



Risk Comparison Between Aurizon Network and Energy and Water Networks

Report for Aurizon Network

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Executive Summary

Aurizon Network's assessment of its commercial and regulatory risks (as set out in its UT5 submission) is based on its view that these risks are fundamentally driven by the characteristics of the market in which it operates, being the transport of a single commodity, coal, which is supplied into a highly competitive international market.

In contrast, in its consideration of WACC for UT4, the QCA's consultant Incenta relied primarily on comparison with regulated energy and water networks, reflecting its views that, as a result of the application of economic regulation, the risks associated with Aurizon Network's provision of below rail services most closely resembled those of regulated energy and water network businesses. The QCA's final approval on DBCT's 2015 Draft Access Undertaking in February 2017 indicates that it continues to hold this view.

Since UT5 was submitted, the ongoing volatility of the coal market reaffirms Aurizon Network's view that its risks are very different to those faced by regulated energy and water network businesses – emerging issues include:

- the ongoing high volatility in prices for thermal and metallurgical coal, and the increasing propensity by coal producers to respond through adjusting operating and contractual arrangements to allow for greater production variability;
- concerns about counterparty risk being reinforced, with increasing evidence of mines being sold to small, independent companies, and with two customers – Caledon Coal and Baralaba Coal – entering voluntary administration in 2017;
- concerns about demand risk also being reinforced, with 2017 international cost curve data showing that 45% of central Queensland's thermal coal production and 22% of its metallurgical coal production is now in the highest cost quartile, as compared to negligible proportions ten years ago;
- increasing risk of service bypass, including:
 - declining diesel prices combined with increasing electric energy prices has resulted in electric traction losing its historic cost advantage over diesel. Due to the divergent energy costs for diesel and electric traction, current comparative modelling indicates that in Goonyella the costs of diesel and electric traction is close to parity and in Blackwater electric is now at a significant cost disadvantage, leading to high bypass risk for Aurizon Network's electric infrastructure; and
 - Adani's 2017 commitment to the development of its Carmichael mine means that there will be an alternate rail route available for Goonyella system mines

to export via Abbot Point, leading to increased bypass risk for the GAPE/Newlands system.

Aurizon Network has commissioned this report to provide a robust comparison of Aurizon Network’s risk factors with those of regulated energy and water network businesses. This report is being provided as additional reference material for the QCA’s consideration in assessing Aurizon Network’s revenue proposal.

Table 1 sets out a summary of our assessment of the key market characteristics that impact on Aurizon Network’s commercial risk, and compares this to the market characteristics for energy and water networks.

Table 1 Comparative market characteristics - summary

Characteristic	Aurizon Network	Energy Networks	Water Networks
Exposure to market segments	Very highly concentrated, 100% large industrial users with exposure to same market segment. Exposure by revenue <ul style="list-style-type: none"> 71% metallurgical coal 29% thermal coal 	Broadly diversified ¹ , eg <ul style="list-style-type: none"> Energex revenue 52% residential users; 36% smaller commercial users and 10% high intensity commercial users Ergon revenue 43% residential users; 45% smaller commercial users and 9% high intensity commercial users commercial users exposed to a range of market segments 	Broadly diversified, eg <ul style="list-style-type: none"> QUU revenue 57% water supply and 43% sewerage, water supply volumes 64% residential, 36% commercial users Unitywater revenue 52% water supply and 48% sewerage, water supply volumes 83% residential, 17% commercial users commercial users exposed to a range of market segments
Exposure to individual customers	Very high <ul style="list-style-type: none"> 34 customers with average RAB value/customer \$175 million 	Low, eg <ul style="list-style-type: none"> Energex 1.42 million customers with average RAB value/customer \$8,000, high volume users 9% of revenue Ergon 735,000 customers with average RAB value/customer \$14,000, high volume users 9% of revenue 	Low, eg <ul style="list-style-type: none"> QUU 577,000 customers with average asset value/customer \$9,000 Unitywater 305,000 customers with average asset value/customer \$11,000
Reliance on customer competitiveness	High <ul style="list-style-type: none"> customers are price takers, with demand subject to market conditions. 22% metallurgical coal in upper cost quartile 45% thermal coal in upper cost quartile 	Low <ul style="list-style-type: none"> Residential demand inelastic Low revenue exposure to large trade exposed businesses 	Low <ul style="list-style-type: none"> Residential demand inelastic Low revenue exposure to large trade exposed businesses
Commercially viable bypass options	Partly <ul style="list-style-type: none"> bypass options for some services, eg electric network 12% RAB GAPE/Newlands 19% RAB 	Limited <ul style="list-style-type: none"> gas is mature market and networks are sized for demand alternate electric energy sources (eg solar) not sufficient to allow bypass of network 	No <ul style="list-style-type: none"> alternate water supply sources (eg tanks) not sufficient to allow bypass of network

¹ Energex and Ergon revenue does not add to 100%. A small proportion of revenue is received through other.

Characteristic	Aurizon Network	Energy Networks	Water Networks
Contracting arrangements to mitigate risk	Partly effective <ul style="list-style-type: none"> take or pay contracts address exposure to individual customers 35% volume off contract by FY22 surplus capacity reduces incentive to contract 	Partly effective <ul style="list-style-type: none"> connection agreements or upfront funding to address exposure to individual customers. low exposure to individual customers on shared network. 	Partly effective <ul style="list-style-type: none"> connection agreements or upfront funding to address exposure to individual property developers or customers. low exposure to individual customers on shared network.

Source: Synergies, based on data sourced from Aurizon Network, AER RIN data for electricity networks, BOM data for water networks

Like Aurizon Network, Australian energy networks are subject to highly prescriptive regulation, while Australian water networks are subject to varying types of regulation under different jurisdictional regimes. Regulation may impact the way in which market characteristics translate to commercial risk for these businesses.

In particular, Aurizon Network’s revenue cap is generally cited as a means by which the regulatory framework reduces Aurizon Network’s exposure to market risk. The revenue cap is moderately effective in managing volume risk in the shorter term, although we note that Aurizon Network continues to bear short term volume exposure due to revenue deferrals for expansion projects and revenue cap exclusions (eg AT1).

However, the revenue cap is unlikely to be effective in dealing with major volume shortfalls. This reflects the characteristics of Aurizon Network’s highly concentrated market exposure – the market factors that would be likely to lead to a loss in demand (eg, low coal prices reflecting low international demand) will impact on all users in a consistent way, that is, all users will be receiving lower coal prices with pressure being placed on their margins. In this context, in the face of significant volume loss, there is real uncertainty as to whether remaining users will have capacity to pay revenue cap-induced price increase. Further, the fragmentation of Aurizon Network’s RAB (with the RAB being increasingly compartmentalised to specific customers for pricing purposes), increases these risks, as resulting prices for a system are highly dependent on the volume decisions of a small number of users, with some systems having only two customers.

This contrasts with Australian energy networks regulated under revenue caps, which are typically highly effective at mitigating volume risk given a single RAB/revenue cap is generally applied for core network services with no exclusions.

Given this context, Table 2 summarises the key commercial risks borne by Aurizon Network, in comparison with Australian energy and water networks, having regard to both market and regulatory characteristics:

Table 2 Comparison of commercial risk

Factor	Aurizon Network	Energy Networks	Water Networks
Volume risk	<p>Moderate</p> <p>High market volatility and demand risk (particularly for thermal coal) mitigated by take or pay contracts and revenue cap.</p> <p>Short term exposure remains due to:</p> <ul style="list-style-type: none"> revenue deferrals for expansion projects revenue cap exclusions (eg AT1) <p>Longer term exposure remains due to:</p> <ul style="list-style-type: none"> short profile of remaining contracts uncertain coal demand with capacity to pay risk and subsequent optimisation risk in face of significant volume loss, accentuated by RAB fragmentation. 	<p>Low</p> <p>High weighting of residential users and diversified commercial /industrial demand means reasonably low market volume risk.</p> <p>Revenue cap is highly effective in mitigating this volume risk</p>	<p>Low</p> <p>Extremely high weighting of residential users and essential nature of service means low market volume risk.</p> <p>This volume risk is generally effectively managed with two part tariffs and regular tariff reviews.</p> <p>Where revenue caps are applied, these are highly effective in mitigating remaining volume risk.</p>
Revenue risk	<p>Moderate</p> <ul style="list-style-type: none"> reflects impact of volume risk also reflects high revenue dependency on individual customers and the credit risk of customers noting nearly half have less than investment grade credit rating 	<p>Low</p> <ul style="list-style-type: none"> reflects impact of volume risk also reflects low revenue dependency on individual customers 	<p>Low</p> <ul style="list-style-type: none"> reflects impact of volume risk also reflects low revenue dependency on individual customers
Opex risk	<p>Low</p> <ul style="list-style-type: none"> regular revenue resets will review efficient operating and maintenance costs pass-throughs and reopeners mitigate impact of significant events through regulatory period 	<p>Low</p> <ul style="list-style-type: none"> regular revenue resets will review efficient operating and maintenance costs pass-throughs and reopeners mitigate impact of significant events through regulatory period 	<p>Low</p> <ul style="list-style-type: none"> where revenue cap regulation does not apply, opex risk typically managed by regular tariff resets
Stranding risk	<p>Variable (low to high)</p> <ul style="list-style-type: none"> varies between RAB component given customer concentration, exposure to thermal coal and bypass opportunities no ability to offset stranding risk between RAB components 	<p>Low</p> <ul style="list-style-type: none"> service alternates (eg gas, home solar) are not likely to cause users to disconnect from the network regulatory framework allows socialisation of stranded assets within RAB 	<p>Low</p> <ul style="list-style-type: none"> service alternates (eg water tanks) are not likely to cause users to disconnect from the network
Financing risk	<p>Moderate to high</p> <ul style="list-style-type: none"> financing and refinancing must be managed to align with regulatory revenue determinations reluctance of debt financiers to finance coal industry reduces capital pool available to Aurizon Network 	<p>Moderate</p> <ul style="list-style-type: none"> financing and refinancing must be managed to align with regulatory revenue determinations 	<p>Moderate</p> <ul style="list-style-type: none"> where relevant, financing and refinancing must be managed to align with regulatory revenue determinations

We consider that, notwithstanding the regulatory frameworks that are in place, Aurizon Network is subject to significantly higher volume and counterparty risks (leading to higher revenue risk) and much higher stranding risks than Australian energy and water networks. This reflects that, while the application of economic regulation may modify the impact of commercial/market risks facing regulated entities, including through mechanism like revenue caps, it cannot change the nature of the underlying

commercial/market risks facing these entities, which we have demonstrated in this report are fundamentally higher for Aurizon Network than for electricity and urban water networks.

