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Paul Martyn
Director General
Department of Energy and Public Works

Lodged online and via email: NWMPoptions@epw.qld.gov.au

28 February 2022

Dear Mr Martyn,

APA Submission to the Consultation Regulatory Impact Statement for electricity supply options for the North West Minerals Province

Thank you for the opportunity to comment on the Consultation Regulatory Impact Statement for electricity supply options for the North West Minerals Province. As the largest generator connected to the North West Power System, we appreciate the Government's ongoing engagement on these matters. Our submission responds to the important issues raised in the Consultation Regulatory Impact Statement, particularly relating to the proposed CopperString 2.0 project.

APA has a proud track record of supplying high reliability energy to the Mount Isa region and surrounding communities, including the many resources projects in the region which are so important to the regional and Queensland economy. We have a deep understanding of the North West Power System, the current pricing, the opportunities for different energy solutions and their impacts in the region. We are deeply concerned that, on the evidence provided through the Consultation Regulatory Impact Statement and Oakley Greenwood's analysis (which is attached to our submission), the CopperString 2.0 project has the potential to cause material adverse impacts on the North West Minerals Province and Queensland more generally.

Put simply, if CopperString 2.0 is approved it will create a 40-year electricity tax on mums and dads and then leave a $1 billion taxpayer debt behind while providing no material reduction in energy costs for the region.

The only way the proposed CopperString 2.0 connection can deliver power to the North West Minerals Province at proposed prices is to smear more than a quarter of the total project costs across all Queensland electricity users. Oakley Greenwood concludes this could see large customers face a staggering $57,000 hike to their yearly electricity bills.

Even with massive subsidies from Queensland energy users and taxpayers, CuString Pty Ltd's claimed $90/MWh price for electricity is highly improbable. Modelling by Oakley Greenwood commissioned by APA, shows that the mining customers are likely to pay $150/MWh for energy delivered by CopperString 2.0.

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The financial impacts of smearing the costs across electricity users in the State – from households to business and industry – will not deliver a net benefit to Queensland. To the contrary, the proposed costs treatment would be grossly unfair to households across Queensland, who would not receive any material benefit.

Furthermore, the developers of CopperString 2.0 are seeking significant derogations that would essentially shift more of the investment risk to the State Government and taxpayers. This means the developers are asking to be shielded from all the normal risks that a regulated electricity transmission business would face, while benefiting from large up front development fees and higher returns, all at the expense of Queensland's electricity users.

There are far superior alternatives for lowering cost and improving sustainability in the North West Minerals Province. For example, progressive development of renewable generation around Mount Isa and augmentation of the local network is a much cheaper, more reliable and environmentally sustainable option than building a 1,100km transmission line. Under the Government's own 'greater renewable penetration scenario', anticipated pricing would be $76-82/MWh in the medium to long term, which is even lower than CuString Pty Ltd's claims of $90/MWh. This is backed by Oakley Greenwood's analysis.

The business case for Powerlink to deliver a transmission connection (under the RIT-T process) is also cheaper than the proposed CopperString 2.0 structure. Under this scenario, a Government-built transmission line is $244 million cheaper and, as such, Queenslanders would pay less.

APA has also identified an opportunity to duplicate the network connection between the Diamantina Power Station complex and the existing grid at a cost of $50 million, which is two per cent of the cost of building CopperString 2.0. A second connection will prevent a repeat of the supply disruptions in 2021 caused by faults in the network connections not faults at the power stations, which were fully available.

APA's long-term vision for the region is to develop a hybrid energy grid that aims to reduce carbon emissions and lower energy costs, while continuing to provide firm, dispatchable energy through APA's Diamantina Power Station complex. This would build on our decision to construct the 88MW Mica Creek solar farm to supply renewable electricity to existing APA customers, MMG Dugald River and Mount Isa Mines Limited. The Mica Creek Solar Farm will reduce the emissions intensity from APA's entire Mount Isa generation fleet, taking it well below the Australian and Queensland average.

In summary, the Queensland Government's Consultation Regulatory Impact Statement modelling is plain proof that the CopperString 2.0 project would not deliver any meaningful reduction in energy costs. The modelling also confirms that electricity users will be paying more for electricity from CopperString 2.0 than they would under the greater renewable penetration scenario. Moreover, to make matters worse, Oakley Greenwood's analysis demonstrates that the costs of CopperString 2.0 have been understated and the demand overstated.

Given uncertain demand in the North West Minerals Province and low confidence that CopperString 2.0 can deliver any meaningful cost savings, investment in CopperString 2.0 would create an unacceptable risk for Queensland electricity customers.

It should be unacceptable to consider building CopperString 2.0 in light of the facts and modelling from the Queensland Government's Consultation Regulatory Impact Statement and to skip over the simple reality that someone has to pay to build the proposed 1,100km high voltage line for no material benefit. We believe CopperString 2.0 is an extremely expensive solution, in search of a problem that does not exist or at the very least has been overstated.

Finally, in preparing our submission, we have interacted with numerous stakeholders who have provided consistent feedback that they were unaware of this consultation process. Given the significant nature of the regulatory matters being considered, APA believes that the process would benefit from a combination of some targeted stakeholder communications, a consultation workshop similar in nature to that used for the Qld REZ scheme and a corresponding extension of the consultation period to give all relevant stakeholders the opportunity to contribute.

If you wish to discuss our submission in further detail, please contact Matthew Forrest on 0419 499 669 or at matthew.forrest@apa.com.au.

Yours sincerely,

Julian Peck
Group Executive
Strategy and Commercial

APA submission

Electricity supply options for the North West Minerals Province

Consultation Regulatory Impact Statement

February 2022

Contents

Index of Tables

Index of Figures and Charts

Executive Summary

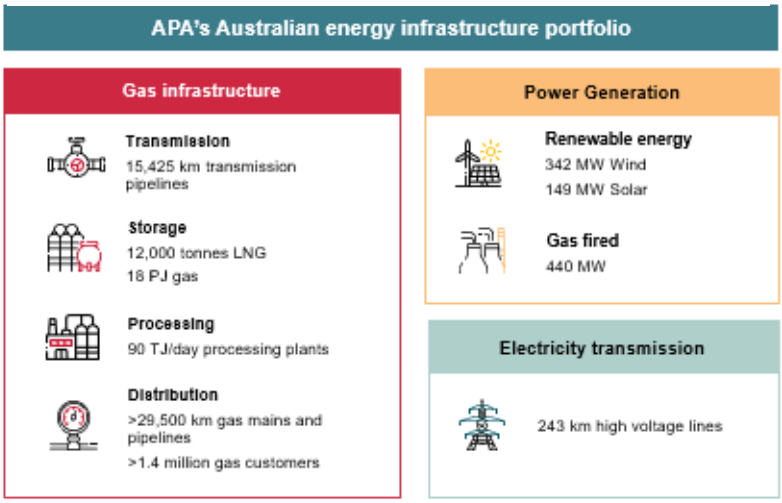
Key points

- As the Queensland Government's Consultation Regulation Impact Statement (Consultation RIS) shows, the lowest long-term energy prices in the North West Minerals Province (NWMP) will be delivered by increased local renewable generation firmed with gas-fired generation.
- There is no evidence of market failure in the NWMP. Competition, together with the falling cost of renewable generation, is the most efficient means of providing low cost, low emissions, reliable and sustainable energy supplies to underpin further development of the NWMP.
- Given improbable demand forecasts and no clear evidence that CopperString 2.0 can deliver meaningful cost savings, proceeding with its development will create unacceptable cost and risk for Queensland electricity customers.
- Government supported subsidies for CopperString 2.0 risk discouraging future private investment in Queensland and create significant 'sovereign risk'.
- CopperString 2.0 has avoided contestability and is incompatible with Queensland Government procurement policies. If CopperString 2.0 is confident it has a business case, it should be privately funded and contracted by its customers and connecting generators, not Queensland taxpayers or residential electricity customers.
- CopperString 2.0 will not create any net new renewable energy, as it will simply displace other renewable generation in the Queensland NEM region. Following the construction of CopperString 2.0, carbon emissions in Queensland will increase as miners in Mount Isa source their power from Queensland coal power stations.

APA is a leading Australian Securities Exchange (ASX) listed energy infrastructure business. Consistent with our purpose to strengthen communities through responsible energy, our diverse portfolio of energy infrastructure delivers energy infrastructure solutions to customers in every state and territory on mainland Australia.

Our investments include over $750 million in renewable generation, making APA the 8th largest renewables investor in Australia. We operate and maintain high voltage electricity transmission which connects Victoria with South Australia and New South Wales with Queensland. We also own and operate more than 400MW of gas-fired generation.

Figure 1: APA's Australian energy infrastructure portfolio

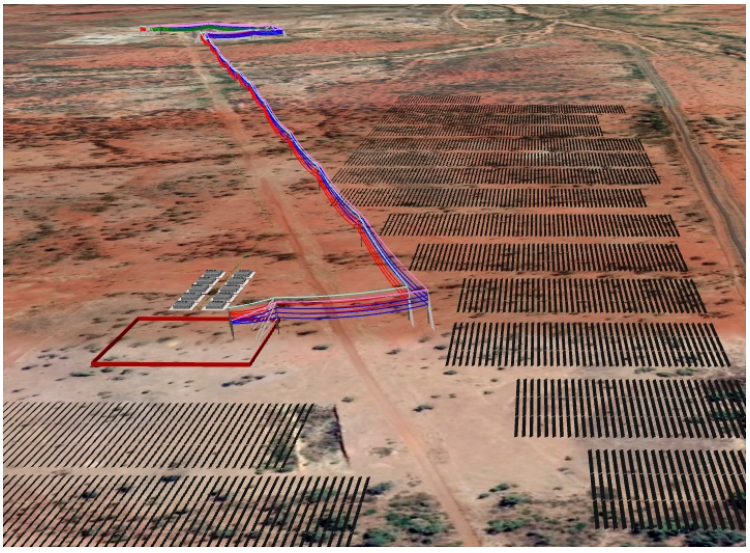


Our 15,425 kilometres of natural gas transmission pipelines connect sources of supply and markets across mainland Australia. We operate and maintain distribution networks connecting 1.4 million Australian homes and businesses to the benefits of natural gas. We also own or have interests in gas storage facilities.

APA supports the transition to a lower carbon future. Our ambition is to achieve net zero operations emissions by 2050. Through our Pathfinder Program, we are investigating how hydrogen and other technologies, such as batteries and microgrids, can support a lower carbon future.

APA has a significant interest in the North West Minerals Province (NWMP). We own and operate the Diamantina Power Station complex (DPS) consisting of 15 generating units which was constructed in 2013 to provide energy to Mount Isa. The competitive tender process that was carried out at the time saw DPS constructed in preference to the CopperString 1.0 project, which was considered to be uneconomic.

Figure 2: Mica Creek Solar Farm, (artist's impression)



DPS has been highly reliable and has met or exceeded its contracted availability targets in every year since commissioning. While there were two interruptions to supply in 2021, both were caused by a failure in the local transmission assets. A duplicate connection to the NWPS could be constructed at a cost of $50 million which is significantly less than the $2.5 billion proposed costs of CopperString 2.0.

Since then, we have continued to invest in Mount Isa. In 2021, we reached Final Investment Decision (FID) to develop two stages of the Mica Creek Solar Farm (see Figure 2) with an investment of $150 million.

Stage 1 of Mica Creek Solar Farm (expected to be operational in early 2023) is 44MW and contracted to MMG's Dugald River Mine. Stage 2 (expected to be operational in mid-2023) is a further 44MW and contracted to Glencore's Mount Isa Mines.

These investments have taken place in a well-functioning energy market where large energy users are able to procure from competing supply options from multiple suppliers including self-supply. These large energy users continue to seek new and more efficient sources of energy. APA supports this competitive environment, which ensures that buyers and sellers compete on a level playing field, and that the most efficient outcomes are achieved.

The Queensland Government's Consultation RIS is seeking views on electricity supply options for the NWMP. The Consultation RIS includes three options:

- **Option 1:** Business As Usual (BAU), which can be summarised as using distributed generation close to the existing customers, without incurring the cost of connection to the NEM;
- **Option 2:** A 1,100km transmission line from Townsville to Mount Isa, also known as 'CopperString 2.0', which is proposed by CuString Pty Ltd (CuString), accompanied by a unique regulatory model that shifts costs and risks to ordinary Queensland electricity customers rather than the benefiting users and proponents of the link;
- **Option 3:** Delivering the same transmission line by Powerlink, under more standard regulatory conditions (with some modifications to consider broader economic benefits).

Analysis in the Consultation RIS shows that the lowest long-term energy prices in the NWMP are delivered by greater renewables in the region under the BAU option. This is not surprising given the falling cost of renewables. APA's independent analysis confirms that renewable penetration of up to 50% can readily be accommodated in the NWMP without the need for additional investment in firming generation.

In APA's view, the Queensland Government should help lower the cost of energy in the NWMP by supporting the existing competitive environment and remove the threat of an uneconomic and publicly funded transmission connection from discouraging

investment in the region. The Queensland Government will accelerate price reductions through its support for new, competitively sourced renewable generation in the NWMP. In addition to lowering costs, this initiative would support local jobs and help lower emissions across the region and the state.

The fact that CuString is seeking revenue protection by way of a unique regulatory model that shifts costs to ordinary Queensland electricity customers highlights its failure to justify its existence on commercial grounds.

The Consultation RIS also seeks views on options to build CopperString 2.0. Consistent with the competitive process in 2011, the Consultation RIS considers that CopperString 2.0 is uneconomic with the costs of the project outweighing the benefits. Queensland electricity customers and/or the Queensland Government would, therefore, be required to subsidise the project if it goes ahead.

Our submission below provides views on these and other issues raised in the Consultation RIS, particularly relating to the CopperString 2.0 project:

- The falling cost of renewables and highly uncertain demand in the NWMP mean that investment in a long-lived transmission asset such as CopperString 2.0 creates significant risk of higher energy prices and long-term subsidisation for Queensland electricity customers. In contrast, renewables can be tailored to fit the identified need when demand eventuates.
- With the exception of four to six large mining companies, if CopperString 2.0 is built, Queensland energy users will pay higher electricity prices for the next 40 years but will not receive commensurate benefit from CopperString 2.0. Some large customers could pay an additional $57,000 per year, for 40 years.
- The high and flat demand forecasts in the Consultation RIS are not credible outcomes. Over-forecasting energy demand, which promotes a lower cost per unit for CopperString 2.0, creates significant risk for Queensland energy users.
- Modelling commissioned by APA confirms the Queensland Government's conclusions in the Consultation RIS that, firstly, the CopperString 2.0 project will not deliver any meaningful reduction in energy costs and, secondly, that electricity users will be paying more for electricity from CopperString 2.0 than they would under the BAU scenario corrected for higher probability of greater renewable penetration
- Government subsidies for CopperString 2.0 would create a perception of sovereign risk for future investment in energy infrastructure.

Option 1 with greater renewable penetration is clearly preferred because it is the lowest risk, most equitable and will confidently provide lowest cost energy with the lowest emissions.

Our submission is structured around the stakeholder questions on pages 3 and 4 of the Consultation RIS:

- PART A considers whether there is any evidence of inefficient electricity prices or market failure in the NWMP;
- PART B outlines a more economically efficient and equitable infrastructure outcome for the NWMP;
- PART C explains how transmission infrastructure is developing across Australia and why a physical transmission connection from the NWMP to the National Electricity Market (NEM) is not required;
- PART D outlines other factors that the Queensland Government should consider in its decision-making process;
- PART E provides comments on the proposed derogations sought by CuString; and
- PART F provides responses to the survey questions.

Glossary

ACCC	Australian Competition and Consumer Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ASX	Australian Securities Exchange
BAU	Business as Usual
Consultation RIS	Consultation Regulatory Impact Statement
CuString	CuString Pty Ltd
DPS / DPS Complex	Diamantina Power Station Complex consisting of 15 generating units with a nameplate capacity of 324MW.
Draft EIS	Draft Environmental Impact Study
FID	Final Investment Decision
GPG	Gas Powered Generation
ISP	Integrated System Plan
MLF	Marginal Loss Factor
MVA	Megavolt-ampere
MW	Megawatt
MWh	Megawatt hour
NEM	National Electricity Market
NER	National Electricity Rules
NWMP	North West Minerals Province
NWPS	North West Power System
PPA	Power Purchase Agreement
RAB	Regulatory Asset Base
RE	Renewable Energy
RIT-T	Regulatory Investment Test for Transmission
ROQ	Rest of Queensland
SAPs	Stand Alone Power Systems

SRMC	Short Run Marginal Cost
TNSP	Transmission Network Service Provider
VRE	Variable Renewable Energy
WACC	Weighted Average Cost of Capital

PART A Electricity provision in the NWMP

Key points

- No evidence has been presented indicating that there is market failure in the NWMP. To the contrary, market signals suggest that there is a functioning market where energy consumers have significant bargaining power.
- Any difference in the delivered price of electricity in the NWMP as compared to the NEM reflects the actual costs to serve and the market circumstances that existed when contracts were entered into.
- It lacks credibility to draw any conclusions on the efficiency of the market based solely on there being a difference in the delivered price.
- Market evidence suggests that industrial customers in the NWMP are actively seeking to develop new supply sources (e.g., large scale solar), which suggests that there is no perceived barrier to entry into the NWMP market.
- The only substantial impediment to new entrant generation is access to land in the vicinity of the NWPS electricity grid because of existing mining tenements.

