



Draft Amending Access Undertaking for electric traction pricing in Blackwater (AT5)

Aurizon Network submission to the Queensland Competition Authority

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Electric traction pricing (AT5) in Blackwater

Executive Summary

Aurizon Network is seeking the QCA's approval of a set of principles intended to address the risks created by a regulatory pricing problem in relation to Aurizon Network's electric traction assets in the Blackwater system.

The existing AT5 access-charging arrangements for the Blackwater electrification infrastructure were intended to allow Aurizon Network to fully recoup its investment costs. In effect users are charged the average cost of using the infrastructure.

These arrangements are proving ineffective because users of the Blackwater system can bypass the electrification infrastructure by running non-electric traction modes on the electrified track, with the following effects:

- Substituting non-electric haulage for electric haulage reduces usage of the electrification infrastructure and drives up its average-cost access charge.
- The rise in the access charge strengthens the incentive for hauliers to use non-electric haulage.
- In the extreme, this could make electric haulage entirely uncompetitive, stranding the electrification assets.

Aurizon Network seeks to amend its Access Undertaking by inserting a new Schedule (Schedule K), setting out the principles upon which a revised charging system will be based. This DAAU proposes a revised charging system, setting the access charge at a fixed level that does not distort traction choice against electric haulage. The substitution of this non-distorting fixed access charge for the former revenue cap does not on its own address the regulatory objectives, because it exposes Aurizon Network to volume risk. Electric-haulage volumes could fall below a level compatible with full cost recovery, either because hauliers continue to opt for non-electric traction despite the reduction in the electrification access charge or because system volumes fall. Had the existing charging arrangements worked as anticipated, Aurizon Network would not have been exposed to either of these volume risks.

The possibility that access charges that do not distort traction choice might fail to recover the full costs of the infrastructure facility should not be a surprise – it is a common feature of natural-monopoly infrastructure for which the marginal cost of access is below the average cost.

To ensure revenue adequacy, the revised charging system supplements the fixed AT5 access charge with a mechanism to apply additional charges if required:

- The additional charges are proposed to be levied on users based on one of the mechanisms proposed in section 2.3
- The charge rates are set to ensure that Aurizon Network achieves full cost recovery over the UT4 and UT5 regulatory periods as a whole.
- Costs in excess of AT5 revenue are recovered by lump-sum charges imposed at the end of each undertaking period (for example the last year of UT4, or UT5), if required.

Any AT5 revenue that is recovered in excess of that required to recoup the accumulated loss (deferred revenue) capitalisation account will be returned to users at the end of each undertaking period.

In order to implement the proposed changes to the AT5 pricing methodology, Aurizon Network is seeking QCA approval to include an additional schedule within the 2010 Access Undertaking (UT3). The AT5 charges will be updated once WACC and tonnage forecasts are agreed for UT4.

1 Introduction/background

This DAAU seeks to address flaws that have become apparent in the existing charging mechanism for access to the Blackwater electrification infrastructure. The current mechanism sets an access charge (AT5) by dividing annual maximum allowable revenue (MAR) equally between the electric gross tonne kilometres (eGTKs) railed on the Blackwater system. In essence, users of the electrification infrastructure are required to pay the average costs of utilising the infrastructure. Hence, the mechanism insulates Aurizon Network from all volume risk.

It has become evident that this mechanism does not cope adequately with the possibility of coal-haulage operators bypassing the electric infrastructure by running diesel consists on the Blackwater system. This has the unintended consequence of increasing the AT5 charge, making electric traction less competitive against diesel traction for reasons unrelated to the relative marginal costs of the two modes. In the extreme, bypass could drive out electric traction completely, preventing Aurizon Network from recouping the costs of the electrification infrastructure.

In summary, the current AT5 mechanism has resulted in an access price that is:

- inefficiently high, distorting traction choice in favour of diesel
- threatening not to provide Aurizon Network with the revenue adequacy that the mechanism was intended to provide.

Aurizon Network believes that the first of these flaws makes the current system inconsistent with Section 69E in Part 5 of the QCA Act, which sets as an object of the access regime the need “...to promote the economically efficient ... use of ... significant infrastructure ...”.

The second flaw makes the system inconsistent with the QCA’s commitment to avoid the stranding of the Blackwater electrification assets¹:

- Aurizon Network believes that the QCA’s position on asset stranding is consistent with the most reasonable interpretation of the WACC approved for UT3, namely, that it does not compensate Aurizon Network for asset-stranding risk in relation to customer-approved assets.
- It is also consistent with S.168A (a) in Part 5 of the QCA Act, which provides that access prices 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”.

This DAAU presents Aurizon Network’s proposed approach to remedying these problems:

- In devising the approach, Aurizon Network has attempted to minimise any adverse effects that its proposals might have (relative to continuation of the existing arrangements) on above-rail operators and end users in the Central Queensland Coal Network (CQCN).
- Aurizon Network has also been guided by the principles set out in the discussion paper issued by QCA staff prior to its stakeholder workshop held in January 2013.

¹ Draft Decision QR Network Electric Traction Services Draft Amending Access Undertaking, July 2012

2 Aurizon Network's proposal

Like most of Aurizon's CQC, the Blackwater electrification infrastructure has the common natural-monopoly property that the marginal cost of providing access to the infrastructure is below the average cost of the infrastructure. To provide economically efficient traction-choice signals to above-rail operators, access should be priced at marginal cost but this alone will not allow the infrastructure provider to recoup the total costs of the infrastructure.

An additional charge on potential users of the infrastructure is expected to be required to ensure revenue adequacy. To avoid distorting traction choice, this additional charge should not vary directly with usage of the electrification infrastructure.

Aurizon Network's proposal has three main features²:

- i. the replacement of the current average-cost AT5 charge, which varies inversely with usage of the electrification infrastructure, with a *fixed* AT5 path that provides more efficient traction-choice signals
- ii. revenue deferral with Aurizon recouping its aggregate approved Blackwater-electrification investment costs over the UT4 and UT5 regulatory periods as a whole, but on average later than it would were it to recover its MAR in each year of these regulatory periods (as is the intention of the current charging mechanism)
- iii. the payment of an infrastructure under-utilisation payment (UUP) to make up any difference between the total approved costs of electrification infrastructure and the revenue raised from the AT5 access charge.

2.1 An efficient AT5 charge

It is widely accepted that the current AT5 charge is too high from the point of view of providing efficient traction-choice signals and that this is likely to continue to be the case through the UT4 period and into the UT5 period if the current charging mechanism is retained.

The discussion paper prepared by QCA staff in support of the January 2013 stakeholder workshop canvassed the possibility of setting AT5 at a "cost difference" level, i.e., at a level that equalises the full costs of electric and diesel haulage. Such a tariff, by construction, would not bias traction choice.

In attempting to implement this possibility, Aurizon Network was confronted by the problem that it did not have sufficient data about above-rail cost structures to allow it to determine the cost-difference tariff with confidence.

In view of the data problem noted above, Aurizon Network first estimated the AT5 charge that would allow it to recoup its approved electrification costs over the UT4 and UT5 regulatory periods on the following assumptions:

- continuation of the regulated WACC at its UT3 level (9.96%)
- indexation of the AT5 charge from its initial level at a rate of 2.5% p.a. (CPI estimate)
- 30-year straight line depreciation of the infrastructure
- capital renewals expenditure of \$15m p.a. from 2017-18 onwards
- eGTK forecasts:
 - at levels currently forecast for UT4 for 2013-14 to 2016-17

² The specific features of the proposed pricing mechanism are proposed to be included in a new 'Schedule K' within the 2010 Access Undertaking (UT3).

