Province to contain Eastern-Australia's **best** co-located wind and solar resources which could drive potential electricity generation capacity totalling over 26GW- but this potential is currently isolated.

Being located along the Townsville to Mount Isa industrial supply chain creates unique opportunities for decarbonisation of minerals mining and processing as well as traditional industrial activities and large-scale agriculture. It also provides a vital ingredient for the development of a future hydrogen hub in Townsville, leveraging off Townsville's existing port infrastructure.

Already nearly 2,000MW of wind and solar projects have formally commenced grid-connection processes to access the CopperString 2.0 transmission network- and start realising this great potential .

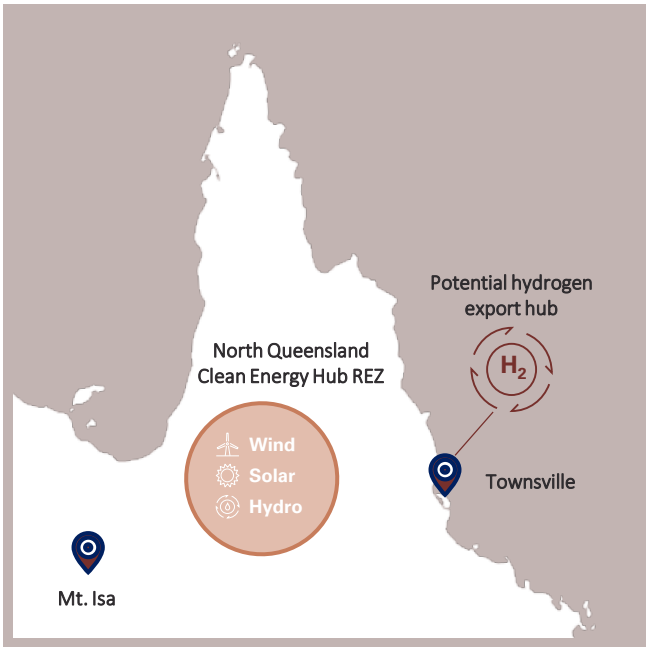
Green Hydrogen production

Hydrogen produced by renewable energy is a key strategic opportunity for Australia and the focus of policies from State and Federals Governments.

The establishment of a "clean energy corridor" between Townsville and Mount Isa is an important opportunity for Queensland in the development of a hydrogen export industry. The complementary nature of the combined A grade wind and solar resources provides a competitive advantage over other potential development regions. Water supply is a key issue for hydrogen production, and Northern Queensland offers high reliability water resources in close proximity, complementing the renewable energy resources.

Based on an assumed annual export volume for 1.75mtpa H2, the energy equivalent to 25% of the annual LNG export volume out of Gladstone, KPMG estimates indicative export value of $4.4bn, and the requirement of additional renewable development of 15GW+.

Northern Queensland has a unique capability to produce vast quantities of clean energy products for export to domestic and international markets



26 GW of renewable resources in the North QLD Clean Energy Hub REZ

A / A AEMO rated wind and solar - the only region in Australia to achieve this

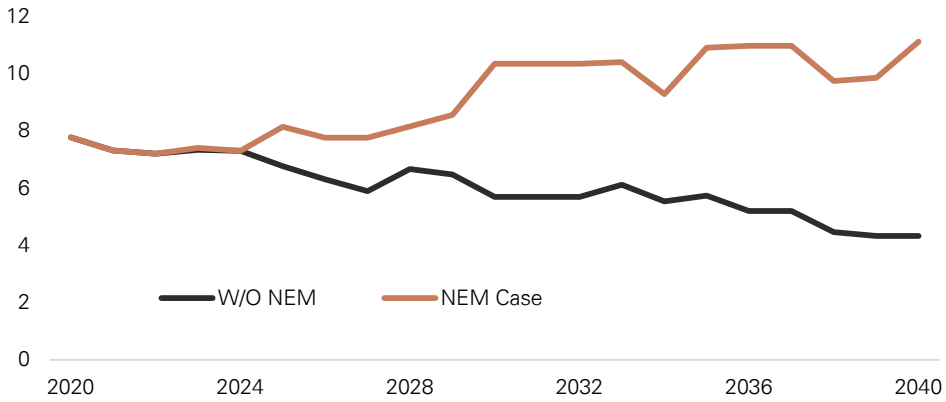
$4.4bn Estimated export value for Hydrogen through the Port of Townsville

*Source – KPMG Analysis

Long term benefits of integrating the NWMP to the NEM

Main energy users in the NWMP are estimated to spend A$400 million per annum on electricity supply, at an average energy price substantially above A$150 per MWh. A connection to the NEM would generate substantial energy savings leading to increased mine production, the extensions of life-of-mine and the reprocessing of tailing deposits. This will result in increased revenue, royalty payments and employment. Izmin Consulting has estimated that lower cost, more flexible electricity supply from the NEM via CopperString should increase the value of minerals in production by $154 billion over the next thirty years.

Impact of NEM access on annual value of mineral production (A$ billion)



Source – IZMIN Consulting – NWMP Resources Study (April 2020)

Increase mine production value to 2050 by

$154 billion

The substantial increase in production levels is supported by strong global demand, and results in a major uplift to the Queensland economy over coming decades through an uplift of real economic output (Gross State Product), real income (Economic Welfare) and employment.

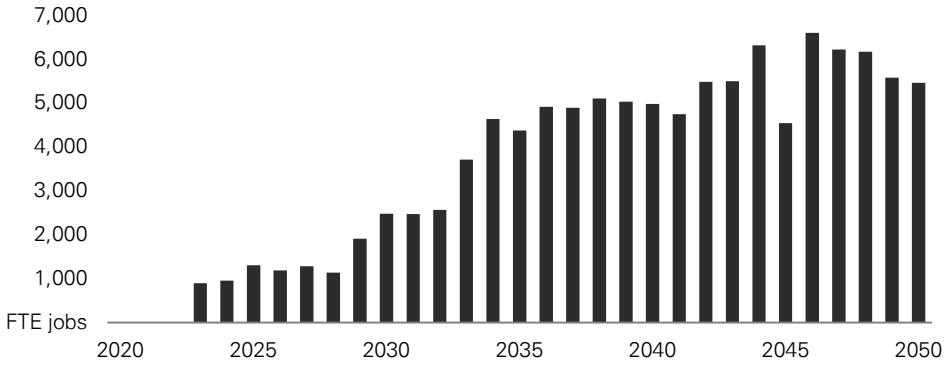
The Queensland Government is also a major beneficiary of increased minerals-sector production through royalty revenue payments from increased mine production. The estimated royalty generated over the next thirty years is approximately A$14.4 billion, an increase of approximately $A6.4 billion compared to current forecasts without a connection to the NEM.

(2020-2050)	Real Economic Output	Real Income
Queensland	A$139.45 billion	A$54.32 billion

Source – ACIL Allen Consulting –Assessment of electricity market and economic impacts (May 2020)

> “Access to the NEM for the NWMP is estimated to increase cumulative royalty payments to the State by $6.4 billion (IZMIN & Soren Consulting)

NEM Employment impact in North West QLD (Full Time Employees)



Source – ACIL Allen Consulting –Assessment of electricity market and economic impacts (May 2020)

+3560 jobs

Additional Full Time Employees sustained over 30 years in Northern Queensland

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