AUSTRALIAN RAIL TRACK CORPORATION LTD

APPLICATION TO VARY THE 2011 HUNTER VALLEY COAL NETWORK ACCESS UNDERTAKING TO PROVIDE FOR THE ADOPTION OF THE FINAL INDICATIVE SERVICES AND CHARGES IN ACCORDANCE WITH SECTION 4.18(B)

SUPPORTING DOCUMENTATION

January 2014

TABLE OF CONTENTS

TABLE OF FIGURES & TABLES

EXECUTIVE SUMMARY

CONTEXT

Terms used in this supporting document are as per the definitions in ARTC's Hunter Valley Coal Network Access Undertaking accepted by the Australian Competition & Consumer Commission (**ACCC**) on 29 June 2011 and varied on 17 October 2012 (**HVAU**) unless otherwise obvious from the context.

The HVAU provides for access by Coal Trains to the Network. Pricing for access is by way of published prices for an indicative service, with prices for non-indicative services determined with reference to the price for the indicative service and incremental cost and capacity impacts.

At the time of commencement of the HVAU, insufficient information was available to definitively establish the indicative service specification and an Interim Indicative Service and later, an Initial Indicative Service, were specified. The Final Indicative Service (**FIS**) is intended to be the configuration of Hunter Valley Coal Train services which delivers the optimum utilisation of Coal Chain Capacity, given certain System Assumptions.

HVAU Section 4.18 sets out the process for the determination, approval and implementation of the FIS. The proposed characteristics of the FIS are to be developed in consultation with the HVCCC, Access Holders and Train Operators. In addition, ARTC is required to submit to the ACCC the Final Indicative Access Charges (**FIAC**) relating to the FIS.

HVAU Section 4.18 also requires ARTC to consult with the HVCCC, Access Holders and Operators on whether gross tonne kilometres (**gtkm**) is the appropriate pricing unit to encourage efficient utilisation of Capacity and, if ARTC considers that gtkm is not an appropriate pricing unit to encourage efficient consumption of Capacity, propose an alternative pricing unit (if any).

This document sets out the process that ARTC has undertaken and the proposed FIS configuration, and consideration of gtkm as the appropriate pricing unit. This document forms part of, and is in support of, ARTC's application to the ACCC for approval to vary the HVAU to incorporate the FIS and resulting charges (**Application**).

CONSULTATION

In line with the requirements of HVAU Section 4.18, ARTC consulted with the HVCCC and other stakeholders on the determination of the FIS. As part of that consultation process, ARTC convened a Stakeholder Reference Group (**SRG**). This group consisted of 8 representatives from Access Holders, Train Operators & Terminal Operators in addition to delegates from the HVCCC & ARTC. Two other stakeholders also participated in the majority of meetings.

The SRG initially met in July 2012 where several key issues were addressed to achieve a consensus on how to progress the FIS review. The topics included;

- modelling methodology and analysis
- parameters & constraints
- basis of measurement of 'optimal'.

The SRG met a total of 4 times during the period of review with modelling updates and scenarios being presented for comment and feedback.

Following on from that consultation, once the modelling was completed, ARTC issued a FIS Consultation Paper[1] describing the issues and the modelling undertaken, giving all stakeholders the opportunity to comment on the FIS prior to a submission being made to the ACCC to incorporate the FIS into the HVAU.

Twelve parties provided written responses to the FIS Consultation Paper. ARTC has not characterised the stakeholder responses in detail in this document. However, as a background to ARTC's selection of the FIS configuration, ARTC's interpretation of the responses is that stakeholders generally opposed the adoption of an aspirational FIS for Pricing Zones 1 and 2 that could not be operated efficiently on the Network in the near term. The responses canvassed a wide range of concerns, in a number of instances reflecting the specific underlying commercial positions of the respondent. Common themes were that there was a lack of transparency in the modelling and that it was difficult to form a view without an understanding of the costs to develop the components of the coal chain to allow the operation of the proposed FIS configurations. In response to the concerns expressed, ARTC has modified its proposed FIS.

MODELLING

The determination of what train configuration delivers the optimum utilisation of Coal Chain Capacity is complex and requires 'whole of coal chain' modelling. ARTC was not in a position to carry out this modelling and was assisted by the HVCCC which did have such a capability, albeit that the modelling process had its limitations. The HVCCC model simulated the movement of coal through the coal chain from load point to ship.

Using the HVCCC model a number of train configurations were tested to determine the volume of coal that could be delivered, a key measure of efficiency. In order to define a set of configurations, ARTC considered the possible future configuration of the Network and direction of rolling stock options over the medium term. This included the possible increase in axle load, train speed, train length and structure gauge. Some of these possible changes were discounted on the grounds of pragmatism as being unlikely to occur within the foreseeable future. As a consequence of these considerations, ARTC came to the view that practical enhancements to existing constraints are most likely to occur in either increasing axle load limits or length limits. This view determined the set of train configurations to be tested.

[1] ARTC, Specification of Final Indicative Service (Efficient Train Configuration), Consultation Paper, October 2013.

The modelling considered each train configuration in two states,

- with an unrestricted shipping queue, and
- with a queue restricted to 20 ships, the so called 'demurrage neutral' queue.

ARTC and the HVCCC considered the restricted queue as the more realistic view and this state was adopted by ARTC. In all cases, the restriction of the queue lowered the total coal chain throughput.

The tests were also run with the Gunnedah Basin trains set at one of three scenarios to gauge modelling sensitivity:

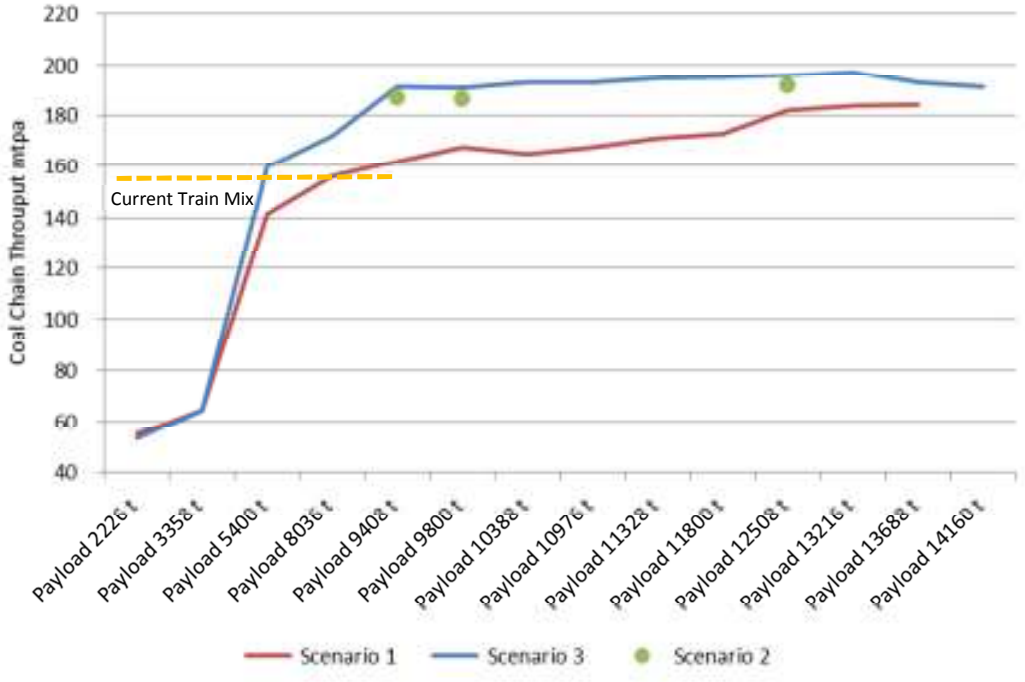
Scenario 1: all Gunnedah trains limited to the current 25 tonnes axle load (**TAL**).

Scenario 2: all Gunnedah trains at 30 TAL and held at the current length in all tests. This configuration is planned to be achieved by 2015. Scenario 2 was only tested for three train configurations to confirm intuitive expectations.

Scenario 3 axle loads and lengths for all Gunnedah trains set equivalent to the same as for central and western Hunter Valley trains (ie Pricing Zones 1 and 2).

The results of the tests for the restricted shipping queue are set out in Figure ES1. For comparison, the current mix of train configurations operating on the Network is also shown.

Figure ES1: Volumes Delivered With Shipping Queue Restricted (mtpa)



The results show large gains in Coal Chain Capacity as train payload increases until a plateau is reached for trains of 9,400 t payload and demand approaches the modelled currently contracted 208 million tonnes per annum (**mtpa**). The

modelling is very sensitive to the precise location and profile of demand. Therefore, it was not possible to reliably model how the various train configurations might perform with volumes in excess of 208 mtpa.

It should be noted that the fact that none of the train configurations delivered the full 208 mtpa is an artefact of the modelling and does not reflect any potential shortfall in capacity in reality. The results should be viewed merely as demonstrating the relative performance of the train configurations only.

ARTC is of the view that it there is a reasonable possibility that volumes will continue to expand beyond the currently contracted 208 mtpa within the medium term but is not in a position to confidently predict either the size or the location of additional volumes. If volumes do expand, it is more likely that coal hauls will become progressively longer as mines move further west and north with the exhaustion of existing mines and the commencement of new ones further afield. This suggests that the rail task will continue to increase, placing further stress on available Capacity and favouring the use of higher payload trains.

As train payload increases, for any given total volume the number of train journeys required will decrease. This has important implications for reducing Capacity enhancing requirements and forestalling expensive additional track construction to the Network.

Notwithstanding the limitations of the modelling, the HVCCC and ARTC have considered what the impact of higher volumes would have on Coal Chain Capacity and the selection of the FIS configuration. As a qualitative view only, Figure ES2 shows the anticipated range of benefits in Coal Chain Capacity that would result from the operation of the larger train sizes at volumes above 208 mtpa. This is shown as the grey cone labelled 'Potential T4 Environment'[2] and reflects the expectation that larger trains will use Coal Chain Capacity more efficiently at volumes above 208 mtpa. It must be stressed that this depiction is qualitative only and should not be taken to represent a quantitative assessment.