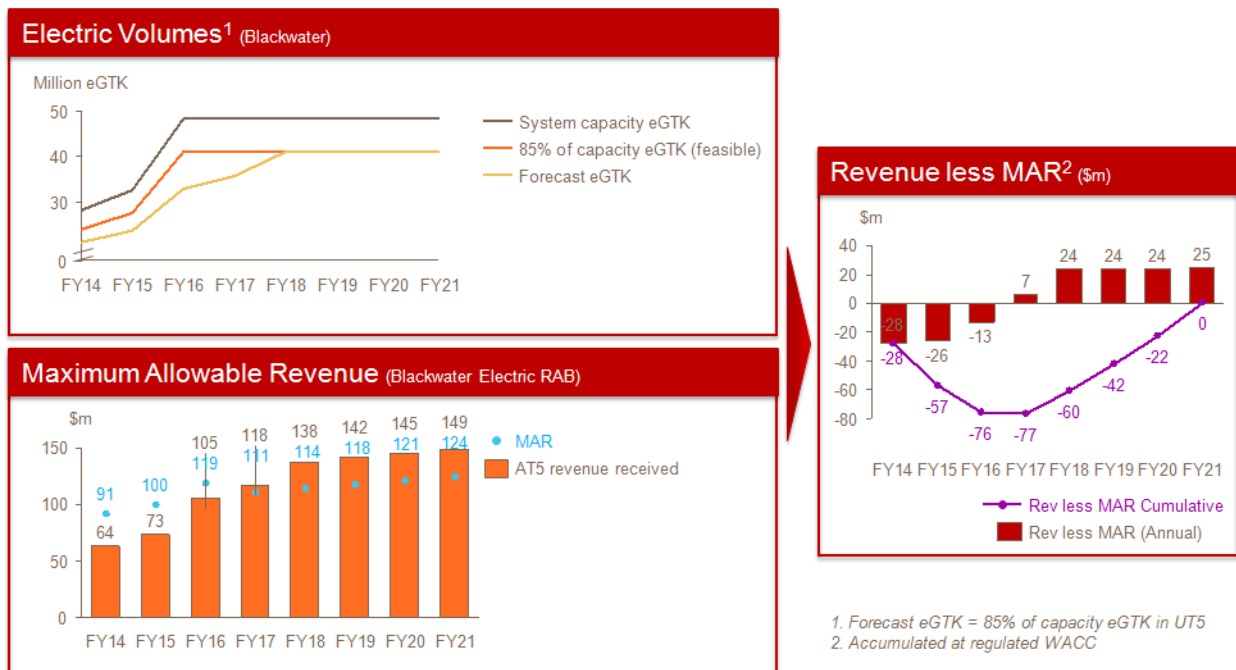
- at 85% of total GTK run over fully electrified paths³ for 2017-18 to 2020-21.

This led to an initial setting for AT5 of \$3.05/000 eGTK. On the basis of a variety of available information, Aurizon Network concludes that this level would give reasonably efficient traction choice signals. In particular, it is confident that it is not lower than the marginal cost of providing access to the electrification infrastructure, i.e., that it would not bias traction choice *in favour* of electric traction. The relevant evidence is discussed in section 4.1 below.

The pattern of cost recovery with AT5 set in this way is shown in Figure 1, where:

- The top panel on the left side of the figure plots the underlying volume assumptions.
- The bottom panel shows the annual MARs (blue dots) and the AT5 revenue (heights of the orange bars).
- It is apparent that there is under-recovery of MAR through to FY16 and over-recovery thereafter.
- With under-recovered revenue accumulated at the UT3 WACC, revenue is fully recovered by FY21, as shown by the purple line in the right-hand panel of the figure. Note that the heights of the red bars in this panel show the annual under/over recoveries of MAR.

Figure 1. Base case using UT4 forecast system volumes



³ The rationale for this assumption is outlined in Section 4.2 below.

2.2 UUP charges

Under the current charging mechanism, AT5 is set as an implication of Aurizon Network achieving its regulated revenue cap. The procedure proposed in section 2.1 (above) replaces this with a fixed AT5 price path. Hence it exposes Aurizon Network to volume risk that it does not face under the current mechanism.

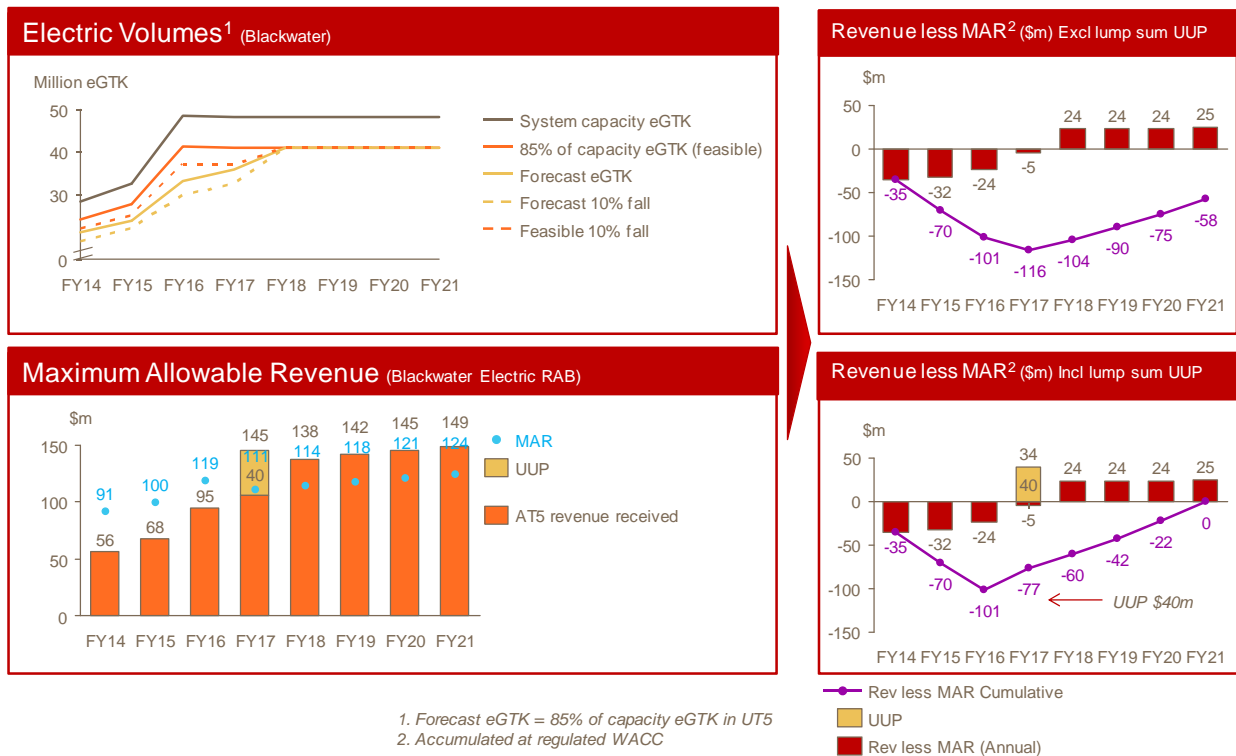
In specifying the UUP, Aurizon Network distinguished between the two types of volume risk that it would face in relation to its AT5 revenue:

- electric-utilisation risk – the risk that electric haulage will not reach Aurizon’s target 85% of feasible electric volumes because above-rail operators opt for diesel despite the reduction in AT5
- system-tonnage risk – the risk that electric haulage volumes are lower than forecast because total volumes do not reach forecast levels.