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1 Introduction and approach

Aurizon Network's submission to the QCA on its 2017 Draft Access Undertaking² (the 'UT5 submission'), sets out its maximum allowable revenue proposal and the resulting proposed reference tariffs for access to its rail network during the period from July 2017-June 2021 (the 'UT5 period').

An important consideration in the development of its maximum allowable revenue proposal is the rate of return to be earned on Aurizon Network's regulatory asset base used to provide declared below rail services. In preparing this element of its proposal, Aurizon Network had regard to the requirements of section 168A of the QCA Act which sets out pricing principles for the purpose of establishing the price for access to a declared service. Of particular relevance to the determination of the rate of return is the pricing principle in section 168A(a), which provides that a price for access should:

generate expected revenue for the service that is at least enough to meet the efficient costs of providing access to the service and include a return on investment commensurate with the regulatory and commercial risks involved.

Reflecting this, as part of the UT5 submission, Aurizon Network set out the rationale for its proposed rate of return which it considered reflects the commercial and regulatory risks applicable to the provision of its services. This is based on its view that these risks are fundamentally driven by the characteristics of the market in which it operates, being the transport of a single commodity, coal, which is supplied into a highly competitive international market. This view was supported by reports from The Brattle Group and Frontier Economics, which were attached to the UT5 submission.

In contrast, in its consideration of WACC for UT4, the QCA's consultant Incenta relied primarily on comparison with regulated energy and water networks, reflecting its views that, as a result of the application of economic regulation, the risks associated with Aurizon Network's provision of below rail services most closely resembled those of regulated energy and water network businesses.

Aurizon Network has commissioned this report to provide a robust comparison of Aurizon Network's risk factors with those of regulated energy and water network businesses. This report is being provided as additional reference material for the QCA's consideration in:

- the selection of appropriate beta comparators; and

² Aurizon Network (2016); Aurizon Network Submission 2017 Draft Access Undertaking; 30 November 2016

- where relevant, the assessment of allowances to compensate for non-systematic risk;

for the purpose of its assessments of Aurizon Network's UT5 proposal consistent with the requirements of the QCA Act, specifically in relation to s168A.

Reflecting this, in section 2, our analysis first considers the key characteristics of the market in which Aurizon Network operates, and the implications of this for Aurizon Network's commercial risk. We also examine those aspects of Aurizon Network's regulatory framework that materially influence how market related risks impact Aurizon Network's commercial risk. In section 3, we then compare and contrast this with the characteristics of the markets in which energy and water networks are supplied. We also consider the regulatory frameworks applicable to those businesses (noting that water networks are generally not subject to clearly defined and consistently applied regulatory frameworks in Australia), and the manner in which they influence the business' market related risks.

2 Aurizon Network characteristics and risks

2.1 Market characteristics and risks

Aurizon Network’s UT5 submission describes in some detail the characteristics of the market in which it provides rail access services, which directly impacts the commercial risks borne by Aurizon Network.³

The purpose of this report is to identify from that analysis the key characteristics of Aurizon Network’s market that impact on its commercial risks, in order to compare and contrast this to regulated energy and water network businesses in Australia.

This section refers to and relies upon the description of the market characteristics from the UT5 submission, providing further detail where this is helpful to assist in the comparison with regulated energy and water networks.

2.1.1 Exposure to market segments

Aurizon Network’s revenue is almost entirely derived from the provision of below rail services to the export coal industry, including both metallurgical and thermal coal. While Bowen Basin production is dominated by high quality metallurgical coal, thermal coal volumes are also significant. Further, thermal coal is typically drawn from the extremities of the Bowen Basin, meaning that the thermal coal volumes are likely to be located on the smaller rail systems, or requiring a longer than average haul distance. This results in Aurizon Network having a higher revenue dependence on thermal coal than would be inferred purely from tonnage volumes. This is shown in Table 3.

Table 3 Export metallurgical and thermal coal split by system

System	Volume		Revenue	
	Metallurgical Share %	Thermal Share %	Metallurgical Share %	Thermal Share %
Goonyella	88%	12%	88%	12%
Blackwater	63%	37%	59%	41%
Newlands	45%	55%	45%	55%
Moura	15%	85%	14%	86%
Total	74%	26%	71%	29%

Source: Aurizon Network. The percentages shown are slightly different to the UT5 submission due to the use of FY17 actual volume and revenue data. It also corrects some minor system misclassifications in the data used for UT5 submission.

³ UT5 Submission, pp 247-256, 271-273

The coal market environment and demand outlook was discussed in some detail in the UT5 submission. Key points from this discussion are: ⁴

- since 2009, there has been high volatility in coal prices with metallurgical coal prices trading in a range from above USD\$300 in 2011 to less than USD\$80 in 2015, with similar volatility observed for thermal coal;
- there are different drivers for volatility in metallurgical and thermal coal:
 - for metallurgical coal, the most significant driver of market volatility is China, both due to it being a dominant source of demand and because of ongoing changes to Chinese government policy in relation to the amount that will be sourced from domestic suppliers;
 - for thermal coal, the key issue is climate change, with pressures from community and government to move away from thermal coal in electricity generation.

While prices for both metallurgical and thermal coal rebounded sharply in the second half of 2016, prices have since been moderating, and market forecasters do not expect the price gains to be maintained long term.⁵

The future demand outlook for metallurgical coal remains generally solid, with expectation of limited growth over the next few years.⁶ However, the demand outlook for thermal coal is far more precarious, given that thermal coal is competing with a range of other fuel sources for electricity production. The Office of the Chief Economist anticipates that world thermal coal trade will decrease in coming years, with declining imports from major trading partners including China, India and South Korea.⁷

2.1.2 Counterparty risk

Reflecting its narrow market exposure, which is limited to the seaborne metallurgical and thermal coal markets, Aurizon Network provides below rail services for a confined group of coal producers. As a result, Aurizon Network has a high average exposure to each of its customers. This is illustrated in Table 4 below:

⁴ UT5 submission, p248-251

⁵ KPMG (2017), Coal Price and FX Consensus Forecasts, June/July 2017

⁶ Office of the Chief Economist (2017), Resources and Energy Quarterly, June, p42

⁷ Office of the Chief Economist (2017), Resources and Energy Quarterly, June, p44-46

Table 4 Customer concentration by system

System	No of users ^a	RAB Value (1 July 2017)		FY18 Revenue (UT5 Submission)	
		\$m	Average Asset \$m/user	\$m	Average Revenue \$m/user
Blackwater ^b	12	2,704.9	225.4	544	45.3
Goonyella ^b	21	1,811.3	86.25	430	20.5
Newlands/GAPE	8	1,132.9	141.6	191	23.9
Moura	2	266.6	133.3	46	23.0
Total	34	5,951.8	175.1	1,211	35.6

^a The total number of operating users does not equal the sum of operating users in each system, as some users use more than one system

^b Includes both non-electric and electric

Source: Aurizon Network UT5 Submission

The combination of small customer numbers, high average RAB value and high average revenue per customer means that credit quality of those customers is a material issue for Aurizon Network’s risk levels.

As described in Aurizon Network’s UT5 submission,⁸ over the past few years Aurizon Network has observed that the credit rating profiles of its customers have materially deteriorated as a result of the change in market conditions. Moody’s has on average downgraded the credit rating of Aurizon Network’s major customers by about 2.6 notches for the past three years, while Standard and Poor’s has similarly lowered the credit ratings by about 1.5 notches on average. Aurizon Network’s increasing counterparty risk is further illustrated by two of its customers – Caledon Coal and Baralaba Coal – being placed into voluntary administration during 2017.⁹ Notably, this has occurred notwithstanding the spike in coal prices since late 2016. Importantly, insolvency is not only a risk for small customers, with Peabody Energy Corporation (the largest US coal producer and owner of five coal mines in central Queensland) being placed under Chapter XI bankruptcy protection in April 2016.¹⁰

Further, the structure of the Queensland coal sector has changed markedly in recent years since the downturn in international coal prices. While the industry had previously been experiencing consolidation, the more recent trend has been the divestment of mining projects by some of the larger companies to smaller entities, some of whom have little or no previous mining experience. The UT5 submission¹¹ identified numerous changes in mine ownership from 2014 to 2016. This trend has continued since late 2016,

⁸ UT5 submission, p 254

⁹ Department of Natural Resources and Mines (2017); Queensland Coal – Mines and Advanced Projects, July 2017

¹⁰ Peabody Energy Corp recommenced trading on the NSYE in April 2017

¹¹ UT5 submission, p 255

with Vale's sale of Carborough Downs to Fitzroy Queensland Resources in December 2016, the sale of Blair Athol mine from Rio Tinto to TerraCom May 2017¹², and Glencore announcing its intention to sell the Rolleston mine in August 2017.¹³

While it is acknowledged that the lower credit quality customers may well be smaller than average (in terms of annual coal production and therefore revenue dependence for Aurizon Network), a relatively small mine transporting around 2.5mtpa¹⁴ at the average proposed UT5 tariff of \$5.36/nt (FY18)¹⁵ would still have a material annual revenue impact for Aurizon Network of \$13.4m. Notably, any unrecovered payments, including take or pay, due to credit default is not mitigated by the revenue cap mechanism.

