Aurizon Network Response to Review of Aurizon Network's Baseline Capacity Assessment Report

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1. Introduction

Aurizon Network submitted the 2016 System Operating Parameters (**SOP**) and Baseline Capacity Assessment Report (BCAR) to the Queensland Competition Authority (**QCA**) for approval on 21 March 2017. The QCA engaged GHD to carry out a review of the Baseline Capacity Assessment (**BCA**), as set out in the BCAR, and published GHD's Review of Aurizon Network's Baseline Capacity Assessment Report (the **GHD Report**) on 1 March 2018 for stakeholder comments.

Aurizon Network notes the GHD Report confirmed that the basis and the outcome of its capacity assessment is appropriate and recommended that the QCA accept the BCA.

There are however five areas where the GHD Report identified differences between Aurizon Network's approach in the BCA and GHD's recommendations for future Capacity Assessments. This submission comments on those areas, specifically:

- Goonyella and Newlands Available Capacity;
- Use of contracted parameters where there are differences in the contracted and physical systems;
- Use of contracted parameters for unloading time at port;
- Use of 12 separate monthly simulations for accuracy; and
- Impact of the warmup period for the model.

2. Goonyella and Newlands Available Capacity

2.1 BCAR Methodology

Aurizon Network use a range of analysis techniques to determine the capacity of the Network. The Available Capacity reported is determined based on calculating Existing Capacity using analytical (or static) methods. Committed Capacity is modelled using a dynamic simulation method. Available Capacity is the difference between the two. Available Capacity is reported for information purposes but is not used in relation to the assessment of specific access requests.

If a specific access request is received, the ability of the network to provide sufficient capacity for the additional demand is modelled using dynamic simulation techniques, to provide the requestor with a detailed understanding of the available capacity or the need to provide additional capacity for the demand.

2.2 Consultant's review of the BCAR

The GHD Report states that Aurizon Network's determination of Available Capacity for Goonyella and Newlands systems is conservative.

2.3 Aurizon Network's View

Aurizon Network do not consider that the utilisation parameters used for the calculation of available capacity are conservative when compared to industry and academic sources as discussed below. Further, based on its experience as a network operator, Aurizon Network considers the parameters used are prudent in relation to the reliable delivery of train services.

2.4 Clarification of Available Capacity

Aurizon Network has considered the academic research and practical applications associated with the determination of the relationship between absolute (or theoretical) capacity and existing (or practical) capacity. It considers these in determination of the utilisation parameter applied to static modelling to assess available capacity.

In particular, Aurizon Network has considered the relationship between the amount of theoretical capacity that is planned to be utilised and the resulting reliable delivery of train services. The relationship is noted in *An Assessment of Railway Capacity by M. Abril, F. Barber, L. Ingolotti, M.A. Salido, P. Tormos, A. Lova* below:

> "*A clear distinction should be made between theoretical and practical capacity (see Figure 39). Practical capacity is a more realistic measure of railway capacity, which takes into account reliability and operational aspects. Clearly, there is a trade-off between capacity and reliability/robustness. In other words, between the physical maximum" level of capacity and the economically optimal" level of capacity. This issue is a key point in operational management. However, there are no clear standards about how this trade-off can be modelled. It requires in-depth analysis to model railway reliability and to standardize the desired levels of robustness.*
>
> *Railway managers know that scheduling as many trains as theoretical capacity is not viable. However, they must make the best use of the expensive railway infrastructures. For this purpose, the application of simulation methods seems to be a convenient way to evaluate the trade-off between capacity and reliability. However, an in-depth analysis using simulation methods must be done to obtain practical capacity measures."*

With regard to the various documents quoted in the GHD Report, care needs to be taken when assessing and comparing utilisation parameters as the method of calculation and the inclusions and exclusions vary.

To compare utilisation parameters it is important to consider whether the capacity required to be consumed for maintenance and infrastructure capital renewals is part of the consideration in the quoted utilisation parameter.