Aurizon Network proposes to specify a UUP that insulates it from both types of revenue risk over the UT4 and UT5 periods as a whole. If volumes fall below base-case assumptions revenue will not be recovered according to the profile set out in the right-hand panel of Figure 1. In this scenario, it is proposed that any unrecovered revenue at the end of a regulatory period relative to base-case recovery is to be recouped by a lump-sum levy based on one of the methodologies proposed in Section 2.3

The operation of this scheme is illustrated in Figure 2 for the case in which system volumes are 10 per cent below base-case assumptions throughout the UT4 period but revert to base-case assumptions in the UT5 period.

Figure 2. Scenario where 10% reduction in volumes over UT4



Analogous to Figure 1, the top panel on the left side of Figure 2 plots the revised volume assumptions. The bottom panel shows the annual MARs (blue dots) and the AT5 revenue (heights of the red bars).

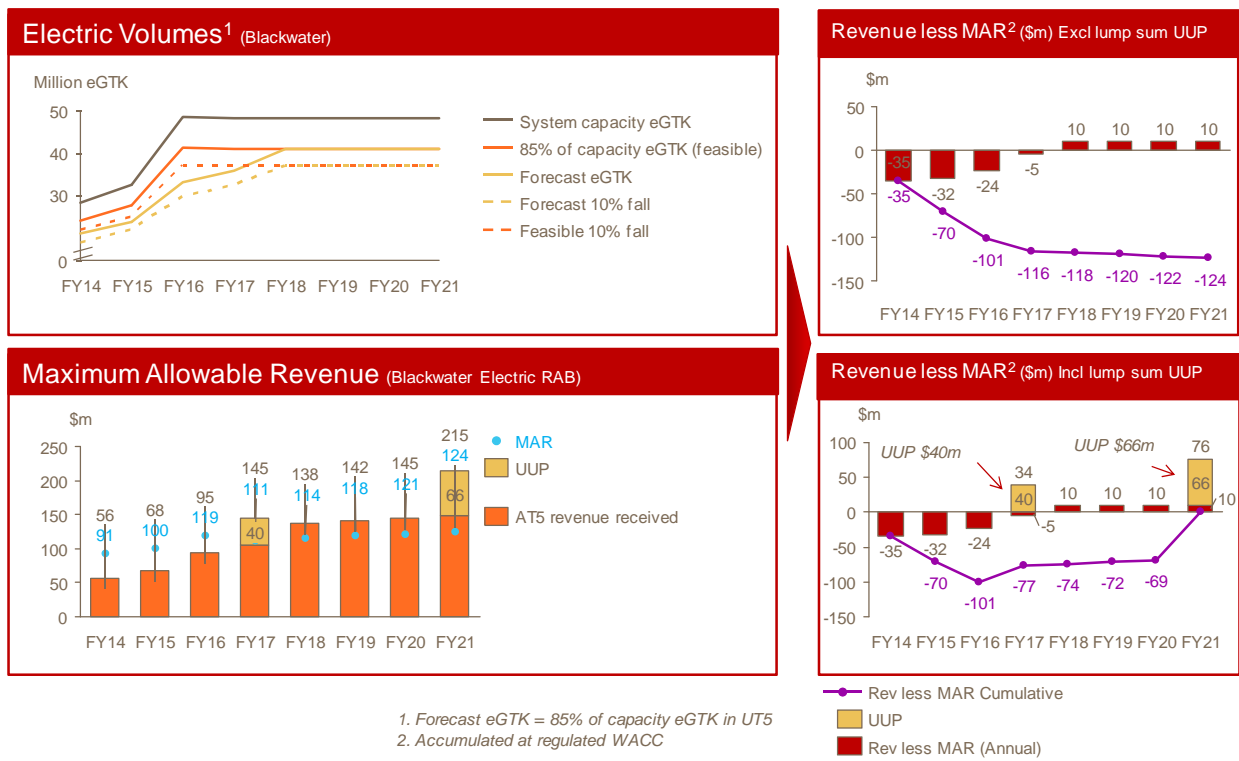
- Consistent with the reduced volumes, AT5 revenue is lower in each year of the UT4 period than it is in the base case.

- As shown in the top panel on the right side of Figure 2, accumulated unrecovered revenue is \$116m in FY17, whereas it is only \$77m in the base case.
- In the absence of a UUP payment, costs would not be fully recovered by the end of the UT5 period.
- This triggers a UUP payment in FY17, shown as the yellow portion of the FY17 revenue bar in the lower panel on the left side of the figure and by the yellow FY17 revenue bar in the lower panel on the right side.

With volumes reverting to base-case assumptions in the UT5 period, the base-case pattern of AT5 revenue also reverts to the pattern evident in the base case. Hence, with the FY17 UUP charge having returned accumulated unrecovered revenue to its base-case level (\$77m), costs are fully recovered by the end of the UT5 period. This is shown in the lower right panel of Figure 2.

If, rather than reverting to base-case levels in the UT5 period, volumes remained 10 per cent below base-case assumptions, costs would not be fully recovered by the end of the UT5 period and a second UUP charge would be triggered. This case is shown in Figure 3. In this case, a second UUP charge (\$66m) is levied at the end of the UT5 period, to ensure full cost recovery. In the absence of this payment \$66m would remain unrecovered.

Figure 3. Scenario where 10% reduction in volumes across UT4 and UT5



The UUP specified in the way described in this section will provide Aurizon Network with the difference between the approved costs of the electrification infrastructure and the AT5 revenue that it earns. This is expected to settle up-front the problems that have become evident in the existing charging mechanism, obviating the need for the QCA to have to re-visit the issue if downside volume scenarios eventuate.

2.3 Allocation of UUP charges

Section 2.2 describes the determination of the aggregate size of UUP payments. This leaves the question of who should be liable for UUP payments.

Aurizon network has explored options of how the UUP could be levied and determined three viable options as follows:

- 1) Allocating the UUP charge to users of the Blackwater system at the end of UT4 and UT5 if required
- 2) Allocating the UUP charge to users of the Central Queensland Coal Network (CQCN) at the end of UT4 and UT5 if required
- 3) Allocating the UUP charge to users of the Blackwater system at the end of UT4 and allocating the UUP charge across all users of the CQCN at the end of UT5 if required.

Option 1 Rationale

Under this option, the UUP is levied on users of the Blackwater system, whether or not they use the electrification infrastructure.

This method of allocation avoids the issue of cross system socialisation, and applies any UUP required across only those users of the Blackwater system. The cross system socialisation from the December 2011 DAAU was heavily criticised during industry consultation in 2012. In an effort to reach a mutually agreeable solution with industry, Aurizon Network made representations that we would withdraw the cross system socialisation element in our proposed AT5 changes.

By levying UUP on Blackwater users only, this method provides higher incentives for utilisation of the electric infrastructure. If an existing electric user decides to choose diesel despite the AT5 reduction proposed in this DAAU, they would be required to pay a portion of the costs they are imposing on the rest of the Blackwater system via UUP.

Aurizon Network proposes this option to be the preferred approach to allocating the UUP, if this mechanism is required.

Option 2 Rationale

In its discussion paper for the January 2013 workshop, the QCA staff suggested an alternative to revising the AT5 charging scheme. They believe not allowing Aurizon Network to recover the costs of the Blackwater electrification investment would be to acknowledge that Aurizon Network is exposed to asset-stranding risk for customer-approved investments.