2.1.3 Reliance on customer competitiveness

Aurizon Network provides below rail services to producers who compete in the global seaborne coal market. These producers are largely price takers in this market. As such, their ability to effectively compete, and to continue to supply coal into this market in future, depends on global demand for coal, together with where these producers are positioned on the world cost curve.

Historically, Queensland coal producers were typically positioned at the lower end of the world cost curve. However, there has been a major change in the structural cost competitiveness of Australian coal mines in recent years. As recently as 2006, Port Jackson Partners reported that 74% of Australian metallurgical coal production was below the global average cost, with only 2% in the top cost quartile. Similarly, for thermal coal production, 63% of Australian production was below global average cost with only 3% in the top quartile. However, by 2011, more than half of Australian metallurgical and thermal coal mines had costs above global averages, with increased labour, energy and transport costs all playing a part. They also reported that rapidly rising capital costs were meaning that Australia's new mining projects were also less competitive.¹⁶

Notwithstanding the intense cost cutting measures that Queensland coal producers have adopted since the rapid decline in international coal prices, as can be seen in Figure 1

¹² Department of Natural Resources and Mines (2017); Queensland Coal – Mines and Advanced Projects, July 2017

¹³ See <http://www.theaustralian.com.au/business/mining-energy/glencore-looking-to-offload-rolleston-coal-mine/news-story/175068886385b3f47fa9986ce42cae4b>, [viewed 12 September 2017]

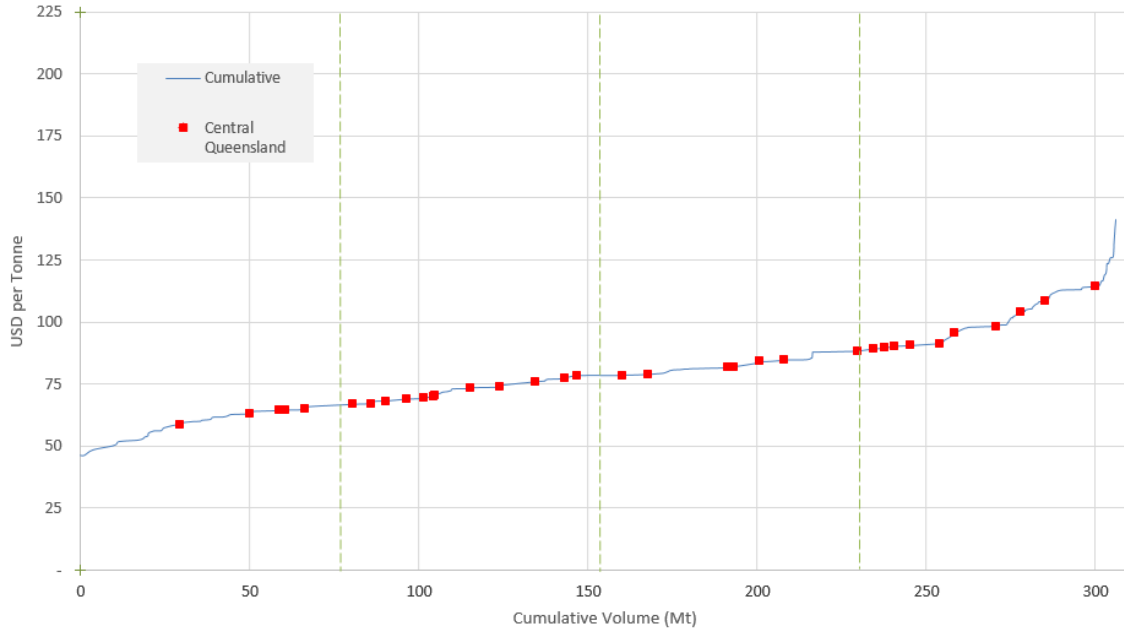
¹⁴ Broadly aligning with the typical production of smaller independent mines in central Queensland

¹⁵ UT5 Submission, p 106

¹⁶ Port Jackson Partners (2011); Opportunity at Risk: Regaining our Competitive Advantage in Minerals Resources, Report Commissioned by and prepared for the Minerals Council of Australia.

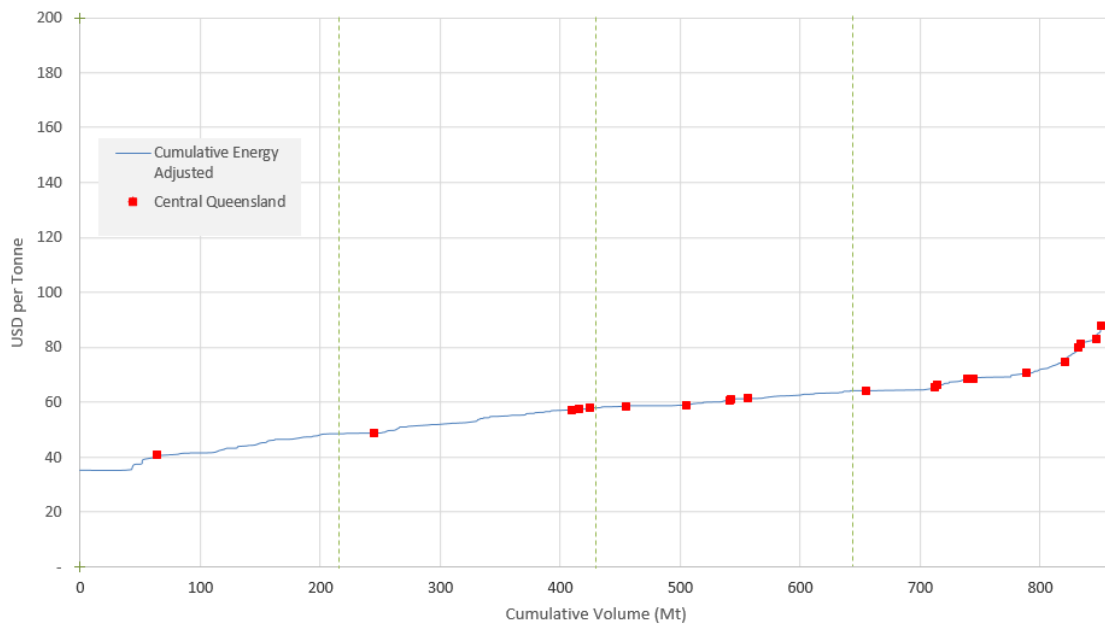
and Figure 2, as at 2017, Queensland mines still remain far higher on international cost curves than was the case historically.

Figure 1 Seaborne Export Metallurgical Coal Cost Curve - 2017



Source: Wood Mackenzie, Synergies

Figure 2 Seaborne Export Thermal Cost Curve (energy adjusted) 2017



Source: Wood Mackenzie, Synergies

Table 5 Central Queensland coal production by cost quartile

	1 st Quartile	2 nd Quartile	3 rd Quartile	4 th Quartile
Thermal Coal				
Proportion of Central Queensland production	6.4%	29.1%	20.0%	44.5%
Metallurgical Coal				
Proportion of Central Queensland production	17.8%	38.5%	21.6%	22.1%

Source: Wood Mackenzie, Synergies

This shows that 65% of central Queensland thermal coal production is now above global average cost, with 45% in the upper quartile of the international cost curve. When this is considered in the context of a declining global trade in thermal coal, the risks associated with Queensland’s thermal coal productions levels can only be described as high.

For metallurgical coal, central Queensland mines are distributed throughout the full range of the cost curve, with 44% of production above global average cost and 22% in the upper quartile.

This structural change in cost competitiveness, particularly for thermal coal, now means that Queensland mines are significantly more vulnerable to changing conditions in the seaborne coal markets than was historically the case. Reduced international coal prices will leave Queensland producers significantly exposed to cash losses on their coal production. In 2016, around a quarter of Queensland coal production was sold at a negative cash margin.¹⁷

Coal producers have demonstrated their willingness to quickly and decisively alter their production to changes in market conditions, with numerous mine closures occurring during the last five years as international coal prices plummeted. Recent price increases have led to reopening of some of these mines, however the longevity of this production is uncertain. As coal producers increasingly structure their operational and contracting practices in order to provide themselves with greater production flexibility, it is highly likely that Queensland coal volumes will become increasingly volatile.

2.1.4 Service alternates

While rail networks are typically considered to be a natural monopoly, with no alternate options available to coal producers to transport coal to port, there are (both currently

¹⁷ Reported by Aurizon Network based on data sourced from Wood Mackenzie Coal Supply Tool (2017 Q2), Platts, RBA

and potentially) alternative services available that may allow users to bypass components of Aurizon Network's rail network.

Electric distribution network

The clearest example of this is Aurizon Network's electric distribution system for the Blackwater and Goonyella systems, which is used for the supply of electric energy to electric-powered locomotives. Operators retain the ability to use diesel powered locomotives on these systems, with the result that they do not necessarily require the use of the electric network in order to transport coal to port.

The risks associated with this component of Aurizon Network's rail network vary significantly from the track components of the network. Despite the increasing and sustained electric utilisation in both the Goonyella and Blackwater systems, declining diesel prices combined with increasing electric energy prices has resulted in electric traction losing its historic cost advantage over diesel. Due to the divergent energy costs for diesel and electric traction, current comparative modelling indicates that in Goonyella the costs of diesel and electric traction is close to parity and in Blackwater electric is now at a significant cost disadvantage.