- In the case of metropolitan passenger rail systems these generally do not operate 24 hours per day and maintenance and renewals work is conducted during the shutdown period, hence the assessment of utilisation is based on the period of train operation and no allowance for maintenance is included. This is almost certainly the case with respect to the reference *Melbourne Metro, 'Better signalling = more trains. How moving block signalling could boost capacity across Melbourne's rail network'.*

- In the case of *ARTC's 2016-2025 Hunter Valley Corridor Capacity Strategy,* it is clear in this document that ARTC apply the utilisation factor of 65% then subsequently apply a further allowance for maintenance work. This is the reverse of Aurizon Network's approach where the allowance for planned maintenance is removed first.

- The reference *A Delay Estimation Technique for Single and Double-Track Railroads* deals with the development of an analysis technique. The quoted utilisation figure of 80% is a theoretical input factor used in testing the developed analytical model and does not bear any relation to achievable levels of utilisation.

- Similarly, the reference *Analyzing the theoretical capacity of railway networks with a radial-backbone topology* is a theoretical methodology development proposed for passenger type networks. The reference to 60 to 75% does not include requirements for planned maintenance and renewals, as is illustrated in the chart figure 1 of the referenced paper.

In fact, in the majority of the references cited in the GHD Report a practical capacity utilisation of 60% to 75% is quoted, however it is unclear in a number of these whether maintenance is included. Given Aurizon Network's planning values are 59.5% to 63.75% which includes consideration for maintenance and renewals activities, Aurizon Network does not agree that its determination of Available Capacity is conservative.

3. Use of contracted parameters where there are differences in the contracted and physical system

3.1 BCAR Methodology

Where there are Access Agreements in place that utilise infrastructure that has not been constructed Aurizon Network performs simulations on the assumed parameters of that infrastructure. This can apply equally to Private Infrastructure or Network expansions.

3.2 Consultants review of the BCAR

The GHD Report notes that Aurizon Network's dynamic modelling reflects contracted parameters where these differ from the physical system, and states that it should reflect what exists in practice at critical supply chain interfaces. This appears to advocate that only infrastructure that is constructed is considered within capacity assessments.

3.3 Aurizon Network's View

As the Capacity Assessment is a forward-looking analysis it is a requirement to include planned infrastructure enhancements, including expansions and private infrastructure. If the analysis was not to include these components it would not meet the requirements of a Baseline Capacity Assessment as detailed in UT4 clause 7A.4.1(b)(iv)(B)(1), which requires an assessment of Capacity including Planned Capacity which is defined within the Access Undertaking to include *"the additional Train Paths (calculated on a Monthly and annual basis) that is expected to result from an Expansion that Aurizon Network is contractually committed to construct."* Similarly, where capacity is contracted on the basis that it will only be railed once private infrastructure is constructed (e.g. a load out), it makes sense to model that capacity as if that infrastructure had been completed. To do otherwise would be inconsistent with both the practical and contractual position.

4. Use of contracted unloading time at port

4.1 BCAR Methodology

Aurizon Network described in the System Operating Parameters the approach used to model interfaces with other elements of the supply chain and how this approach aligns with the requirements of the Undertaking. Section 1.3.1 of the SOP states

"Aurizon Network has, when developing the System Operating Parameters, in line with clause 7A.5(b)(iii), sought to be consistent with the assumptions affecting the Baseline Capacity Assessment. This approach requires that in conducting its capacity analysis Aurizon Network must include:

> *"(iii) consideration of the following factors:*
>
> *(A) The terms of Access Agreements relating to Train Services operating in each Coal System; and*
>
> *(B) The interfaces between the Rail Infrastructure and other facilities forming part of, or affecting, the relevant Supply Chain…"*
> *(clause 7A.4.1(b)(iii)).*

Consistent with the Undertaking Aurizon Network has developed its System Operating Parameters to align with contractual commitments to its access holders. These contractual parameters provide an objective basis for the development of the SOPs, as Aurizon Network and each of its access holders are committed to these metrics.

The key interface metrics recorded in Access Agreements, and which are used in the generation of the System Operating Parameters include:

- *number of Train Service Entitlements (TSEs) required;*
- *the time taken for trains to traverse sections of the network (Section Run Times or "SRTs");*
- *the time at interface locations (load and unload times); and*
- *how rail operators will operate on the network – supported by Operating Plans."*

This approach ensures that the simulations performed are aligned to the obligations between Aurizon Network and the Access Holder with respect to Supply Chain interfaces where those are stated in Access Agreements. This enables the outcomes of the simulation to be able to be used to determine whether or not there is sufficient capacity on the CQCN.