In the QCA's staff's view, Aurizon Network's regulated WACC does not compensate it for this risk. The QCA discussion paper points out that increasing the WACC would increase access charges for all users of the CQCN. Based on this approach, it can be argued that all CQCN users should therefore be liable for any UUP charges that are required to allow recovery of the Blackwater electrification costs.

Allocating the UUP charge to all users reduces the charge that would otherwise be levied on Blackwater users, including diesel users in the Blackwater system. This has the advantage of minimising the risk that the UUP charge could distort traction choice in Blackwater.

Option 3 Rationale

Levying any UUP required at the end of UT4 across Blackwater users only will allow Aurizon Network to assess the market response to a lower, fixed price path. If the utilisation of infrastructure remains at levels such that asset stranding remains a valid risk, the UUP would be applied to all CQCN users at the end of UT5.

The potential impact to users under the scenarios illustrated in Figures 2 and 3 is summarised in Table 1.

Table 1. Indicative impact on end users under various recovery mechanisms

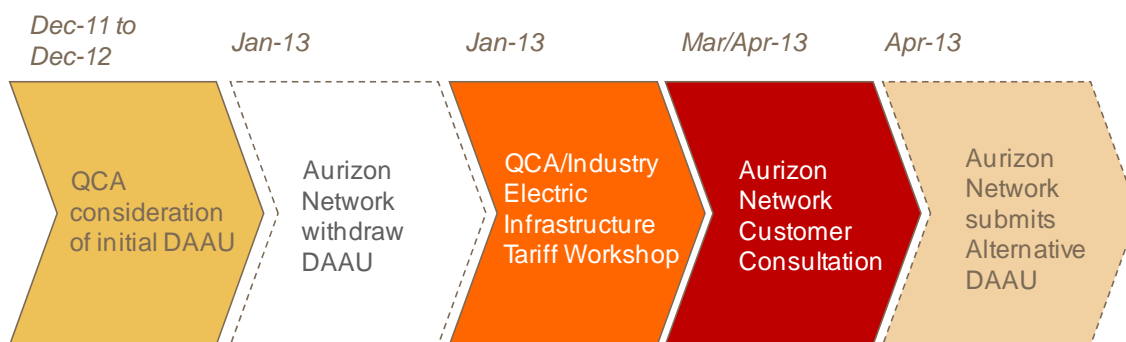
Scenario	\$/nt impact in FY17 if UUP recovered from Blackwater users	\$/nt impact in FY17 if UUP recovered from CQCN users	\$/nt impact in FY21 if UUP recovered from Blackwater users	\$/nt impact in FY21 if UUP recovered from CQCN users
10% reduction in system volumes over UT4 (Figure 2)	Options 1 & 3 0.56	Option 2 0.16	0.00	0.00
10% reduction in system volumes over UT4 and UT5 (Figure 3)			Options 1 0.94	Option 2 & 3 0.26

2.4 Reimbursement of any over-recovery of AT5 revenue

Similar to the existing revenue adjustment mechanism within the 2010 Access Undertaking, any AT5 revenue that is recovered in excess of that required to recoup the accumulated loss (deferred revenue) capitalisation account will be returned to users at the end of each undertaking period (UT4 and UT5).

3 Consultation on reforming AT5 in Blackwater

The AT5 scheme outlined in this proposal is the culmination of over 12 months of discussions with QCA staff and stakeholders on how best to resolve the prevailing inefficiency of electric traction pricing in Blackwater:



Aurizon Network has attempted to capture feedback from QCA staff and stakeholders within this submission through a program of customer briefing sessions prior to the submission of this DAAU (summarised in Attachment A).

4 Substantiating the Proposed Mechanism

4.1 The efficiency of the initial AT5 charge

The proposed AT5 price path has been determined by solving for the value that equalises the present value of electric system revenues and costs over an eight-year time frame (UT4 and UT5) using Aurizon Network's UT3 WACC as the discount rate and assuming that the resulting price path is consistent with eGTK accounting for 85% of total GTK.

The consistency of the proposed price path for AT5 (underpinned by a high level of electric utilisation) is supported by Aurizon Network's internal modelling (Total Cost of Ownership, TCO), where electric traction is substantially less expensive per GTK than diesel traction at high utilisation of the electric

infrastructure. Aurizon Network's TCO model has been independently reviewed⁴, confirming that the differences in fuel costs and in locomotive capital and maintenance costs are sufficient to establish the cost superiority of electric traction⁵.

Supporting this view is the fact that electric utilisation on the Goonyella system is nearly 100%. This outcome has been achieved through the profit-maximising decisions of private firms -- a diesel-dominated system would have eventuated had electric traction not been the more efficient traction mode.

Further, the combination of EC and an AT5 value for Blackwater based on high electric utilisation is less than the average cost of diesel fuel per gtk.

On the basis of this evidence, Aurizon Network considers \$3.05/000 egtk to be a reasonably efficient initial level for the AT5 charge. The initial AT5 charge will be updated once WACC and tonnage forecast are agreed for UT4.

4.2 Electric utilisation at 85% is an appropriate target level

System Capacity eGTK includes all mines expected to have access to electrified paths (e.g. Rolleston expected to become electrified during UT4)⁶.

Aurizon Network has identified that 85% of system capacity eGTK is the eGTK percentage required for the Blackwater electrified network to be sustainable when forecast volumes are achieved.

- Where electric utilisation is 85% or more of the system capacity eGTKs, the UUP would not be triggered (all else equal).
- Where electric utilisation is below 85%, it is proposed that the consequent revenue deficiency be recovered through a UUP (all else equal).

4.3 Modelling of revenue deferral and the need for UUP charge is sound and transparent

To ensure effective governance was applied to the AT5 pricing model, Aurizon Network had the model independently reviewed.

The scope of the assignment included reviewing the model for logical consistency and fidelity to the mathematical principles that underpin the revised pricing structure. Note that evaluating the correctness of the input data was outside the scope of this review.

In addition to the independent review, Aurizon Network engaged with QCA staff, providing context as to how the proposed pricing structure was developed. The AT5 pricing model was also provided to QCA staff for scrutiny.

4.4 Operation of customer-vote procedure was reasonable

As part of the process for the 2008 Coal Rail Infrastructure Master Plan (Master Plan) Aurizon Network received industry scope pre-endorsement.

The Blackwater power system upgrade project was a component of this Master Plan which sought funding as part of the 2008 Master Plan customer vote process. The primary objective of the upgrade

⁴ Economic analysis of revised Aurizon DAAU for electric infrastructure, Independent report for Aurizon Network prepared by Sapere Research Group, February 2013, page 10.

⁵ Based on the assumption that the input data is correct, noting that key TCO assumptions have been previously distributed to the QCA and stakeholders

⁶ Noting that some paths are assumed to be uneconomic to electrify, due to low volumes relative to the cost of electrification.

was to allow the operation of an increased number of electric trains to enable more tonnes to be hauled on the Blackwater system and to reduce congestion at critical constraint points.

In February 2009, the QCA made a decision to defer regulatory pre-approval for this project (and several others) on the basis that it was not clear the project was General Expenditure Capital Expenditure.