Electricity prices in the NWMP

The Consultation RIS sought stakeholder feedback on:

- What is the evidence of inefficiently high electricity prices in the NWMP? Are there enduring barriers (or market failures) to efficient electricity prices for industrial customers in the NWMP?
- Does the difference in the delivered price of electricity between NWMP and NEM connected customers indicate a market failure that requires Government intervention to address?

There is no evidence to indicate that there is material market failure in the NWMP[1]. Rather, the market is working efficiently evidenced by the fact of there being various potential providers of electricity in the region, new supply agreements being entered into, and existing supply agreements being varied to reflect changing supply/demand fundamentals.

[1] The only potential market failure relates to the market's ability to access land that is conducive to the siting of new gas fired power generation facilities. This is not a physical limitation (i.e., there is available land), rather, it results from particular ownership, tenure and zoning issues affecting land in and around the existing gas facilities servicing Mount Isa.

There has not been any evidence presented that electricity prices are inefficiently high in the NWMP – that is, that prices exceed the efficient costs of supply in the long run.

There are many factors that will affect the cost of providing electricity services in different markets (particularly when they are geographically and physically isolated from each other), and those costs may differ over time. Attempting to draw conclusions regarding the relative efficiencies of different markets by comparing their respective price outcomes is likely to lead to incorrect conclusions being drawn.

This type of assessment is particularly fraught if other relevant factors are not considered. These factors include:

- Differences in how different markets are designed;
- How risks are allocated under the contracts that underpin those price outcomes;
- The levels of service provided to customers in each of those markets; and
- The length of the contracts in question.

Competitive contract prices that are agreed at a given point in time may later be seen to be above or below the prices that could be achieved at some future point in time. The important consideration is whether competitive conditions existed at the time the contract was initially entered into and continue to exist, especially at the time a new contract is to be negotiated or an existing contract is being re-negotiated.

In this context, a key feature[2] of any efficient market is that there are many rational, profit maximising sellers of services actively and freely able to compete with each other to provide services to many potential buyers (i.e., there are no material barriers to entry or exit and there is no monopoly or monopsony power). These features of efficiency exist in the NWMP, with existing and prospective electricity users in the region freely able to:

- Negotiate with existing electricity suppliers (and/or developers of new supplies) for the provision of wholesale electricity services, with the conveyance of that electricity to their site via the existing (open access) electricity transmission

[2] Other key features of an efficient electricity market include: (a) it should lead to electricity prices that are cost-reflective in the long-term, having regard to the level of service provided and how risks are allocated; (b) it should minimise the transaction costs incurred by buyers and sellers interacting with the market; (c) it should provide easy access to relevant information and minimise information asymmetries; (d) it should incentivise service providers to innovate by providing a range of products and services that customers express a willingness to pay for; and (e) it should place downward pressure on overall costs and therefore prices, as business seek to retain or gain market share by helping customers reduce their electricity costs.

system and any downstream (including site-specific) electricity distribution infrastructure able to be procured from a competitive market;

- Access gas from a competitive east coast gas market for use in a behind-the-meter gas fired electricity generator[3], with the conveyance of that gas to a customer's site being via existing gas pipeline infrastructure under terms and conditions that are subject to strong regulatory oversight, and any additional downstream (including site-specific) infrastructure able to be procured from a highly competitive market; or
- Construct, operate and maintain a behind-the-meter electricity generation solution (e.g., solar plus battery) or instead, procure an equivalent solution from a competitive market via a power purchase agreement (PPA).

Recent competition in the NWPS

- In 2019, three large customers ran competitive tender processes for energy in the NWPS. DPS was awarded three contracts as a result.
- In 2021, Stanwell Corporation mothballed their Mica Creek Power Station as these customers migrated to DPS leaving no load for the Mica Creek Power Station. The decision of these customers to select DPS was driven by cost and fuel efficiency as customers typically procure their own gas supply.
- If there is no NEM connection by the time that the current contracts expire, then APA expects that, consistent with usual practice, the NWPS customers will run competitive procurement processes and the Mica Creek Power Station and/or other new entrants will have the opportunity to compete for this load and/or customers will consider self-supply options as they have in the past.
- APA does not hold any power to prevent Mica Creek Power Station from re-opening or new generators from entering the market. Indeed a number actively propose to do so.
- The only impediment to a new gas-fired generator is access to land conveniently located near the gas supply and NWPS. Most of the land is owned by the Queensland Government (i.e., Crown Land) and subject to mining tenements.

[3] Examples of where this has historically happened in the NWMP include at the Cannington mine, which has a 35MW natural gas reciprocating engine, and the Phosphate Hill mine, which has a 42MW combined cycle/open cycle gas turbine, both of which are connected to the Carpentaria Gas Pipeline, which is a scheme pipeline that provides light regulation services under the National Gas Law and the National Gas Rules. 2006 X41/XPS PowerStation, which, while owned by APA/EII, is a NWPS connected BTM plant with full dispatch control by Xstrata (now Glencore). This was a product of a competitive process that Xstrata ran which included Transfield Services as competition.

Recent examples of these types of supply solutions occurring in the NWMP include:

- The development of APA's 88MW Mica Creek Solar Farm:
    - First stage[4] (44MW) involves the supply of renewable electricity from 2023 to MMG's Dugald River Mine under a 15-year offtake agreement; and
    - Second stage[5] (another 44MW) involves the supply of renewable electricity to Mount Isa Mines for 15 years via a variation to an existing offtake agreement.
- The installation of 3MW of behind-the-meter solar at the Cannington mine in 2018 by EDL as part of an ongoing Independent Power Producer.
- VAST Solar's proposal to install a flexible, modular and concentrated solar thermal power technology to deliver utility scale renewable energy generation with scalable and thermal storage[6].[7]

The evidence of different supply solutions being made available at competitive prices in response to customer demand (including as a variation to an existing offtake agreement, which, prima facie, indicates the strength of the bargaining power of users) strongly suggests that there is a highly active and competitive market for the provision of electricity to customers in the NWMP. This is despite it being geographically remote and physically isolated from the NEM.

This is consistent with evolution of the electricity market in the NWMP. In particular, the supply solutions that have been revealed historically by the market have reflected the historical opportunity costs of the different supply options (and their relative levels of reliability and risk) at different points in time. For example, the high reliance on gas generation in the NWMP has been underpinned by access to relatively cheap wholesale gas at the time investment decisions were being made. Since the Diamantina Power Station Complex began operations, it has met the guaranteed supply reliability as shown in detail in Appendix B.

[4] https://www.apa.com.au/globalassets/asx-releases/2021/2021-11-01-apa-to-commence-stage-one-of-mica-creek-solar-farm.pdf

[5] https://www.apa.com.au/news/media-statements/2022/stage-two-of-apas-mount-isa-mica-creek-solar-farm-powers-ahead-with-second-customer/

[6] https://vastsolar.com/ The VAST solar development is still at the feasibility stage of development.

[7] Neoen and CleanCo are also proposing renewables in the region. https://renwrenewables.com.au/

For example, when the Diamantina Combined Cycle Gas Turbine power plant reached FID, wellhead gas prices in Queensland were in the order of $3.50/GJ, with forecast prices of around $5.50/GJ. These prices resulted in a short run marginal cost (SRMC) of production in the order of $55/MWh. In contrast, the cost at that time of building a solar farm was estimated to be around $180-260/MWh with wind at around $90/$120/MWh ($2009)[8].

Like any contract, there is always a risk that once it has been agreed, the cost of adopting alternate solutions will change, relative to what was forecast at the time the contract was entered into. In the case of the NWMP, the cost of different supply options has been affected by a number of factors, including:

- Higher gas prices; and
- Declines in the cost of renewables and other supporting technologies (such as batteries).

Brief history of DPS

- DPS was developed in response to a competitive process, run by the NWPS users led by Xstrata (Mount Isa Mines) and Ergon, and included MMG, South32 (formerly BHP) and Incitec Pivot.
- Competing options included gas-fired generation options including DPS, redevelopment and overhaul of the existing Mica Creek Power Station (owned by CS Energy at that time) and a transmission connection to the NEM (CopperString 1.0).
- This competitive process resulted in DPS being constructed in preference to other potential solutions, including CopperString 1.0 which was not preferred by the users, despite receiving commitments to significant government subsidies at the time.
- Ergon and Xstrata contracted offtake from the DPS for a term of 17 years reflecting their preference for the solution.

These risks would have been analysed and factored into the decisions made by customers and generators at the time they entered into their supply contracts. Importantly, it is the two contracting parties that bear those risks, not an external (third) party or taxpayers.

NWMP is competitive

As customers renegotiate their existing supply arrangements (or as they change their levels of demand and seek to vary their agreements), a competitive market will see these (now more efficient) supply solutions being revealed by market participants and

[8] Simms, Providing a circuit breaker to meet North West Queensland's future electricity needs, Commissioned by the Queensland Resources Council and the Queensland Government, May 2009, page 37

becoming the preferred options adopted. The NWMP is witness to this, with miners such as South32 (Cannington), MMG and Glencore all having sought alternate, lower cost and renewable supply solutions in recent times as the underlying economic costs of these options declined.

The NWMP is not an isolated example – this outcome also occurs in many other mining areas, with numerous isolated mines moving towards distributed (and lower emission) energy solutions[9]. This is a logical and economically efficient outcome, given the declining costs of smaller scale distributed energy solutions that can both produce and store electricity at smaller scales (e.g., solar and battery)[10].

Table 1: Examples of isolated mines and regions moving towards distributed energy solutions

Development	Summary of details
Gruyere Gold Mine	49MW gas engines, 13MW solar and 4.4MW/4.4MWh battery
Agnew Gold Mine	21MW gas and diesel engines, 18MW wind, 4MW solar and 13MW/4MWh battery.
De Grussa Project	19MW diesel, 10.6MW solar and 6MW battery
Granny Smith	27.3MW gas engines, 7.7MW solar and 2MW/1MWh battery.
Strandline Resources – Coburn Mineral Sands Project	18MW gas engines, 11MW solar and 4MW battery.

[9] Gruyere Gold Mine - https://www.apa.com.au/globalassets/asx-releases/2020/apa-makes-first-hybrid-energy-microgrid-investment.pdf Agnew Gold Mine - https://edlenergy.com/project/agnew/ De Grussa project - https://arena.gov.au/knowledge-bank/degrussa-solar-project/ Granny Smith - https://www.pv-magazine-australia.com/2020/10/08/granny-smith-gold-mine-receives-one-of-the-worlds-largest-renewable-energy-microgrids/ Strandline Resources – Coburn Mineral Sands Project - https://www.strandline.com.au/irm/content/coburn-heavy-mineral-sands-project-100.aspx?RID=306 Warrawoona Gold Project https://thewest.com.au/business/public-companies/calidus-powers-gold-mine-with-renewable-energy-c-5427041 Esperance Renewables Hub - https://onestepoffthegrid.com.au/hybrid-solar-and-battery-system-to-power-mineral-sands-project-in-w-a/ Jabiru Hybrid Renewable Project - https://onestepoffthegrid.com.au/territory-town-runs-on-100-solar-during-day-with-new-hybrid-microgrid/ Lake Wells potash project - https://www.australianmining.com.au/news/lake-wells-microgrid-creates-greenest-sop-project/

[10] This is also impacting the way smaller customers are being served. For example, Western Power (in Western Australia) is proposing to use Stand Alone Power Systems (SAPs) to service thousands of individual isolated farms/properties over the next decade, in lieu of replacing the ageing infrastructure that is currently used to service those properties. SAPs are considered to have cost, reliability and resilience (e.g., to natural disasters, bushfires) benefits.

Development	Summary of details
Warrawoona Gold Project	11MW gas, 4MW solar and 3.5MW battery
Esperance Renewables Hub	22MW gas, 9MW wind, 4MW Solar and 2MW of battery
Jabiru Hybrid Renewable Project	4.5MW diesel, 3.9MW solar and 3MW/5MW battery
Lake Wells potash project	10.7MW Gas and 2MW Diesel, 4.5MW Solar, 9MW Wind and 9MW Battery

If CopperString 2.0 is viable, it should be underwritten by its users not taxpayers

Notwithstanding this, if accessing energy from another adjacent market via a large transmission connection (e.g., akin to CopperString 2.0) was the most efficient supply solution, having regard to its relative risks, then an efficient market (or the regulatory arrangements underpinning the market) should have already revealed that as being the most efficient solution.

In the context of electricity transmission services, industry participants generally consider the Regulatory Investment Test for Transmission (RIT-T) under the National Electricity Rules (NER) as being the basis for determining whether or not a transmission investment is efficient, as its application is a fundamental part of the regulatory framework that underpins the provision of electricity transmission services in the NEM.

APA does not disagree. In fact, we believe that a robust cost benefit analysis should be used in this case. However, it is also worthwhile considering the approach that is adopted in the gas market, whereby users (shippers) contract directly with pipeliners for the provision of pipeline services.

In these circumstances, it is individual users' willingness to pay for those pipeline services that underpins the commercial development of transmission pipelines. Clearly, a user's willingness to pay for gas transmission services will reflect their view of the additional economic value (producer surplus) that they will achieve from being able to access cheaper and potentially more reliable gas via that transmission pipeline, given (amongst other things):

- Forecasts of wholesale gas prices;
- The costs of alternate supply solutions;
- The economic life of their facility; and
- The certainty that they have around their demands.

Again, the risk that outturn conditions will be different to what was forecast when the contract was agreed is borne by the contracting parties – not external (third) parties or taxpayers.

This development pathway is particularly relevant in markets that are characterised by a small number of large commercially astute users, who can assess the costs, benefits and risks of different supply solutions, with relatively low transaction costs. This approach has been critically important to the development of gas transmission infrastructure across the east coast gas market.

There is a strong analogy with CopperString 2.0's potential connection to the NWMP from the NEM. The NWMP is characterised by a relatively small number of large commercially astute users who would benefit if they believed they could obtain lower electricity prices from the distant NEM via CopperString 2.0. Doing so would allow them to increase production levels and/or reduce their costs, increasing their overall producer surplus. Those large users are able to internalise the risks, costs and benefits of different electricity supply options, and reflect all of these factors into their willingness to pay for transmission services from CopperString 2.0 (as compared to other potential sources of electricity).

To the extent that there are no other positive or negative externalities associated with the provision of those transmission services, no market intervention would be required. As in the gas market, the market would reveal the most efficient solution and market participants could monetise the economic benefits that their solution provides by entering into long-term access agreements.

However, what is clear from both the CopperString 2.0 draft Environmental Impact Study (Draft EIS) and the Consultation RIS is that:

- The transport of electricity that is to be provided by CopperString 2.0 to customers in the NWMP will be significantly subsidised, leading to inefficient price signals; and
- Many of the commercial risks associated with the CopperString 2.0 development will be borne by Queensland electricity customers, not the counterparties providing/receiving the electricity.

The former reflects the fact that the CopperString 2.0 proposed price to customers in the NWMP is expected to be significantly below its actual cost, reflecting its proposal to receive a significant subsidy from Queensland electricity customers. This is despite:

- The Draft EIS acknowledging that Queensland customers receive no material gross economic benefit from being able to access the services that may be able to be provided by CopperString 2.0; and

- There being no evidence presented in either the Draft EIS or the Consultation RIS that there are material, positive externalities associated with sourcing electricity from the NEM as opposed to from local supply sources[11].

The latter reflects the fact that if demand is materially below what is forecast, or costs are materially higher than what is forecast, it is Queensland customers – not CopperString 2.0's developers or its customers in the NWMP – who bare that risk.

In this context, it is important to understand the nature of the subsidies, such as those sought by CopperString 2.0[12] are largely a wealth transfer:

- From Queensland electricity consumers and historical investors in the NWMP;
- To the owners and developers of CopperString 2.0 and mining companies that benefit from the subsidised transmission prices.

From an economic perspective, these subsidies distort the market for electricity services in the NWMP, given that:

- Another fundamental requirement of any efficient market is that prices are cost reflective in the long-term, such that economic welfare (producer and consumer surplus) is maximised; and
- The current NWMP market is, as stated above, underpinned by economically efficient price signals.

Based on independent analysis of CopperString 2.0's actual cost to serve, the level of subsidy is in the range of $18 to $76/MWh (based on the update to the OGW Pricing Report).