This ongoing cost disadvantage of electric traction in Blackwater, together with the reduced differential between diesel and electric traction in Goonyella has substantially increased the risk that rail operators or end customers may bypass the electric network and operate diesel train services.

In addition to the current cost structure of electric and diesel traction, the high degree of uncertainty in relation to future AT5 prices potentially makes diesel traction a significantly preferable traction choice for an operator going forward. This includes when an existing operator is required to replace expiring electric rollingstock or make additional rollingstock investment to meet increased demand. The significant uncertainty that now exists over the future usage of electric networks, exacerbated by the ongoing cost disadvantage in Blackwater and more recent reduced cost advantage in Goonyella creates a significant asset stranding risk for Aurizon Network. This risk remains even if total demand for coal transport remains strong. Aurizon Network's electric network accounts for 12% of its total RAB value

Goonyella to Abbot Point link

As note in the UT5 Submission,¹⁸ there is also a threat of future competition for Aurizon Network's below rail services resulting from development of mines in the northern Galilee Basin.

Since the UT5 submission, Adani has now committed to the development of its Carmichael mine in the northern Galilee, including the construction of a 388km standard gauge rail link from the mine to Abbot Point.¹⁹ Adani has announced that this rail link will be fully open access and available to other users. Once constructed, this will present an alternate rail route for existing Goonyella and Newlands system mines to Abbot Point, allowing them to bypass Aurizon Network's recently constructed Goonyella to Abbot Point Expansion (GAPE) and Newlands systems.

Even in the absence of the Adani rail link, the existing Goonyella trunk line to DBCT/Hay Point provides an alternative route for users of the GAPE system to export their coal. In the event that there is capacity availability on this route, coal producers may redirect tonnages to DBCT/Hay Point, again allowing a bypass of the GAPE and Newlands systems.

The GAPE and Newlands systems combined accounts for 19% of Aurizon Network's total RAB value.

2.1.5 Contracting arrangements to mitigate risk

Mines typically enter into long term take or pay contracts with the rail network provider, the rail operator and the port terminal, which provide users with a commitment to the capacity that will be available for transport of their product, and provide the infrastructure provider with revenue certainty for the term of the agreement. Where capacity is fully contracted over the long term, the existence of take or pay contracts can be effective in substantially mitigating Aurizon Network's exposure to international coal market volatility.

In times of capacity scarcity, as was apparent in the mining boom period from 2005-2012, mining companies have a strong incentive to enter into such long term capacity contracts, to provide certainty that they can transport their product to market. Since international coal prices have fallen, these long term take or pay contracts have been effective in providing an element of stability for Aurizon Network's coal volumes and

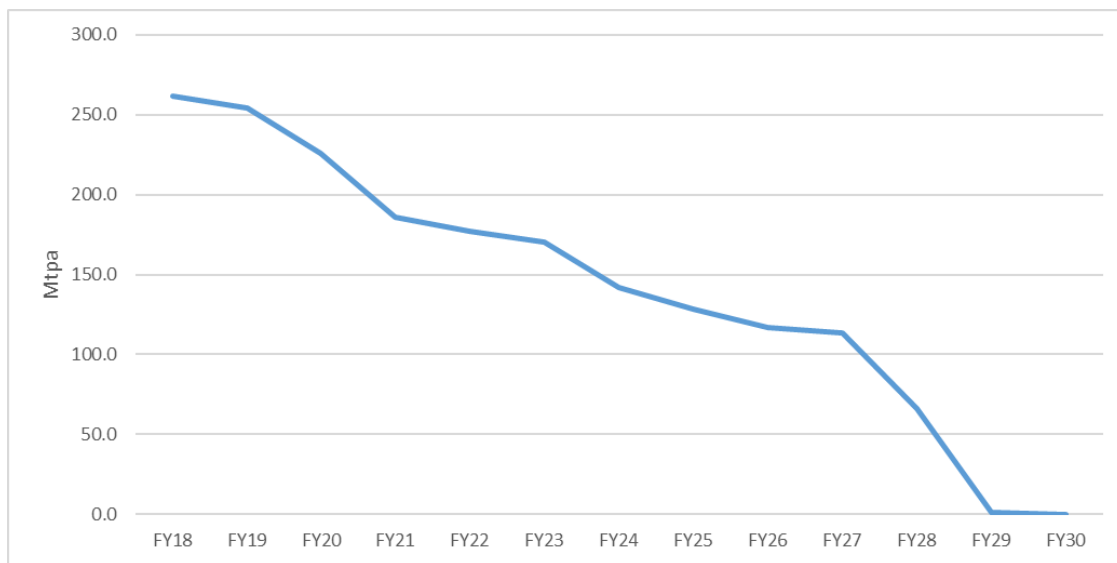
¹⁸ UT5 submission, p 250

¹⁹ See <http://www.theaustralian.com.au/business/mining-energy/adani-gives-official-approval-for-giant-carmichael-coal-mine/news-story/e717d355d300661d8a3c4130a258a5d6>, [viewed 13 September 2017]

revenues. As noted above, in 2016, around a quarter of Queensland coal production was sold at a negative cash margin – the existence of take or pay contracts for rail and port services will have contributed to the miners’ decision to continue production in the short term, notwithstanding the low coal price.

However, many of these contracts are now substantially through their term. Figure 3 shows the profile of Aurizon Network’s contracted volumes for the next ten years:

Figure 3 Aurizon Network Contract Profile - all systems (mtpa)



Source: Aurizon Network

This shows that, in aggregate across all systems, Aurizon Network’s contracted volumes will fall from 262mtpa in FY18 to 176mtpa in FY22 – a reduction of nearly 35% in five years. The rate of drop-off varies across systems, with limited reductions until FY22 in the GAPE systems, but with 35% in Goonyella and more than 50% in Newlands and Moura systems coming off contract. There are currently no contracted volumes from FY29 onwards.

In an environment where demand has moderated, and capacity is no longer scarce, there will not be the same imperative for coal producers to enter into long term commitments for the entirety of (or greater than) their planned production, as there will be a good opportunity to transport additional volumes without such a long term commitment. Reducing their commitment to long term take or pay contracts will be consistent with miners’ desire to adopt operating and contracting arrangements that allow greater flexibility to adjust production to reflect changes in international market conditions. If this trend develops, it represents a shift of risk to Aurizon Network with increasing volume uncertainty.

Recent contracting behaviour reflects this approach, with Aurizon Network reporting that its customers are seeking new access contracts for shorter terms when existing contracts expire, rather than renewing for a ten year period.²⁰ As a recent example, a mine in Blackwater has applied for a 1-year access contract for two consecutive years. This is also consistent with emerging contracting trends for DBCT, where, upon expiry, some users have renewed for a lesser volume, or chosen not to renew altogether. The released capacity has not been taken up by other producers, and remains available. In the last four years, DBCT has seen its contracted volumes fall from 85mtpa to a current 78.7mtpa. DBCTM has similarly highlighted the risk that, in an environment where there is available capacity, mines have less imperative to contract for capacity, and may rely more on ad hoc capacity.²¹

Notwithstanding that long term take or pay contracts will continue to be a feature of the coal supply chains, in the current environment, it is likely that Aurizon Network's contract coverage will reduce (both in terms of capacity contracted and term of contract), meaning that contracting arrangements are expected to be less effective in mitigating Aurizon Network's market risk in the future.

2.2 Impact of regulation on risk

When an infrastructure provider such as Aurizon Network, or electricity or water networks, are subject to economic regulation, the regulatory framework will impact on the way in which market risks translate to commercial risks for the business, including through controls placed on prices and/or revenues.

This section outlines some of the key features of Aurizon Network's regulatory framework that impact the way in which market risks translate to commercial risks for the business.

2.2.1 RAB fragmentation

Aurizon Network operates a fully interconnected rail network. However, for the purposes of pricing access to its network, this network is substantially fragmented. This means that prices for access are set with reference to components of the RAB for application to a subset of customers. While some of these fragments relate to the geographical location of the network and customers, others have been imposed by the regulatory framework through the requirement that major expansions be fully funded through the access charges from new and expanding users. Table 6 illustrates the extent

²⁰ UT5 Submission, p 255

²¹ DBCTM (2016); DBCT 2015 DAU Supplementary Submission; p 5-6

to which the geographic systems identified in Table 4 are fragmented as a requirement of the regulatory framework.

Table 6 RAB Fragmentation

System	No of users ^a	RAB Value (1 July 2017)	
		\$m	Average \$m/user
Blackwater	12	2,704.9	225.4
• Track	12	2,305.1	192.1
• Electric	8	435.8	54.47
Goonyella	21	1,811.3	86.25
• Track	21	1,563.3	74.4
• Electric	21	248.0	11.8
Newlands/GAPE	8	1,132.9	141.6
• Newlands	2	195.3	97.65
• GAPE	6	937.6	156.3
Moura	2	266.6	133.3
Total	34	5,951.8	175.1

^a The total number of operating users does not equal the sum of operating users in each system, as some users use more than one system
Source: Aurizon Network UT5 Submission

In addition, there are further customer groupings applied for the setting of prices for major capacity expansions, which requires all of the expansion costs to be at minimum recovered from those users. This includes WIRP users on both the Blackwater and Moura system, and NAPE users.

To the extent that Aurizon Network suffers revenue shortfalls or stranding events in a RAB component, there is no mechanism in the regulatory framework that allows such shortfalls to be recovered from another component, even within the same geographic system, where there may be commonality of users.