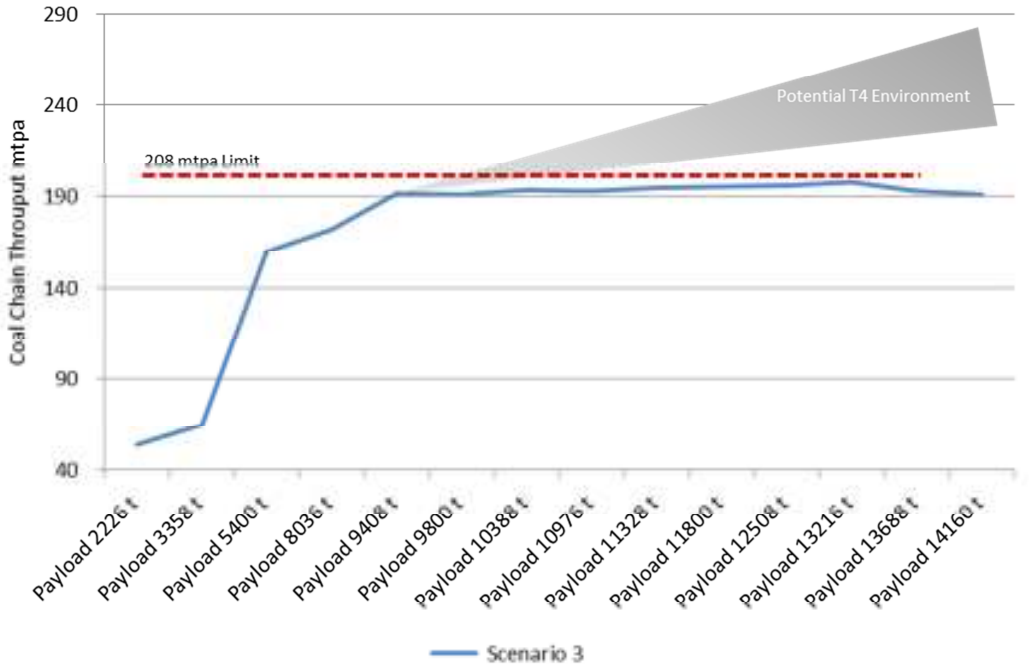
OTHER CONSIDERATIONS

Train configurations within the Network continue to evolve, successfully pushing the boundaries of train payloads. Over the foreseeable future, it can be expected that this will continue, regardless of the FIS, given the benefits to Train Operators and Access Holders from higher payload trains under appropriate circumstances.

The differentiation of access charges that arise from the adoption of the FIS seeks to provide a pricing signal that will encourage movement towards or adoption of the more efficient FIS, but the economics of other factors will compete with this pricing signal. ARTC cannot influence those other economic factors. Nevertheless, providing a signal that encourages movement towards or adoption of the FIS will be one step towards promoting efficient use of Coal Chain Capacity.

[2] T4 is a reference to the 4th export coal terminal at Newcastle that will need to be built to expand volumes beyond 208 mtpa.

Figure ES2: Indicative Benefit Beyond 208 mtpa



Given the results of the modelling and the indication that higher payloads would be increasingly beneficial as volumes rise beyond current contract levels, ARTC initially chose, and recommended in the FIS Consultation Paper, FIS configurations based on payloads that could not be efficiently operated on the Network currently. These configurations would have required increases in axle loads and/or train length and were designed to encourage development of the Network and potentially other Coal Chain infrastructure in either or both of these directions.

FIS CONFIGURATION

Taking into account stakeholder concerns about the choice of an aspirational FIS, ARTC has decided to adopt the configuration of the current Initial Indicative Service for the Pricing Zone 1 and 2 FIS, i.e. a train of 30 TAL, 96 wagon and maximum length of 1,543 m. This train is capable of servicing most load points throughout Pricing Zones 1 and 2, noting some mine specific hauls rely on infrastructure not capable of sustaining 30 TAL operations and/or length requirements.[3] As can be seen in Figure ES1, this configuration of payload 9408t, is at the point at which the effect on Coal Chain Capacity plateaus as modelled under the current 208 mtpa contractual limit.

For Pricing Zone 3, ARTC has chosen a configuration of 30 TAL, 82 wagons, payload of 8,000 t and maximum length of 1,330 m. The Network is planned to be able to accept trains to all load points in this configuration in Pricing Zone 3 by the end of 2014. Note that the Pricing Zone 3 train configuration will be priced in Pricing Zone 1 as a variation to the Pricing Zone 1 FIS.

[3] See Table 6 in the main body of the document for a list of hauls not capable of operating the FIS.

Table ES1: Proposed Characteristics Of The FIS (Indicative Services)

Segments	Indicative Service Characteristics
In Pricing Zone 1	
Indicative Service 1	30 tonne maximum axle load 60 kph maximum speed (loaded) 80 kph maximum speed (empty) 96 wagon train length 1,543 metres maximum train length section run times as per applicable Hunter Valley standard working timetable
Indicative Service 2	30 tonne maximum axle load 60 kph maximum speed (loaded) 80 kph maximum speed (empty) 82 wagon train length 1,330 metres maximum train length section run times as per applicable Hunter Valley standard working timetable
In Pricing Zone 2	
Indicative Service 1	30 tonne maximum axle load 60 kph maximum speed (loaded) 80 kph maximum speed (empty) 96 wagon train length 1,543 metres maximum train length section run times as per applicable Hunter Valley standard working timetable
In Pricing Zone 3	
Indicative Service 1	30 tonne maximum axle load 60 kph maximum speed (loaded) 80 kph maximum speed (empty) 82 wagon train length 1,330 metres maximum train length section run times as per applicable Hunter Valley standard working timetable

GTKM PRICING

In October 2013, ARTC issued a gtkm Consultation Paper[4] describing the issues and the modelling undertaken, giving the HVCCC, Access Holders, Train Operators and other stakeholders the opportunity to comment on whether gtkm is an appropriate pricing unit to encourage efficient consumption of Capacity prior to ARTC's Application being made.

[4] ARTC, 'Is gtkm the appropriate pricing unit to encourage efficient consumption of Capacity, Consultation Paper', October 2013.

From submissions, it seemed that the process undertaken to establish the Initial Indicative Service and the attendant differentiation in prices had alleviated earlier concerns in relation to the appropriateness of gtkm as a pricing unit to encourage efficient consumption of Capacity. The earlier concerns may have stemmed from the interim pricing prescribed in the 2011 HVAU that was not differentiated.

Following consideration of the views expressed by stakeholders, ARTC considers that, whilst there may be other pricing units that could be used that would achieve the same or similar outcome to the use of gtkm, there would not seem to be any basis upon which to conclude that gtkm is not an appropriate pricing unit to encourage efficient consumption of Capacity, nor to propose an alternative pricing unit at this time. ARTC does not consider that an alternative pricing unit would deliver any significant benefit in encouraging efficient consumption of Capacity, but would result in additional complexity and administrative and systems cost to ARTC, and the industry, as well as amendment to regulatory and contract documents requiring further consultation and negotiation.

FINAL INDICATIVE ACCESS CHARGES

In accordance with HVAU section 4.18(d) and in support of its Application, ARTC submits current estimates of FIAC to apply in 2015 based on existing forecasts with respect to costs and volumes for 2015. Estimates with respect to each FIS in each Pricing Zone are detailed in Figure ES2. ARTC reserves the right to submit FIAC for 2015 to form part of the Application following the annual review of Charges as contemplated at HVAU section 4.20.

Table ES2: Current Estimate Of FIAC

Segments	Non-TOP $/gtkm (ex GST)	TOP $/gtkm (ex GST)
In Pricing Zone 1		
Indicative Service 1	1.011	9.487
Indicative Service 2	1.020	10.603
In Pricing Zone 2		
Indicative Service 1	1.693	7.958
In Pricing Zone 3		
Indicative Service 1	1.592	11.255

The preparation of estimated FIAC for the Application has assumed that the extended Pricing Zone 3, i.e. from Muswellbrook to Turrawan Junction applied. Inclusion of the rail network beyond The Gap to Turrawan is currently under consideration by the ACCC and should the extension of Pricing Zone 3 not be approved, this is likely to have a material impact on the FIAC.

1 INTRODUCTION

1.1 Purpose

The purpose of this document is to describe the process undertaken by ARTC to:

- select the FIS
- determine the current estimates of FIAC; and
- determine whether gtkm is an appropriate pricing unit to encourage efficient consumption of Capacity.

These form the subjects of the Application. This document is in support of the Application.

The process to determine the above matters has conformed with the requirements of Section 4.18 of the HVAU (see section 1.3 below for further details).

For clarification, capitalised terms used in this this document have the same meaning as defined in the HVAU.

1.2 Context

Terms used in this supporting document are as per the definitions in the HVAU unless otherwise obvious from the context.

ARTC operates the Network in central and northern New South Wales. The economic and commercial aspects of the Network are regulated by the ACCC through operation of the HVAU. An abridged history of the development of the HVAU is provided in section 2 below for further context.

Of relevance to this document, the pricing for access to the Network under the HVAU is determined by reference to an Indicative Service. Prices are published for trains operating in accordance with the relevant Indicative Service.[5] ARTC may offer Train Paths for train configurations that vary from the Indicative Service and prices for such trains are determined through an assessment of the relative cost impact, both directly and through impacts on Capacity and Coal Chain Capacity, compared to those of the Indicative Service. (See section 8 below for a discussion on the differentiation process.)

As discussed in section 2 below, at the time of the commencement of the HVAU, modelling of the optimal train configuration for the FIS had not been completed. Such modelling is complex and requires consideration of the whole of the Hunter Valley coal chain. The Interim Indicative Services and Initial Indicative Services

[5] ARTC's application is with respect of the approval of the Final Indicative Services and Final Indicative Access Charges. Currently Initial Indicative Services (and related access Charges) apply. Prior to the ACCC approval of the Initial Indicative Services (and related access Charges), Interim Indicative Services (and related Access Charges) were in place. Where the term 'Indicative Service' is used without a qualifier, it is intended to apply to Interim, Initial and Final Indicative Services.

were implemented in the absence of appropriate modelling. Further modelling has now been undertaken by the HVCCC and additional consideration undertaken by ARTC, in consultation with others, in order to allow this paper to set out the FIS and associated FIAC, which is intended to be the train configuration that will deliver the optimum utilisation of Coal Chain Capacity, based on certain System Assumptions.