Aurizon Network provided a response in March 2009 to the QCA, expressing the consideration the project did meet the criteria established in the definition of General Expansion Capital Expenditure in the 2008 Access Undertaking. Aurizon Network acknowledged that the 2008 Master Plan contained only high level information on this project and that a number of customers requested more explanation of the project prior to its commencement. Subsequent to the publication of the Master Plan, further detailed electrical capacity modelling was completed and a working paper was prepared explaining more fully the rationale for these projects.

In addition, Aurizon Network noted that:

- The non-provision of sufficiently detailed information is a valid reason for customers to reject a project through the Master Plan voting process. However, whilst a number of customers did request further information on this project no customer provided a negative vote rejecting the project.
- The QCA has previously approved the industry's scope pre-endorsement of a number of other feeder stations (for example Raglan, Mindi and Bolingbroke) which were put forward for endorsement under past Master Plans as General Expansion Capital Expenditure

Based on this subsequent information provided by Aurizon Network, the QCA decided to pre-approve the scope of the project as provided for in clauses 2.2(a)(ii) and 2.3.2(b)(i) of schedule FB of the 2008 Access Undertaking.

5 Conclusion

This DAAU proposes a revised charging system for access to the Blackwater electrification infrastructure. The current average-cost AT5 system has resulted in the AT5 usage charge rising to a level which biases traction choice away from electric traction and towards diesel.

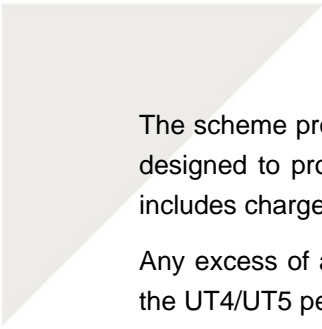
In the revised system, AT5 is reduced from its current high level to a level that better approximates the charge that would make users indifferent between electric and diesel haulage. The reduced AT5 charge is then held (with CPI indexation) through to the end of the UT5 period.

Reducing and holding the AT5 charge in this way results in an expected revenue shortfall relative to MAR in early years of the UT4/UT5 period, when railed electric volumes (eGTKs) are expected to be low. But if volumes rise as expected, revenue in later years of the UT4/UT5 period will be more than sufficient to recover MAR.

Nevertheless Aurizon Network's modelling indicates that this revised setting of AT5 cannot be guaranteed to recover the full costs of Aurizon Network's Blackwater electrification investment by the end of the UT5 period. Full cost recovery is threatened by two risks:

- the risk that diesel bypass will prevent electric usage from rising to the level consistent with full cost recovery, despite the reduction in AT5
- the risk that system volumes will not reach expected levels.

The existing AT5 arrangements were designed to protect Aurizon Network against both these risks. But it is failing to do so because it has allowed AT5 to rise so high that it is creating a short term pricing signal that promotes bypass of the electrification infrastructure.



The scheme proposed in this DAAU restores the revenue adequacy that the existing arrangements were designed to provide. It also removes the short term bypass incentive. To achieve these, the scheme includes charges unrelated to usage of the electrification infrastructure to be paid.

Any excess of approved costs over AT5 revenue could be recovered with a variety of time profiles over the UT4/UT5 period. This DAAU opts for a profile that defers the required charges relative to the charges that would be required to recover Aurizon Network's annual MAR in each year of the period – annual recovery of the MAR is a feature of the design of the existing AT5 system. In the proposed new scheme, un-recouped revenue is recovered by lump-sum charges paid at the end of each of the UT4 and UT5 regulatory periods, if triggered.

This proposed scheme achieves cost recovery for Aurizon Network in all circumstances. Hence it eliminates any need for Aurizon Network to reopen the electric charging issue with the QCA because of revenue inadequacy.

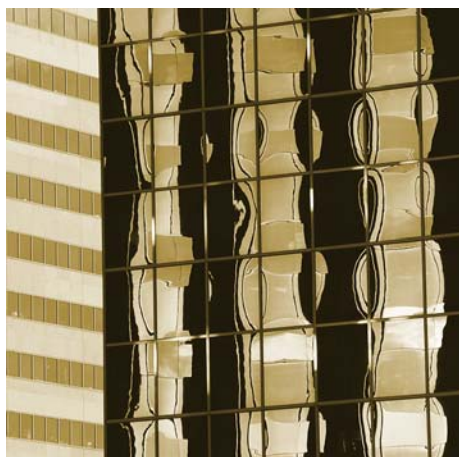
Appendix A: Consultation

Stakeholder	Consultation
Anglo	Meeting held in March 2013
Aquila	Meeting held in March 2013
Bandanna Energy	Meeting held in April 2013
BMA/BMC	Meeting held in March 2013
Caledon	Meeting held in April 2013
Cockatoo Coal	Meeting held in April 2013
GCEE	Meeting held in March 2013
Idemitsu (Ensham)	Meeting held in March 2013
Jellinbah	Meeting held in March 2013
Pacific National	Meeting held in March 2013
Peabody	Telephone discussion in March 2013
QCA	Meetings held in March 2013
QRC	Meeting held in March 2013
RTCA	Meeting held in March 2013
Stanwell	Meeting held in March 2013
Vale	Meeting held in March 2013
Wesfarmers	Meeting held in April 2013
Xstrata	Meeting held in March 2013
Yancoal	Meeting held in April 2013

Economic analysis of revised Aurizon DAAU for electric infrastructure—FINAL REPORT

Mike Smart

19 April 2013



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Mike Smart is a director of Sapere Research Group in Sydney. He advises industry leaders in telecommunications, rail, gas, logistics, mining, electricity and aviation. Mike has given expert evidence in the Federal Court of Australia and the Australian Competition Tribunal. He is a member of the Competition and Consumer Committee of the Law Council of Australia and the Economics Society of Australia.

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1 Background

1.1 Process to date

Aurizon Network’s Electric Traction Draft Amending Access Undertaking (DAAU) was submitted in December 2011 (**2011 DAAU**). Following the QCA’s Draft Decision in July 2012 and subsequent discussion with stakeholders, Aurizon Network withdrew the 2011 DAAU on 22 January 2013. Aurizon Network indicated that it was motivated to withdraw the DAAU to facilitate a QCA-led workshop process on this issue.

The problems that motivated the 2011 DAAU remain pressing and commercially significant. In order to address them in a timely fashion, Aurizon Network has proposed a revised DAAU. This report presents an economic analysis of the revised DAAU’s pricing elements and demonstrates that it is consistent with the requirements of the QCA Act.

1.2 Anticipated process going forward

I understand that Aurizon Network proposes that the new pricing rules discussed here would:

- be proposed for inclusion in Aurizon Network’s next undertaking periods (UT4 and UT5); and
- subject to further consultation with the QCA, potentially be incorporated into a binding ruling to achieve revenue adequacy across multiple regulatory periods.

1.3 Motivations for revised DAAU

The current method of determining AT5 involves average cost pricing: the pool of electric system costs each year is divided by the actual total electric gross tonne kilometres (“egtk”) on the system. This pricing scheme has the unintended consequence of making electric traction artificially less competitive against diesel traction when the diesel mode share increases. I refer to this shift in competitiveness as artificial because it is unrelated to the relative marginal costs of the two modes, which are not affected by the modal shares.

Clearly, the further the electric modal share drops, the less attractive electric traction will be to customers. This tipping phenomenon has the potential to strand the substantial investments that Aurizon Network has made in the Blackwater electric power system. In this respect, I note that Aurizon Network earns a

regulatory WACC on those assets that does not compensate it for non-systematic risks of this kind.