4.2 Consultants review of BCAR

The GHD Report set out that:

"*While Aurizon Network's approach reflects a condition specified in Access Agreements, Access Agreements in this respect, do not reflect what is expected to occur on a day-to-day basis but reflect, commercially, the maximum time threshold in which a train should be at the port (see Standard Access Agreement Definitions, page 10).*

The act of assuming the worst-case scenario for port times (given that these intrinsically determine the outturn rate of the coal supply chain), while modelling rail components in a more realistic and efficient manner can only serve to

make rail operations 'appear' better than perhaps really occurs. It also fails to meet clause 7A.5(b)(iii)(b)[1] of the Access Undertaking."

In this regard, Aurizon Network submits that the GHD Report:

- has suggested delinking the commercial terms in Access Agreements from the assessment of capacity which in Aurizon Network's view is inappropriate and inconsistent with clause 7A.4.1(b)(iii) of the Undertaking;
- incorrectly deduces that Aurizon Network is simulating the worst-case performance of port interfaces;
- incorrectly concludes that simulation of the worst-case performance of port interfaces makes rail operations appear better than reality; and
- wrongly concluded that Aurizon Network has not met clause 7A.4.1(b)(iii) of the Undertaking

4.3 Aurizon Network's View

The primary reason for Aurizon Network to perform Capacity Assessments is to determine if there is sufficient capacity to support the Access rights of Access Holders and Access Seekers in line with the obligations and conditions provided for in the agreements. The outcomes from these Capacity Assessments are also used to provide information to Access Holders and Access Seekers regarding the capacity of the Central Queensland Coal Network.

If Aurizon Network were to delink the Capacity Assessment from the commercial terms set out in Access Agreements, this could lead to scenarios where the performance of other access holders outside of their contract would impact the ability of Aurizon Network to either contract capacity or provide capacity in line with our obligations. These scenarios are illustrated in Table 1 below.

Table 1

Scenario	Description	Outcome
Existing customers are performing better than contract	Unload times at port have been better than contracted due to the speed port operator has been running belts to stock piles. This decreased load time is incorporated into Capacity Assessments and access is granted to an Access Seeker on the basis of these decreased unload time. The port operator recognises that operating the belts at this speed is degrading the asset and introducing reliability issues and reverts to unload times in line with their obligations with customers. When this change occurs, the contracted capacity can no longer be met with Aurizon Network identifying this through the Capacity Assessment report.	*Over contracting*
Existing customers are performing worse than contract	Unload times at port have been worse than contracted due to coal type issues from a particular mine. An increased unload time is incorporated into the Capacity Assessment leading to a Capacity Deficit being identified. An Access Seeker participates in an Expansion to provide the Capacity required to support their access. When the first mine resolves the coal issues unload time reverts to contract and subsequent Capacity Assessments identify that the expansion was not required.	*Unwarranted Expansion*

[1] We believe that the Consultant intended to reference 7A.4.1(b)(iii)(b) as there is no section 7A.5(b)(iii)(b) in the Undertaking

Scenario	Description	Outcome
	Unload times at port have been worse than contracted due to coal type issues from a particular mine. An increased unload time is incorporated into the Capacity Assessment leading to a Capacity Deficit being identified. An Access Seeker is unwilling to participate in an Expansion and does not develop their mine. When the first mine resolves the coal issues, unload time reverts to contract and subsequent Capacity Assessments identify that there is Capacity available for subsequent Access Seekers who contract that capacity.	*Capacity not contracted*

For clarity, Aurizon Network supports changes to interface parameters (such as load and unload) in Capacity Assessments when parties are willing to change contracted parameters in the relevant agreements. Aurizon Network supports trials at ports to enable this to occur and incorporates these changes into the relevant Access Agreements when it is agreed that the performance at the interface is such that these changes would be supportable on a sustained basis.