This aspect of Aurizon Network’s regulatory framework actually heightens the market risk that is borne by Aurizon Network by strictly compartmentalising the customer base from which Aurizon Network can source its revenue.

2.2.2 Volume risk mitigation

Aurizon Network’s revenue cap is generally cited as a means by which the regulatory framework reduces Aurizon Network’s exposure to market risk, by insulating it against volume risk. However, while the revenue cap arrangement may be effective in managing modest variations in volume, it is unlikely to be effective in dealing with major volume shortfalls.

As described in section 2.1, Aurizon Network’s customers are price takers in a highly competitive global market for seaborne coal. Structural changes in international cost

competitiveness mean that many Queensland coal mines are now located in the upper quartile of the global cost curve, with the result that a renewed downturn in coal prices would leave these mines in a highly vulnerable position. In the event that market circumstances caused a significant loss in coal volumes in a system, these same market circumstances will constrain the ability of the remaining mines in the system to accommodate the resulting revenue cap-related price increases. This is particularly the case given the high customer concentration for some segments, with some systems having only two users. This risk has been explicitly recognised by Moody's in its credit assessment of Aurizon Network.²²

Notably, the revenue cap applies at the customer group level, which are generally highly concentrated. Some of these groups have only two users, so that the closure of one mine could trigger the need for a very significant revenue-cap related price increase, undermining the ability of Aurizon Network to recover its invested capital.

Further, the manner in which Aurizon Network's revenue cap is applied in its regulatory framework means that, even in the absence of a major volume shortfall, Aurizon Network bears some volume risk. The exclusion of AT1 from the revenue cap mechanism means Aurizon Network retains some exposure to volumes. More significantly, during the UT3 and UT4 regulatory periods, the QCA has required a deferral on the inclusion of capital expenditure in the RAB, which has the effect of delaying Aurizon Network's ability to recover revenue related to this expenditure. Recovery of this deferred revenue is dependent on the commencement of the increased volumes upon which the expansion was predicated. By the end of UT4, the deferred RAB amounts reflected around 7.5% of Aurizon Network's total RAB value.²³

Recognising these factors, in the short term, the revenue cap mechanism will substantially (but not fully) mitigate Aurizon Network's revenue risk. However, over the medium to long term, it cannot fully protect Aurizon Network against the risk of falling demand, particularly in systems with a small number of customers. It is unlikely that revenue cap regulation provides any more effective mitigation of Aurizon Network's market risk than would the typical commercial solution in unregulated markets of take or pay contracts.

2.2.3 Stranding risk mitigation

Asset stranding risk is inherently asymmetric in nature, and not compensated through WACC. Aurizon Network's regulatory framework provides for prices to be set to

²² Moody's Investors Services (2016a), Credit Opinion, Aurizon Network Pty Ltd, p4

²³ Source: Aurizon Network

recover all costs associated with a RAB group from the customers of that RAB group. This provides an opportunity for socialisation of the cost of stranded assets within a RAB group. This could apply, for example, in relation to an individual spur line if it is no longer required for connection to a mine.

In addition, the regulatory framework provides for accelerated depreciation for new investment in order to mitigate the risk that the expanded capacity will not be required over the long term.

However, as is the case with the revenue cap arrangements, the stranding risk mitigation measures in Aurizon Network's regulatory framework are unlikely to be effective in protecting Aurizon Network against significant falls in volumes, particularly in those systems with a small number of users.

2.2.4 Conclusion

We consider that the risks facing Aurizon Network fundamentally reflect the factors that drive demand for its services, which is entirely based on demand for coal exports from central Queensland. While the application of economic regulation does modify the way in which these market risks impact on Aurizon Network in the short term, including through the revenue cap mechanism, regulation cannot change the nature of the underlying market risks that Aurizon Network faces.

3 Comparison to energy and water networks

3.1 Methodology

As highlighted previously, the purpose of this report is to compare and contrast Aurizon Network's commercial and regulatory risks to those typically found in regulated energy and water network businesses in Australia.

In order to do this, for each of the aspects of Aurizon Network's market risk and regulatory framework discussed above, we have sought to compare this to energy and water network businesses, with a specific focus on Queensland. The major Queensland energy and water network businesses we have considered are:

- For energy: Powerlink, Energex and Ergon Energy (note, while Energex and Ergon are both part of Energy Queensland Limited, we have compared the relevant characteristics of the subsidiary businesses given they will continue to be subject to economic regulation as separate network entities);
- For water: Queensland Urban Utilities (QUU) and Unitywater, being the major water network businesses in Queensland.

3.2 Comparison of market characteristics

The results of our comparison of market characteristics between Aurizon Network and energy and water network businesses are set out in Table 7.

Table 7 Comparative market characteristics

Market factor	Aurizon Network	Australian energy networks	Australian water networks
Exposure to market segments	<p>Exposure only to large industrial customers who are themselves exposed entirely to international coal markets</p> <p>By volume:</p> <ul style="list-style-type: none"> • Metallurgical coal 74% • Thermal coal 26% <p>By revenue:</p> <ul style="list-style-type: none"> • Metallurgical coal 71% • Thermal coal 29% 	<p>Exposure to broad cross section of domestic economy, with high weighting towards domestic residential and low voltage commercial users (not intensive energy users nor individually important to the network in terms of electricity supplied or revenue earned). Commercial and industrial users typically cover a range of market segments, with both domestic and trade-exposed segments, creating a broadly diversified demand risk. Network exposure to individual users in terms of electricity supplied and revenue earned is low.</p> <p>Examples²⁴:</p>	<p>Exposure to broad cross section of domestic economy, with high weighting towards domestic residential users. Commercial and industrial users typically cover a range of market segments creating a broadly diversified demand risk.</p> <p>As for electricity networks, residential and smaller commercial customers are not individually important to the network in terms of water supplied/sewerage collected, or revenue earned. Network exposure to larger individual commercial and industrial users in terms of water supplied/sewerage collected and revenue earned is similarly low.</p> <p>Examples²⁵:</p>

²⁴ Data is for 2015-16 and is sourced from relevant AER Economic Benchmarking RINs.

²⁵ Data is for 2015-16 and is sourced from Bureau of Meteorology Urban National Performance Report.

Market factor	Aurizon Network	Australian energy networks			Australian water networks	
	<p>Proportionally higher revenue dependence on thermal coal, which has a highly uncertain long term outlook.</p> <p>International coal markets are increasingly volatile, with likelihood that demand volatility will increase.</p>	<p><u>Powerlink</u></p> <p>By volume:</p> <ul style="list-style-type: none"> • 63% delivered to distribution networks (Energex & Ergon) • 7% to other transmission networks • 29% to directly connected commercial and industrial users <p>By revenue:</p> <ul style="list-style-type: none"> • 79% from distribution networks • <1% from other transmission networks • 15% from directly connected customers 	<p><u>Energex</u></p> <p>By volume:</p> <ul style="list-style-type: none"> • 36% to residential customers • 36% to low voltage commercial users • 27% to high voltage commercial and industrial <p>By revenue:</p> <ul style="list-style-type: none"> • 52% from residential customers • 36% from low voltage commercial users • 10% from high voltage commercial and industrial users 	<p><u>Ergon</u></p> <p>By volume:</p> <ul style="list-style-type: none"> • 28% to residential customers • 33% to low voltage commercial users • 38% to high voltage commercial and industrial <p>By revenue:</p> <ul style="list-style-type: none"> • 43% from residential customers • 45% from low voltage commercial users • 9% from high voltage commercial and industrial users 	<p><u>Queensland Urban Utilities</u></p> <p>By volume:</p> <ul style="list-style-type: none"> • 64% water supply to residential customers • 35% water supply to commercial, municipal and industrial customers <p>By revenue:</p> <ul style="list-style-type: none"> • 57% from water supply • 43% from sewerage 	<p><u>Unitywater</u></p> <p>By volume:</p> <ul style="list-style-type: none"> • 83% water supply to residential customers • 17% water supply to commercial, municipal and industrial customers <p>By revenue:</p> <ul style="list-style-type: none"> • 52% from water supply • 48% from sewerage
		<p>To the extent that Powerlink is providing energy to the distribution networks, its market characteristics will mimic those of the distribution businesses which supply electricity to most of the National Electricity Market. In this regard, around 79% of Powerlink's revenue is received from the distribution networks.</p> <p>While each Queensland network business provides a significant volume of energy to large industrial users in aggregate, its revenue dependence on these customers is proportionally much lower. Revenue is weighted towards residential customers whose demand profile is typically more stable.</p> <p>Ergon Energy does serve a relatively large industrial customer base, including coal mines, gas LNG plants and aluminium smelters. However, these customers are connected to the high voltage part of Ergon's network and account for only around 9% of its total revenue.</p>			<p>Both QUU and Unitywater are residential customer-based network service providers. For this customer segment, demand is of an essential non-discretionary nature, with observed declines reflective of drought and/or demand-management policies rather than changing consumer preferences. Hence, residential demand places a significant revenue floor under the Queensland water distribution networks.</p> <p>No data is available on the proportion of water supply revenue from residential and commercial/industrial users. However, given the relatively high revenue proportion of sewerage services (which will have very low variability in demand), the revenue dependence on commercial/industrial users will be low. While not as strong as for residential customers, commercial and industrial customers' demand can also be characterised as of an essential non-discretionary nature.</p>	