Associated with the determination of the FIAC, the HVAU requires a review of the appropriateness of gtkm as a unit of pricing for Access Charges. For the Interim and Initial Indicative Access Charges, pricing has been set on the basis gtkm and the HVAU required consideration as to whether this remained the most appropriate unit for pricing. The review is discussed in section 9 below.

1.3 Requirements Of The HVAU

HVAU section 4.18 sets out the process for the determination, approval and implementation of the FIS and FIAC and the conduct of the review as to the appropriateness of gtkm as the unit of pricing for Access Charges.

In summary,[6] within 30 months of the commencement of the HVAU, i.e. by 31 December 2013, ARTC was required to:

a) In consultation with the HVCCC, Access Holders and Operators, develop the proposed characteristics of the indicative service (i.e. the FIS) which ARTC considered will deliver the optimum utilisation of Coal Chain Capacity, given certain System Assumptions, including scenarios under which System Assumptions are also varied in addition to the Coal Train configurations.

b) Assist the HVCCC to undertake modelling to determine the FIS.

c) Develop FIAC associated with the FIS.

d) Consult with the HVCCC, Access Holders and Operators as to whether gtkm is the appropriate pricing unit to encourage efficient consumption of Capacity.

e) Once the consultation process was complete, submit an amendment to the HVAU to incorporate the FIS, FIAC and, if ARTC considered that gtkm was not an appropriate pricing unit, an alternative pricing unit to the ACCC for approval.

2 RELEVANT DEVELOPMENT OF ARTC'S HUNTER VALLEY ACCESS UNDERTAKING

The initial HVAU was lodged by ARTC on 23 June 2011 (**2011 HVAU**) and accepted by the ACCC 29th June 2011. This followed lodgement (and subsequent withdrawal) of two earlier versions of the Hunter Valley access undertaking, the

[6] A copy of the HVAU is provided as Attachment A Annexure 2 to the Application.

initial version lodged with the ACCC in 2009 (**2009 HVAU**) and a subsequently amended version in early September 2010 (**2010 HVAU**).

Each version was lodged with ACCC following substantial consultation with relevant industry stakeholders and the ACCC, resulting in significant re-engineering of many parts of initial consultation documents provided to industry in order to address industry needs.

2.1 2009 HVAU

In the 2009 HVAU, ARTC committed to the development of the Indicative Services, needed to underpin coal pricing and provide incentives for efficient utilisation of Coal Chain Capacity, but sought to recognise that the limitations of existing institutional arrangements (such as the HVCCC not being established at the time) and existing coal chain modelling may constrain development of the Indicative Services intended to represent optimal coal chain capacity utilisation in a comprehensive and effective manner. ARTC initially committed to such development when the use of the Indicative Services to represent optimal coal chain capacity utilisation and underpin pricing was formally recognised in the undertaking, and when it considered appropriate institutional arrangements and modelling were in place.

The Draft Decision[7] on the 2009 HVAU released by the ACCC reflected industry concerns in relation to the lack of process and timeframes in relation to the development of the Indicative Services. Of particular relevance, the Draft Decision provided that:

'... ARTC should clearly specify the date Indicative Service descriptions and related access charges will be proposed for consultation with industry, the date these will come into effect and the date these must be approved by the ACCC.'

2.2 2010 HVAU

Following further consultation with the industry and ACCC, ARTC revised its proposal in relation to the development of the Indicative Services to:

1) prescribe a detailed process for the development and proposal of the Indicative Services (including development in consultation with the HVCCC);

2) provide for submission of the characteristics of the Indicative Services to the ACCC for approval within 12 months of ARTC being reasonably satisfied that modelling undertaken by the HVCCC was sufficiently robust to enable an efficient train configuration that optimises Coal Chain Capacity to be accurately determined; and

3) provide for, in any event, submission of the characteristics of the Indicative Services to the ACCC for approval within 4 years of the Commencement Date.

[7] ACCC, Hunter Valley Coal Network Access Undertaking, Draft Decision, 5 March 2010, p628

The latter revisions were intended to:

a) reflect ARTC's caution in relation to the development of the Indicative Services (and associated pricing signals) before modelling existed that would enable it's accurate determination, and the risk of sending out inappropriate pricing signals as a result;

b) reflect ARTC's expectations as to a reasonable timeframe during which the HVCCC and ARTC could design and develop appropriate modelling;

c) provide the industry with a maximum timeframe for the development of the Indicative Services; and

d) reflect the ACCC's views as to what it considered to be a reasonable balance between the parties' interests at the time.

The Position Paper[8] on the 2010 HVAU reflected further concerns of stakeholders as follows:

'… interested parties expressed concern at ARTC's proposed timeframe, with recommendations that the service be determined in a shorter period, but with appropriate transitioning for parties who may have invested on the basis of the current arrangements (see further above).

In light of these views, the ACCC considers that the development of an efficient train configuration should be undertaken expeditiously, to promote the efficient use of the Hunter Valley rail network as soon as possible, as well as to encourage efficient complementary investment by parties using the network (such as investment in rolling stock). The ACCC's view is also informed by its understanding that long lead times are not required for the HVCCC to provide requisite data to ARTC to facilitate the process.

Consequently, the ACCC considers that ARTC should submit a proposed variation of the HVAU, regarding the efficient train configuration and appropriate pricing approach, to the ACCC within six months of receiving the relevant information from the HVCCC, and in any event within twelve months of the commencement of the undertaking.'

During further consultation with the ACCC, ARTC expressed its concerns with the ACCC position above, in that the timing referred to for the provision of adequate HVCCC advice could only relate to where that advice was forthcoming from existing HVCCC modelling.

ARTC subsequently confirmed with the HVCCC that existing HVCCC modelling was not sufficient to develop a configuration that represented optimal utilisation of the coal chain which considered optimisation of the coal chain as a whole, including all parts of that chain. This was ARTC's intended purpose for the development of the Indicative Services which it understood was in line with industry requirements expressed to ARTC in 2008, where pricing signals were intended to incentivise users to adopt optimal configuration across the coal chain, as opposed to one aspect of the chain based on existing constraints.

[8] ACCC, Hunter Valley Coal Network Access Undertaking, Position Paper, 21 December 2010, p135

ARTC also confirmed with the HVCCC that it would take a number of years to develop modelling that could achieve this objective.

In ARTC's view, the ACCC position would result in the development of Indicative Services that would not necessarily be consistent with optimal utilisation across the coal chain, but may result in efficient utilisation of one part of that coal chain bound by constraints placed on the coal chain by existing infrastructure limitations (such as load/unload rates) that could be incorporated in existing HVCCC modelling.

ARTC did not believe that if it were to provide for the development of the Indicative Services aligned to the ACCC position, then efficient or optimal utilisation of the coal chain as a whole, and pricing signals to deliver this, may not be the outcome.

2.3 2011 HVAU

Following further consultation with key stakeholders, supported by the ACCC, ARTC sought to agree a solution that achieved a balance between:

1) the expressed concern by the industry in relation to the timing of advice in relation to efficient utilisation of the coal chain for certainty of investment in rolling stock;

2) ARTC's concerns in relation to basing such advice on robust whole of chain optimisation modelling rather than existing HVCCC modelling; and

3) HVCCC requirements in relation to reasonable model development times.

The solution agreed between ARTC and key stakeholders is prescribed in sections 4.17 and 4.18 of the 2011 HVAU, and represents a balance between the parties' interests in that;

a) at least some guidance is provided to industry in the short term in relation to efficient utilisation of the coal chain that can inform early investment decision making;

b) it is clear that such advice is based only on existing HVCCC modelling and, as such, there are constraints on that advice in relation to optimal utilisation of coal chain capacity as a whole;

c) such advice should not necessarily be taken as an outcome of any more robust coal chain modelling, nor development of the Indicative Services; and

d) the time frame for development of the early advice is reasonable, as is the time frame allowed for development of more robust modelling.

Key stakeholders recognised that there was no guarantee that the longer term outcome (Final Indicative Services) would necessarily reflect the initial Indicative Services, and any investment decisions by stakeholders could not rely on this being the case.

2.4 2012 HVAU

In December 2011, ARTC submitted proposed characteristics for the Initial Indicative Services, and Initial Indicative Access Charges to the ACCC for approval to be incorporated as a variation in the 2011 HVAU. The proposed Initial Indicative Access Charges were intended to be updated following industry advice provided to ARTC in accordance with section 4.20 of the 2011 HVAU.

During the ACCC consultation and assessment of ARTC's proposed variation to the 2011 HVAU, the ACCC sought further information from ARTC as to the development of the Initial Indicative Services and Initial Indicative Access Charges, including information as to the direction and magnitude of differentiation of Charges in relation to Service configurations that were not Initial Indicative Services.

During the ACCC consultation, ARTC also agreed to develop and propose a set of guiding principles that it would intend to apply in determining Initial Indicative Access Charges and Charges for other Services until the Final Indicative Services were approved. These principles were intended to increase pricing transparency and certainty to a level that the ACCC considered was appropriate. These principles were set out in a subsequent revision to ARTC's application to vary the 2011 HVAU and are provided at Annexure A to this paper.

In October 2012, the ACCC approved ARTC's proposed variation to the 2011 HVAU to incorporate the Initial Indicative Services and Initial Indicative Access Charges. The approved variation also incorporated the removal of the classification of Interim Services as Indicative Services, but retained the annual review of Interim Access Charges in accordance with section 4.20 of the 2012 HVAU.

The proposed Initial Indicative Access Charges (and Charges for Interim Services and other non-Indicative Services) were published soon after the ACCC approval and applied for the remainder of 2012.

Initial Indicative Access Charges, Interim Access Charges and Charges for other non-Indicative Services to apply in 2013 were also developed in accordance with sections 4.15 and 4.20 (as applicable) of the 2011 HVAU. These Charges were determined following the principles for differentiation incorporated in ARTC's application above.

Under the 2012 HVAU, 2014 Initial Indicative Access Charges, Interim Access Charges and Charges for non-Indicative Services were reviewed in accordance with sections 4.15 and 4.20 as applicable. These Charges were determined following the guiding principles for differentiation incorporated set out in ARTC's final Initial Indicative Service variation application above.

3 FIS DEVELOPMENT

3.1 FIS Development Process

In conformance with the HVAU, ARTC worked with the HVCCC to model options for the FIS. A description of that modelling is set out in the remainder of section 3. The results of the modelling are set out in section 4.