4.3.1 The effect of port performance on rail capacity

Section 5.1.2 of the GHD Report states that "*If the concept of maximum times at an unloading facility form part of Committed Capacity, and are significantly above average for whatever reason, the impact is that Available Capacity would be artificially under-estimated.*"

Aurizon Network does not agree with this hypothesis. To clarify, the effect of a longer port time compared to a shorter one is an increase in train cycle time. This may affect the number of train consists required but does not affect the number of train paths consumed (Committed Capacity) nor the Existing Capacity, therefore there is no effect on Available Capacity

The GHD Report states that Aurizon Network's modelling of the contractually provided parameters for unloading time at port is assuming the worst-case scenario, and may result in making rail operations appear better. Aurizon Network does not agree, as it models the contractually provided parameter rather than the worst case. Further, the effect of longer port times is to increase train cycle times thus affecting the number of train consists required. More consists lead to higher system congestion hence having a negative effect on rail capacity, not a positive one.

4.3.2 Compliance with clause 7A.4.1(b)(iii)(b)

Aurizon Network does not agree that the use of contracted times does not meet the requirements of 7A.4.1(b)(iii)(b). When considering the Terms of Access Agreements and the interfaces to the CQCN, in cases where the terms of Access Agreements specify interface metrics, including the contractual load and unload parameters, these provide an objective basis for the development of Capacity Assessments, as each of Aurizon Network and its access holders are committed to these metrics.

4.3.3 Proposed UT5 System Capacity Assessments will provide an opportunity to assess actual unload times

Aurizon Network developed a collaborative position with stakeholders during the UT5 process to undertake System Capacity Assessments. The proposed System Capacity Assessments would incorporate historic values for a range of parameters including load and unload times. The collaborative position was agreed to with Queensland Resources Council (**QRC**) and Pacific National and the QCA has supported this position in their UT5 Draft Decision.

Aurizon Network has set out relevant extracts from the QRC, Pacific National and Aurizon Network submissions made during the UT5 collaborative submission period in March 2017 below.

QRC Collaborative position

"Aurizon Network has agreed to commit to undertake a system capacity assessment for information purposes under UT5 on a regular basis. The purpose of the system capacity assessment is to provide a more realistic measure of capacity by assessing the capacity of the network as an integrated element of the entire supply chain from mine to port.

Unlike the general capacity assessment required under UT4 (and under UT5), the system capacity assessment will be modelled based on assumptions developed having regard to:

(a) reasonable requirements in respect of maintenance and repair of each element of the supply chain (including loading facilities, load out facilities and coal export facilities);

(b) reasonably foreseeable delays or failures occurring in the relevant supply chain (including mine, port and rolling stock associated losses);

(c) the supply chain operating mode; and

(d) such other assumptions as are agreed between Aurizon Network and any supply chain group for the relevant coal system.

In this way, the system capacity assessment is intended to be modelled based on reasonable and real life forecast assumptions rather than contractual requirements (as is Aurizon Network's current process). The QRC considers this information will be invaluable in the context of existing contracting practices and future planning processes for the supply chain as a whole. The QRC has agreed to depart from its position in respect of the effect of the system capacity assessment as put forward in the QRC February Submission, to instead agree that the system capacity assessment will be undertaken for information purposes only. The QRC considers this will allow all stakeholders to participate openly in developing a system capacity assessment without the fear that such an assessment will impact negatively on existing contractual obligations or future contracting rights. The QRC's revised drafting is set out clause 7A.4 of annexure 5 and annexure 6."

Pacific National:

"7A.4.3 System Capacity Assessment Substantial drafting changes to require Aurizon Network to provide an annual supply chain capacity review for information purposes only.
Pacific National accepts these proposed changes."

Aurizon Network collaborative position

"Aurizon Network has agreed to undertake an annual assessment of system capacity (essentially, supply chain capacity) for each coal system. Aurizon Network has agreed to undertake this System Capacity Assessment on the basis that it will be for information purposes only for the benefit of Access Holders and Access Seekers (and their respective Customers and Train Operators), is not subject to expert review and will not result in any consequence for Aurizon Network in the event that a supply chain capacity deficit is identified in the System Capacity Assessment. Aurizon Network considers this position is appropriate given that Aurizon Network does not control elements of the supply chain other than its below rail infrastructure, and hence should not be penalised in the case of deficit which is outside its control.