Market factor	Aurizon Network	Australian energy networks	Australian water networks																
Exposure to individual customers	<p>Small number of users</p> <ul style="list-style-type: none"> Total number of users is 34 Number of users in individual systems ranges from 2-21. <p>Average RAB value/user is \$175 million</p>	<p>The electricity distribution networks are characterised by very large numbers of low volume customers across residential and commercial sectors. There is greater concentration in high volume customers. However, dependence on high volume customers is not as high in volume or revenue terms, and there is economy-wide diversity in those high-volume customers (as opposed to a single (coal) industry exposure). This is reflected in significantly lower average asset values/customer than for Aurizon Network.</p> <p>Examples (note, Powerlink is not shown as, to the extent that Powerlink is providing energy to the distribution networks, its market characteristics will mimic those of the distribution networks):²⁶</p> <table border="0"> <tr> <td style="text-align: center;"><u>Energex</u></td> <td style="text-align: center;"><u>Ergon Energy</u></td> </tr> <tr> <td>Customer numbers</td> <td>Customer numbers</td> </tr> <tr> <td> <ul style="list-style-type: none"> 1.294 million residential customers 124,000 low voltage commercial users 589 high voltage commercial and industrial users </td> <td> <ul style="list-style-type: none"> 0.624 million residential customers 110,000 low voltage commercial users 81 high voltage commercial and industrial users </td> </tr> <tr> <td>Average RAB value/customer is \$8,000</td> <td>Average RAB value/customer is \$14,000</td> </tr> </table>	<u>Energex</u>	<u>Ergon Energy</u>	Customer numbers	Customer numbers	<ul style="list-style-type: none"> 1.294 million residential customers 124,000 low voltage commercial users 589 high voltage commercial and industrial users 	<ul style="list-style-type: none"> 0.624 million residential customers 110,000 low voltage commercial users 81 high voltage commercial and industrial users 	Average RAB value/customer is \$8,000	Average RAB value/customer is \$14,000	<p>The networks are characterised by large numbers of low volume customers. There is somewhat greater concentration in high volume customers. However, dependence on high volume customers for revenue is not high and there is economy-wide diversity in these customers.</p> <p>Examples:²⁷</p> <table border="0"> <tr> <td style="text-align: center;"><u>Queensland Urban Utilities</u></td> <td style="text-align: center;"><u>Unitywater</u></td> </tr> <tr> <td>Customer numbers</td> <td>Customer numbers</td> </tr> <tr> <td> <ul style="list-style-type: none"> 540,000 residential customers 37,000 commercial, municipal and industrial customers </td> <td> <ul style="list-style-type: none"> 288,000 residential customers 17,000 commercial, municipal and industrial customers </td> </tr> <tr> <td>Average asset value/customer is \$9,000</td> <td>Average asset value/customer is \$11,000</td> </tr> </table>	<u>Queensland Urban Utilities</u>	<u>Unitywater</u>	Customer numbers	Customer numbers	<ul style="list-style-type: none"> 540,000 residential customers 37,000 commercial, municipal and industrial customers 	<ul style="list-style-type: none"> 288,000 residential customers 17,000 commercial, municipal and industrial customers 	Average asset value/customer is \$9,000	Average asset value/customer is \$11,000
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Reliance on customers' competitive position	<p>Customers are price takers in international coal markets, with demand subject to market conditions.</p> <p>A significant proportion of customer production is in the upper cost quartile, and hence vulnerable to lower prices</p>	<p>All residential demand and a clear majority of low voltage commercial demand relates to economic activity in the domestic economy. Residential demand is not subject to competitive market pressures. For commercial users providing domestic goods and services, changes in energy prices will not generally affect relative competitiveness, as all competitors are in a similar position.</p> <p>Some larger commercial and industrial users will operate in export-exposed international markets, with their ongoing demand subject to remaining cost competitive. However, as noted above, the distribution networks are not subject to large revenue exposures in relation to individual users. Transmission networks have a slightly larger exposure to individual users directly connected to their networks. However, as</p>	<p>The clear majority of water and sewerage demand relates to residential users, who are not subject to competitive pressures.</p> <p>For water and sewerage-intensive commercial users who will typically be providing domestic goods and services, changes in water or sewerage prices will not generally affect relative competitiveness, as all competitors are in a similar position.</p> <p>As for electricity networks, some larger commercial and industrial users will operate in export-exposed international markets, with their ongoing demand subject to remaining cost competitive. Similarly, the water networks' revenue</p>																

²⁶ Data is for 2015-16 and is sourced from relevant AER Economic Benchmarking RINs.

²⁷ Data on customer numbers is for 2015-16 and is sourced from Bureau of Meteorology Urban National Performance Report; data on asset values is for 2014-15 and is sourced from QCA SEQ Price Monitoring 2013-15 Final Reports.

Market factor	Aurizon Network	Australian energy networks	Australian water networks
	<ul style="list-style-type: none"> • 22% for metallurgical coal • 45% for thermal coal <p>Rail access charge is a significant cash cost, typically around 7.5% of cost (excluding royalties and levies)</p>	<p>noted above, the revenue exposure to these users is small relative to total revenue.</p>	<p>exposure to any of these users individually is small relative to their total revenue.</p>
Service alternatives	<p>Diesel traction is alternate to the electric network</p> <ul style="list-style-type: none"> • given current cost structure, bypass risk is moderate to high • 11.5% of RAB subject to bypass risk <p>There are potential for alternate export routes for users of the GAPE and Newlands network:</p> <ul style="list-style-type: none"> • the planned Adani rail line will offer an alternate route for Goonyella users to Abbot Point • the existing Goonyella system offers an alternate export route (where capacity is available) via DBCT/Hay Point • 19% of RAB subject to bypass risk 	<p>Service alternatives for grid-supplied, end-use electricity demand are primarily natural and LPG/LNG gas, and customer on-site solar PV installations.</p> <p>Gas is regarded in the energy market as a 'fuel of choice' for most consumers rather than an essential fuel like electricity. The main exception is industrial users that require gas as a feed stock in their production processes. Domestic gas market penetration varies across Australian jurisdictions with much higher penetration in southern markets where it has traditionally been used for residential and commercial heating purposes. However, the long-established nature of this demand means that electricity and gas networks have been sized accordingly. In other words, this service alternate does not present a material bypass risk</p> <p>The increasing price of domestic gas and its newly established link to international gas prices, including due to the Gladstone export LNG plants and domestic exploration restrictions, is making gas a less competitive fuel source compared to electricity (while recognising that electricity prices have also increased significantly in recent times).</p> <p>There has been a sharp increase in the penetration of customer on-site solar PV installations in recent years. This has reduced the volume of electricity delivered by electricity networks, as well as changed the daily profile of electricity consumption on these networks (ie reduces electricity delivered during sunlight hours). However, this increasing penetration has not been associated with customers by-passing the electricity networks in a material way, including by going off-grid. Rather, customers have become own-generation sources. Indeed, many solar customers are also earning revenue streams from exporting the electricity they generate back into the grid. To this end, one of the future roles of electricity networks is increasingly being seen as the provision of a platform for energy trading amongst connected entities (residential and commercial).</p> <p>In terms of electricity transmission networks, the increasing penetration of renewables (such as wind and grid-scale solar), with the associated</p>	<p>Service alternatives for residential customers are primarily limited to water tanks. Water tanks are significantly higher cost than mains supply and subject to usage limitations, meaning that they are not sufficient for users to disconnect from the water network. High incentives for water tanks during the Millennium Drought caused high investment in water tank capacity from 2001-2009, but this is a mature market and not expected to cause a significant change in future water demand.</p> <p>In recent times, some developers have indicated a desire to build, own and operate water and sewerage infrastructure in new sub-division developments and which is not necessarily connected to existing network infrastructure. It is not clear, at this stage that this presents as a major service alternate to network-supplied services, including because it appears to have limited relevance to most customers served by existing network infrastructure.</p> <p>Overall, residential and commercial/industrial water and sewerage customers have no feasible alternates for the services provided by water distribution networks. This suggests network by-pass risk is negligible.</p>

Market factor	Aurizon Network	Australian energy networks	Australian water networks
		<p>closure of some older fossil fuel generators, is changing the location of generation rather than reducing the supply of electricity and hence the need for the transmission network. The aggregate decline and/or flattening of electricity demand across Australian jurisdictions has reduced utilisation of transmission networks but again has not materially reduced the role of such networks in the electricity supply chain.</p> <p>Overall, it is reasonable to conclude that Australian electricity networks are not subject to material risk of by-pass due to service alternates.</p>	
Contracting arrangements	<p>Standard contracting conditions include take or pay commitments for up to 10 years. However, effectiveness subject to the take up of such long term contracts, noting:</p> <ul style="list-style-type: none"> • 35% of volume will come off contract in next five years • in an environment of surplus capacity, there is reduced incentive for users to commit to long term contracts for all potential volumes 	<p>Australian electricity customers are typically required to either pay upfront for connection to the network, where extensions are required and/or the connection assets are atypical, or to enter into long term connection agreements, which addresses the customer-specific risks.</p> <p>However, take or pay contracts associated with the supply of electricity are not a feature of the electricity network sector. As noted above, electricity networks are not exposed to significant volume or revenue risk in relation to individual customers on their networks when assessed against total electricity supplied and total revenue earned.</p>	<p>Property developers are typically required to pay upfront for connecting new sub-division water and sewerage infrastructure to the network, which addresses the customer specific risks. Similarly, new individual customers may also be required to make up-front contributions for network extensions or atypical connection assets.</p> <p>Take or pay contracts associated with the supply of water or removal of sewerage are not a feature of the Australian water network sector. As for electricity networks, water distribution networks are not exposed to significant volume or revenue risk in relation to individual customers when assessed against total water supplied/sewerage removed and total revenue that they earn hence there being no commercial need for take or pay contracts.</p>

The analysis in Table 7 indicates that electricity and urban water networks face very different market risks to Aurizon Network including in regards to:

- exposure to specific market segments, with the electricity and water networks facing a diversified economy-wide risk not the individual market segment risk faced by Aurizon Network;
- customer concentration, which is very low for both electricity and water networks compared to the high customer concentration faced by Aurizon Network;
- reliance on individual customers' competitive position is negligible for electricity and water networks compared to Aurizon Network whose whole customer base is a price taker on international coal markets;
- service alternatives, which for electricity networks is low and for water networks is negligible compared to the by-pass risk Aurizon Network faces in regards to its electric network, the GAPE and Newlands system; and
- contracting arrangements, with Aurizon Network relying on long term take or pay contracts in order to protect its asset stranding risk, whereas electricity and water networks generally relying on contractual protections for connection assets only (noting however that they have limited exposure to individual customers in relation to their shared network assets).