My December 2012 letter to the QCA (Aurizon Network Addendum, Dec 2012), identifies a Prisoner’s Dilemma situation that is caused by the average cost pricing rule. The rule itself creates an incentive for all parties to choose diesel over electric traction under certain conditions, despite the fact that electricity represents a lower cost fuel type.

In both my earlier report (Sapere, Sep 2012) and letter, I recommended a modified rule for determining AT5: the pool of electric system costs should be divided by a fixed level of egtk corresponding to a large proportion of the maximum feasible egtk on the system. This rule would overcome the tipping problem noted before and would ensure that electric traction is not artificially disadvantaged relative to diesel traction. A variant of this rule is a central part of the revised DAAU.¹

A pricing rule of this type places the electric utilisation risk with Aurizon Network. There are three reasons why electric utilisation may fail to reach a cost-recovering level in any given year:

1. Mines on electrified lines may opt for diesel traction;
2. Some mines may be unable to use electric traction because they are situated on non-electrified lines; or
3. The aggregate volume of coal in the system may be insufficient despite electric traction holding a high modal share.

In section 2 I explain how the revised DAAU deals with each of these sources of risk.

¹ The revised DAAU rule selects a constant real AT5 price that equalises the present value of electric system revenues and costs over the 8-year period from 2013/14 – 2020/21, assuming billable egtk corresponds to 85% of the maximum feasible egtk in each of those years.

2 Main pricing features of revised DAAU

The proposed pricing for the revised electric traction system DAAU has three components:

1. A constant real AT5 price maintained for eight years, subject to review under specified circumstances;
2. An additional component to AT4 that compensates Aurizon Network for certain specific events that lead to electric power cost under-recovery; and
3. A requirement that, over the terms of UT4 and UT5 combined, the present value of electric system revenues and costs are equalised.²

Each of these components is considered in detail below.

2.1 Determination of AT5 for Blackwater

AT5 must be set in such a way that three requirements are satisfied:

1. It is stable over time;
2. The level should not be so high that electric traction becomes uncompetitive with diesel; and
3. The CRIMP-approved electric system investments do not become stranded.

The first requirement will be met if a constant real AT5 is specified. The third requirement will be met if the constant real AT5 is determined by solving for the value that equalises the present value of electric system revenues and costs over an appropriate time frame.

The revised DAAU proposes this approach to determining AT5. The present value calculations are proposed to be done using Aurizon Network's regulatory WACC as the discount rate and an eight year time frame (the combined terms of UT4 and UT5).

The electric system revenues in this present value calculation are forecast on the following basis. The constant real AT5 is multiplied by a hypothetical egtk figure for each year that is set at 85% of the maximum feasible volumes for that year. The

² This requirement is subject to system volume and cost forecasts being approximately accurate. If system volume forecasts are too high or cost forecasts too low, then there is a possibility that the present value of costs will not be recovered by the end of UT5 under this pricing scheme.

maximum feasible volume in a given year is the number of gtk forecast to be shipped from all mines that are on electrified lines. Obviously it is not feasible to derive egtk from mines on non-electrified lines. Table 1 below summarises the definitions of the different measures of usage.

Table 1: definitions of usage metrics

Usage metric	Explanation
gtk	gross tonne-kilometres
Contract gtk	gtk specified in access contract
Actual gtk	gtk for trains that actually run
Actual egtk	Actual gtk hauled by electric locomotives
Maximum feasible egtk	gtk to and from mines on electrified lines
Hypothetical target egtk	85% of maximum feasible egtk

In the event that less than 85% of the gtk from mines on electrified lines uses electric traction, the forecast revenue will not materialise. This shortfall is proposed to be recouped from an Under-Utilisation Payment (“UUP”) that is described in section 2.2 below.

Aurizon Network has undertaken some preliminary modelling of the approximate level of Blackwater system AT5 that would result from the present value calculation just described. This modelling indicates that AT5 would be \$3.05/ ‘000 egtk (in \$2013/14) if the Rolleston branch line is electrified from 2015/16 onward.

I am advised by Aurizon Network that it understands from stakeholders that an AT5 of approximately \$3/ ‘000 egtk (or less) in 2013/14 would permit electric traction to be competitive with diesel traction on a total cost of ownership basis. Assuming that this advice is correct, this pricing approach would meet the second requirement outlined at the beginning of this section.

2.2 Under-utilisation payment

My September 2012 report proposed that the under-recovery of electric costs from AT5 when electric utilisation is below target be met through a lump sum electric traction availability charge payable by all mines. Subsequently, Aurizon Network has

advised me that, while the lump sum approach is understood, it believes stakeholders are concerned about its complexity. As a consequence, Aurizon Network has determined to take an alternate approach in this DAAU.

The revised DAAU implements a somewhat different method for recouping the AT5 shortfall. A UUP payable by access customers is calculated to make up the shortfall caused by the difference between actual egtk and the benchmark 85% of feasible egtk.

This amount is allocated among access customers at the end of each undertaking period in proportion to their actual net tonnes. In effect, it is an additional component to the AT4 tariff element that they would otherwise pay. This UUP would ensure *partial* recovery of Aurizon Network's electric power system costs not recouped through AT5 in the early years of UT4 and UT5.

The proposal to allocate this UUP according to net tonnes instead of a lump sum has economic consequences that will be discussed in section 3 below. Given the need to recover these costs, the difficulties with the lump sum approach, and the unattractive features of the alternative allocation methods, this aspect of the revised DAAU is likely to create the least distortion to pricing signals.

The UUP amount at the end of each undertaking period shall not permit Network to exceed allowable revenue that includes any deferred revenue (i.e. if sufficient revenue is recovered from electric trains to cover target revenue and any accumulated capitalised shortfall then there is no requirement for a UUP).

Section 3 below will consider the distributional and efficiency consequences of that rule.

2.3 Potential deferral of revenue to UT5

Preliminary modelling by Aurizon Network suggests that Blackwater electric system revenue deferrals in the early years of UT4 and UT5 will be significant. These deferrals represent under-recoveries of electric system costs that arise because some mines are not (initially) on electrified lines and because overall system coal volumes are (initially) too low for full cost recovery even at high electric utilisation. Back-ending cost recovery in this way would present an unreasonable stranding risk for Aurizon Network unless recoupment is ensured by a binding regulatory ruling.

I say this stranding risk is unreasonable for two reasons. First, Aurizon Network undertook this investment after receiving QCA and customer approval through the

CRIMP process. Second, even mines that do not currently use electric traction receive a benefit from the availability of electric traction infrastructure on the system. This benefit is an option to switch³ from diesel to electric at low cost when relative fuel prices change.⁴

A third reason has been highlighted by the QCA: Aurizon Network's regulatory WACC is insufficient to compensate it for asset stranding risk. The QCA said,

“The weighted average cost of capital for Aurizon Network is currently set on the assumption that assets will only be optimised once, at the time the asset enters the asset base. ... If the current approach is changed to allow for subsequent optimisation of the asset base, the WACC may have to be reviewed (upward).”⁵

The accumulated revenue shortfall will not be recovered within the UT4 period if actual volumes are consistent with forecasts, necessitating a binding ruling to ensure revenue recovery in UT5.

³ It is recognised that switching is difficult within the term of a haulage contract. The idea is that switching would occur at the point of renewal of haulage contracts. The option should be viewed with a long-term perspective, reflecting the long economic life of the electric system infrastructure.

⁴ Fuel price hedging might conceivably offer an alternative method of dealing with relative fuel price change. Unfortunately there is a mismatch of time scales. Fuel price hedges tend to be fairly short-term. The option to switch that is considered here would be taken up over a multiple year time frame corresponding to the expiry of haulage contracts. Fuel price hedges of such long duration would likely be difficult to source and prohibitively expensive.