This measure is volunteered by Aurizon Network to provide clarity in relation to supply chain capacity, assist in identifying supply chain bottlenecks and promote industry discussion on how best to address these."

Agreed drafting (new clause 7A.4.3) is provided in Appendix 1."

5. Use of monthly simulations for accuracy

5.1 BCAR Methodology

Aurizon Network simulates and reports on each month on an individual basis, i.e. twelve separate monthly simulations. This is undertaken on the basis that it aligns with the monthly TSE requirements and enables the modellers to vary above rail asset availability to meet the operational conditions in that monthly period.

5.2 Consultants review of BCAR

The GHD Report states that "*the process of modelling monthly will result in a lack of continuity that will not capture congestion issues"*, inferring that Aurizon Network should implement a continuous 12 month modelling process.

5.3 Aurizon Network's View

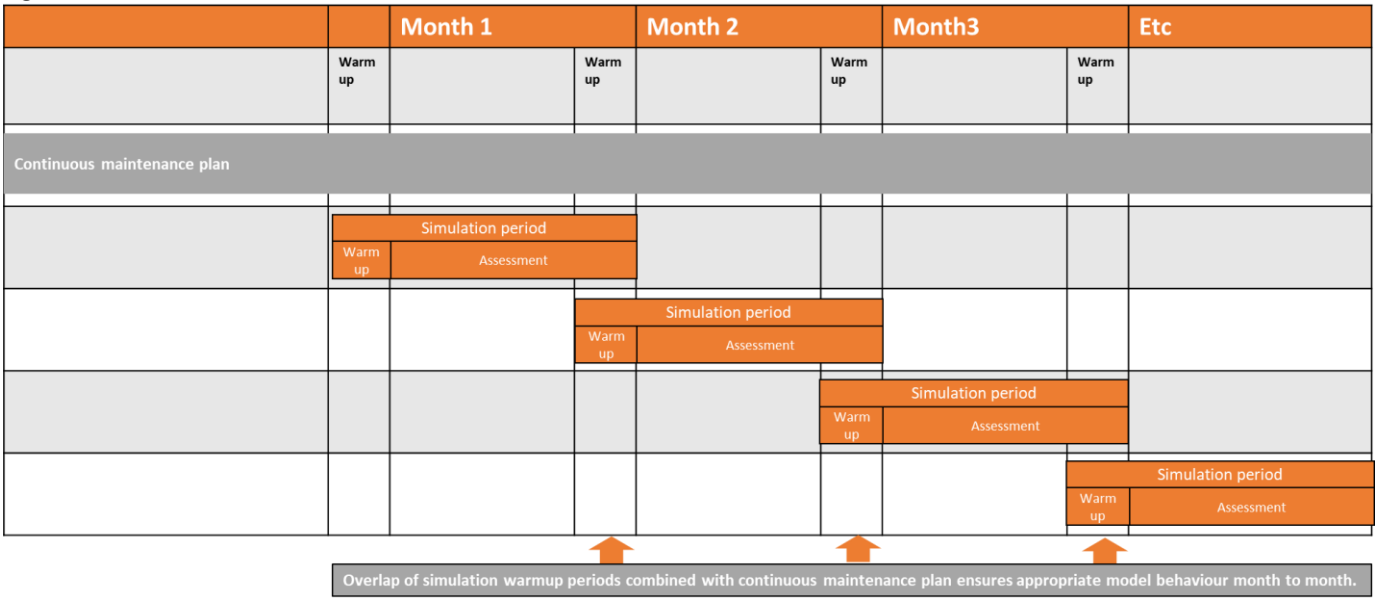
Simulation of individual months is appropriate as ongoing events are captured.

Aurizon Network carried out a 12 month continuous simulation for the BCA to test the difference between the two approaches. A shortcoming of the 12 month continuous process with the available modelling process is that the number of train consists assigned cannot be varied from month to month, as is the practice in actual operations. The analysis carried out indicated that the overall results between the two approaches were very similar, however the monthly process was more accurate due to the train consist quantity issue.