Therefore, in summary, rather than focus on incorrect perceptions that there is market failure that is currently leading to inefficiently high electricity prices in the NWMP, a more pertinent question policymakers should ask is:

- What level of inefficiency will be introduced into the NWMP market as a result of providing a large, unjustified and direct subsidy to one particular market participant (CopperString 2.0), along with a misallocation of risk; and

[11] And for the avoidance of doubt, the additional mining activity promoted in the NWMP as a result of lower priced electricity is not in fact related to the source of electricity; the same economic benefits accrue whether energy is sourced from local renewables or from renewables that are able to be accessed as a result of the construction of CopperString.

[12] This includes both the direct subsidies CopperString 2.0 it is seeking from Queensland customers (e.g., that they contribute to around 30% of CopperString 2.0 actual costs), as well as the indirect subsidies that CopperString 2.0 is seeking as a result of its proposed derogations (e.g., allocation of the risk of cost overruns, demand forecasting risk).

- What economic cost will this lead to over a very long period of time given the life expectancy of transmission assets (40+ years).

Responses to formal questions

We have responded to the specific question asked of respondents below:

1 What is the evidence of inefficiently high electricity prices in the NWMP?

No evidence has been presented that would indicate that there is market failure in the NWMP. To the contrary, market signals suggest that there is a functioning market where users have significant bargaining power:

- There are various potential providers of electricity in the region;
- New supply agreements are being struck; and
- Existing supply agreements are being altered to reflect changed supply/demand fundamentals.

There is no evidence that electricity prices are inefficiently high – that is, that prices exceed costs.

2 Are there enduring barriers (or market failures) to efficient electricity prices for industrial customers in the NWMP?

No, as outlined above, the evidence indicates that the market has been, and still is, characterised by many rational, profit maximising sellers who are freely competing with each other for the provision of services to many potential buyers. For example, a competitive process saw DPS constructed in preference to CopperString 1.0 in the first place.

Broader market evidence suggests that various suppliers have been actively seeking to develop various electricity supply sources (e.g., large scale solar, behind the meter solar and wind). The fact that a new electricity supplier using cutting edge technology, VAST Solar, has nominated the NWMP as the location for its proposed new electricity generator is highly suggestive that the market does not perceive there to be any barrier to entry into the NWMP market. Queensland Government owned corporation, CleanCo, is also co-developing a wind farm with private developer Neoen in the NWMP.

Evidence drawn from other mining provinces and individual mines is strongly suggestive that distributed scale electricity solutions are now highly competitive with large scale solutions. This is also being witnessed in non-mining sectors, with the stand alone cost of serving some residential and commercial customers approaching the cost of a grid-connected solution. For example, in Western Australia, isolated customers are being disconnected from the grid and instead, provided with a standalone power system, as this is considered to be more efficient and reliable. Solutions that place the locus of control with the customer (by allowing them to locate facilities behind the meter, and hence

avoid 'the market'), which are also economic, are significant mitigants to market power.

3 Does the difference in the delivered price of electricity between NWMP and NEM connected customers indicate a market failure that requires Government intervention to address?

No, it does not. Any difference in the delivered price of electricity in the NWMP as compared to the NEM reflects the actual costs to serve.

Electricity prices reflect the investment of capital being recovered over the foundation contract period. This contrasts to Option 2, where CuString is seeking to reduce average apparent prices by spreading costs over:

- a user base that are not actual customers for the infrastructure;
- a far longer period of time than the actual customer requirement, i.e., well beyond foreseeable mine lives; and
- still has $1.1b of debt at the end of its economic life,

only made possible by way of government intervention.

As noted earlier, DPS was initially contracted for 17 years and customer charges reflect recovery of the capital invested over the expected economic life of the plant.

This means that it is very difficult to draw any conclusions on the efficiency of the market based solely on there being a difference in the delivered price. There are many factors that will affect the cost of providing electricity services in different markets (particularly when they are geographically and physically isolated from each other) and those costs may differ over time.

PART B A more feasible option for the NWMP

Key points

- The Consultation RIS modelling showing that the lowest long-term energy prices are delivered by greater renewable penetration in the NWMP has been validated by independent modelling by both Oakley Greenwood and APA.
- Oakley Greenwood's analysis confirms that renewable penetration of up to 50% can be readily accommodated.
- The Queensland Government should continue to rely on the competitive environment to underpin the development of new generation in the NWMP.
- The Queensland Government should solve any perceived reliability issues via investment in the NWPS grid.
- The Queensland Government should consider supporting the development of the NWPS as a showcase of electricity grid development to support greater renewable penetration and the development of the NWMP as the world's most ethical and environmentally responsible resource hub.

How can the Queensland Government facilitate an affordable, secure, reliable and sustainable supply of electricity in the NWMP?

The competitive pressures present in the NWMP[13] and the abundance of high-quality renewable resources will drive a higher renewable penetration than that described in the BAU case.

Moreover, the analysis presented in the Consultation RIS makes it clear that 'greater renewable penetration' of the NWMP would provide a more efficient price outcome than CopperString 2.0 without the need for large subsidies from the rest of Queensland.

Table 4: Summary of results Option 1 – Greater renewable penetration (reprinted below) from the Consultation RIS reports lower development costs, zero contribution from the rest of Queensland and lower prices than any of the other three options assessed. It is unclear why this option was not analysed against the stakeholder impact framework or assessed against the "Equity, Practical, Cost effective" criteria.

[13] As discussed in the previous section, for example, the 88MW Mica Creek solar farm underwritten by PPAs with MMG and Glencore, the output from which will displace GPG at less than half the cost.

Figure 3: Extract from C-RIS page 13 "Summary of results Option 1 – Greater renewable penetration"

Table 4: Summary of results Option 1 – Greater renewable penetration

Demand level	Development cost est. ($M)	Contribution by RoQ (taxpayers) ($M NPV)	FY2025 electricity price ($/MWh)	FY2031 electricity price ($/MWh)	FY2041 electricity price ($/MWh)
Low	347	0	121	82	83
Flat	485	0	119	82	76
High	2,105	0	95	101	88

The constraint on renewable energy penetration in the NWMP is purely an economic limit[14] that takes account of the alternative cost of different supply options. The cost to supply must take account of both energy and capacity to ensure demand can always be met[15]. In relation to the latter, the existing Gas Powered Generation (GPG)[16] represents a practical and cost-efficient way of firming renewables in the NWMP.

It is also important to understand that economic cost is different to the competitive price that can be charged to customers:

- The competitive price that a supplier can charge its customers is capped by the new entrant cost[17] (as this plant is not yet committed, the new entrant cost includes capital recovery and a margin).
- In the NWMP, Oakley Greenwood has independently calculated that the new entrant cost[18] is in the range of $112-$122/MWh in 2025, dependent on inputs chosen for variables such as economic project life and the Weighted Average Cost of Capital (WACC) (the range of new entrant cost projected until 2041 are shown in Figure 4).

[14] The Consultation RIS refers to the potential for system security impacts and technical challenges in integrating renewables into the NWPS. Our engineering advice concludes that there is very low probability of issues arising and an even lower probability that any issue that did arise could not be solved by the design of the actual technology installed (e.g., grid forming inverters). Further, there is no evidence to support a claim that the NWPS would be unreliable under the BAU case and even less so with higher renewable energy penetration, battery energy storage system and hybrid control system.

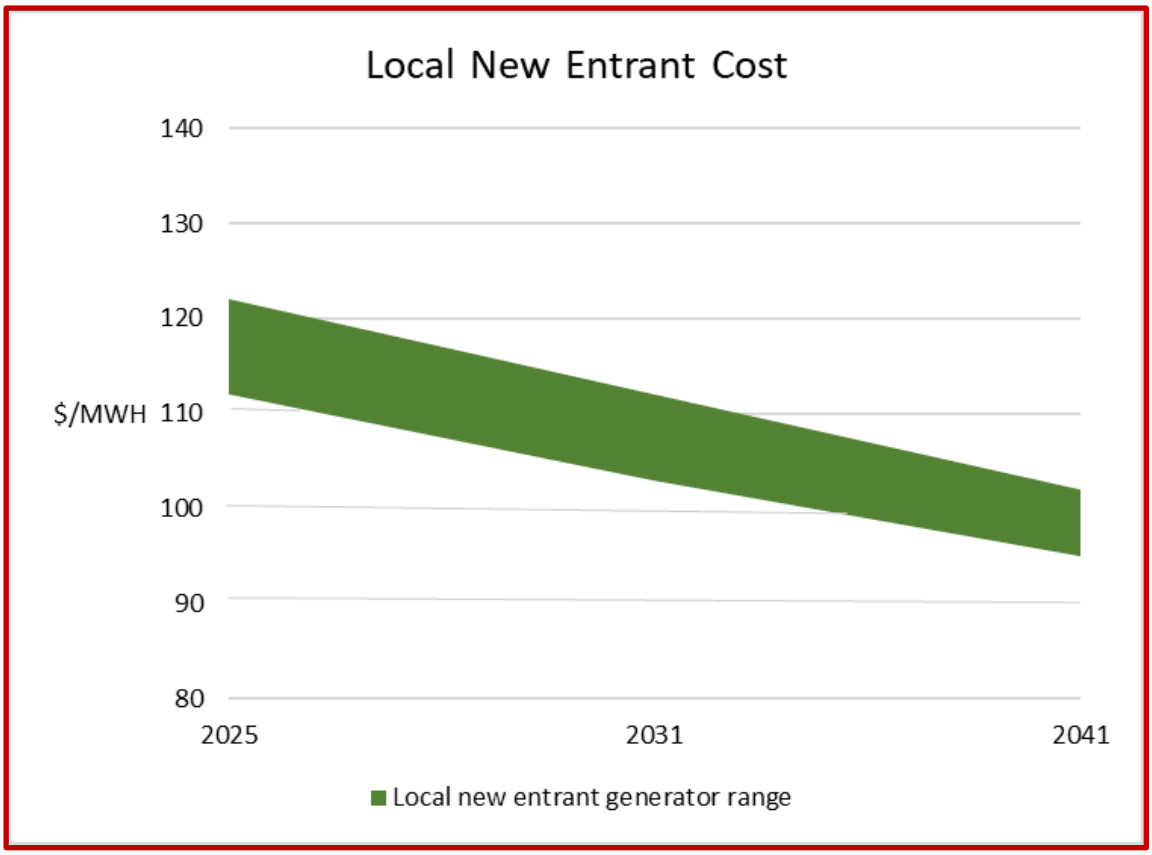
[15] Subject to customers' willingness to pay for that level of reliability.

[16] With some modifications to adapt to a different dispatch profile.

[17] The DPS was built because it had the most economic new entrant cost at the time. Some of the existing generation was closed down as it was uneconomical to refurbish.

[18] The new entrant modelled is a hybrid of solar PV, BESS and gas reciprocating engines. This new entrant delivers 30MW of new capacity at greater than 50% renewable generation. Other alternatives with higher renewable generation are also expected to be competitive.

Figure 4: New Entrant Cost



- As contracts are renegotiated, this will inform customers' opportunity cost of supply and hence create a cap on future prices; and
- Investors and incumbent generators, such as APA, recognise that lower cost renewable energy is essential to remain competitive in the NWMP.

These market fundamentals support a much higher renewable energy penetration assumption than the selected 200MW (~500GWh) of solar in the Consultation RIS BAU case.

Oakley Greenwood has undertaken an assessment[19] as to what level of renewable energy penetration the NWMP can readily accommodate. Oakley Greenwood's expert opinion is that:

- 40% (800GWh) [20] energy contribution from variable renewables supported by the existing GPG and a large battery is readily accommodated.

[19] Calculated using 2021 average and maximum demands, and limiting over-sizing of renewable capacity to <10% (common industry assumption).

[20] 800GWh of the current annual consumption of 2,000GWh. The demand from the southern connection is not included as explained later in this submission.

- It is highly probable that 50% could be achieved by accepting economic spill of VRE at times when supply exceeds demand (including battery recharging).

APA's own optimisation study (hourly modelling) also concluded that 50% (1000GWh) renewable penetration is readily achievable with minimal spilled energy.

A key reason for selecting 40% penetration for the Oakley Greenwood analysis is that this level of investment is robust to a 20% reduction in demand without over capitalising. It also demonstrates that the modified or enhanced BAU (Greater Renewable Penetration) case produces delivered electricity prices equal to or lower than CopperString 2.0 without the hefty subsidies or other high and extreme risks (see risk assessment in Appendix D).

The hybrid renewable energy cost is based on the following configuration assumptions for the two scenarios.

Table 2: Configuration assumptions

Development	Solar PV (32% cf)	Wind (39% cf)	Battery (4%)	Total (GWh)
40% RE case	132MW	130MW	120MW (1hr)	813
50% RE case	185MW	188MW	170MW(1hr)	1040

A key strength of this approach is that renewables are built based on customer load at the negotiated price[21] (i.e., it eliminates the perceived risk of generators not passing lower prices on to customers which is a risk stated in the Consultation RIS). Development is consumer led.

Similarly, any investment in additional firming supply will be cost efficient as it will also be brought to market by committed customer demand with the price capped at the standalone new entrant price at that time.

Table 3 shows the economic cost of supply for both the 40% and 50% renewable energy penetration cases supported by GPG in 2025.

[21] These customers and suppliers are sophisticated entities that are highly capable of constructing commercial terms that protect their respective interests.

Table 3: Economic cost of supply in 2025 under BAU

Development	Hybrid RE Cost ($/MWh)	GPG SRMC ($/MWh)	Blended Cost ($/MWh)
40% RE case	$61/MWh[22]	$110/MWh[23]	$90/MWh
50% RE case	$67/MWh	$110/MWh	$89/MWh

The difference between the economic cost of supply and the new entrant price sets the maximum capacity charge that APA can expect to be able to negotiate with market customers. Whilst this charge continues making a positive contribution to APA's capital recovery, the on-going commercial viability of APA's operations in Mount Isa will be maintained for the contracted period. Future contracts will continue to be negotiated in light of continued price pressure applied by declining new entrant costs.

As previously explained, and contrary to the modelling results presented in Table 3 of the C-RIS, the price to customers does not increase in a high demand case as it is set by new entrant costs. The risks of low demand are minimised as the asset development is underpinned by committed load.

Maximising local renewable energy development has additional advantages to the forecast decline in both economic cost and prices relative to the three options considered, including:

- An almost immediate reduction to CO2e emissions, materially contributing to the Queensland Government's targets.
- Creation of substantial sustained employment opportunities for the Mount Isa region.
- Focussed transmission network expansion and upgrades where this is part of the best economic option or improves reliability.
- Flexibility to scale up and down as demand fluctuates over time:
    - Accessing the 'technology of the day' to keep price low and emissions reduction high; and
    - Allowing under-utilised elements[24] to be redeployed elsewhere.

[22] Assumes 20 year project life with 3% real WACC.

[23] The GPG SRMC is based on an average heat rate of 10GJ/MWh, which is the estimated generation heat rate of the plant installed at DPS with modified dispatch and a delivered gas price of $11/GJ.

24 Solar plants are now being built with the flexibility to be relocated to different sites. Over investment in wind-farms is not as readily salvageable as much of the build cost goes into the foundations.

It is noted that the Consultation RIS's assessment of stakeholder impact, equity, practicality and cost effectiveness of the BAU case did not reveal any fatal flaws or extreme risks. Rather, it raised concerns regarding delivered price under a high demand scenario, possibility of technical issues, reliance on generators to pass on cost savings to customers and a reliance on competitive market conditions to drive change. In our opinion, the higher probability case described in this section addresses all of the perceived disadvantages and risks.

Therefore, in relation to the specific question, '*how can the Queensland Government facilitate an affordable, secure, reliable and sustainable supply of electricity in the NWMP*?', it is APA's view that:

- The Queensland Government should continue to rely on the competitive environment that has, and will continue to underpin, the development of new generation in the NWMP. Customers will continue to drive low cost renewable development as they negotiate new supply agreements or modify their existing agreements[25].
- The Queensland Government could support these market outcomes, ensuring affordable, secure, reliable and sustainable supply is delivered in the NWMP, by:
    - The Queensland Government owned Ergon Energy participating as a lead customer in an aggregated customer PPA[26] for the construction of a large-scale windfarm and similar size battery (1 hr storage). This would have an immediate impact on both emissions and cost savings, with the resulting savings reducing and potentially eliminating, the Community Service Obligation liability as it currently stands.[27];
    - Making Queensland Government owned land available for the development of more firming generation, close to the existing electricity network and gas supply;
    - Funding investment in the existing network to improve reliability (see Appendix B); and

25 It is common practice in energy markets to modify contractual arrangements mid-term where those modifications create value for both parties. This often involves a 'blend and extend' to facilitate a timely transition to the mutually beneficial arrangements.

26 The Business Renewable Council – Australia (BRC-A) provides a good source of information for collective buying of PPAS. BRC-A could also provide facilitation services (assuming funding would be required).

27 By underwriting the PPA, Ergon would make available additional low cost, low emissions energy for mining operations with lives shorter than the wind farm economic life. Ultimately this will not require a subsidy from the Rest of Queensland as there is and will be demand for this energy.

- Assisting new customers to connect to the existing network as it is often the dedicated connection assets that can be the disincentive to connecting to the network.