⁵ QCA (Jan 2013), p. 3.

3 Economic evaluation

The proposed Blackwater pricing in Aurizon's revised DAAU addresses most of the key shortcomings of the December 2011 ETS DAAU that were noted in the QCA's July 2012 Draft Decision.

- It does not charge diesel trains the AT5 price.
- It provides appropriate price signals for the use of electric infrastructure:
 - the proposed AT5 corresponds to an efficient long run marginal cost for the Blackwater electric power system.
 - Efficiency is interpreted as the assumption of high utilisation of the electric infrastructure.
- It maintains traction mode neutrality by aligning prices with long run marginal costs:
 - it does not distort the competition between diesel and electric train operators since prices are cost-reflective; and
 - it does not distort the competition between makers of diesel and electric locomotives since prices are cost-reflective.

The revised DAAU also addresses the problems that motivated the submission of the December 2011 ETS DAAU:

- it avoids stranding of the Blackwater electric power system investments;
- it avoids the perverse incentives created by an average cost pricing rule for AT5; and
- it ensures that electric traction remains competitive with diesel traction when efficient electric long run marginal costs are no higher than diesel.

The remainder of section 3 considers in detail how the revised DAAU satisfies the statutory requirements.

3.1 Object of Part 5

Before turning to the specific objects of Part 5 of the QCA Act, it is important to establish two propositions that will be relied on throughout this analysis. The first proposition is that the pricing proposed in the revised DAAU corresponds to an efficient long run marginal cost for the electric infrastructure. The second proposition is that electric traction represents the least cost transport option, provided that electric infrastructure utilisation is sufficiently high.

Concerning the first proposition, section 2 set out the pricing rules in detail. The prime consideration in determining the constant real AT5 value was to equalise the

present value of revenues and costs over an eight year period. Accepting the appropriateness of the time frame,⁶ this AT5 level is therefore cost-reflective. The costs thus reflected are efficient in the sense that they assume electric utilisation is high: 85% of the maximum feasible. In my view, this method of establishing AT5 represents the best available estimate of an efficient LRMC for the electric infrastructure.

The existence of the UUP does not really alter this conclusion. Where electric utilisation is 85% or more of the maximum feasible, there would be no UUP. Where electric utilisation is below 85% of feasible in an electrified area, it is the cost of this inefficiency that is recovered through the UUP.

Concerning the second proposition, Aurizon advises me that electric traction is substantially less expensive per gtk than diesel traction, assuming moderately high utilisation of electric infrastructure. This conclusion is based on total cost of ownership modelling. I have examined this modelling and, on the assumption that the input data is accurate, I find it convincing.⁷

Supporting this view is the fact that electric utilisation on the Goonyella system is nearly 100%. That outcome has been achieved through the profit-maximising decisions of private firms. Presumably these decisions would have resulted in a diesel-dominated system had electric traction not been cheaper.

Further supporting this view is the fact that the combination of EC and an AT5 value for Blackwater based on high electric utilisation is less than the average cost of diesel fuel per gtk. Aurizon's total cost of ownership modelling demonstrates this point.

⁶ The choice of eight years as the period reflects concern about the stranding risk and the difficulty of guaranteeing regulatory decisions far into the future. The electric asset life assumed in the cost calculations is 30 years. By the end of the eight year period, regulatory depreciation would represent less than the full original investment.

⁷ Some aspects of Aurizon's total cost of ownership modelling were contested by submissions to the QCA. Among the most contentious of these points were the claims concerning network congestion and relative diesel and electric train operating speeds on the network. I have not relied on these points in my evaluation of relative costs of diesel versus electric traction. The differences in fuel costs and in locomotive capital and maintenance costs alone were sufficient to establish the cost superiority of electricity.

3.1.1 Economically efficient outcomes

S69E of the QCA Act contains the object of part 5, which is “to promote the economically efficient operation of, use of and investment in, significant infrastructure by which services are provided, with the effect of promoting effective competition in upstream and downstream markets.” The first part of s69E refers to economic efficiency.

The first proposition established above is that the proposed AT5 price represents an efficient LRMC. That being so, the proposed pricing is allocatively efficient: scarce investment funds will be allocated to their highest-value end-uses under long-run marginal cost pricing. This statement applies not only to investments in electric system infrastructure, but also to investments in locomotives and associated assets. Thus, the proposed pricing promotes efficient investment in significant infrastructure by which services are provided.

The second proposition established above is that electric traction is the least-cost transport option. Therefore, by incentivising higher utilisation of the lowest-cost technology, the proposed pricing is also productively efficient: a given coal transport task would be accomplished for least input cost. Thus, the proposed pricing promotes efficient operation and use of significant infrastructure by which services are provided.

3.1.2 The implications for competition

The second part of s69E refers to the promotion of effective competition upstream and downstream of the significant infrastructure. In general, a cost-reflective AT5 price (as is proposed—refer to the first proposition established above) is minimally distorting to competition in adjacent markets. Turning to consider each of these adjacent markets individually, I note the following.

Competition in locomotive supply markets

The traction choice would be made on the basis of a strict comparison of costs and benefits, encompassing comparative locomotive costs and the comparison between prices of diesel and electric energy plus AT5. There is considerably less distortion to the traction choice under the revised DAAU than there is under the prevailing average cost AT5 pricing rule. There is also less distortion to the traction choice under the revised DAAU than there would have been under the now withdrawn December 2011 ETS DAAU.

Competition in above-rail haulage markets

Under the revised DAAU, electric train operators pay AT5 and diesel train operators do not. AT5 is cost-reflective. These facts make the revised DAAU competitively neutral with respect to the above-rail haulage markets and the traction choices

these operators make. The DAAU would therefore seem to meet the QCA's objective of maintaining traction choice in the CQCR.

Competition in Blackwater rail haulage market

By overcoming the acknowledged distortions to electric traction pricing in UT3, the prospects for effective competition between Blackwater miners and between train operators in the Blackwater system would be improved.

3.2 Interests of Owner

S120(1) of the QCA Act contains a list of matters that must be considered by the QCA in making an access determination. S120(1)(b) refers to the access provider's legitimate business interests and investment in the facility.

On the proviso that the QCA issues a binding ruling to ensure recovery of capitalised losses from UT4 within the term of UT5, this pricing proposal would advance the interests of the infrastructure owner by preventing the stranding of the Blackwater electric power system assets.

3.3 Interests of Access Seekers

S120(1)(c) refers to the legitimate business interests of persons who have, or may acquire, rights to use the service. Such persons may include end customers and the above-rail operators that haul coal for them. Each is considered separately below.

3.3.1 End customers

Thanks to the incentives created by the proposed pricing in the revised DAAU, miners on the Blackwater system would have certainty of cost-reflective access to the lowest-cost transport option for at least the next two regulatory periods.

A future world in which the UT3 pricing rules were continued would be less advantageous to these miners for the following reasons:

- the option to move to electric traction would become increasingly unattractive over time and eventually, perhaps, unavailable;
- a least-cost system configuration in which electric traction infrastructure is widely available and highly utilised would become unattainable;
- transport costs would be higher than necessary and increasingly vulnerable to shocks in the world oil price.

Compared to the December 2011 DAAU proposal, which sought to apply the full AT5 charge to diesel trains operating from mines on electrified lines, the revised DAAU

maintains a significant price differential between electric trains (which pay AT5) and diesel trains (which do not). The impact of the UUP on end customers, if required, is significantly less than in the prior DAAU proposal.