These factors mean that the demand for Aurizon Network's services is likely to be significantly more variable and subject to market shocks than is the case for Australian electricity and water networks.

3.3 Comparison of impact of regulation on risk characteristics

The applicable economic regulatory frameworks for electricity and urban water networks are characterised by some important differences with that applying to Aurizon Network as follows.

Electricity Networks

Australian electricity networks are subject to regulation under the national electricity regulatory framework applied in all jurisdictions that form part of the National Electricity Market, and which establishes their maximum allowable revenues and network prices. Further, the networks are regulated solely by the AER. Key features of the regulatory framework and its operation over time include:

- detailed national law and subordinate rules, which place some constraints on the matters that can be considered by the AER and/or the way in which it considers them.
- there are a large number of regulated network businesses that are subject to regulatory resets on a five year rolling basis, meaning a strong body of precedent is established and continually updated.
- all transmission and distribution networks are currently subject to revenue cap controls; and
- public safety and supply reliability legislative requirements play a large role in determining the nature and cost of electricity services.

Water Networks

Australian urban water networks are subject to jurisdictional regulatory frameworks. Key features of the jurisdictional water regulatory frameworks and their operation over time include:

- a range of forms of regulation are applied from government ownership and/or direct price control, independent economic regulation and price-setting, and price-monitoring (eg price monitoring in Queensland and building block regulation in jurisdictions such as NSW, Victoria and SA); and
- public health, safety (particularly dam safety) and environmental regulations play a large role in determining the nature and cost of urban water services.

In Table 8, we summarise the impact that regulation has on market and commercial risk for Aurizon Network compared to the regulated energy and water networks.

Table 8 Comparative regulatory impact on risks

Factor	Aurizon Network	Australian energy networks	Australian water networks					
Fragmentation of RAB	<p>Remaining counterparty risk - high</p> <p>RAB fragmented into multiple components:</p> <ul style="list-style-type: none"> • Four geographical rail systems • Seven discrete RAB components <p>Result is greater concentration of market risk factors, as each RAB component separately bears the market risk factors for its customer group. There is no mechanism for revenue shortfalls or stranding events affecting one RAB component to be compensated from another RAB component, even if in the same geographical system with common users.</p>	<p>Remaining counterparty risk - low</p> <p>A single RAB applies to the delivery of core regulated electricity network services (most revenue earned by electricity networks is derived from these services). There are limited instances where specific assets have been separated from the main RAB (eg street lighting, metering).</p> <p>The RAB is not compartmentalised either geographically or by customer group. Cost allocation is used to allocate capital (and operating costs) across tariff classes for recovery purposes. However, Ergon Energy has three separate pricing zones, which are geographically-based. Examples:</p> <table border="0"> <tr> <td style="vertical-align: top;"> <p><u>Powerlink</u></p> <ul style="list-style-type: none"> • Core network services provided by non-disaggregated transmission network RAB </td> <td style="vertical-align: top;"> <p><u>Energex</u></p> <ul style="list-style-type: none"> • Core network services provided by non-disaggregated distribution network RAB </td> <td style="vertical-align: top;"> <p><u>Ergon Energy</u></p> <ul style="list-style-type: none"> • Core network services provided by non-disaggregated distribution network RAB. Tariffs based on three geographic pricing zones. </td> </tr> </table>	<p><u>Powerlink</u></p> <ul style="list-style-type: none"> • Core network services provided by non-disaggregated transmission network RAB 	<p><u>Energex</u></p> <ul style="list-style-type: none"> • Core network services provided by non-disaggregated distribution network RAB 	<p><u>Ergon Energy</u></p> <ul style="list-style-type: none"> • Core network services provided by non-disaggregated distribution network RAB. Tariffs based on three geographic pricing zones. 	<p>Remaining counterparty risk - low</p> <p>The application of economic regulation to bulk water and water distribution network service providers varies widely across Australian jurisdictions.</p> <p>In circumstances where an established RAB applies, including in Victoria and NSW, it is more likely to be disaggregated by asset type, eg. water supply & sewerage asset classes, rather than by customer groups.</p> <p>Some water networks are not subject to building block price regulation with an established RAB that is used to set revenues and prices, including the Queensland distribution networks.</p> <p>Examples:</p> <table border="0"> <tr> <td style="vertical-align: top;"> <p><u>Queensland Urban Utilities</u></p> <ul style="list-style-type: none"> • Price monitoring only </td> <td style="vertical-align: top;"> <p><u>Unitywater</u></p> <ul style="list-style-type: none"> • Price monitoring only </td> </tr> </table>	<p><u>Queensland Urban Utilities</u></p> <ul style="list-style-type: none"> • Price monitoring only 	<p><u>Unitywater</u></p> <ul style="list-style-type: none"> • Price monitoring only
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Volume risk mitigation	<p>Remaining volume risk - moderate</p> <p>Volume risk is mitigated by take or pay contracts and revenue cap.</p> <p>Revenue cap is applied with some exclusions and adjustments, meaning Aurizon Network remains subject to some volume risk:</p> <ul style="list-style-type: none"> • QCA requirement to defer capex entry to RAB until planned volume increases commence – by end of UT4, over 7.5% of 	<p>Remaining volume risk - low</p> <p>Regulation sets maximum allowable revenue with network tariffs also subject to regulatory approval. Networks are entitled to recover maximum allowable revenue, with an 'unders and overs' account operating annually where actual revenues differ from allowable revenue. Volume risk is borne by customers.</p> <p>Given the outlook for moderate growth in energy demand, and the highly diversified nature of this demand (meaning market conditions will not affect all demand in the same way), the revenue cap is likely to be effective in managing volume risk for regulated electricity networks in the medium to long term.</p>	<p>Remaining volume risk - low</p> <p>Where revenue caps are not applied, volume risk is borne by the network service provider and typically is mitigated through tariff structures (eg two part tariffs) and price reviews.</p> <p>Sewerage charges are generally fixed in nature, particularly for residential customers.</p>					

Factor	Aurizon Network	Australian energy networks	Australian water networks
	<p>RAB deferred contingent on future volumes</p> <ul style="list-style-type: none"> AT1 excluded from revenue cap <p>Capacity to pay risk if volumes materially reduce due to poor market conditions</p> <ul style="list-style-type: none"> Applies within each customer group – no ability to moderate price increases by averaging risk across customer groups <p>Regulation will generally mitigate minor variations in volume, but not likely to be effective in mitigating risk associated with a substantial reduction in volume within a customer group.</p>	<p>Examples:</p> <p><u>Powerlink</u></p> <ul style="list-style-type: none"> Single revenue cap for prescribed transmission services provided by non-disaggregated transmission network No exclusions of tariff components or nominated services from the revenue cap <p><u>Energex</u></p> <ul style="list-style-type: none"> Single revenue cap for standard control (core) network services provided by non-disaggregated distribution network No exclusions of tariff components or nominated services from the revenue cap 	<p>Examples:</p> <p><u>Ergon Energy</u></p> <ul style="list-style-type: none"> Single revenue cap for standard control (core) network services provided by non-disaggregated distribution network No exclusions of tariff components or nominated services from the revenue cap <p><u>Queensland Urban Utilities</u></p> <ul style="list-style-type: none"> Price monitoring only Two part tariff moderates volume risk, including relatively high fixed charge component QUU notifies customers of revised prices on an annual basis, providing some opportunity to adjust prices for changing volumes <p><u>Unitywater</u></p> <ul style="list-style-type: none"> Price monitoring only Two part tariff moderates volume risk, including relatively high fixed charge component Unitywater notifies customers of revised prices on an annual basis, providing some opportunity to adjust prices for changing volumes
Asset stranding risk mitigation	<p>Remaining asset stranding risk – variable (high to low)</p> <p>Asset stranding risk varies across different systems, ranging from high (electric network) to low (Goonyella system).</p> <p>Regulatory framework allows accelerated depreciation of new investments to mitigate stranding risk. Opportunity for socialisation of stranding risk within RAB group, but no stranding protection between RAB groups</p> <p>Additional regulatory stranding risks also apply:</p> <ul style="list-style-type: none"> Network condition 	<p>Remaining asset stranding risk - low</p> <p>Asset stranding risk generally low given the essential nature of the transmission and distribution services, the highly diversified customer base and the limited bypass options.</p> <p>The treatment of stranded assets for distribution and transmission networks is somewhat different, although the national electricity regulatory framework provides a high degree of protection from asset stranding risk. This reflects the intent of the then Ministerial Council on Energy (now COAG Energy Council) and AEMC in 2007-08 to provide relatively strong incentives for efficient network capital expenditure in the National Electricity Market</p> <p>A transmission network's RAB can be reduced subject to certain prescribed conditions being met.²⁸ However, we are not aware of this ever happening.</p> <p>In contrast, the regulatory framework is silent regarding stranding of distribution network assets. It has been assumed that this silence</p>	<p>Remaining asset stranding risk - low</p> <p>Most water networks manage asset stranding risks for customer connection assets through a requirement for upfront capital contributions.</p> <p>Otherwise stranding risks are generally socialised across network customers with price impacts managed through annual price reviews.</p> <p>Asset stranding risk is very low given the essential nature of the water and sewerage services, the highly diversified customer base and the limited bypass options.</p>

²⁸ These conditions are: the asset is dedicated to one or more transmission network users (not being a DNSP) and the value of the asset in the RAB at the beginning of the current regulatory control period exceeds the indexed amount, as at the time of the AER's determination, of \$10 million; the AER determines that the asset is no longer contributing to the provision of prescribed transmission services; and the AER determines that the TNSP has not adequately sought to manage the risk of the asset that is no longer contributing to the provision of prescribed transmission services.