These supportive actions will help to ensure economic benefits of increased mining activity, from new and existing participants, are captured at lowest cost without the distortion of material market intervention.

If the Queensland Government determined that it was beneficial to the State to intervene, then it could build upon the previous initiatives and support the development of a showcase renewable energy zone, minerals province and hybrid renewable energy grid with upwards of 75% renewable energy. The benefits of such an initiative would include:

- Attracting mining investment in the extraction and processing of the minerals critical for further decarbonisation;
- Demonstrating and validating the pathway to high (>75%) renewable penetration for the NEM;
- Demonstrating solutions to maintain reliability and security of supply in a high renewable penetration grid; and
- Further reducing the cost of energy and the intensity of emissions for mining and minerals processing.

PART C Is a transmission line to the NWMP required?

Key points

- The falling cost of renewables combined with the highly prospective renewables resource in Mount Isa means that a transmission option is uneconomic.
- The purpose of building transmission is to connect generation to load. The load in Mount Isa is already fully supplied without requiring an additional transmission connection.
- The renewable resources in Mount Isa are equal to or better than elsewhere in the NEM and thus, it makes no sense to construct a redundant transmission connection.
- Where demand is highly uncertain (such as in the NWMP), investment in long lived transmission assets is not a sensible approach. In contrast, the timing, size and location of renewables can be tailored to fit the identified need if additional demand eventuates.

Is a physical transmission connection to the NEM required for the NWMP?

A physical transmission connection to the NEM from the NWMP is *not* required to facilitate an affordable, secure, reliable and sustainable supply of electricity in the NWMP[28]. As Part B of this submission demonstrated, the falling cost of renewables combined with the highly prospective renewables resource in Mount Isa means there is a superior economic alternative to an electricity transmission connection of this distance – particularly one that requires a significant subsidy from customers in the rest of Queensland to be viable.

At a conceptual level, the fact that a long transmission connection such as CopperString 2.0 is uneconomic makes intuitive sense, given its characteristics. In particular:

- CopperString 2.0's primary economic benefit[29] relates to bringing renewable generation from one location (Hughenden) to load in another location (Mount

[28] Often physical connection is also incorrectly linked to the presence of competition. This is clearly not the case as explained in Part A of this submission.

[29] The Draft EIS highlights that it is the ability to access low incremental cost (primarily wind) energy to displace gas in the NWMP that is the principal driver of the economic benefits, with a much smaller contribution being made by: (a) the dispatch of the gas-fired power stations in Mount Isa back into the NEM, (b) the dispatch of Hughenden generation back into the NEM, or (c) the firming of Mount Isa loads via its connection to the NEM.

Isa), by way of a very long transmission line. The falling cost of renewables combined with the highly prospective renewables resource in Mount Isa means that a transmission option of this distance simply becomes uneconomic compared to adding local generation located around Mount Isa; and

- The forecast loads that CopperString 2.0 will be servicing are highly uncertain and overly optimistic.

Whilst there has always been a particular distance at which the use of a transmission option to supply to a remote location becomes uneconomic compared to local generation, this distance is shortening as the cost of renewables falls rapidly in the new 'renewables-centric world'. CopperString 2.0 is simply too long to be economically viable, as demonstrated by the data in the Consultation RIS.

This issue is magnified in the CopperString 2.0 case, as the connection is to a region with a very prospective renewables resource that has existing firming capacity. In the absence of a transmission line, it is reasonable to expect the cost of supply and outturn prices in both the NEM and the NWPS to converge towards the cost of new entrant renewable supply adjusted for localised factors that impact cost (such as renewable energy capacity factors, land access, construction costs and connection costs). None of these factors are material, particularly when compared to the cost of a very long transmission line.

This is not always the case in every situation and has not always been the case. Historically, some transmission investments that have ostensibly been developed to bring generation to load, have been deemed to be economic. An example of this is the (much shorter, ~260km) transmission connection to Broken Hill. This transmission line was constructed 42 years ago in 1980, when renewables were uneconomic relative to a transmission connection to the NSW grid and its then cheap black coal-fired power.

If a transmission link to Broken Hill was being contemplated in today's environment, it would clearly face a very different set of competing options in a very different competitive environment:

- A very prospective local renewables resource in Broken Hill;
- The impending retirement of existing black coal generators; and
- A predominately renewables-based NEM firmed by GPG.

This is not to say that all long transmission investments are uneconomic. For example, Project Energy Connect – which involves ~900km of transmission infrastructure (similar to CopperString 2.0) being installed to directly connect NSW to SA – has been deemed by the AER to be economic. However, unlike CopperString 2.0, its economics are not overwhelmingly driven by the different costs of siting renewables in one region

as compared to the other region[30]. It also has a very different risk profile to CopperString 2.0, due to the established and more certain demands it services.

This is the other characteristic of CopperString 2.0 that makes it intuitively uneconomic – the significant level of uncertainty around the demand customers will place for the services it is offering, which is fundamentally driven by the underlying nature of the mining industry that it would be serving, with:

- Existing operations all part way into their expected mine life and expected to decline overtime (though noting that as companies are generally looking for ways to extend mine life with nearby or deeper deposits, this can slow the decline); and
- Significant uncertainty of new development that relies on resource quantity (which determines mine life), resource quality and commodity prices that change in response to global supply and demand.

There is no immediate need for a transmission connection to supply unmet demand.

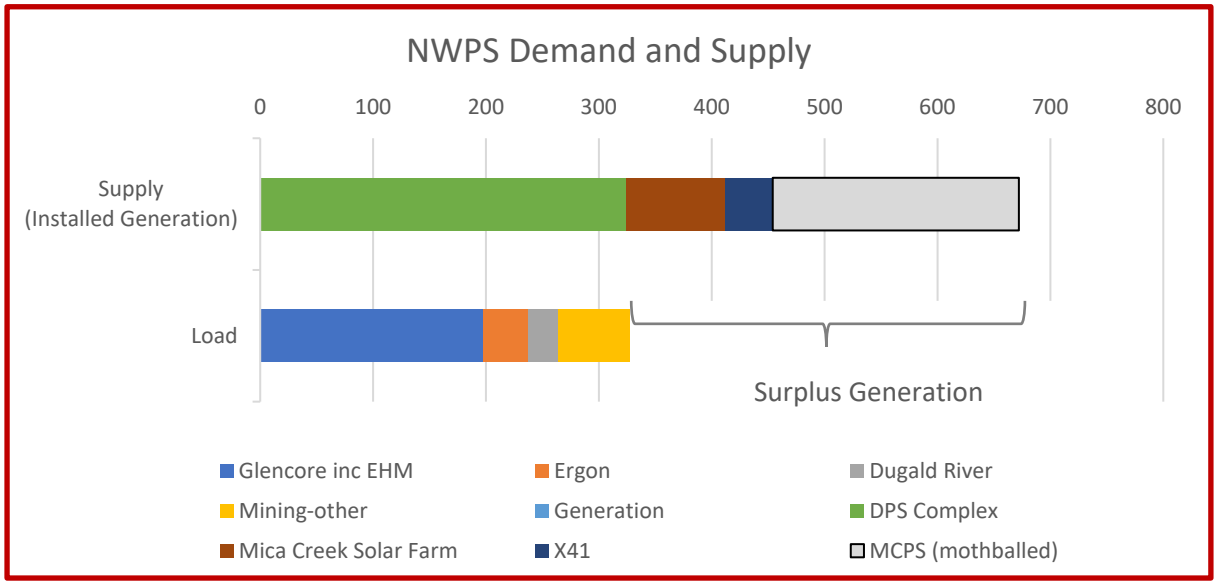
The current (2021) capacity demand in the NWPS is approximately 330MW which is currently supplied by a combination of the DPS Complex with an installed capacity of 324MW and X41 with an installed capacity of 42MW. In addition there is 218MW of installed capacity at the Mica Creek Power Station[31] which is in cold storage. The owners of Mica Creek Power Station, Stanwell Corporation[32], remain active in development of new power generation projects and seeking new opportunities to support development in the NWMP.

[30] For example, at the time of publication of the RIT-T, one of the key benefits was the use of surplus black coal resources in NSW to displace gas energy and capacity in the early years after commissioning. Over time, and as South Australia's renewable resources grew abundant, relatively cheap wind and solar was assumed to be able to be exported to NSW during high production periods in South Australia, displacing existing higher (marginal cost) thermal generation in NSW (and in the medium term, avoiding the need to build some local transmission network to connect new local renewables under the 'without' case).

[31] Stanwell Corporation media release: https://www.stanwell.com/our-news/mica-creek-power-station-to-be-placed-into-cold-storage/

[32] https://www.stanwell.com/wp-content/uploads/STAN_FactSheet_Mica-Creek-May-2021.pdf

Figure 5 Supply and Demand in the NWPS in 2021



It is very difficult to have confidence in any demand forecast beyond 10 to 15 years. Therefore, when assessing transmission developments, it is important to consider many aspects, including demand risk and credible, local alternatives[33].

The greater the level of demand uncertainty, the greater the risk of investing in an asset that requires a large upfront capital commitment that has no flexibility (i.e., it cannot be repurposed) and which requires sustainable demands over a long period of time for it to be economic. The corollary is that in situations where demand is uncertain, the inherent flexibility that some supply-side investments deliver (such as modular renewables) have enhanced value. Their timing, size and location can be tailored to fit the revealed information with regards to forecast demands, closer to when those demands actually eventuate (rather than attempting to forecast them 40 years in advance). The technical life of renewables is also more aligned to the lives of the mines they would be servicing.

Therefore, leveraging the local, very prospective, renewable resources in and around Mount Isa (and avoiding the link to Hughenden) has the advantage of:

- Allowing those resources to be deployed in a more scalable and less risky manner (i.e., incrementally in response to new information with regards to the prospective level of demand in the Mount Isa region);
- Involving significantly less upfront (irreversible) expenditure on the transmission connection, thus reducing the financial risks associated with meeting the (highly uncertain) future demands in the Mount Isa region. We note that this risk

[33] In the NEM, this is done by AEMO through the ISP process, which leads to a detailed RIT-T. A highly consultative, robust process designed to ensure customers are protected from inefficient investment.

is predominately borne by Queensland customers and taxpayers under CuString's proposal, despite those customers being unable to manage this risk or receiving any material benefit from CopperString 2.0[34];

- Avoiding a situation whereby a subsidised solution (CopperString 2.0) leads to unintended lower levels of reliability for customers in the NWMP, given the high likelihood that it would crowd out the operation of the existing local gas fired power stations – operations that appear to be assumed to support reliability in the region under the 'with CopperString 2.0' case; and
- Avoiding the significant amount of compliance and complexity (including cost) for market participants that connecting to the NEM brings, which is unlikely to benefit the NWPS.

Leveraging the local, very prospective, renewable resources in and around Mount Isa would also have the advantage of not imposing costs on Queensland electricity customers because of the subsidies that are required to support the development of the asset[35].

[34] Yet despite this allocation of risk, CopperString's proponents are seeking equity returns that: (a) exceed those that the AER would provide any other investor in the Australian electricity sector based on current market conditions; and (b) are fixed for a period of 23 years

[35] If subsidies were to be applied, they would be better targeted at facilitating additional renewable energy in the NWMP rather than be used to fund a single asset transmission line, given its associated risks

PART D Other factors to consider

Key points

- Government subsidies for the CopperString 2.0 project, which is an uneconomic investment, would create a perception of sovereign risk for future investment in energy infrastructure.
- The high and flat demand forecasts in the Consultation RIS are not credible outcomes and create significant risk of over-forecasting energy demand for Queensland energy users.
- Queensland energy users will pay higher electricity prices for the next 40 years but will not benefit from CopperString 2.0. Large high voltage customers could pay an average additional $141,279 per year for the first five years and $57,796 per year for the next 35 years. Queensland households will pay between an additional $11-$14 per year for the first five years and then at $3-$6 per year for the next 35 years.
- A realistic or even likely outcome is that a transmission connection will not deliver any significant reduction in electricity prices for the mining and mineral processing customers in the NWMP and that the Queensland Government and electricity customers will be paying a regressive tax for more than 40 years.
- The CopperString 2.0 project will increase carbon emissions, making it harder for Queensland to achieve its goal of reducing emissions by 50% by 2030, while the alternative renewable development will provide a showcase in sustainable development for Australia and the world.
- Investment in the local NWPS grid will have greater impact on improving reliability and connecting new mining customers than constructing a new transmission connection, and be much more cost efficient.
- The cost of constructing CopperString 2.0 is highly likely to overrun the current cost estimates, leading to a greater subsidy being required or higher prices being paid by the NWPS industrial users.
- The additional demand on transmission construction resources from building CopperString 2.0 risks delay or disruption to the construction of critical and economically justified transmission networks planned elsewhere in Queensland and Australia.

What else should the Government consider?

There are several other factors that should be considered when assessing the options for servicing the NWMP. These include:

- The perception of sovereign risk;
- Other risks associated with CopperString 2.0; and
- The impact on the electricity customers across Queensland.

These are discussed in further detail below.

Sovereign risk

The construction of large-scale infrastructure projects requires investors to make large upfront capital investments. A stable and predictable legal and regulatory framework encourages investors to make those investments. Everything else being equal, this stability and predictability incentivises investors to accept lower rates of return from those investments, leading to lower prices for the end customers.

APA's business has thrived on providing services in competitive markets. If an electricity transmission connection between the NWMP and the NEM was the most efficient solution, then the market (or the existing regulatory arrangements) would (and should) facilitate that solution.

However, what APA, as a rational infrastructure investor, is fundamentally opposed to is radically altering the market without a transparent process and inequitably, particularly after investors have already made significant, sunk investments.

In the context of the CopperString 2.0 development, the inequity is created by way of the subsidies CuString is relying on to make its project commercially viable, namely the:

- Explicit subsidy from Queensland electricity customers, which, according to the Consultation RIS, could result in Queensland customers contributing up to $1.7 billion of revenue (out of $3.3 billion) over the 40 year period that CopperString 2.0 is privately owned; and
- Hidden subsidy from Queensland customers which results from the requirement for the Queensland Government to take over ownership of CopperString 2.0 and its expected $1.1 billion of debt in 40 years' time. There is a significant risk that the electricity demands placed on CopperString 2.0 will not support a stream of cashflows to the Queensland Government to support the on-going viability of the business. Therefore, this would necessitate the Queensland Government or Queensland electricity customers to provide further subsidies.

CopperString 2.0 will only go ahead if it receives these subsidies. An efficient market would not make this investment.

Should these subsidies be provided and the CopperString 2.0 project proceeds:

- Future investment in energy assets will be discouraged and may even stop altogether as a result of the uncertainty created by the Queensland Government's support for an otherwise uneconomic project; and
- There will be an obvious negative and unfair financial impact on the existing investors who have, in good faith, invested shareholder funds in the NWMP.

Queensland, and Australia more broadly, is in the midst of a once in a generation energy investment cycle – one that will transform the way electricity is both generated and delivered to customers. The level of investment required will necessitate access to deep and liquid private capital markets. Given the scale of the investment, efficient provision of capital will be paramount to help minimise the cost to consumers of the energy transition. For example, how will investors view the risks of investing in Queensland's renewable energy zone developments if they believe their generator or battery could be bypassed or stranded at a later date?

Capital markets would react negatively to a decision to provide what is an unwarranted subsidy to an otherwise uneconomic project to the detriment of existing and intending investors. Every future investment in a remote area power system will be looked at through the lens of there being the risk that a subsidised transmission (or network) connection might occur in the future. Every future mine site development will consider the risk that its competitors may receive a subsidised electricity price because of a government's future actions. Every electricity infrastructure investor may want the same deal terms granted to CopperString 2.0, such as a fixed return for 23 years.

Australia, and Queensland, has built a strong reputation for having a stable and predictable legal and regulatory framework which supports significant private capital investment. In APA's opinion, one of the Queensland Government's objectives from the Consultation RIS process should be to ensure that this reputation is not likely to be impacted by the funding arrangements that underpin the servicing solution proposed for the NWMP, as this would not be in the long-term interests of Queensland and its electricity consumers.

Other risks associated with CopperString 2.0

There are a number of inherent risks associated with CuString's proposed transmission connection to the NWMP. These are risks which any potential investor undertaking due diligence on such an investment (including a government who is committing to provide a subsidy to a private proponent on behalf of its citizens for at least 40 years) would consider.

These key risks are explained in more detail in the following table. The ultimate outcome of these risks materialising is that no significant reduction in electricity prices will be delivered for the large mining and mineral processing customers in the NWMP and that the Queensland Government and Queensland electricity customers will be saddled with a substantial and regressive tax for 40 years as a result.