In addition to working with the HVCCC, ARTC set up a representative group of stakeholders (the Stakeholder Reference Group or **SRG**) to participate from the early stages of the work. The SRG provided a forum in which industry could guide the work for the determination of the FIS and provide feedback on the modelling as work progressed. The SRG consisted of 8 industry representatives from Access Holders, Train Operators and Terminal Operators. The represented organisations are listed in Table 1. Idemitsu (Access Holder) and Freightliner (Train Operator) also attended the majority of SRG meetings though they were not formally members. Delegates from the HVCCC and ARTC participated in all SRG meetings.

Table 1: Membership Of The SRG

Access Holder	Coal and Allied Glencore (formerly Xstrata) HVEC (BHP Billiton) Whitehaven Yancoal
Train Operator	Asciano (Pacific National) Aurizon (formerly QR National)
Coal Terminal Operator	Port Waratah Coal Services

The relationships between the various stakeholder groups in the project are set out in Figure 1.

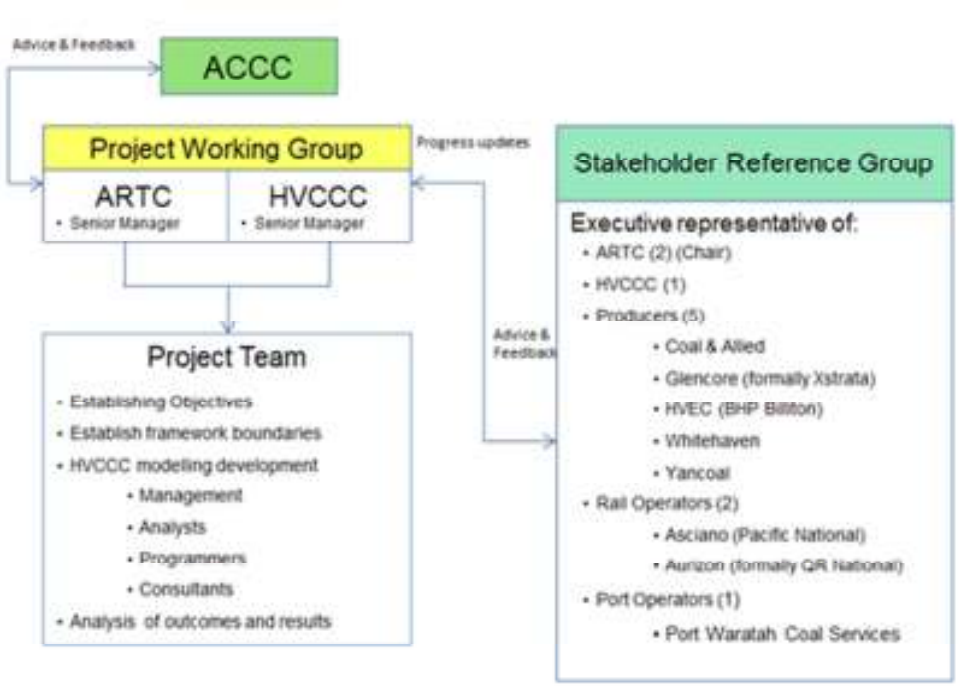
The SRG met for the first time in July 2012 where several key issues were addressed to achieve an understanding on how to progress the FIS review. The topics included:

- modelling methodology and analysis;
- parameters and constraints; and
- basis of measurement of "optimal".

The SRG met 4 times during the period of review with modelling updates and scenarios being presented for comment and feedback.

In addition, ARTC made available the minutes and presentations from these meetings to all other coal chain participants and also provided a briefing of progress at the quarterly meetings held with each Access Holder (4 in total up with each Access Holder to the point at which the FIS Consultation Paper was issued).

Figure 1: Participants In The FIS Selection Process



The modelling work proceeded from July 2012 with the HVCCC undertaking the detailed work in discussion with ARTC and guided by feedback from the SRG. By September 2013, the modelling had reached the stage where it was appropriate for ARTC to circulate the FIS Consultation Paper, describing the issues and the modelling results and seeking comments from stakeholders on the proposed FIS. The FIS Consultation Paper was issued to stakeholders in October 2013. A copy of that paper is included as Attachment E to the Application.

ARTC took account of responses from stakeholders to the FIS Consultation Paper in the formulation of the FIS configurations which are the subject of the application for amendment to the HVAU. This is discussed in sections 6 and 7 below.

3.2 Description Of Model & Assumptions

ARTC does not have the modelling tools nor the data required to carry out an analysis of whole of coal chain impacts arising from the choice of the FIS. Therefore, ARTC relied on the modelling capability of the HVCCC, to the extent that this was available, to determine the impact of various train configurations on the coal chain as a whole.

The model used to analyse the options for the FIS is managed by the HVCCC. The model is a whole of coal chain, discrete event simulation. It is a detailed model of the Hunter Valley coal chain from each load point to ship loading and despatch. The model has been used and modified over a number of years to assist the HVCCC in its long term planning role and is the best currently available tool to analyse the FIS configurations and their effects on the whole coal chain.

The primary goal of the model is to determine the maximum volume of coal delivered through the coal chain over a year, given certain assumptions about:

- the distribution of volumes (i.e. both contracted volumes of coal and the availability of coal) across the various load points throughout the system;
- the capabilities of load points, coal terminals (train discharging, stockpiling and ship loading); and
- the capabilities of the available train fleet and rail infrastructure.

The model was set up using the likely near term available infrastructure. By holding the infrastructure components constant while varying the train configuration, the model determined the variation in the volume of delivered coal, along with other metrics, such as the average length of the ship queue waiting to be loaded.

The model is capable of providing results that either allow the shipping queue to be unlimited, or to limit the queue to a certain level. The modelled outcomes without managing the queue resulted in unacceptably long queues (in some instances +100). Therefore, the model was constrained to achieve an average queue of 20 ships. This length of queue was expected to be 'demurrage neutral' and reflected a target that would achieve maximum coal chain throughput while keeping demurrage cost to acceptable levels. It is also reflective of the HVCCC's planning target queue.

ARTC interpreted the FIS as one or more configurations that would maximise coal chain capacity, as measured by the throughput of coal volume, into the medium to long term future. In particular this included train configurations not constrained by the existing infrastructure. As such, ARTC considered a broad range of train payloads and subsequently configurations. Trains that exceeded existing infrastructure capabilities, either in length or axle load were treated as though the infrastructure was capable of handling the train, i.e. it was assumed that the Network, load points and coal terminals would be modified to cater for the train requirements. This is consistent with the HVAU reference to consideration of options that required alteration to the existing System Assumptions. The FIS Consultation Paper explored why axle load and length were considered, compared to alternatives such as increasing maximum train speeds or increasing the dimensions of the structure gauge.

Note that the modelling assumed throughout that the extended Pricing Zone 3, i.e. from Muswellbrook to Turrawan Junction applied. Inclusion of the rail network beyond The Gap to Turrawan is currently under consideration by the ACCC.

3.3 Modelling Limitations

As with all models, the HVCCC capacity model has some limitations. A key limitation for the FIS work was that the HVCCC was not in a position to provide accurate modelling for scenarios beyond the currently contracted 208 million tonnes per annum (**mtpa**). The model is particularly sensitive to the locations and distributions of coal volumes among load points and without a high level of confidence of the source of coal beyond 208 mtpa, the modelled results are unreliable. To provide a model capable of dealing with a wider range of volumes

and demand profiles was beyond the available time and resources of the HVCCC. This meant that, while the 208 mtpa modelling results were informative, the model could not inform conclusions about a larger task except on an indicative basis. Such modelling exercises as have been attempted at volumes above 208 mtpa support the intuitive expectation that larger payload trains continue to deliver benefits to Coal Chain Capacity, all other things being equal.

While not a modelling limitation, the analysis took no account of the requirement for, nor cost to provide, the infrastructure necessary to allow any particular train configuration. Nor did the analysis attempt to quantify the benefit that might accrue to Train Operators, load points or Terminal Operators through the use of different train sizes; the HVCCC modelling was solely based on the coal chain delivered tonnage. It is ARTC's view that evaluation of the infrastructure and operational costs to the various Coal Chain participants is beyond the scope of the FIS evaluation as contemplated in HVAU Section 4.18 and that to undertake such work would require very substantial time and resources.

Although the modelled results are directed towards delivering a targeted 208 mtpa, none of the scenarios tested actually delivered this volume. It is important to understand that this should not be taken as predicting a shortfall in the provision of contracted tonnages. The model used in the exercise was constrained by limiting the number of train sets available in order to be able to distinguish the differences in Coal Chain Capacity delivered by the different train configurations. The model was further limited in that it was constrained to an infrastructure set that would in fact be augmented[9] to deliver the contracted 208 mtpa. Thus the modelled results should be seen as reflecting the relative performance of the train configurations only.

3.4 Description Of Scenarios

Taking into account the existing network constraints, the potential for these to be relaxed and the resulting Coal Chain Capacity benefits ARTC, in consultation with the HVCCC and the SRG, tested 15 different combinations of train size and axle load under three different scenarios specific for Gunnedah Basin trains:

1) The Gunnedah Basin network will remain at 25 tonnes axle-load (**TAL**).[10]

2) The Gunnedah Basin network will operate trains at a maximum 30 TAL, a likely near term scenario, but will remain constrained to current lengths.

3) The Gunnedah Basin network will move to the same axle load and train length configurations as the central and western Hunter Valley.

The reason for treating the Gunnedah Basin traffics separately is that the infrastructure challenges on that corridor are likely to remain different to those in

[9] This should not be confused with the previous statement that train configurations were not constrained by the existing infrastructure. In effect, the model assumed that only the existing infrastructure was in place, but that the infrastructure did not prevent the operation of train configurations that could not, in practice, operate on the current infrastructure.

[10] At the time that modelling commenced and continuing through 2013, commitment by Access Holders to 30 TAL operation in Pricing Zone 3 was uncertain and therefore there was a reasonable possibility that 25 TAL operation would remain. It is only in the last several months that ARTC was able to proceed with confidence that 30 TAL operation would be endorsed by Access Holders.

the central and western Hunter Valley in the foreseeable future (notwithstanding Scenario 3).

In order to test the ideal train size, a variety of sizes were tested from the smallest currently operating coal train of 2,226 tonne (**t**) payload through to a very large 19,352 t payload. The train sizes also incorporated a variety of different maximum axle loads and lengths.