Factor	Aurizon Network	Australian energy networks	Australian water networks
	<ul style="list-style-type: none"> Prudence of capex <p>Regulation will generally mitigate stranding risk associated with individual branch lines, but will not be effective in mitigating risks that apply across a whole RAB segment (noting some groups have only 2 customers)</p>	<p>means that once assets are incorporated in the RAB, a return on and of capital can be earned on these assets for the remainder of their lives</p> <p>These provisions effectively provide an opportunity for socialisation of stranding risk within the whole customer base.</p> <p>Additional regulatory asset stranding risk under the regulatory framework stem from:</p> <ul style="list-style-type: none"> Ex-post review by economic regulator of prudence and efficiency of capex incurred during previous regulatory period – review process applies only if there is an aggregate capex overspend (not individual program over-spends). Additional capex incurred re an eligible cost pass-through event that is not subsequently recognised by the economic regulator. 	
Operating and maintenance cost risk mitigation	<p>Remaining opex risk - low</p> <p>Operating and maintenance costs are a relatively low proportion of revenue base.</p> <p>Operating and maintenance cost reviewed for prudence/efficiency at regulatory reset, with re-openers during the regulatory period permitted if relevant conditions are met. Risk that economic regulator will approve opex allowance below an efficient level.</p> <p>The nature of the re-openers permitted under the regulatory framework means that economic regulation is likely to partly mitigate operating and maintenance cost risk associated with major unexpected events that occur during a regulatory period.</p>	<p>Remaining opex risk - low</p> <p>Operating and maintenance costs are a relatively low proportion of revenue base.</p> <p>Operating and maintenance cost reviewed for prudence/efficiency at regulatory reset, with certain re-openers during the regulatory period permitted, if relevant conditions are met. Regulatory risk that economic regulator will approve opex allowance below an efficient level.</p> <p>The nature of the re-openers permitted under the regulatory framework means that economic regulation is likely to partly mitigate operating and maintenance cost risk associated with major unexpected events that occur during a regulatory period.</p>	<p>Remaining opex risk - low</p> <p>Operating and maintenance costs are a relatively low proportion of revenue base.</p> <p>Water network service providers in NSW, Victoria and SA are subject to building block economic regulation where operating and maintenance costs are reviewed for prudence/efficiency at each regulatory reset.</p> <p>For water networks not subject to building block regulation, operating and maintenance cost risks will be managed through annual internal price reviews rather than being subject to regulatory oversight.</p>
Performance risk	<p>Remaining performance risk - low</p> <p>Aurizon Network bears liabilities for performance under contracts.</p> <p>Regulation unlikely to have material impact on performance risk.</p>	<p>Remaining performance risk - moderate</p> <p>Electricity networks subject to strict legislative performance requirements re the provision of a safe and reliable supply of electricity.</p> <p>Electricity networks are also subject to a service performance incentive regime approved by the economic regulator, which imposes rewards/penalties for actual service performance relative to target performance.</p>	<p>Remaining performance risk - moderate</p> <p>Water networks are subject to strict legislative performance requirements re the provision of a safe and reliable supply of water and removal of sewerage.</p>

Factor	Aurizon Network	Australian energy networks	Australian water networks
Financing risk	<p>Remaining financing risk - moderate to high</p> <p>The allowable return on assets for pricing purposes is fixed for the regulatory period.</p> <p>Regulation changes the way in which Aurizon Network must manage its financing requirements, with risk that market changes mean that new investment cannot be financed at that rate. Access to debt capital is more constrained given reluctance of debt financiers to finance coal related industries.</p> <p>Aurizon Network is subject to the uncertainty of a new WACC approved by the economic regulator applying at each regulatory reset.</p>	<p>Remaining financing risk - moderate</p> <p>The allowable rate of return on equity for pricing purposes is fixed for the regulatory period. However, the allowable rate of return on debt is updated annually and reflected in network tariffs.²⁹</p> <p>Regulation changes the way in which the energy networks must manage their financing requirements, and there is a risk that changes in market conditions mean that new investment cannot be financed at the regulated rate of return, particularly the return on equity.</p> <p>Networks are subject to the uncertainty of a new WACC approved by the economic regulator applying at each regulatory reset.</p>	<p>Remaining financing risk - moderate</p> <p>For water networks subject to building block economic regulation, the allowable rate of return for pricing purposes is fixed for the regulatory period.</p> <p>This changes the way in which the water networks must manage their financing requirements, and there is a risk that changes in market conditions mean that new investment cannot be financed at the regulated rate of return.</p> <p>Networks are subject to the uncertainty of a new WACC approved by the regulator applying at each regulatory reset.</p> <p>For water networks not subject to building block regulation, financing risks are managed internally through annual price reviews with no regulatory oversight.</p>
Regulatory discretion at reset	<p>Remaining regulatory risk – moderate to high</p> <p>The economic regulator has high discretion at regulatory resets in relation to most aspects of the regulatory framework, including policy aspects of access undertaking, setting of reference tariffs including expenditure assessment and setting of an approved WACC. The regulatory outcomes at reset alter both terms upon which new contracts are set as well as terms of existing contracts which are linked to the regulatory framework outcomes.</p>	<p>Remaining regulatory risk - moderate</p> <p>The economic regulator has high discretion at regulatory resets, which primarily relates to expenditure assessments and the setting of an approved WACC. This affects each networks' maximum allowable revenues in the next regulatory period.</p> <p>The supply of electricity for most customers is not subject to contractual arrangements beyond a connection agreement. Hence, regulatory resets may impact on the terms of new connection agreements given these are subject to regulatory oversight. However, the terms of existing connection agreements would be unaffected.</p>	<p>Remaining regulatory risk – moderate to low</p> <p>For water networks subject to building block economic regulation, there is high regulatory discretion at regulatory resets, which primarily relates to expenditure assessments and the setting of an approved WACC.</p> <p>For water networks that are not subject to building block economic regulation, this is not generally a relevant issue or a risk factor.</p>

²⁹ The implementation of this annual updating process for the return on debt is subject to a 10-year transitional arrangement, with most networks around half way through the transitional period.

The analysis in Table 10 indicates that electricity and urban water networks face a somewhat different regulatory impact on their commercial risks compared to Aurizon Network, including in regards to:

- Fragmentation of RAB, with the electricity and water networks generally maintaining aggregated RABs rather than customer segmented RABs as is the case for Aurizon Network.
 - For Aurizon Network, the fragmented RABs cause even greater customer concentration, with the recovery of some RAB components being subject to the performance of only two customers;
- While revenue caps are used for mitigation of volume risk for both Aurizon Network and electricity networks, this is likely to be more effective for electricity networks given their broadly diversified demand base and the limited impact that changes in demand of a single user will have on the price overall.
 - In contrast, Aurizon Network has concentrated exposure to the coal market, increases or decreases in demand are likely to affect all users in a similar way. While the revenue cap passes volume risk to customers, where market circumstances result in a significant loss in demand, the capacity of remaining users to pay revenue cap-induced price rises is uncertain.
 - For water networks, volume risk is generally low given the essential nature of the service;
- The electricity regulatory framework provides strong protection against asset stranding risk for the electricity networks. Water networks generally do not receive this level of regulatory protection but asset stranding risk is low given their very large and highly diversified customer bases and the essential nature of the service which means that volume risk is negligible.
 - This compares to Aurizon Network, which only has the opportunity under the regulatory framework for socialisation of stranding risk within segmented RAB groups, with no specific stranding protection between RAB groups, together with a highly concentrated market and customer exposure leading to significant stranding risk for some segmented RAB groups;
- Operating and maintenance risk, which is generally low across each of the businesses, given their capital intensive nature. In particular, the risk for electricity networks and Aurizon Network are broadly comparable given the high degree of regulator discretion in assessing expenditure proposals at each regulatory reset.

- Performance risk, which is higher for electricity and urban water network providers given strict obligations created by safety and supply-related legislation and subordinate regulations.
 - This can be contrasted with Aurizon Network, for which regulation is unlikely to have a material impact on performance risk.
- The application of regulation changes the way in which regulated businesses must manage their financing risk, in order to best match regulatory reset periods. Financing risk is generally higher for Aurizon Network given many financiers are withdrawing from providing finance to businesses that have direct coal exposure. Aurizon Network has a greater financing and refinancing risk as it will have access to a smaller pool of available capital.
- Regulatory discretion regarding expenditure assessments and WACC approval is comparable for revenue and/or price regulated electricity and urban water networks and Aurizon Network. Aurizon Network is subject to some additional risk, as the regulatory discretion extends to the non-price terms and conditions upon which it negotiates and provides access.

We consider that, notwithstanding the regulatory frameworks that are in place, Aurizon Network is subject to significantly higher volume and counterparty risks (leading to higher revenue risk) and much higher stranding risks than Australian energy and water networks. This reflects that, while the application of economic regulation may modify the impact of commercial/market risks facing regulated entities, including through mechanism like revenue caps, it cannot change the nature of the underlying commercial/market risks facing these entities, which we have demonstrated in this report are fundamentally higher for Aurizon Network than for electricity and urban water networks.