Table 4: Key risks associated with CopperString 2.0's proposed transmission connection to the NWMP

Risk	Summary of Issue
Demand forecasting risk	The Consultation RIS presents three demand forecasts: high, flat and low. The high and low demand forecasts appear to align with the Draft EIS. In our opinion, the high and flat cases are not credible outcomes: **Implied elasticities of demand are unreasonably high:** the implied elasticity of demand between 2024 and 2050 appears unrealistically high. There is almost a doubling of demand resulting from an assumed 40% reduction in electricity costs. As outlined in the Oakley Greenwood Pricing Report, other studies that have been reported in Australia[36] indicate an elasticity range of between -0.2 to -0.5 (meaning a 10% decrease in price leads to a 2% to 5% increase in demand). Also, ACIL Allen's analysis presented in the Draft EIS states that energy costs as a proportion of total operating costs range between 17% and 26% for open cut mines and between 10% and 13% for underground mines. This equates to a reduction of between 2% and 7% of total operating costs. Therefore, this creates questions as to the veracity of the underlying level of demand assumed in the modelling of CopperString 2.0. **At least one foundation customer is not connecting:** South 32, one of CopperString 2.0's foundation customers, has already informed CopperString 2.0 that it will not be connecting[37]. The Consultation RIS does not appear to reflect this reduction in forecast load. The loss of South 32 almost certainly makes the Southern Connection uneconomic. Despite CuString's proposal to adopt postage stamp pricing, the actual prices customers connected to the Southern Connection *should* pay should reflect this dedicated connection asset. If this occurred, the

[36] See for example results summarised or reported in: Lorraine Conway and David Prentice, *How much do households respond to electricity prices? Evidence from Australia and abroad.* Technical Paper for Infrastructure Victoria, September 2019, page 11; or AusGrid, Appendix 5: Price Elasticity of Demand (https://www.aer.gov.au/system/files/Ausgrid%20-%20Appendix%205%20Price%20Elasticity%20of%20Demand%20-%20November%202015.pdf)

[38] Acil Allen Consulting, "*CopperString Economic Technical Report Assessment Of Electricity Market And Economic Impacts*", Final Report, December 2020, page 38

Risk	Summary of Issue
	connection costs for these southern customers would be materially higher than those assumed for the purposes of preparing the original demand forecasts (adding to the cost of sourcing electricity from CopperString 2.0, thus reducing the likelihood of the demand eventuating). **Additional connection costs have not been considered:** the additional connection costs that will be required to connect isolated mines to the core CopperString 2.0 network could be significant as many of the additional mines listed in the Draft EIS are geographically distant from the core CopperString 2.0 project (and/or existing infrastructure). This will add to the cost of accessing electricity from CopperString 2.0, thus reducing the likelihood of the demand eventuating. **Existing contractual arrangements have not been considered:** the demand forecasts do not appear to have regard for the existing contractual arrangements that persist until 2030. As the Draft EIS states "*ACIL Allen understands that DPS supplies electricity to Glencore's Mount Isa mines and Ergon Retail to 2023 when the gas supply contract with AGL expires. Both PPAs continue to 2030 under a capacity tolling arrangement*.[38]". These arrangements account for over half of the entire NWMP demand targeted by CopperString 2.0 for the first 5 years of the stated project life. A material omission in the analysis. Further Glencore have recently entered into a PPA for 44MW from second stage of the Mica Creek Solar Farm. Glencore's Mount Isa Mine assets are currently directly connected to the DPS at Mica Creek D-sub, which is also the connection point for the new Mica Creek Solar Farm. These physical connection points enable Glencore to be treated as an embedded customer supplied directly by APA and, therefore, not connected to the NEM. Given these physical and contractual arrangements, it is hard to foresee how Glencore could connect to the NEM (as reconfiguration of connection is part of CopperString 2.0) until at least 2031 with significant uncertainty remaining at that time.
Wholesale price risk	The Consultation RIS has assumed that wholesale electricity prices in the NEM will be $50/MWh over the 40-year evaluation period. In our opinion, this is almost certainly too low, as it is unlikely to even allow new entrants to recover their costs.

[38] Acil Allen Consulting, "*CopperString Economic Technical Report Assessment Of Electricity Market And Economic Impacts*", Final Report, December 2020, page 38

Risk	Summary of Issue
	In its Pricing Report, Oakley Greenwood estimates that a new entrant wind generator is expected to require in the order of $53/MWh at the Townsville node. Oakley Greenwood note that this is a supply side price and consumers pay a higher price after accounting for retailing, wholesale market charges including for ancillary services, market operator fees and portfolio hedging to match their individual load profiles. In addition the cost of firming generation needs to be added to this. In contrast, the Draft EIS indicated a NEM-connected energy price of ~$50-$60/MWh between 2025 and 2035, rising to $75/MWh in the long-term. Over the last 7 years, historical prices have ranged from time weighted moving average prices in Queensland of just over $100/MWh to just under $40/MWh. These trends are affected by factors including the falling capital cost of intermittent plant and the gas market trends which continue to impact the marginal cost of production and therefore the spot price. While materially elevated prices due to disruptive events are generally not sustained, they flow through to customers, often through a risk premium in contract price over spot prices.
Marginal Loss Factors (MLFs)	The Consultation RIS makes no mention of MLFs, hence it is not clear what MLF has been assumed for CopperString 2.0. It is also not entirely clear what MLF was used in the Draft EIS, other than that the economic assessment of wholesale prices was based on AEMO data. In their Pricing Report, Oakley Greenwood note that MLF values of 1 or less are inappropriate for load connection points in Mount Isa. This is because the energy flow is expected to be *from* Hughenden *to* Mount Isa for the vast majority of the time, the MLF for the transmission connection point at Mount Isa will be materially higher than 1. Oakley Greenwood compared MLFs for two other long radial transmission lines: The MLF at Broken Hill (220kV, 260km radial supply from Buronga) where, prior to augmentation of generation at Broken Hill, the MLF was approximately 1.3, indicating a significant loss in supplying demand there.

Risk	Summary of Issue
	The MLF for Kalgoorlie (220kV, 655km) for 2021-22 is 1.143, however this is complicated by the presence of generation at Kalgoorlie[39].
Construction cost risk	As discussed in the Oakley Greenwood Pricing Report, evidence from AEMO's Integrated System Plan (ISP) and recent AER expenditure allowances approved for Project EnergyConnect indicates that it is likely to cost in the order of $2.6 billion - $2.7 billion to construct CopperString 2.0. This represents a 30% - 35% premium to the capital costs that were adopted in the Draft EIS ($2 billion). This does not take into account the expected high demand for electricity network construction services to deliver the ambitious network development programs including the build out of the REZ zones in the NEM states. In our opinion, the capital costs in the Draft EIS were unrealistically low. The Consultation RIS assumes capital costs of $2.48 billion. Whilst this forecast is more reasonable than the one adopted in the Draft EIS, the available evidence suggests there is still downside risk to this forecast (i.e., capital costs are likely to be higher, presenting higher costs to consumers).

The impact on electricity customers in the rest of Queensland

As Queensland customers will be providing CopperString 2.0 with a subsidy for the next 40 years (and potentially beyond), Queensland customers' bills will be higher than they otherwise would be had CopperString 2.0 not been built[40].

It is important to note that the quantum of any direct subsidy provided by the rest of Queensland customers is inversely related to the level of demand for CopperString 2.0's services. If demand for CopperString 2.0's services is lower than what was forecast, then electricity customers in the rest of Queensland will bear the cost of this lower level of demand by having to contribute more to the overall costs of CopperString 2.0. This is demonstrated in the Consultation RIS, which highlights the contribution different Queensland customers make to the costs of CopperString 2.0 under the different demand scenarios modelled in the Consultation RIS.

[39] https://aemo.com.au/energy-systems/electricity/wholesale-electricity-market-wem/data-wem/loss-factors

[40] Note that any subsidy is not offset by electricity cost reduction

Figure 6: Comparison of Contribution from Rest of Queensland (RoQ)

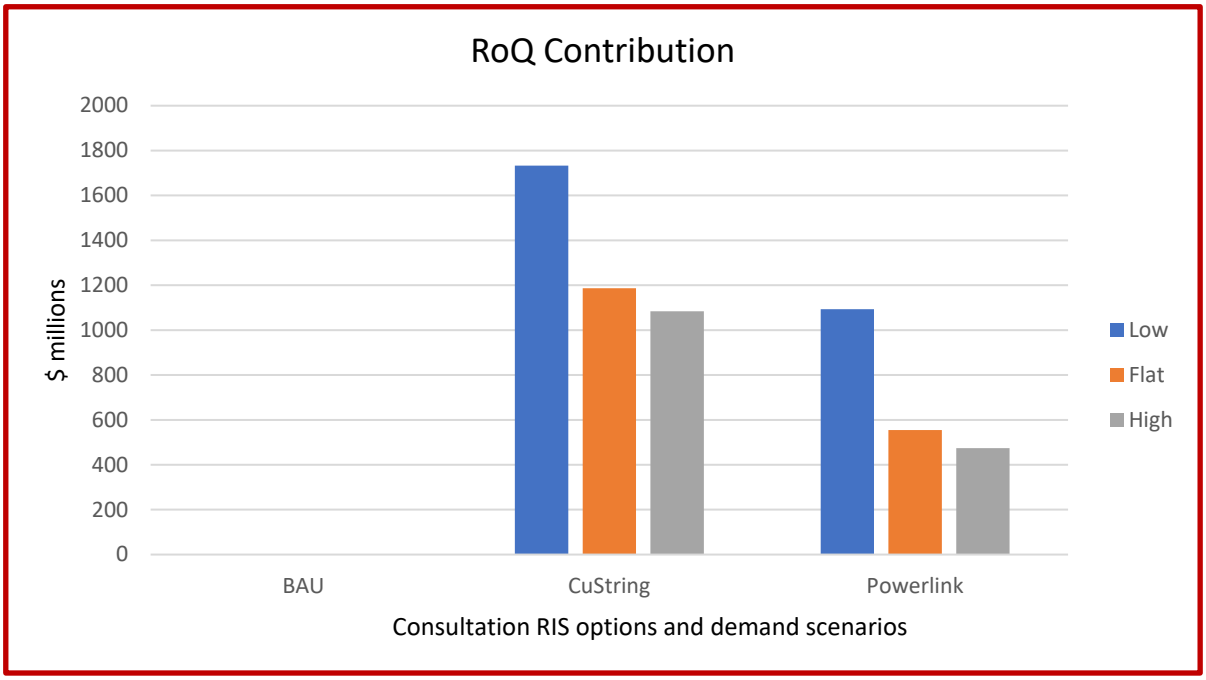


Figure 3 compares the Rest of Queensland (RoQ) contributions as set out in the Consultation RIS[41] for each of the three cases and demand scenarios.

Key points to note are:

- Both the CopperString 2.0 and Powerlink transmission options require significant cost recovery from the RoQ under all demand scenarios.
- The majority of the risk associated with low demand is placed on the non-benefitting consumers in the RoQ.
    - In the worst-case scenario, which is CopperString 2.0 low demand, the contribution from the RoQ is greater than 50% of total project costs.
    - In the best-case scenario, Powerlink high demand, the contribution from the RoQ is still 17% of total project costs for no material benefit.

Using the Consultation RIS information, and an assumed Queensland operational demand of 50,000GWh/year, our analysis indicates that the impact on the RoQ electricity customers is approximately $0.55/MWh under the high demand case, which increases to approximately $0.9/MWh under the low demand case and increases even higher if there are capital or operating cost overruns. In addition to this, the connection of the NWMP to the NEM was forecast by ACIL Allen (CopperString 2.0's consultant) to increase wholesale electricity costs by $1.30/MWh

[41] Data contained in Tables 3,6&8 of the Consultation RIS

in the period from 20225 to 2030[42]. Therefore, Queensland customers will face an increase of between $1.85/MWh and $2.20/MWh.

Importantly, assuming that the recovery of any subsidy is via an uplift to the variable charge customers in Queensland face, the actual dollar amount of this subsidy will be proportionate to the amount of energy a customer uses. This means that larger customers will be more affected.

The following table highlights the potential impact that a subsidy might have on different types of customers.

Table 5: Estimated impact ($/pa) on customers in the rest of Queensland

Customer Type	Estimated Bill Impact due to CopperString 2.0 subsidy – High Demand ($/pa)	Estimated Bill Impact due to CopperString 2.0 subsidy – Low Demand ($/pa)	Estimated Impact on Qld Wholesale electricity prices – ($/pa) - 2025-2030	Total Customer Impact ($/pa) – 2025-2030
Residential customers energy deliveries	$3	$6	$8	$11-$14
Non-residential customers not on demand tariffs energy deliveries	$8	$12	$18	$25-$30
Non-residential low voltage demand tariff customers energy deliveries	$221	$361	$521	$742-$822
Non-residential high voltage demand tariff customers energy deliveries	$35,320	$57,796	$83,483	$118,803 - $141,279

NOTE: Customer categories are aligned to those reported by Ergon Energy in their 2019/20 RIN data ('Ergon Energy 2019-20–- Economic Benchmarking–- Consolidated–- 25 November 2020–- PUBLIC (#11671052.2).xls'). Average usage levels have also been derived from this information.

[42] ACIL Allen Consulting, "*CopperString Economic Technical Report Assessment Of Electricity Market And Economic Impacts*", Final Report, December 2020, page 63

There are further financial risks that are borne by Queensland customers because of the proposed derogations and the Queensland Government's commitment to take on $1.1 billion of debt after 40 years.

In particular, there are risks:

- to taxpayers of owning a potentially stranded or significantly underutilised asset post 40 years;
- of cost overruns relative to what is approved by the 'Independent Expert', with RoQ customers having to fund 70% of these overruns; and
- to RoQ electricity customers associated with the derogation that allows CuString to offer discounted transmission costs to attract approximately six large customers to commit to CopperString 2.0, with the aggregate of discounts being recovered from RoQ customers in Queensland.

Each of the above reflects an inappropriate allocation of risk to RoQ customers. The foundation customer discount is of particular concern, as there is no stated rationale for this subsidy, no stated criteria against which the subsidy will be assessed, no apparent limit to the level of the subsidy and no independent, non-Government, oversight of the subsidy. It seems self-evident that such a derogation will not be in the long-term interests of the Queensland electricity consumers that are subsidising these private miners.

These proposals lack equity, as future generations of Queensland electricity customers will be locked into paying for infrastructure which is not required and from which they obtain no benefit.

Each of these is discussed in more detail in Part E ("Comments on proposed derogations sought by CuString").

Other issues with the analysis of Consultation RIS options

There are several other issues that affect the comparison of options in the Consultation RIS, which we believe are not correct or require further clarification. These are summarised in Table 6 below.

Table 6: Issues with the comparison of options

Issue	APA Comment
New Connections	A significant cost item for new mining developments is the connection assets from the site to the existing network. There is no explanation in CuString's proposal as to how new customers will be treated in this regard should they want to connect. It is likely that longer connections (>20-30km) will either:

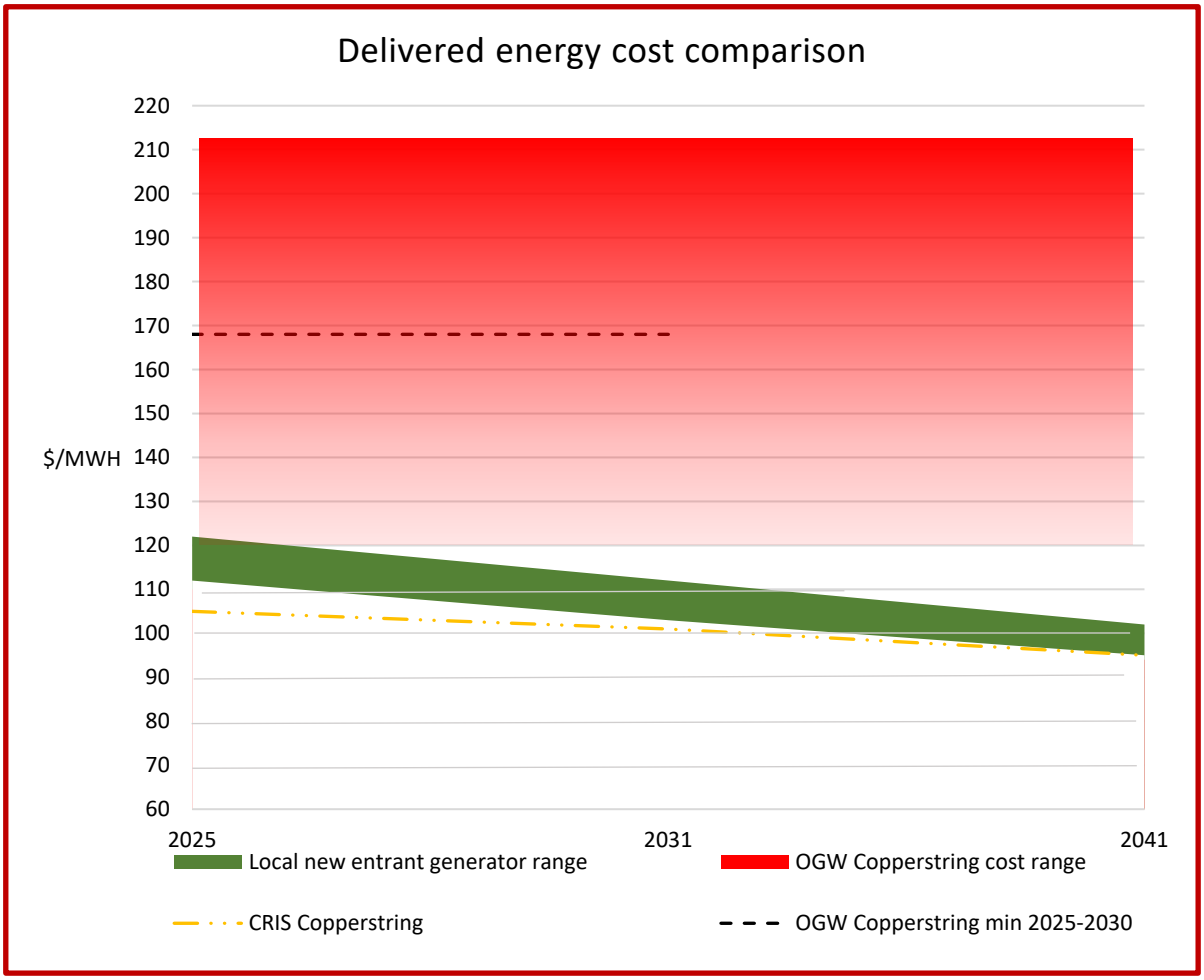
Issue	APA Comment
	• Seek subsidies; or • Use standalone energy supply solutions.
Sustainability	The Consultation RIS is silent on sustainability: • In the short to medium term, CopperString 2.0 will displace GPG firming capacity with coal fired generation to some extent (exact line flows have not been modelled). • If it displaces all GPG, then Mount Isa will have the same carbon intensity as the rest of Queensland (currently ~0.78t CO2e/MWh). In contrast, the modified BAU scenario reduces carbon intensity in Mount Isa to <~0.25t CO2e/MWh, which would be industry leading in 2024/25.
Reliability	Should some or all the local generation around Mount Isa be retired as a result of connection to the NEM, it is reasonable to conclude that there will be no material improvement in reliability. Rather, there will be a change from combined local generation + NWPS transmission system risk to combined Queensland generation + Powerlink + CopperString 2.0 + NWPS transmission reliability risks. There is no evidence to support a claim that the NWPS would be unreliable under the BAU case and even less so with higher renewable energy penetration, battery energy storage systems and hybrid control systems. In all cases, investment in the local NWPS transmission network is most likely to improve reliability for end customers.
Impact of line ratings/flows	The distance between renewable energy resources and loads is a major contributor to the economics of renewable energy development and one of the key considerations AEMO uses to produce its optimal development path for NEM transmission contained in the ISP. It is not good practice to ignore the impact of line flows and electrical losses over such a long distance, and adjustments to analysis outcomes need to be made as a result. The MLFs for this proposal could be some of the worst in the NEM.
Potential for system stability issues	The Consultation RIS refers to the potential for system security impacts and technical challenges in integrating renewables into the NWPS. Engineering advice (Appendix F) concluded that there is very low probability of issues arising and an even lower

Issue	APA Comment
	probability that any issue that did arise could not be solved by the design of the actual technology installed (e.g., grid forming inverters). Under the modified BAU case, incorporation of a battery and hybrid control system, while maintaining a minimal amount of base load gas powered generation, provides good frequency control, inertia and fault level.
Benefits for projects / proponents outside the NWPS network	The Consultation RIS identifies the lack of benefits for projects/proponents outside the NWPS as a "disadvantage" with the BAU option. The counterfactual argument is that projects/proponents outside the NWPS will benefit as their projects will not be exposed to the risk of a heavily subsidised transmission project displacing more equitable and cost-efficient development.

Comparison of CopperString 2.0 and Local New Entrant Generator Costs

The points made throughout this paper concerning the cost of CopperString 2.0 to large customers (as presented in the Consultation RIS) versus the Oakley Greenwood assessment of probable CopperString 2.0 costs and local new entrant generator costs are presented in Figure 4 for easy comparison.

Figure 7: CopperString 2.0 costs compared to Local New Entrant Generator



Key points to note are:

- The modelling of the CopperString 2.0 costs in the Consultation RIS are overly optimistic and unrealistic for the reasons set out in this submission and the attached Oakley Greenwood report. The energy unit rates ($/MWh) in the Consultation RIS are prices to large customers and not the cost of providing the actual service as they do not include the subsidy, therefore, it is incorrect to compare them.
- Oakley Greenwood cost range shows how the lowest possible customer price is $112/MWh with a probable customer price of around $150/MWh. The actual cost of providing the service ranges up to $221/MWh (CuString's modelling could be out by a factor of 2). This is reflective of the risk exposure that the RoQ has to CopperString 2.0.
- The new entrant cost provides the competitive market pressure that caps prices in the BAU case. These new entrant prices are readily verified by the Queensland Government and will decrease over time as has been observed for grid connected renewables. The range of expected new entrant prices fall

in a much tighter band indicating the lower risks associated with local generation developments.

- The minimum cost for CopperString 2.0 up until 2030, taking into account the existing contracts, is estimated to be at least $56/MWh higher than reported in the Consultation RIS modelling.

PART E Comments on proposed derogations sought by CuString

The following table provides APA's comments on each of the proposed derogations sought by CuString for the CopperString 2.0 project.

Table 7: Comments on each of the proposed derogations sought by CuString

Proposed derogation	APA response
Pre-approval of capital expenditure on project to the exclusion of the AER	It is not clear how relying on an, as yet unappointed, 'Independent Expert' in lieu of using an experienced economic regulatory body in the Australian Energy Regulator (AER) could lead to outcomes that are in the long-term interests of consumers (including the Queensland electricity consumers who will be paying the costs of the project which will be materially affected by the Independent Expert's decisions). CuString has not provided any information on the Independent Expert's governance arrangements, including responsibilities, objectives, information transparency and assessment criteria. Further, no information is provided about the regulatory process the Independent Expert is to follow (e.g., whether the Independent Expert's draft decisions will be made public so that stakeholders can respond or whether the Independent Expert's decisions appealable or subject to oversight). This proposal is also concerning as the stated rationale for not appointing the AER appears tenuous at best, given: • The AER is already undertaking reviews of greenfield transmission links (e.g., Project Energy Connect and HumeLink, as well as smaller greenfield construction projects in every other regulated business); • The AER's recent and relevant experience in reviewing transmission projects, as well as its broader regulatory experience, means that it has unparalleled knowledge in this area which cannot be replicated by any Independent Expert; and

Proposed derogation	APA response
	• The project is, in all likelihood, a number of years away from being built and hence, the benefit of a 'more timely' process appears hollow in this case – in any case, rushing through a decision to achieve effectively a notional start date for construction, at the expense of undertaking a rigorous assessment of the project's costs and viability, will almost certainly be to the detriment of Queensland's electricity customers. Given this, the adoption of an Independent Expert appears to be a means for CuString to escape detailed scrutiny of its costs, which is a material concern. Moreover, when combined with other aspects of CopperString 2.0's proposed economic and commercial framework that shift a significant amount of risk away from CuString to Queensland's electricity consumers (e.g., other derogations and agreements such as the one to hand back the asset to the Queensland Government after 40 years with $1.1b of debt), the proposed approach is concerning. This process itself is also likely to add an unnecessary cost burden to Queensland taxpayers as it duplicates a function that is already efficiently undertaken by a Transmission Network Service Provider (TNSP) and regulated by the AER.
23-year fixed return to the exclusion of typical 5 year regulatory reset periods	The Consultation RIS indicates that a regulated transmission network operating in the NEM would currently attract an indicative overall rate of return (nominal vanilla) of 4.65 per cent for a five-year regulatory period, with this being reassessed at the time of each regulatory 'reset'. The proposed derogation provides: • Higher returns to CuString and CopperString 2.0's investors than are provided to other investors in Australian regulated electricity infrastructure; • The perpetuation of above-market returns for at least 18 years beyond the first regulatory reset period; and • Greater certainty to CuString and CopperString 2.0's investors than are provided to other investors in Australian regulated electricity infrastructure.

Proposed derogation	APA response
	The rationale for this is not apparent from the information provided by CuString. For example, is this a reflection of the purportedly different risks associated with this investment, relative to other regulated infrastructure investments? If so, what, specifically, are these risks, and how do they relate to the different components of the formula that the AER uses to determine the returns regulated business are provided with? And is this assessment of risks aligned with CopperString 2.0's proposed regulatory and commercial framework (i.e., the broader suite of proposed derogations)? Custring appears to be seeking to lock in a higher return than for a comparable regulatory asset, while also seeking lower risks. APA considers that should CuString proceed on the proposed risk profile, its allowable returns should be correspondingly lower than for typical regulated assets, not higher. To this end, it is unclear why 23 years has been chosen as the period over which returns would be fixed – is this driven by specific market parameters or the individual needs of CuString? If so, how is fixing this rate for 23 years in the long-term interests of consumers, including Queensland customers who will be providing the underlying subsidy to customers of the NWMP and to providers of equity?
Preservation of Regulatory Asset Base (RAB) to the exclusion of the normal discretion of the AER	The concept of 'setting and forgetting' the initial RAB determination provides certainty to investors with regard to the recovery of the asset's initial capital base and is consistent with regulatory precedence. By adopting this approach, the regulatory framework contributes to the de-risking of investments in regulated assets, which in turn drives investors to require lower risk-adjusted returns from those investments. In the context of the CopperString 2.0 development, the approach of 'setting and forgetting' the initial RAB determination: • Reinforces the importance of adopting a robust, transparent and rigorous process for setting the initial RAB as there is only one opportunity to do so. Any inaccuracy will materially impact both the level of tariffs levied upon customers in the NWMP and the subsidies that are required to be paid by Queensland customers over the life of the asset. This reinforces the need to engage the most respected and experienced organisation, being the AER,

Proposed derogation	APA response
	to fulfil this role. To not do so is likely to be to the detriment of the long-term interests of consumers. The fact that this derogation is even being proposed suggests that CuString are aware that their proposed capital base is inefficient; and • Is inconsistent with CuString's proposal to receive a 23-year fixed return at higher rates than what would otherwise have been derived if CopperString 2.0 was subject to the usual AER process, as this removes a key risk faced by CuString and CopperString 2.0's investors. This position is further reinforced when also considering other derogations requested by CuString that also seek to carve out and allocate risk to parties other than itself.
Adjustments to a TNSP's regulated revenue allowances	While the project has already received significant financial support from state and federal governments, the actual costs of building and operating CopperString 2.0 are still very unclear, with the Draft EIS indicating that it would cost ~$2 billion and the Consultation RIS providing development cost estimates of ~$2.45 billion. Increases in project cost estimates are relatively common as projects move along the development curve, with almost every recent transmission interconnection project's forecast costs materially increasing as they neared project commencement. Whilst increased project cost estimates are important when assessing the economics of the solution, once a decision has been made to make an investment, a pre-condition of delivering efficient outcomes is that the construction cost risk of a project is allocated to the party that is best able to manage that risk. This promotes the adoption of the least cost means of mitigating that risk (e.g., physical solution, self-insurance, external insurance). CuString's proposed derogation for over-expenditure against an allowed expenditure (plus contingency) represents an inappropriate allocation of that risk, with Queensland customers bearing 70% of the impact of any cost overrun despite having no control over the existence of, or quantum of, any cost overrun. It also fails from an equity perspective, as 70% of any cost over-run is borne by Queensland customers who do not benefit from the investment, whilst none of the cost over-run is borne by customers in the NWMP.

Proposed derogation	APA response
	We note that whilst the proposal to pass 100% of any cost under-spend through to Queensland customers via lower tariffs appears attractive, it is likely to simply incentivise CuString to spend to the agreed allowance, as it receives no financial benefit from any under-spend. This is to the detriment of productive efficiency. Given that CuString appears to have deliberately underestimated both the capital and operating costs of the project, there appears no chance of any under-spend saving being realised.
Foundation customer discounts to 6 privately owned customers	This derogation is essentially an additional subsidy from Queensland electricity customers to a select few private miners who operate in the NWMP, including Glencore, MMG, Incitec Pivot, New Century Resources and Chinova[43]. Concerningly, there is no stated rationale for this subsidy, no stated criteria against which the subsidy will be assessed, no apparent limit to the level of the subsidy and no independent, non-Government, oversight of the subsidy. It seems self-evident that such a derogation will not be in the long-term interests of the Queensland electricity consumers that are subsidising these private miners. This derogation lacks equity and is profoundly anti-competitive, given that Queensland energy consumers in the same businesses as the proposed foundation customers will be cross-subsidising their profits.
Cost Allocation and Pricing Methodologies to the exclusion of the AER	Similar to other derogations, it is clear that CuString is seeking to avoid normal regulatory scrutiny that applies to every other electricity transmission asset in the NEM. No reasoning has been provided for this lack of transparency.

43 CopperString 2.0, *Additional Information Economics, Volume 4 Attachment H*, slide 11

Proposed derogation	APA response
Transitional protections for customer connections	This is a common derogation with much precedence when connecting new regions or sub-regions to the NEM. However, the transitional regime proposed is incomplete and the transitional costs have not been fully accounted for. Currently, the NWPS operates using bilateral contracts between customers and generators with a small balancing function and operates on different technical standards and operating philosophy to the NEM. The NEM is a completely different model involving a gross, energy only compulsory pool where wholesale risks are hedged with very detailed and onerous technical requirements. Firstly, the construction of the derogation would need to ensure it applies to generators and customers alike – currently the wording of the derogation is flawed as it only mentions customers. As connecting generators are fit for purpose under the existing market model and contracts, and are not actively seeking NEM connection but rather the CopperString 2.0 project would be imposed by the Queensland Government as a change in regulation, the generator connection costs should be borne by the project and its proponents. Secondly, CuString proposes that if a customer is currently below the minimum standard, the customer will pay its upgrade costs. If they meet the minimum standard but AEMO still requires a further augmentation, then CuString will meet those upgrade costs but they will be passed onto Queensland customers. These costs for NWPS customers and for Qld consumers have not been determined particularly if you consider the technical transition costs of other NWPS participants. Thirdly, the derogations would need to not just deal with technical issues but also contractual and other arrangements. The long term contract arrangements in the NWPS involve physical delivery of electricity and are inconsistent with the NEM market design. Participants should not be left in breach of their contracts or have existing contracts frustrated or simply overridden by law to accommodate another private participant.

Proposed derogation	APA response
	Fourthly, there are transitional costs beyond technical costs. Joining the NEM involves, for example, registration with AEMO, system changes to integrate with AEMO's systems, new reporting regimes, posting of credit support to AEMO by market participants, a requirement to obtain an Australian Financial Services Licence to enter into hedges and very detailed and onerous compliance requirements – the National Electricity Rules are over 1600 pages long. These costs may need to be met by CuString or the Queensland Government or it may be uneconomic for the generators who are faced with this cost and they may decide not to register in the NEM and withdraw leaving the NWPS vulnerable. The assessment of Option 2 is incomplete as the transitional regime has not been adequately considered and no information has been provided on these costs and the costs to be passed on to consumers. As such, the complexity and disruption of the transition has not been addressed and the true cost of CuString has been under-estimated.
Operation and Maintenance risk and costs avoided by CuString	This derogation highlights numerous flaws in Option 2: • Powerlink is proposed to be the Operator under both Options 2 and 3; • As such, the operating plan, risks and costs of Powerlink can be presumed for this purpose to be largely identical; • CuString has zero operating risks as it is seeking for these to be a complete pass through, unlike every other electricity transmission business in the NEM that has to justify the efficiency of its costs and take the risks of those costs within regulatory periods; and • Notwithstanding CuString having zero operating risks, it is still seeking to charge Queensland consumers a higher return on capital employed than comparable assets that do face these risks. APA notes that costs such as insurance and compliance with the *Security of Critical Infrastructure Act 2018* (Cth) are rising and there can be no assurance that CuString's charges to Queensland consumers will be efficiently incurred.

Proposed derogation	APA response
	No cost allocation methodology between Powerlink's other assets and CopperString 2.0 has been explained and the different risk allocation proposed to customers raises questions regarding adverse incentives to shift costs.
Significant network investments approved without passing applicable economic tests	This derogation, along with the other proposed derogations, seeks to circumvent existing processes and remove independent oversight of decisions to spend money, which in turn will be recovered from Queensland electricity consumers – being the same consumers that will receive no material benefit from those expenditures being incurred. The fact that this derogation is even being proposed highlights that the proponents are aware that the project is not economically justifiable.
Single transmission pricing across all NWMP connection points	Under the NER, separate transmission prices may be calculated for each connection point within a network. This enables different prices to be charged depending on where in the network a particular customer is located. Any derogation that allows CopperString 2.0 to move away from this would have the effect of requiring CopperString 2.0 to levy non cost-reflective prices leading to: • Inefficient outcomes, with customers responding to a price that is not reflective of their marginal costs; and • Inherent cross-subsidies, with, for example, customers connected to the Southern Link (if it were to be built) being materially subsidised by customers connected to the core CopperString 2.0 network.