For each test, all central and western Hunter Valley hauls (i.e. Pricing Zones 1 and 2) were assumed to use the train configuration under test. For the Gunnedah Basin 25 TAL scenario, the Gunnedah Basin trains were held at 6,150 t payload, reflecting the average of the larger 25 TAL trains currently operating. Under the Gunnedah Basin 30 TAL scenario, the Pricing Zone 3 trains were set at approx. 8,000 t payload. For the 'same axle load and length' scenario, the same train configuration as for the remainder of the Hunter Valley was used.

In practice, Scenario 2 delivered results very similar to Scenario 3 for train sizes operating at 30 TAL as scenario 2 only affected only 15% of the throughput volumes with payload difference of only 15%.[11]In order to keep the modelling task manageable, only two examples of Scenario 2 were actually modelled. These two examples conformed to the intuitive expectation that Scenario 2 performed better than Scenario 1 and only slightly worse than Scenario 3 for train sizes above 8,000 t payload.

In broad terms, train configurations were tested with increasing payloads. Once current Network infrastructure constraints are reached, trains can continue to increase in payload by increasing train length (i.e. the number of wagons per train), by increasing permitted axle-loads (i.e. increasing the payload per wagon) or a combination of these.[12] The FIS Consultation Paper discussed issues surrounding these options and the practical limitations.

The train configurations tested are set out in Table 2. Where configurations were tested with a similar payload, achieved by either increasing length or axle-load, these are designated as a (a) or (b), eg. Test 4(a) and Test 4(b) both test a payload of approx. 9,500 t. Test 4(a) increases the number of wagons to achieve the volume whereas Test 4(b) increases axle load but uses a lower number of wagons per train unit compared to Test 4(a).

[11] The difference between Option 2 and Option 3 for test configurations at 30 TAL is that under Option 2 the Gunnedah trains are held at the current maximum 82 wagon length (8,000 t payload). Thus Option 2 will perform slightly worse for test trains above 8,000 t and increasingly better for Option 3 test trains as they reduce below 8,000 t, though the results are more complex than this abbreviated and simplified explanation.

[12] Both are likely to require either higher horsepower locomotives or more locomotives.

Table 2: Description Of Scenarios

Test	# Locos	# Wagons	TAL	Wagon Payload (t)	Train Length (m)	Train Payload (t)
1	2	42	15	53	691	2,226
2	4	46	25	73	824	3,358
3	2	82	30	98	1,307	8,036
4(a)	3	96	30	98	1,545	9,408
4(b)	3	82	35	118	1,307	9,676
5	3	100	30	98	1,606	9,800
6	3	106	30	98	1,699	10,388
7	3	112	30	98	1,791	10,976
8(a)	3	116	30	98	1,853	11,368
8(b)	3	96	35	118	1,545	11,328
9(a)	3	120	30	98	1,914	11,760
9(b)	3	100	35	118	1,606	11,800
10	3	106	35	118	1,699	12,508
11	3	112	35	118	1,791	13,216
12	4	116	35	118	1,875	13,688
13	4	120	35	118	1,936	14,160
14	4	164	30	98	2,614	16,072
15	4	164	35	118	2,614	19,352

4 MODELLING RESULTS

4.1 Unadjusted Queue Results

The results for the unadjusted queue are presented graphically in Figure 2. For Tests 4(a) and (b), Tests 8(a) and (b), Tests 9(a) and (b) the results are shown as a single output for each pair (9,408 t, 11,328 t and 11,800 t payloads respectively) as, from the perspective of the model, they are effectively equivalent in terms of Coal Chain Capacity.

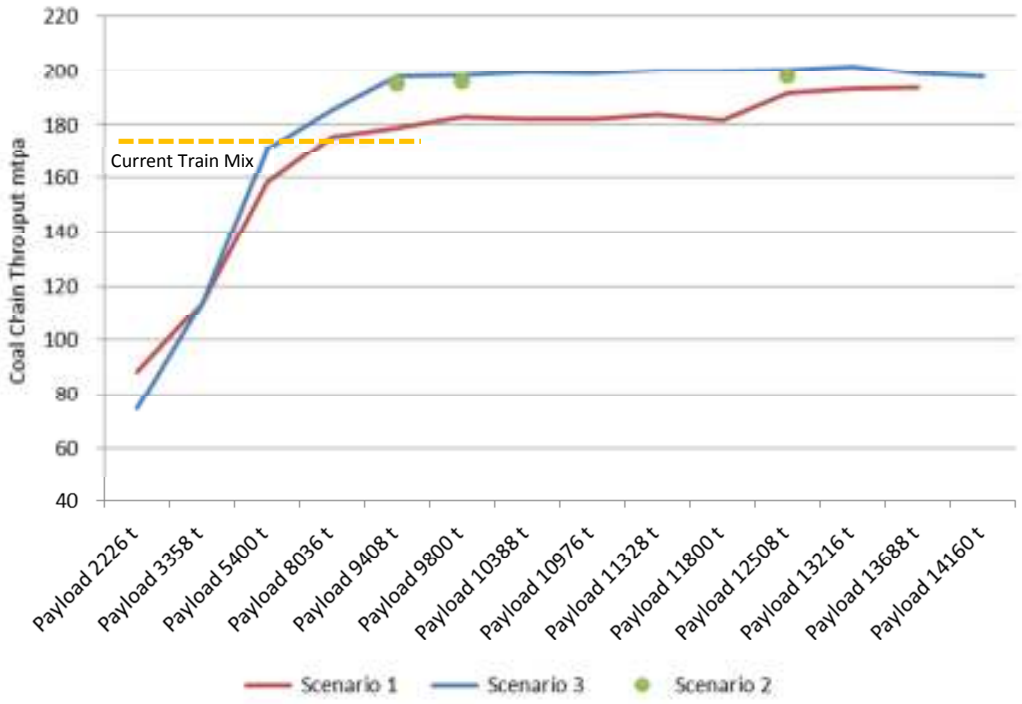
For comparison, the modelled output of the train fleet currently in operation is shown as a dotted orange line. The current train fleet is a mix of different train configurations.

It is readily apparent from Figure 2 that the efficiency of trains, in terms of delivered coal volume, increases rapidly from the small train sizes (trains of 2,226 t and 3,358 t respectively) but reaches a fairly stable plateau. In particular, gains for trains with a payload of more than 9,400 t under Scenario 3, are small. The results for Scenario 1 (Gunnedah Basin remains at 25 TAL) are very similar with a plateau being reached at the 8,036 t train and small gains arising beyond this.

The results demonstrate the large gains in Coal Chain Capacity as train payload increases up to a point. These gains are then capped as demand approaches the modelled maximum of 208 mtpa. The nature of the modelling, i.e. with a capped

volume, limits the benefits once train sizes approach the capacity to deliver the nominated task.

Figure 2: Volumes Delivered With Unadjusted Shipping Queue (mtpa)#1



#1 mtpa = million tonnes per annum

4.2 Adjusted Queue Results

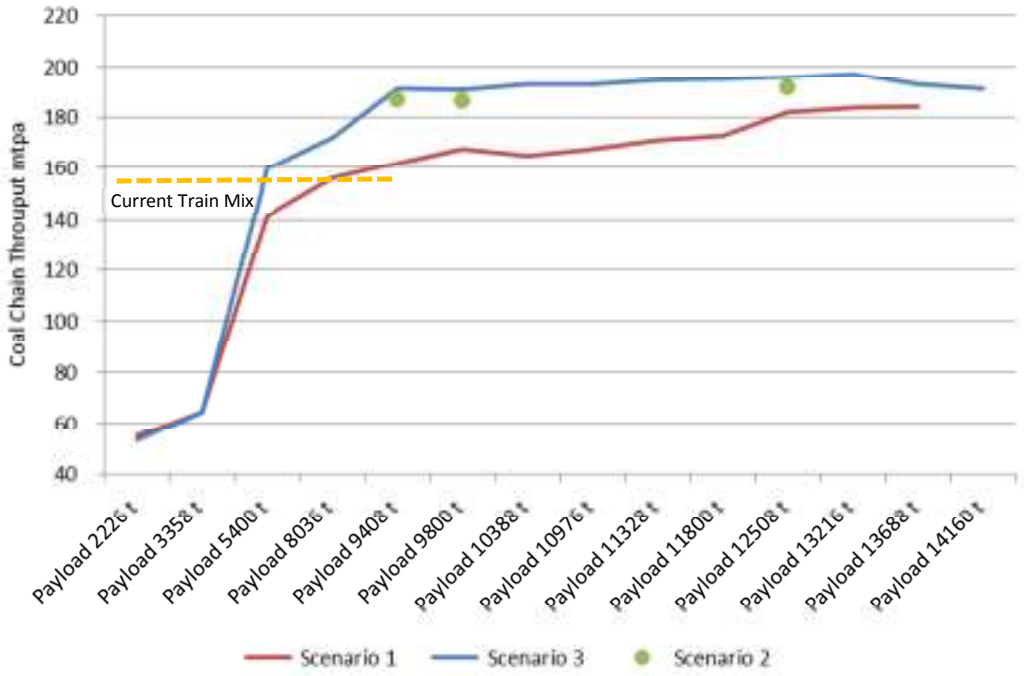
The adjusted queue scenarios restrict the shipping queue to a maximum of 20 vessels. The results for the various train sizes under this option are set out graphically in Figure 3.

Again, for comparison, the modelled output of the current train fleet is shown as a dotted orange line at 156 mtpa.

The results are similar to the uncapped queue results in the shapes of the curves, but the total volumes delivered are reduced. Again, there is a marked plateauing, driven by impact of the capping of volumes at 208 mtpa, though the train configurations above the 8,036 t train continue to deliver an incremental benefit that is larger than in the unrestricted queue case.

It is again noted that the results must be viewed as demonstrating relative rather than absolute performance, and the modelling should not be interpreted as demonstrating an inability of the coal chain to deliver the contracted 208 mtpa.