3.3.2 Above rail operators

The revised DAAU proposes a pricing system that will result in greater certainty of the recovery of efficient electric system costs because it removes a perverse pricing anomaly intrinsic to the average cost pricing rule that is embedded in UT3. Blackwater diesel train operators, in particular, have benefitted from this pricing anomaly to date. The proposal is to close off that anomaly and restore pricing to efficient and sustainable levels.

In the medium to longer term, input price changes will ultimately filter through to end customers, even though haulage contracts that are on foot may not permit pass-through. This eventual ability to pass access price changes through (perhaps at renegotiation time for haulage contracts) will mitigate the longer-term impact on above rail operators.

More importantly, the relative competitive position of above rail operators will not be affected as long as input price changes affect all operators equally. The pricing proposal does not discriminate between operators based on their identity—only on the basis of the costs they impose on the infrastructure provider.

3.4 Pricing Principles

The relevant pricing principles are set out in s168A of the QCA Act. These pricing principles must be considered by the QCA in making an access determination (see s120(1)(l).)

Revenue adequacy

S168A (a) contains the principle that the price should generate expected revenue for the service that is at least enough to meet the efficient costs of providing access.

Subject to the QCA providing a binding ruling that ensures recovery in UT5 of capitalised losses in UT4, this proposal should provide Aurizon network with adequate revenue over the life cycle of the electric system assets.

Efficient price discrimination

S168A (b) contains the principle that the price should allow for multi-part pricing and price discrimination where it aids efficiency.

The revised DAAU only price differentiates between diesel and electric traction. As shown above, this differentiation is cost-reflective and therefore efficient.

Avoid related-party favouritism

S168A (c) contains the principle that the price should not allow an access provider to discriminate in favour of a related downstream entity, except to the extent the cost of providing access to other operators is higher.

Nothing in this proposal discriminates between above-rail operators based on their identity. Although there will be some differential pricing impacts on above-rail operators based on their mix of traction types, these differentials are cost reflective.

Improve productivity

S168A (d) contains the principle that the price should provide incentives to reduce costs or otherwise improve productivity.

The proposed AT5 pricing is cost-reflective, which will promote productivity by improving allocative efficiency within the coal chain.

3.5 Public interest

S120(1)(d) of the QCA Act notes that one of the matters that must be considered by the QCA in making an access determination is the public interest, including the benefit to the public in having competitive markets. The key public interest aspects are considered separately below.

Coal industry development

By reducing the average cost of coal transport in the short and long term, the revised DAAU would promote the development of the Queensland coal industry.

Competition in markets

The revised DAAU would improve competition in some markets and have no impact in others. There are no identifiable markets in which the revised DAAU would lessen competition. See section 3.1.2 above.

Environmental impact

Compared to a continuation of the UT3 pricing rules, the revised DAAU would lead to more widespread use of electric traction in the Blackwater system. The environmental impacts of this change are mixed.

On one hand, conventional air pollution along the routes of coal trains travelling between Blackwater mines and the port would be reduced by the shift to electricity. Near the port and in other built-up areas, this shift may have important health implications. Increased use of electric trains would also minimise noise in localised areas.

On the other hand, electric trains may create somewhat more carbon dioxide emissions per gtk than diesel trains. This situation occurs at the present time

because electric trains in Central Queensland rely on coal-fired electricity generation, which has a relatively high carbon intensity. Additionally, the fuel efficiency of this electricity source is relatively low because of the long-distance transmission losses.

3.6 Any other issues (Pricing Principles in 2010 Undertaking)

S120(2) of the QCA Act notes that the QCA may consider any other matter relating to the s120(1) matters that it considers appropriate. Below, I consider some of the matters that were discussed in connection with the 2010 Undertaking.

Cost reflectivity

As noted in s3.1 above, the proposed AT5 pricing is reflective of efficient long run marginal costs.

Cost transfer between users and systems

In my September 2012 report, I recommended the allocation of the equivalent of the UUP on the basis of annuitized lump sums determined separately for each mine. My preference for a lump sum was based on the fact that lump sum charges are welfare-neutral because they do not affect a mine's decision to produce more or less coal at the margin.

Since the revised DAAU allocates the UUP based on mine output, there will be some impact on each mine's output decisions at the margin. The extent of any distortion to output decisions should not be overstated, however. Mine output decisions are based on total marginal costs, of which the UUP component of the electric traction infrastructure charge is a very small part. Overall, any such distortion would probably be immaterial.

Allocation by net tonnes is probably more efficient than allocation by any other transport usage metric (such as net tonne kilometres or gross tonne kilometres, for example) since it is better aligned to ability to pay. Mine income is determined by tonnes of coal shipped to customers. This consideration suggests the superiority of using AT4, rather than AT3, as the pricing element for recovery of this cost.

As noted in my September 2012 report, the principle of charging diesel-train operating mines for some part of the electric power system cost is sound because mines on electrified lines derive a benefit from the option to switch at short notice and at low cost from diesel to electric traction should fuel price changes make it worthwhile.

Under-Utilisation Payment

If the following points are accepted:

- the UUP is required,

- all mines in the system receive some present or future benefit from electrification,
- an output-based allocator must be used if lump-sum payments are not available, and
- making a mine's allocation dependent on the electrification of its line creates a perverse incentive to resist electrification,

then given that a simple, objective rule is required, the proposed allocation by net tonnes is the best option.

Pricing limits

The pricing limits of stand-alone and incremental cost would not be exceeded by the proposed AT5 pricing or the AT4 UUP. The revenue earned by both price components combined is equal, in present value terms, to the cost of the electric infrastructure.

4 Conclusions

In this report I have reviewed the mechanics of the proposed pricing in Aurizon Network's revised DAAU. Based upon the economic analysis presented here, I conclude that the revised DAAU pricing for the Blackwater system is consistent with the requirements of the QCA Act.

In particular, I note the following points:

- Observed market outcomes and cost modelling indicate that electric traction is a lower cost technology than diesel traction for Central Queensland coal mines, provided that the utilisation of electric infrastructure is roughly on the order of three quarters or more of the maximum feasible capacity.
- The revised DAAU method of calculating AT5 represents the best available approximation of the efficient long run marginal cost of the electric infrastructure.
- The proposed pricing is therefore cost reflective, and therefore least distorting to competition in upstream and downstream markets.
- The revised DAAU would lead to significantly better electric utilisation than a continuation of the current UT3 pricing rule for AT5. This would mean a promotion of the economically efficient operation of, use of and investment in electric system infrastructure, consistent with the objects of part 5 of the QCA Act, s69E.

- Given these points, the revised DAAU would better advance the interests of end customers than a continuation of UT3 pricing.
- The revised DAAU would remove a current pricing anomaly in UT3 that benefits Blackwater diesel train operators. The removal of that benefit is unavoidable if pricing is to be made more efficient and stranding of the electric system investments is to be prevented. The fact that any UUP would only be charged at the end of an undertaking period provides scope for these operators to mitigate these impacts in the medium term.
- The proposed pricing would be consistent with the interests of the access provider as long as the QCA makes a binding ruling to ensure recovery of capitalised losses in UT4 within the UT5 period.
- The revised DAAU overcomes the pressing problems that motivated the submission of the December 2011 ETS DAAU.
- The revised DAAU overcomes most of the objections that were raised against the now withdrawn December 2011 ETS DAAU.

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