PART F Responses to the survey questions

The following tables provide APA's response to each of the survey questions.

Table 8: APA's response to each of the survey questions (Option 1 – business as usual)

Question	APA Response – Option 1 – Business as Usual
Does this option deliver affordable, secure, reliable, and sustainable electricity supply in an equitable, practical and cost-effective manner?	The analysis presented in the Consultation RIS concludes that the BAU case would deliver affordable, secure, reliable and sustainable electricity supply, particularly after corrections to the following assertions: • Elevated prices in the high demand case. There is an extremely low probability that such demands will eventuate and generation expansion solutions are readily available below the prices presented. New entrant cost will cap the price between $112 and $122/MWh. New variable renewable energy projects can be efficiently delivered in the region of ~$55/MWh or even less, depending on the prevailing cost of inputs. • The forecast level of renewable energy penetration is lower than what could rationally be expected to occur in the region, given the abundant renewable energy resources available locally and the market design (which provides for new entrants to enter the market), both of which support the significant level of interest from several parties (APA, VAST and Stanwell, Neoen and CleanCo). • The description of reliability is incorrect and sensationalised by referring to 'life support customers'. The recent outages referenced were caused by network assets, not generation assets. There is no quantitative analysis of relative reliability under each scenario or compared to any relevant standards or similar networks. • There is no basis to suggest that system stability issues may be a major concern Of the options considered, it is the most: • **Equitable**: this option does not require non-benefitting Queensland customers to provide a subsidy to a private infrastructure owner to support its commercial operations. Rather, customers who receive the service, pay for the full costs of the service and competitive market factors drive development on an equal footing.

Question	APA Response – Option 1 – Business as Usual
	• **Practical**: the NWPS Dispatch Protocol (the system rules for the NWMP) has served the participants well because it provides a practical and fit for purpose structure that enables development of the energy system in the region. An adaptive continuation (the protocol anticipates the need for change and contains a relatively simple change process which is very practical when compared to the NER rule change process) of the protocol is a very sensible way forward. • **Cost effective**: BAU minimises development cost and operational costs, recognising that all demand is and will continue to be met without unnecessary, expensive, transmission infrastructure being built. The competitive forces active in the NWMP will ensure cost effectiveness endures the entire life of the province under the broadest range of demand scenarios (including volatile demand). • **Has a low risk profile**: The BAU option has much greater flexibility embedded within it. The economics are such that it will inevitably involve a combination of local, modular and centralised large-scale wind and solar, and flexible behind the meter solutions. Decisions around the timing and size of these types of supply options are much better made once demand is committed and the latest technologies and price curves are available. In a region where forecast demand is so uncertain, the ability to respond using scalable and flexible solutions (as many can be re-located if required) has significant value compared to a large transmission investment.
How well does this option capture the pipeline of generation projects for the NWPS?	This option does not recognise the material pipeline of projects that may be developed in response to the current market signals. APA have entered agreements with two customers to underpin the 88MW Mica Creek Solar Farm and are investigating other renewable projects. VAST/Stanwell are progressing a 50MW hybrid plant that contains solar thermal, solar photovoltaic, large battery and GPG (85% renewable) and CleanCo/Neoen are exploring wind/solar/battery/firming options in the region as well. With this level of known interest, there is likely to be other additional activity. This observable evidence suggests that there is strong competition in the region and higher renewable penetration using the rich local resources will almost certainly happen.

Question	APA Response – Option 1 – Business as Usual
Are there any concerns around the key inputs and assumptions?	The flat and high demand (CopperString 2.0 target demand) forecasts are extremely optimistic and contain factual errors and inconsistencies. In particular, the high case is not a credible outcome. It is premised on the Southern Link occurring – yet CuString now acknowledge that South 32, a cornerstone customer of the Southern Link, will not connect. Without this cornerstone customer, it will almost certainly be uneconomic to build the ~200km of infrastructure required to service the other purported potential customers in the region (Phosphate Hill and the Osborne Mine). This is discussed more in the Oakley Greenwood Pricing Report, attached in Appendix C. More broadly, the methodology for formulating these forecasts does not appear to be robust or sufficiently scrutinised commensurate to the importance of the input to the analysis.
Are there any risks or gaps to raise with Government?	Only select options have been assessed without the type of comprehensive consultation generally followed by the industry and expected by industry participants. It would be appropriate to pause this process, call for submissions and implement independent robust assessment.

Table 9: APA's response to each of the survey questions (Option 2 – CopperString 2.0 NEM Connection)

Question	APA response – Option 2 – CopperString 2.0 NEM Connection
Does this option deliver affordable, secure, reliable, and sustainable electricity supply in an equitable, practical and cost-effective manner?	Aside from the obvious flaw of generous subsidies being used to disguise affordability, there are no advantages in terms of security, reliability or sustainability. Option 2 is the most inequitable option with the only beneficiaries being: • The proponents that are seeking to lock in large taxpayer funded development profits. The publicly known investors include the O'Brien family, a Korean corporate, and a Dutch financial investor; and • Potentially a small number of large mining customers with interests in the NWPS who may benefit from cross-subsidised reduced transmission costs, but who will need

Question	APA response – Option 2 – CopperString 2.0 NEM Connection
	to procure energy from the NEM as well as continue to pay for their existing energy supply contracts. The disadvantaged parties include: • NWPS customers who have existing contracts that remain on-foot until 2030 (including Ergon); • The mining industry outside the NWPS, given they will pay higher costs than competitors inside the NWPS; • local generators; • prospective renewable energy developers throughout Queensland, given the artificial subsidies for Option 2 may displace other more economic renewable generation projects elsewhere; • all Queensland tax-payers; and • all other Queensland energy consumers. In today's environment, there is nothing practical about building 1100km of transmission assets to supply a region of around 300MW of maximum demand that already has adequate supply and a genuine pipeline of renewable projects standing ready to lower energy prices. Further, it is completely impractical and uneconomic to build and socialise the costs of a 40+ year solution to address a ~20 year opportunity, given the innate degree of uncertainty associated with mine lives and reserve replacement in the mining industry. If this project was cost effective, then it simply would not need the raft of subsidies sought by CuString. These are in the form of both the direct subsidies from Queensland taxpayers over CopperString 2.0's 40-year private ownership period, as well as the subsidies that will inevitably need to be provided by the Queensland Government and potential Queensland electricity customers after the Queensland Government is required to take ownership of the asset (and $1.1 billion of debt associated with the asset). It is forecast to cost an additional $244 million more than if the same project was built by the regional TNSP (in Option 3) with the proponents taking less risk and higher returns.

Question	APA response – Option 2 – CopperString 2.0 NEM Connection
	APA expects that the proponents are seeking to obtain significant development fees as part of this $244 million cost premium. Any such fees should be transparently disclosed and subject to public scrutiny. It is completely inappropriate for private development fees to be funded by taxpayers without contestability or the standard economic benefit tests (RIT-T) being applied to this project. Of the three options assessed, this is clearly the least preferred and is clearly not in the long-term interests of consumers.
Are there any concerns around the key inputs and assumptions?	The key inputs are flawed, erroneous and/or simply unrealistic in many respects and appear deliberately distorted to improve the apparent economics of the project. The committed 88MW Mica Creek Solar Farm has not been accounted for in terms of demand for CopperString 2.0's network services. There is no rational reason to exclude an already committed project from the assumptions, particularly as it is included in the BAU or base case. As discussed in other parts of the submission, and in the Oakley Greenwood Pricing Report, other concerns relate to: • NEM price forecasts, which are unsustainably low and do not appear to take into consideration MLFs which are a mandatory factor in the NEM. This input assumption should be sensitivity tested; • The capital cost associated with constructing the asset, which, at ~$2 billion in the Draft EIS and $2.4 billion in the Consultation RIS, appears well below the estimates that are being ascribed to other similar length transmission projects. APA's interpretation is that the proponents have submitted an unrealistically low price in order to improve the apparent optics of the proposal; and • The demand forecasts that are used to support the analysis lack credibility, overstating demand and are designed to improve the apparent cost per unit of the project. The existing commercial arrangements are acknowledged but not recognised as either a cost or reduced demand. This is a

Question	APA response – Option 2 – CopperString 2.0 NEM Connection
	material impact that needs to be addressed in the assessment but has simply been ignored. Line flows have not been modelled, rather it is implied that Hughenden wind farm can fully supply the NWMP. This is incorrect and likely to lead, at least in the short to medium term, to a net increase in CO2e emissions. Sustainability is an obvious gap that should be added to the (quantitative) assessment criteria.
Are there any risks or gaps to raise with Government?	The justification for large subsidies funded by the rest of Queensland electricity consumers is non-existent other than a reference to wider economic benefits. These benefits need to be identified, robustly quantified, made transparent and open to scrutiny. Especially when the subsidies are estimated at between $1.1 – $1.7 billion with a very real risk of being substantially higher. The perception of sovereign risk created by this market intervention, leveraging substantive subsidies to underpin uneconomic investments should not be under-estimated. A decision to proceed with CopperString 2.0 as described could have immense and immeasurable consequences for decades to come. The full impact of handing the asset to the Queensland Government, beyond the transfer of $1.1 billion debt, at the end of project life has not been described or quantified. All of the forecasts provided suggest utilisation will be 20-40% of capacity at that time, representing a significant liability. Option 2 is extremely poor public policy as it is: • A project that has previously failed to be preferred under a contestable process; • Not subject to any contestability; • Not subject to the applicable national RIT-T tests to ensure that only efficient and needed infrastructure is built and paid for by the community; • Outside and appears to be inconsistent with other Queensland Government procurement policies;

Question	APA response – Option 2 – CopperString 2.0 NEM Connection
	• Contradictory to the Queensland Governments' 'Market Led Proposal Guidelines'; and • Contradictory to the principles of National Competition Policy. Option 2 would open the floodgates for any developer to seek guaranteed private profits from projects of any type, without competition and where the costs and risks are fully socialised to Queensland taxpayers via regulatory instruments. No justification has been provided for the uniquely favourable approach to procurement of CopperString 2.0 under Option 2.

Table 10: APA's response to each of the survey questions (Option 3 – Modified RIT-T (Powerlink) NEM Connection)

Question	APA response – Option 3 – Modified RIT-T Powerlink NEM Connection
Does this option deliver affordable, secure, reliable, and sustainable electricity supply in an equitable, practical and cost-effective manner?	This is the same project as CuString's proposal but built by a different proponent under the well-established NEM regulatory framework modified to include wider economic benefits (addressed below). The RIT-T process includes a call for nominations on non-network solutions and has a number of steps that provide the opportunity to scrutinise the analysis and results. The process is designed to ensure efficient investment for the benefit of electricity consumers. To answer this question comprehensively, the RIT-T or an equivalent process needs to be followed. Anything less is simply insufficient for transmission investment of this scale. The capital costs of this option appear cheaper, which APA attributes to private developer fees being included under Option 2 but not under Option 3.
Should wider economic benefits be considered in the RIT-T?	If wider economic benefits are to be included, it is critical to ensure that those benefits are realised by the parties that bear the costs. In the absence of a clear linkage then subsidisation and wealth transfers occur, distorting the outcome of the cost benefit analysis.

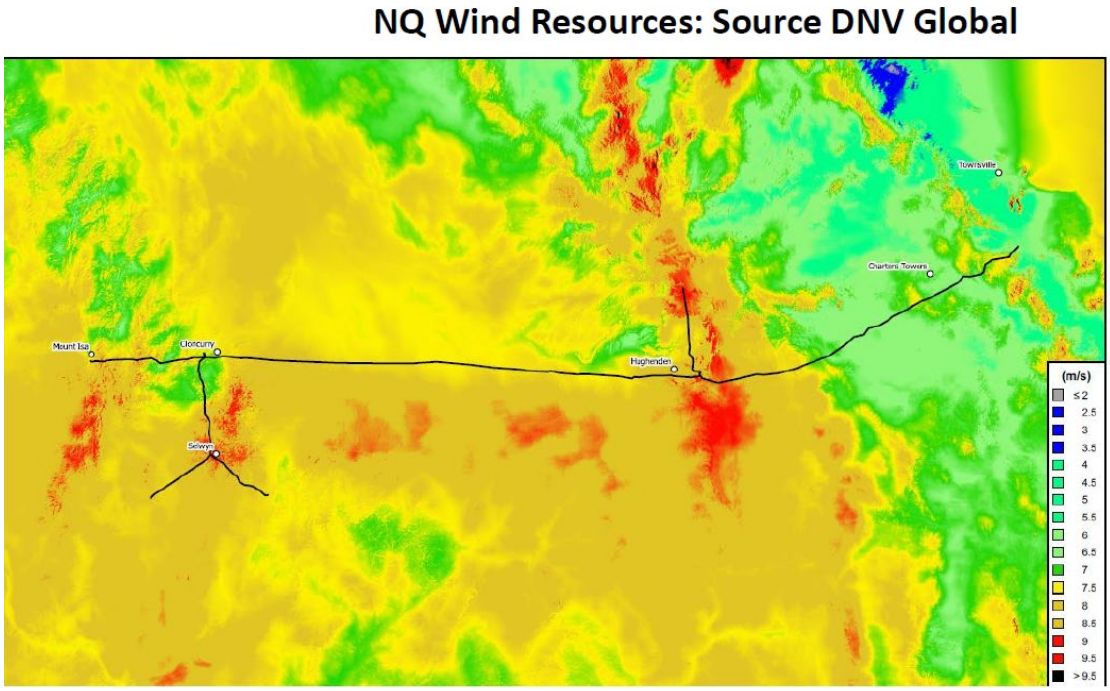
Question	APA response – Option 3 – Modified RIT-T Powerlink NEM Connection
Are there any concerns around the key inputs and …0%?	Same as Option 2.
Are there any risks or gaps to raise with Government?	Same as Option 2.

Appendices

Appendix A: More information on the renewable resources available in Mount Isa

In the SOREN Consulting report,[44] which is a key input into the EIS, they present figures highlighting the quality of the renewable resources in the Hughenden area. The first one we have reproduced below reflects the available wind resource in the area.

Figure 8: NQ Wind Resources



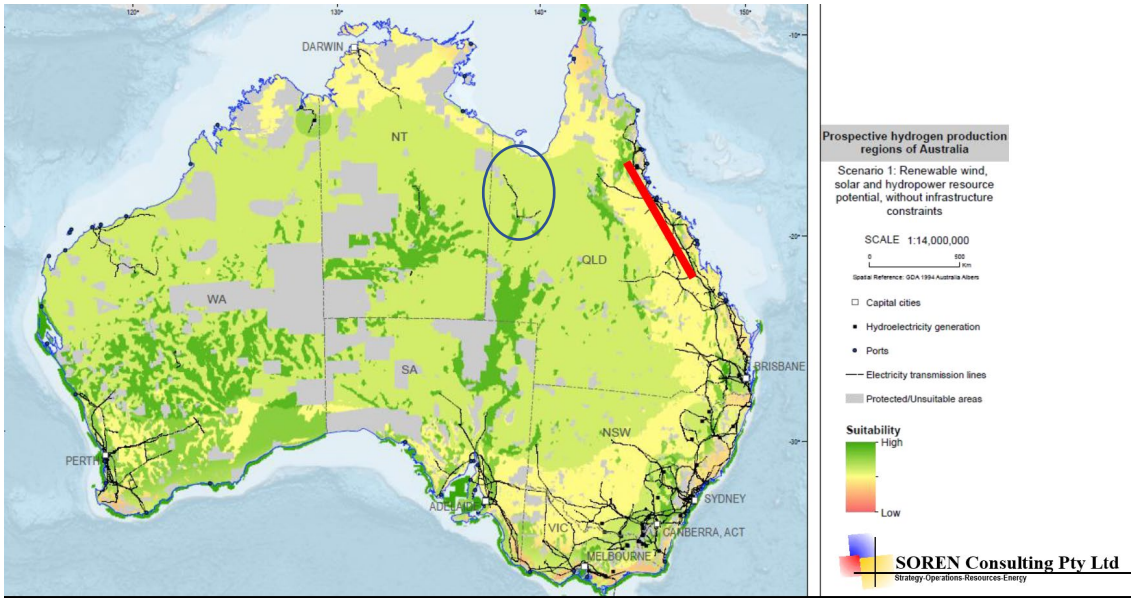
Source: SOREN Consulting, *North West Minerals Province Resource Economics, TEL Webinar*, 19 August 2020

This clearly highlights the scale of the wind potential in Hughenden - it also highlights significant potential in the Mount Isa and Selwyn regions.

The second figure reflects the renewable wind, solar and hydropower resources across Australia.

[44] SOREN Consulting, *North West Minerals Province Resource Economics, TEL Webinar,* 19 August 2020

Figure 9: Prospective Hydrogen Production regions of Australia



Source: SOREN Consulting, *North West Minerals Province Resource Economics, TEL Webinar*, 19 August 2020

Again, this figure reinforces the view that there is a significant amount of renewable potential in the region in and around Hughenden, but also in the Mount Isa region (circled in the above graph for easier reference).