Figure 3: Volumes Delivered With Adjusted Shipping Queue (20 ships) (mtpa)



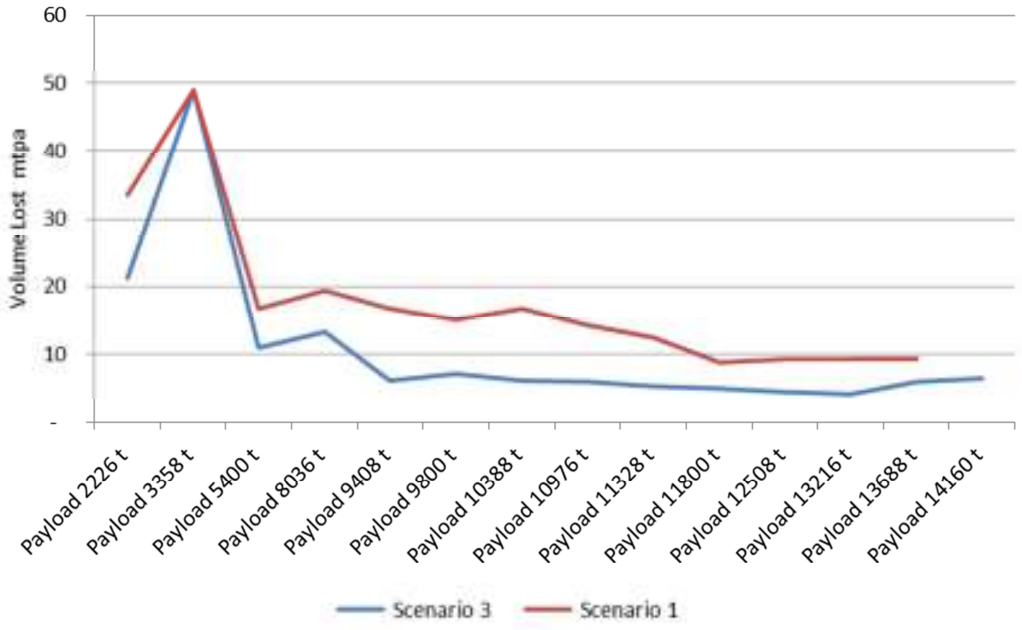
4.3 Effect Of Restricting The Queue

Restricting the shipping queue to the 'demurrage neutral' level of 20 ships results reduced total volumes achieved. Figure 4 shows the volume reductions for both Scenarios 1 and 3 for each train size as a result of restricting the shipping queue. As with the total throughput measure, this difference reduces and then plateaus as train sizes increase for both options. The difference between the capped and uncapped queues is roughly half for Scenario 3 compared to Scenario 1.

Figure 4 demonstrates that using either the capped or uncapped shipping queue will not significantly bias the choice of train configuration.

ARTC adopted the Restricted Queuing modelling outputs.

Figure 4: Difference Between Unrestricted & Restricted Queuing By Train Configuration, Scenarios 1 & 3 (mtpa)

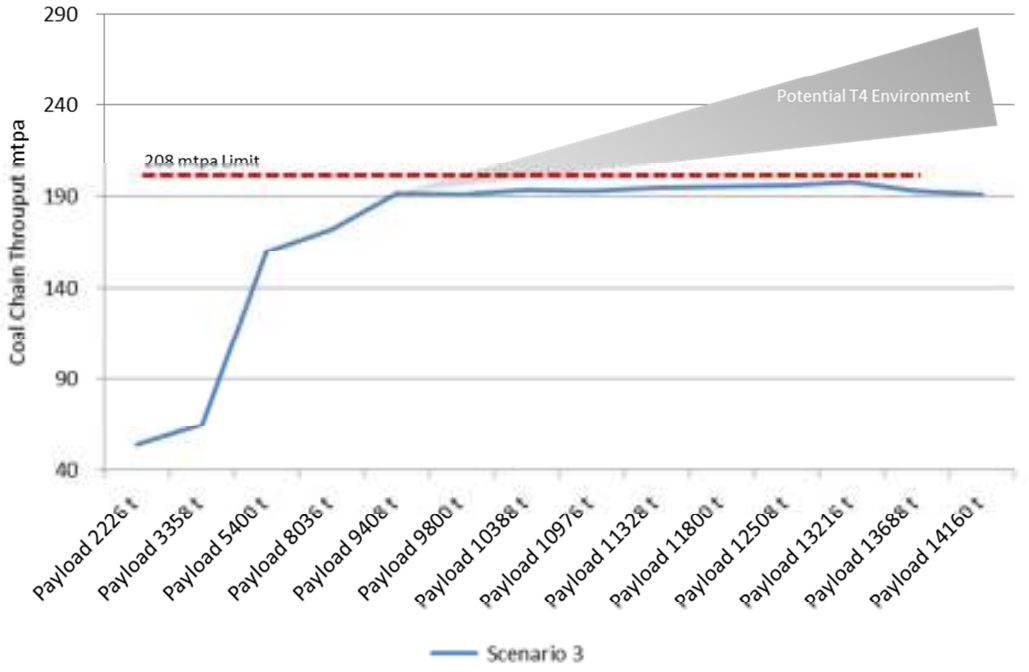


4.4 Beyond 208 MTPA

Notwithstanding the inability to currently model beyond the contracted 208 mtpa with any precision due to uncertainty as to the location and distribution of additional volumes, the HVCCC attempted to model the effect of different train sizes at higher volumes on an indicative basis. While there is insufficient confidence in the value of this modelling for it to be published, it did tend to confirm the intuitive expectations and inferences drawn from the 208 mtpa modelling, ie that larger train sizes, supported by appropriate infrastructure, will continue to increase Coal Chain Capacity as volumes increase.

Figure 5 attempts to show, in qualitative terms only, the anticipated range of benefits in Coal Chain Capacity that would result from the operation of the larger train sizes at volumes above 208 mtpa. This is shown as the grey cone labelled 'Potential T4 Environment'. It must be stressed that this depiction is qualitative only and should not be taken to represent a quantitative assessment. It should also be noted that the grey cone increases in size as an attempt to reflect the potential zone demand impacts, ie a high or low range of throughput results dependant on the source of this coal.; again this is provided for illustrative purposes only.

Figure 5: Indicative Benefit Beyond 208 mtpa



It is ARTC's view that the modelling of volume demand profiles greater than 208 mtpa, were this capable of being down with confidence, would show a continuing benefit from adopting larger train payloads. The existing 208 mtpa modelling is suggestive that this would be the case but this support is only by inference rather than being directly observable from modelling over which the HVCCC has confidence. The 'indicative' modelling beyond 208 mtpa also supports this view.

ARTC's view is also supported by the intuitive benefits to capacity that arise from the operation of fewer trains on the Network for any given volume. As long as the train is sufficiently powered to maintain scheduled speed and is capable of efficiently refuging (i.e. it is able to fit within locations where it is required to cross or pass other trains), and its payload and length do not exceed the capabilities of loading and unloading infrastructure, then it will consume less overall track capacity than a smaller payload train for any given level of volume.

In the FIS Consultation Paper, ARTC adopted two aspirational train configurations partly on the likelihood that volumes will continue to expand beyond 208 mtpa. However, in saying this it is recognised that within the constraint of the current contracted volumes, the 208mtpa capped modelling outputs were appropriate and provided the best available data for determination of the FIS.

4.5 Scenario Selection

ARTC has adopted Scenario 3 for all modelled outputs, as this reflects the value of all trains operating in each test configuration. Scenarios 1 and 2 make assumptions about the Gunnedah trains as constant values and therefore test something other than the relative performance of one configuration compared to the FIS.

5 DETERMINING THE FIS

The existing Initial Indicative Service of 96 wagons with a payload of 9,400 t, was chosen on the basis of modelling by the HVCCC. It was the largest (in both number of wagons and payload) and most efficient train generally capable of operating on the Network, given existing rolling stock at the time, in accordance with the parameters defined by the HVAU. Since the adoption of the Initial Indicative Service, Train Operators have successfully tested a train of 100 wagons with a payload of 9,800 t. At 1,606 m, this train is at the limit of train lengths capable of operating on the Ulan line west of Mangoola.[13]

One Access Holder and its Train Operator are currently investigating the operation of a 110 wagon train of 10,700 t payload. This train could only operate on a restricted number of hauls east from Mangoola to the port due to the constraints imposed by the rail infrastructure on the Network, at some coal terminals and at load points. Yet for those hauls where this configuration could operate, it would be highly efficient for the individual Access Holders and/or Operators, delivering a 14% payload benefit over the existing Initial Indicative Service.

This latter example demonstrates the difficulty in trying to 'tie down' a particular train configuration as the one to which the coal chain should aspire, given the propensity for Operators to, quite appropriately, continue to 'push the envelope' to achieve operational efficiencies. It is also a demonstration that what may be most efficient for the coal chain as a whole may not necessarily be the most efficient for any particular Train Operator and/or Access Holder, nor for ARTC or the ports. What may suit one Train Operator, given a particular set of installed equipment, may not suit another. It is not ARTC's intention to set a standard, nor a pricing mechanism, that would advantage one over another except to the extent that this drives towards a common goal, which is to maximise efficient use of Coal Chain Capacity. There is a trade-off between seeking to maximise Coal Chain Capacity and allowing Train Operators to manage their train operations through the use of different train configurations.

It is not unrealistic to expect that the access price will be but one of several determinants in a Train Operator's decision as to which configuration(s) to use in operating its trains. At best, price differentiation of access charges will help in a decision to adopt the desired outcome, but in all likelihood, this would only be where other factors also favour this outcome, eg. rolling stock efficiency, rolling stock fleet availability, infrastructure compatibility etc.

ARTC's understanding of the concept of the FIS, as it was originally conceived in the preparation of the HVAU, is that it is intended to be a configuration for the medium to long term. The HVAU makes it clear that this could include consideration of configurations beyond the existing system limitations (i.e. the reference in HVAU Section 4.18(a) to *"include scenarios under which System Assumptions are also varied in addition to the Coal Train configurations"*.

With these considerations in mind, ARTC initially proposed to adopt an aspirational target which was reflective of a future train configuration that might

[13] With limitations; this train length does not fit into two existing crossing loops on the Ulan line.

be achieved within the medium term future. As discussed in the FIS Consultation Paper, ARTC envisaged that Network capability over the medium term might be enhanced in one or both of two dimensions, ie increased train length and/or increased axle load. ARTC does not have a fixed view as to which of these is the more likely to be pursued; indeed it is possible that a combination of axle load and length enhancements might be the most appropriate. A substantial amount of analysis, consultation and planning would be required before such a direction could be determined with confidence.

However, ARTC saw it as entirely feasible to set an FIS based on each of those two directions for consideration by stakeholders in the FIS Consultation Paper, recognising that the actual movement towards either one or both infrastructure solutions will unfold as demand and customer support dictate.