GHD were provided with the results of the continuous 12 month model in order to provide them with the data to carry out a comparison between the two modelling techniques, however this analysis is not reflected in the GHD Report.

The GHD Report infers that there may be incidents and events that pass from month to month that are not captured in the simulation model. To clarify, simulation of individual months does capture ongoing events. In particular, the maintenance plan used in the BCA covers a 12 month period, hence provides continuity to a 12 x 1 month model. The warmup periods overlap into the previous month, hence any congestion effect created by maintenance activities will develop in the warmup period and continue into the analysis period, as detailed in Figure 1 below. This approach applies for other factors that may have a longer impact such as speed restrictions and Day of Operations losses.

Figure 1



In summary, Aurizon Network considers that the process of using monthly simulations is the most accurate means of capacity assessment within the bounds of the current simulation tools, and has confirmed that the concerns raised in the GHD Report do not occur by comparing both modelling techniques. This information has been provided to GHD.

6. Impact of the warmup period for the model

6.1 BCAR Methodology

Aurizon Network utilises a 7 day warm up period to distribute above rail assets through the supply chain ahead of the simulation period.

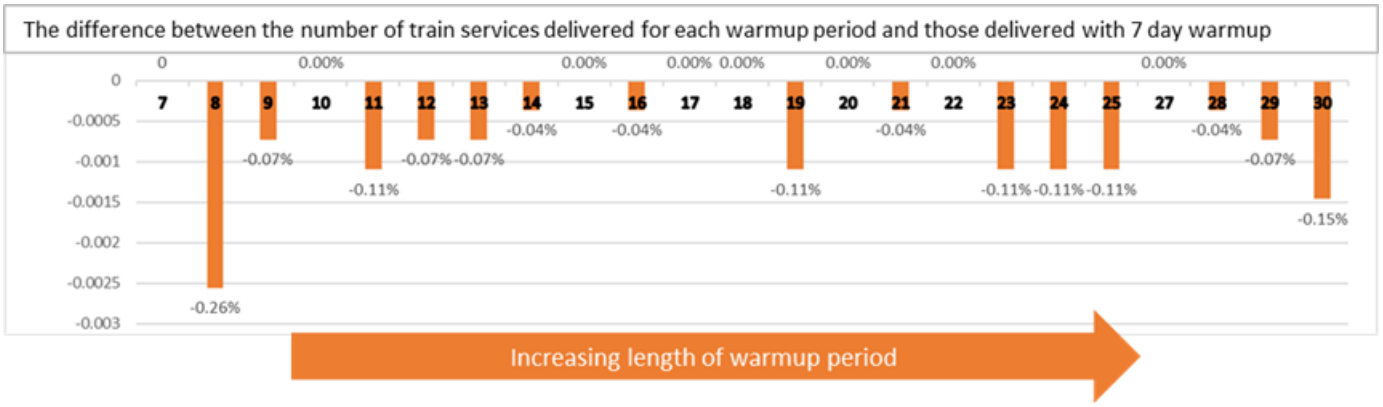
6.2 Consultants review of BCAR

The GHD Report considers this warmup period to be insufficient, and recommends a 30 day warmup period, "*to at least reflect how TSEs are contractually provided (i.e. on a monthly basis) to access holders.*"

6.3 Aurizon Network's View

Aurizon Network performed an analysis to compare the outputs of simulations run with warmup periods from 7 to 30 days and with the results as illustrated in Figure 2 below provided to GHD.

Figure 2



The results indicate that there is insignificant change in results for warmup periods longer than 7 days, and demonstrate that stability is achieved in 7 days with no material difference in the throughput achieved for all warm up periods.

For clarity, when the warm up period is running all of the normal constraints in operation are applied within the simulation. This includes Day Of Operations losses, speed restrictions and maintenance activities.

Aurizon Network does not agree that there is any relationship between how TSE's are provided (i.e. monthly) and the length of the warmup period. Given that analysis does not indicate any benefit of improved accuracy associated with using a 30 day warmup period Aurizon Network considers that the additional time and expense associated with implementing this recommendation is not warranted.