Finally, using data derived from the national map (formerly AREMI), we assessed the average wind speed at a height of 150m over the years 2005 to 2014 at both Hughenden and Mount Isa. We chose 150m, as this is reasonably representative of the height of large capacity wind towers (100m-150m), and the 2005 – 2014 period was chosen due to data availability (this is the default data set analysed by DNV-GL for the National Map).

The results were:

- 7.79m/s (Mount Isa); and
- 7.96m/s (Hughenden).

The difference, at only 2.2%, is marginal.

Appendix B: North West power System Operations and Reliability

How the NWPS currently operates

The NWPS is operated much like the NEM with a set of rules for participation, operation and technical standards as they apply to the connected parties. This is known in the NWPS as the Dispatch Protocol and is governed by a Working Committee made up of representatives of the connected parties.

The Dispatch Protocol was conditionally authorised by the ACCC on 25 January 2015 and re-authorised on 11 March 2020 (AA 1000454).

Some examples of how the Dispatch Protocol effectively serves the NWPS are:

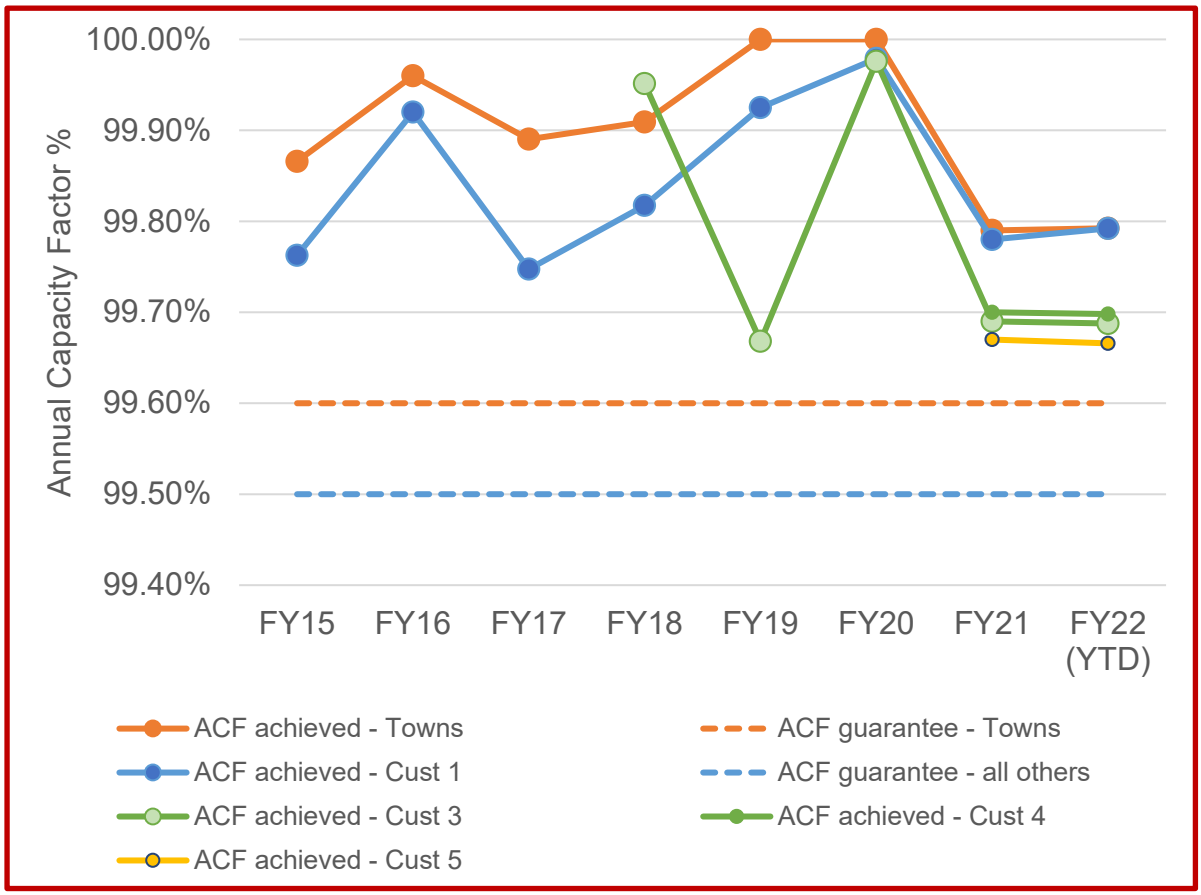
- **Designed and operated to achieve low cost for users** – conscious choice to utilise master load shed system instead of carrying large spinning reserve (avoiding the cost of maintaining under-utilised spare capacity).
- **Efficiency of operating arrangements** - the Working Committee can make changes to the protocol with changes to key clauses requiring agreement of all parties. This provides much better solutions, flexibility and timeliness as compared to the NER rule change process that is typically lengthy and resource intensive. As an example, the Dispatch Protocol was recently amended to provide for new entrants using inverter-based technology (solar, wind and battery).
- **Competition drives customer outcomes** – the ACCC authorisation enables participants to agree certain technical and operational matters and to rely on load shedding to ensure safety, security and reliability of supply in the NWPS, while not breaching competition law (though noting that commercial arrangements cannot be discussed).
- **Off market arrangements as required** – offtakers contract with generators in a commercially competitive manner under a regulated regime to purchase generation capacity or energy outside of the Dispatch Protocol with agreements kept confidential. These agreements typically contain more detailed performance standards that are more bespoke than those contained in the Dispatch Protocol.

The NWPS is reliable

The DPS Complex consists of 15 units spread across three power stations. The DPS consists of 6 units including 4 x 40MW gas turbine generators and 2 x 40MW steam turbine generators in a high efficiency combined cycle configuration. The Leichhardt Power Station consists of a single 60MW open cycle gas turbine and the 24MW Thomson Power Station consists of 8 reciprocating gas engines. The DPS Complex has contracted availability and reliability targets that it has always met. Figure 10 shows

the actual availability versus contracted for the previous five years and the current financial year to 31 January 2022.

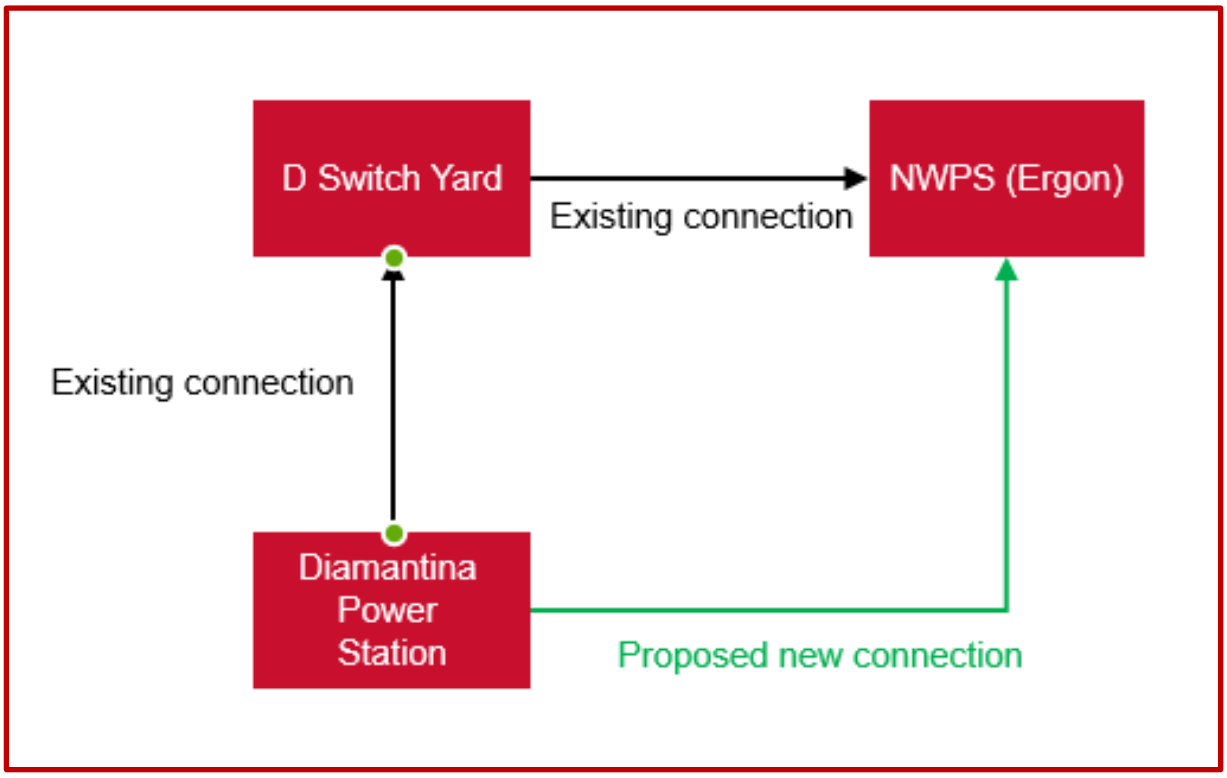
Figure 10 – DPS reliability performance versus guarantee



The two loss of supply incidents referred to in the Consultation RIS were caused by transmission network elements while generation was fully available. The issues which caused these supply interruptions could be readily addressed by the construction of duplicate connection between the DPS and the NWPS grid at an estimated cost of $50 million. This would further improve the reliability of the network connection between the DPS generation fleet and NWPS customers, making a significant improvement to reliability at a cost of 2% of the cost of CopperString 2.0.

The Queensland Government could fund this work directly or through Ergon (as a shared network asset), achieving equal or greater reliability than a region supplied by a single transmission connection (while noting the current single connection has been able to deliver reliability above the targets that customers have sought).

Figure 11 – Proposed arrangement for duplication of DPS complex grid connection



Reliability of Electricity Transmission vs Gas Transmission

The Australian Pipeline and Gas Association (APGA) recently commissioned a report entitled "*The Pipelines vs Powerlines: a Technoeconomic Analysis in the Australian Context*"[45] which analysed the costs of storing and transporting energy via powerlines and via pipelines in several scenarios with a particular focus on options for the growing hydrogen industry. This study, which was carried out by independent consultants, GPA Engineering Pty Ltd (GPA), included an analysis of the relative reliability of pipelines when compared to powerlines.

GPA reported that "The reliability of energy infrastructure can be considered in terms of loss of supply incidents per 1000 km per annum. Over the past decade, gas pipelines demonstrate superior reliability when compared to high voltage transmission lines on this basis." The following table showing the relative event intensity has been reproduced from this report:

[45] https://www.apga.org.au/news/pipelines-more-affordable-energy-transport-and-storage-report

Figure 12 – Extract from APGA report, page 13, "Table 3: Loss of supply comparison"

Table 3: Loss of Supply Comparison between Gas Transmission Pipelines and Electricity Transmission Powerlines

Infrastructure	Period of Review	Approximate length	Loss of Supply Events	Event per annum (average)	Events per annum per 1000 km installed
Gas pipelines	9 years (2009-2018)	39,000	10 (9 leaks, 1 rupture)	1.1	0.03
HV Powerlines	9 years (2010-2019)	43,000	164	18.2	0.42

Mount Isa is already served by two separate and redundant pipelines from different gas supply sources. This network of gas supply provides superior security and reliability of energy supply to Mount Isa when compared with the long transmission connections proposed under Option 2 or 3 in the Consultation RIS.

Appendix C: OGW Pricing Report

Attached under separate cover.

Appendix D: Detailed Risk Matrix

To further inform the stakeholder impact analysis provided in the Consultation RIS, Oakley Greenwood has quantified each of the disadvantages and risks using a standard risk management matrix. The risk matrix overleaf captures all the issues highlighted in the Consultation RIS and some that Oakley Greenwood believe have been overlooked.

Key Points:

- Oakley Greenwood acknowledges that the accuracy of the absolute risk ratings could be improved with more time and information, although they are expected to be reasonable estimates.
- The more important perspective is the relative risk between options.
- The accumulative risk position (total of all risks) attributed to CopperString 2.0 is very high. This level of project risk would be clearly unacceptable to commercial entities and should also be unacceptable to the Queensland Government.
- From the investor's perspective, these risks are being managed (transferred to Queensland Government and electricity consumers) through the derogations sought.

		CopperString 2.0				Greater Renewable Penetration			
Item	Risk	Comments	Likelihood	Consequence	Rating	Comments	Likelihood	Consequence	Rating
1	**NWMP customers**								
	Projected prices not achieved due to forecast errors, ommissions and exposure to NEM	Forecast NEM prices under-estimated MLFs not modelled No benefit for residential customers	6. Likely	4. Major	24	Price forecasts based on less variable inputs Retains some exposure to gas prices, (noting that new supplies from NT forecast to come on-line putting downward pressure on gas price) Price reductions flow through to residential customers	5. Possible	3. Moderate	15
	Reliability not improved	Generation reliability risk replaced with transmission reliability risk. Local network unchanged. Broader impact if reliant on single source (I.e. transmission circuit)	4. Unlikely	3. Moderate	12	Diversification of total reliance on GPG BESS and hybrid control system likely to improve reliability Local network unchanged	4. Unlikely	2. Minor	8
	System security impacts	NER and standards used to alleviate any issue	4. Unlikely	2. Minor	8	Hybrid design and control system used to alleviate any issue	4. Unlikely	2. Minor	8
	May require investment in firm supply	Not likely to be applicable to this option	2. Extremely Rare	1. Insignificant	2	Efficient investment in firm supply isn't a problem perse. Options to utilise new technology, refurbished second hand plant and/or large batteries. Lead times aligned with new load. Unserved load extremely unlikely.	5. Possible	2. Minor	10
2	**Qld Government (taxpayers)**								
	End of project life (40 years)	The (optimistic) forecast economic activity does not extend beyond 2041 leaving stranded capacity for the remainder of the asset life. Capital cost is not fully recovered after 40 years.	7. Almost Certain	5. Extreme	35	Shorter project life expectancies (more aligned to demand) Redeployable if necessary Market and project risks bourne/accepted by the proponents	2. Extremely Rare	1. Insignificant	2
	Forecast economic activity not achieved	No evidence to support optimistic forecasts	6. Likely	5. Extreme	30	Easily scalable to avoid unnecessary costs	6. Likely	1. Insignificant	6
	Large up-front investment without committed demand	Southern connection highly unlikely Glencore/Ergon contracted until 2030	6. Likely	5. Extreme	30	Can be staged in response to actual demand (smaller blocks and timing) Current contractual arrangements can be accommodated	2. Extremely Rare	2. Minor	4
	Fails to deliver affordable, secure, reliable and sustainable supply	Big question over the affordability aspect when subject to very large undefined subsidies	5. Possible	5. Extreme	25	Feasible,efficient risk mitigations available	4. Unlikely	3. Moderate	12
	Project risks allocated to Qld Gov't	State guaranteed revenue 70% construction cost overruns added to RAB Project proponents take lower/risk, higher return	7. Almost Certain	3. Moderate	21	Market and project risks accepted by the proponents	2. Extremely Rare	1. Insignificant	2
	Sovereign risk	Changing rules for a single project viewed unfavourably by private investors New rules leveraged to Qld taxpayers disadvantage by future projects (unintended consequences)	5. Possible	4. Major	20	Allows existing market processes to guide development of the NWMP and NEM (NQ REZ) without intervention. No additional sovereign risk	2. Extremely Rare	1. Insignificant	2
	Ineffective regulation	Taking on regulatory functions otherwised managed by AER leads to unintended outcomes and costs	5. Possible	3. Moderate	15	No need for changes to regulatory processes or oversight	2. Extremely Rare	1. Insignificant	2
3	**RoQ customers**								
	No benefit for $1.1b contribution	Benefits outside of those described for large customers in the NWMP have not been adequately identified, quantified or justified.	7. Almost Certain	6. Catastrophic	42	No cost, risk or disadvantages identified	2. Extremely Rare	1. Insignificant	2
	Contribution increased due to under-utilisation, project overruns etc.	RoQ may end up paying inexcess of half the costs for little or no benefit	6. Likely	5. Extreme	30				
4	**Supply/storage developers**								
	Develop renewable energy (Qld region)	Hughenden via CopperString not likely to be the most economic option to develop NQ Clean Energy Hub (ref:ISP)	6. Likely	5. Extreme	30	No impact on economic development of NQ Clean Energy Hub	2. Extremely Rare	1. Insignificant	2
	Develop renewable energy (Mount Isa region)	NWMP renewables not developed	6. Likely	3. Moderate	18	Maximises efficient construction of local renewables	2. Extremely Rare	1. Insignificant	2
5	**Network businesses**								
	Efficient resourcing for network development	Low probability network investigations tie up critical resources	5. Possible	3. Moderate	15	Smaller scale network investment reduces risk proportionately	4. Unlikely	2. Minor	8

Appendix E: Demand Forecasting Report

Attached under separate cover.

Appendix F: Engineering Advice

Attached under separate cover.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