ARTC came to the view that, for technical and economic reasons, it is unlikely that an axle load beyond 35 TAL could be achieved within the foreseeable future for a brownfield development such as the Hunter Valley.

The FIS that would be achievable for a 35 TAL train that would fit (more or less) within current length limitations is a train of 100 wagons up to 1,606 m. This length would fit in the three existing export terminals[14] and Macquarie Generation domestic terminal. This configuration has a payload of 11,800 t.

For the 'length enhancement' scenario, ARTC has considered what length restriction could realistically be achieved. The longest train that could fit into the NCIG coal terminal is 1,914 m.[14] This length train could not currently be accommodated at the Kooragang or Carrington terminals and at least some roads in these terminals would need to be extended. A 1,914 m train can operate on the Network as far west as the Mangoola load point. A number of crossing loops west of Mangoola would need to be lengthened in order to allow operation of this size train to Ulan. A 1,914 m train at 30 TAL would have a payload of almost 11,800 t which would be equivalent in terms of Coal Chain Capacity to the 35 TAL FIS being proposed.

Neither of these configurations could be operated on a routine basis on the existing infrastructure. However, both configurations could conceivably be operated at some future time if the infrastructure was modified accordingly. It is likely that coal chain participants would seek to develop the Network in one direction or the other through RCG managed initiatives; however, without detailed analysis of the economics it is not possible to predict which way this might go. Therefore, in the FIS Consultation Paper ARTC proposed two FIS configurations.

- a 'Long' FIS of 30 TAL, 120 wagons, maximum length of 1,914 m and payload 11,800 t;
- a 'High axle-load' FIS of 35 TAL, 100 wagons, maximum length of 1,606 m and payload of 11,800 t.

[14] Operating trains of this length would require some minor operational compromises under current infrastructure constraints.

6 STAKEHOLDER FIS CONSULTATION PAPER

The FIS Consultation Paper was circulated to the stakeholders listed in Table 3 in October 2013. The paper outlined the process for determination of the FIS and discussed a number of related issues. The paper also described the HVCCC modelling and results and elicited stakeholder views. A copy of the paper forms Attachment E to the Application.

ARTC initially sought stakeholder responses by 22 November 2013. This due date was subsequently extended to 29 November.

Table 3: Stakeholders To Whom Consultation Document Provided

HVCCC	HVCCC
Access Holder	Anglo American
	Hunter Valley Energy Coal (BHP Billiton)
	Bloomfield Collieries
	Centennial Coal
	Glencore
	Idemitsu
	Macquarie Generation
	Peabody Energy Australia
	Rio Tinto Coal & Allied
	Vale
	Whitehaven Coal
	Yancoal (also representing Gloucester and Donaldson)
	Bluescope
	Shenhua
Train Operator	Asciano
	Aurizon
	Freightliner
	Southern Shorthaul Railroad
Coal Terminal Operator	Port Waratah Coal Services
	Newcastle Coal Infrastructure Group
Other	RailCorp
	Transport NSW
	NSW Trains
	Qube
	Lachlan Valley Rail Society
	Australian Railway Historical Society
	Rail Motor Society

Twelve parties provided written responses. These are listed in Table 4. Three parties (see Table 4) did not permit publication by ARTC, but all respondents agreed that their responses could be provided to the ACCC. The responses are included at **Attachment F** to ARTC's application to the ACCC for consent to vary the 2012 HVAU.

Table 4: Respondents To ARTC FIS Consultation Paper

Stakeholder Category	Stakeholder	Confidential #1
Producer	Anglo	No
	Centennial	Yes
	Coal and Allied	No
	Glencore (formerly Xstrata)	Yes
	HVEC (BHP Billiton)	Yes
	Idemitsu	No
	Integra (Vale)	No
	Peabody	No
	Whitehaven	No
Train Operator	Asciano (Pacific National)	No
	Aurizon (formerly QR National)	No
Coal Terminal Operator	Port Waratah Coal Services	No

#1 In all cases, respondents indicated that their responses may be provided to the ACCC but where indicated as confidential may not be published by ARTC.

ARTC has not characterised the stakeholder responses in detail in this document. However, as a background to ARTC's selection of the FIS configuration, ARTC's interpretation of the responses received is that stakeholders generally opposed the adoption of an aspirational FIS that could not be operated on the Network in the near term. Responses canvassed a wide range of concerns, in a number of instances reflecting the specific underlying commercial positions of the respondent. However, common themes were that:

- there was a large amount of complexity in the model which made it difficult to verify the results; and
- it was difficult to form a view regarding an aspirational FIS without an understanding of the costs to develop the Network.

7 ARTC RESPONSE & CHOICE OF FIS

ARTC understands that it has been a difficult task for stakeholders to evaluate the proposed FIS configurations given the complexity of the concepts and the limited modelling that has been available. These complexities are inevitable in circumstances where there is no unambiguous route to the achievement of a somewhat open-ended and uncertain goal. While it is relatively simple to state the goal of identifying an efficient train configuration to deliver the optimum utilisation of Coal Chain Capacity, the modelling shows that there is no clear, unique, superior train configuration that would neatly achieve this. The problem is exacerbated when the parameters of the system are made effectively unbounded. That is, by allowing the alteration of System Assumptions one removes the constraints that allow the determination of a 'best option'. A best option is only 'best' within a given set of constraints. In that context, when constraints are relaxed without new boundaries, the answer is inevitably 'it depends …'. This is clearly demonstrated by asking the simple question as to what task limitation should be used to determine the FIS. As indicated in Figure 5, albeit on an

indicative basis only, the answer is very likely to change depending on what value of Coal Chain Capacity is chosen.

It was in this context that ARTC proposed the aspirational FIS configurations. Given that the modelling suggests that the benefits of larger trains more or less plateaus from Test 4(a) (the currently operating 96 wagon 9,400 t payload train), in the context of the constraint of the current 208 mtpa contracted volumes, the selection of any of train configurations tested with higher payloads could reasonably be justified as meeting the FIS criteria. However, it was ARTC's view that the FIS is intended as a longer term configuration that would provide guidance and encouragement for the adoption of a particular developmental path. This suggested the adoption of an aspirational target that reflected the increased efficiency of higher payload trains than can currently operate in an environment beyond current contractual limitations would be beneficial to the Coal Chain. The train configurations were ultimately constrained to what ARTC believes are practical infrastructure limitations in axle load and length, as discussed in the FIS Consultation Paper. ARTC's decision to propose an aspirational target was also discussed with participants in the SRG, who were fully appraised of the modelling and its outcomes.

Some stakeholders expressed concern that offering the FIS and associated FIAC in 2015 would prematurely encourage operation of such trains, when this would be to the detriment of Capacity and Coal Chian Capacity until appropriate infrastructure had been built. ARTC was of the view that this was unlikely to occur as ARTC would be in a position to refuse to accept the operation of such a configuration until such time as the infrastructure was appropriate. Nevertheless, it is understood that this might seem counterintuitive when the purpose of the FIS is to encourage the use of that configuration.

In the light of stakeholder responses to the FIS Consultation Paper, ARTC appreciates that stakeholders have indicated a preference for an FIS train configuration that is reflective of the near-term capabilities of the Network and therefore subject to less uncertainty. The adoption of an FIS for Pricing Zones 1 and 2 of the Test 4(a) train configuration best meets this preference while still generating an efficient outcome (under the 208 mtpa cap). The Test 4(a) train is the same as the current Initial Indicative Service and is the highest payload configuration that can operate to almost all load points within Pricing Zones 1 and 2.[15]

The rail infrastructure in Pricing Zone 3 is currently rated at a maximum of 25 TAL, but work over the last two years has been undertaken that, when completed as planned in late calendar 2014, will increase the track capability to 30 TAL. ARTC expects that Train Operators will be able to take advantage of this increased capability, at least in part, immediately that it becomes available. Therefore, for the Pricing Zone 3 FIS ARTC has selected a train configuration based on a maximum 30 TAL that also reflects the maximum length that can be accommodated on the Pricing Zone 3 infrastructure.

[15] See Table 6 for exceptions.

As a consequence of moving to 30 TAL, trains in that configuration will only be able to operate at 60 kph when loaded, compared to the nominal maximum of 80 kph allowed for 25 TAL train configurations. This reduction impacts operations in Pricing Zone 3 only, as movements of these traffics in Pricing Zone 1, though nominally capable of operating at 80 kph, are constrained by the other coal trains operating at 60 kph. In order to facilitate the 30 TAL FIS for Pricing Zone3, ARTC will be altering the timetabled train paths to reflect the slower operation of loaded trains in time for implementation in January 2015. The details of proposed FIS configurations are set out in Table 5.

Table 5: FIS Configurations & Rolling Stock Details

	FIS PZ 1 & 2	FIS PZ 3
Specified In HVAU		
Maximum Axle Load (t)	30	30
Maximum Speed Empty (kph)	80	80
Maximum Speed Loaded (kph)	60	60
Maximum Wagons	96	82
Maximum Length (m)	1,543	1,330
Sectional Running Times	As per SWT[#1]	As per SWT[#1]
Expected Configuration Details		
# Locomotives	3	3
# Wagons	96	82
Train Tare Mass (t)	2,514	2,247
Nominal Train Payload (t)	9,400	8,000
Train Gross Mass Loaded (t)	11,914	10,247
Train Length (m)	1,540	1,329

#1 SWT = ARTC standard working timetable, as amended from time to time, see http://www.artc.com.au/library/TOC%20Manual_North%20Coal.pdf. Note that the sectional running times for Pricing Zone 3 will be adjusted to reflect 30 TAL operation in the timetable once 30 TAL running is implemented as planned.

It will be noted that the maximum permitted length of 1,330 m is 20 m shorter than the current Initial Indicative Service. This has arisen due to a review of requirements for sighting and stopping distances in Pricing Zone 3 that has determined that the shorter maximum is required for safety considerations. In practice, no existing train configurations operate at a length greater than 1,330 m, so this change will not impact on train operations, nor did it impact on ARTC's choice of FIS for Pricing Zone 3.

ARTC confirms that, once planned 30 TAL operation is commenced in Pricing Zone 3, the two configurations will be able to operate to all load points and ports relevant to their regions on the Network. This includes all passing loops, signalling and track infrastructure on the Network. ARTC is not in a position to confirm that this is the case for infrastructure not owned by ARTC at load points and the coal

terminals but it is ARTC's understanding that this is so. ARTC intends to make access available on the Network for these train configurations.[16]

It is noted that several existing hauls are not able to operate at the current Initial Indicative Service configurations and these will continue to operate non-indicative configurations as a matter of necessity. These are set out in Table 6.

Table 6: Hauls Not Capable Of Operating FIS Configurations

Load/Unload Point	Limitation
Newstan Teralba Vales Point Southern domestic hauls	Interstate and RailCorp networks south of Newcastle, limited in length (42 wagons) and axle load (25 t)
Stratford	Interstate network north of Maitland limited in length (72 wagons) and axle load (25 t)
Austar	South Maitland Railway axle load limit 19 t

It would be possible for a longer service to operate in parts of Pricing Zone 1 east from Mangoola (on the eastern end of Pricing Zone 2). Longer services could also technically operate west of Mangoola in limited circumstances, but these could not be routinely scheduled as two crossing loops are limited to the 96 wagon train.

Currently two Train Operators are operating trains in the proposed configuration for the Pricing Zone 1 and 2 FIS. This configuration is based on the use of a wagon design that has only relatively recently become available. The majority of the existing Hunter Valley wagon fleet is based on older designs that are slightly longer. New purchases by Train Operators are now typically of the newer, more efficient design.

8 FIAC DEVELOPMENT

In HVAU section 4.18(d)(ii), ARTC has committed to submit to the ACCC the FIAC relating to the FIS and seek the approval of the ACCC to vary the HVAU to provide for the adoption of the FIS and FIAC applicable.

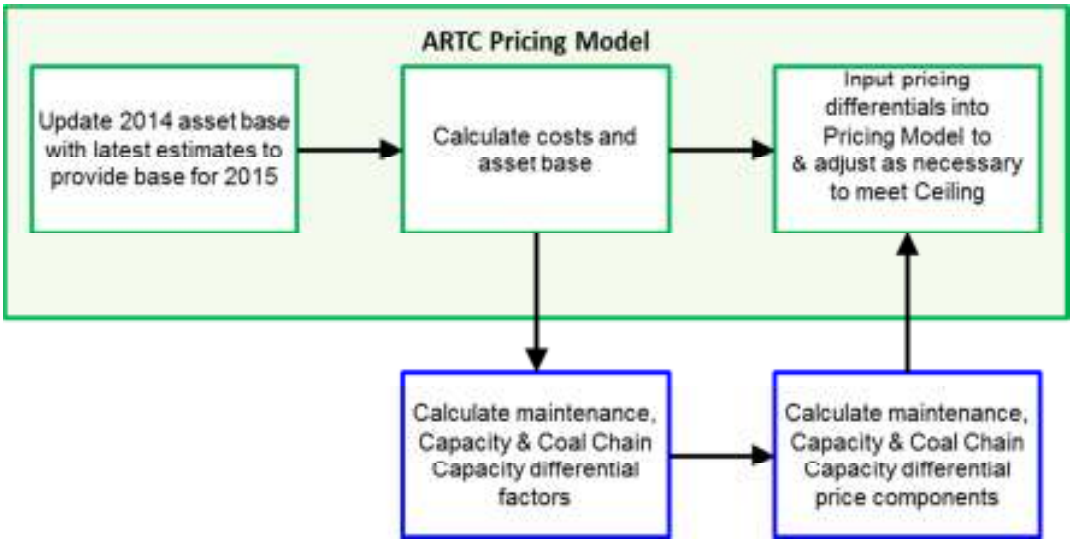
ARTC would not normally be in a position to accurately forecast Access Charges for the following year (in this case 2015) until the final quarter of the preceding year (i.e. 2014), as the accuracy of cost and capital forecasts improve, for example with the adoption of formal budgets for the forthcoming year, and HVCCC Coal Chain Capacity and forecast Access Holder volumes are confirmed. HVAU section 4.20 provides a process for the calculation of the following year's prices, including

[16] The PZ 1 & 2 FIS configuration currently operates to all load points in PZ 1 & 2 and the related coal terminals. The PZ 3 configuration, being shorter and the same axle load, will therefore be able to operate at all coal terminals and it is ARTC's understanding that all PZ 3 load points will be able to operate the higher axle load, the length reflecting the currently operated maximum, and noting that the current length constraint applicable to Werris Creek will be removed imminently.

advice by Access Holders in July as to their volume forecasts. Access Charges are to be advised to Access Holders by 1 November each year for the following year.

Therefore, ARTC has developed estimated FIS Access Charges for the 2015 calendar year, using the process set out in Figure 6, using the best information that is currently available regarding the 2015 calendar year. However, it should be recognised that these prices are subject to revision when the annual HVAU section 4.20 pricing process is undertaken.

Figure 6: Calculation Of Estimated 2015 FIS Access Charges



The preparation of estimated Access Charges for the Application has assumed that the extended Pricing Zone 3, i.e. from Muswellbrook to Turrawan Junction applied. Inclusion of the rail network beyond The Gap to Turrawan is currently under consideration by the ACCC and should the extension of Pricing Zone 3 not be approved, this is likely to have a material impact on the FIAC.

8.1 ARTC's Approach To Access Pricing Hunter Valley Coal

Access pricing in relation to Hunter Valley coal traffic is governed by the pricing principles contained in the HVAU. As such, ARTC's approach to pricing will have regard to provisions under the HVAU as outlined in this section 8.

In addition to considerations under the HVAU, other relevant circumstances are:

- There are currently Initial Indicative Access Charges in place for Initial Indicative Services applicable to the 2014 calendar year. These Initial Indicative Access Charges were prepared on the basis of volume and cost forecasts adopted for 2014 and in accordance with the requirements of HVAU section 4.
- There are prices in place for those train configurations that vary from the Initial Indicative Services. These prices have been determined, taking into account the pricing differentiation criteria set out in HVAU section 4.15(a).

- The provisions outlined in HVAU section 4.15(a)(iii) will cease to apply at the end of the Regulatory Transition Period, i.e. 31st December, 2014 and therefore are not applicable to the FIAC that commence 1 January 2015.

The intention is that the FIAC will create incentives for users to plan and invest in a way that promotes more efficient utilisation of Capacity and Coal Chain Capacity through the use of the FIS. In order to achieve this, the FIAC must be differentiated on some basis from Charges for other Services where these differ from the characteristics of the FIS.

Under the HVAU, factors upon which ARTC may differentiate Charges other than Indicative Access Charges as prescribed in HVAU section 4.15(a) are:

'(a) In formulating its Charges for Coal Access Rights other than Coal Access Rights for an Indicative Service contracted for under an Indicative Access Holder Agreement, ARTC will:

(i) subject to section 4.15(a)(iii), reflect the commercial impact on ARTC's business of the relative consumption of Capacity and Coal Chain Capacity compared to the Indicative Service and the logistical impact on ARTC's business of the relative reduction in Capacity and relative reduction in Coal Chain Capacity compared to the Indicative Service;

(ii) have regard to a range of factors which impact on its business including:

(A) the Indicative Access Charges for Indicative Services;

(B) the particular characteristics of the relevant Service intended to utilise the Access Rights sought, which include axle load, speed, wheel diameter, Train length, origin and destination (including number and length of intermediate stops), departure and arrival times and days of the week;

(C) the commercial impact on ARTC's business which includes:

(aa) the term of the Access Holder Agreement;

(ab) the consumption of ARTC's resources;

(ac) the Segments of the Network relevant to the Access Rights sought;

(ad) previously negotiated Charges agreed under the terms of the Undertaking, where relevant, as published by ARTC under section 2.6(b);

(D) logistical impacts on ARTC's business which include:

(aa) the impact on other Services and risk of failure of the endorsed Operator to perform its obligations under the Operator Sub-Agreement; and

(ab) system flexibility;

(E) Capital Contributions or other contributions by the Applicant to ARTC's costs;

(F) the cost of any Additional Capacity; and

(iii) for the purpose of assisting transition between regulatory and contractual arrangements and to remove uncertainty to support investment decisions relating to Trains, charge the same price for the two primary existing services using the Network as at the Commencement Date in accordance with sub-paragraphs (A) and (B) below during the Regulatory Transition Period:

(A) the Charges for the services described in section 4.19(c) as Interim Indicative Service 1 and Interim Indicative Service 2 in Pricing Zone 1 may be the same, and the Charges for Interim Indicative Service 1 and Interim Indicative Service 2 in Pricing Zone 2 may be the same, notwithstanding those services will no longer constitute Interim Indicative Services after the Interim Period; and

(B) for the purposes of this section 4.15(a)(iii), Charges are taken to mean the unit TOP price and unit Non-TOP price.'

When differentiating between Charges for Coal Access Rights ARTC is required to reflect the impacts associated with the relative consumption of Capacity and Coal Chain Capacity (noting that HVAU section 4.15(a)(iii) will not apply to Charges from 1 January 2015), and may have regard to any of the other factors prescribed in HVAU section 4.15(a).

For the development of the FIAC, ARTC has elected (in addition to Capacity and Coal Chain Capacity considerations) to have regard to factors commercially impacting on ARTC's business and, specifically, the consumption of ARTC's resources, focussed on maintenance impacts. In order to differentiate on these bases, ARTC must also have regard to other factors such as *'the particular characteristics of the relevant Service intended to utilise the Access Rights sought, which include axle load, speed, wheel diameter, Train length, origin and destination (including number and length of intermediate stops), departure and arrival times and days of the week'*.

As stated above, HVAU section 4.15 prescribes a range of factors that ARTC may consider in price differentiation. While ARTC will take this range of factors into consideration, it should not be assumed that ARTC will base future differentiation of coal pricing on the same weighting of each of these factors nor any prescribed methodology for considering such factors. Notwithstanding this, in the interests of transparency, section 8.2 details the methodology used by ARTC in this instance to estimate the FIAC.

During the ACCC consultation on ARTC's application to vary the 2011 HVAU to incorporate the Initial Indicative Services, ARTC developed and proposed a set of guiding principles that it would intend to apply in determining Initial Indicative Access Charges and Charges for other Services until the Final Indicative Services were approved. These principles were intended to increase pricing transparency and certainty to a level that the ACCC considered was appropriate. These

principles were set out in a subsequent revision to ARTC's application to vary the 2011 HVAU and are provided at Annexure A to this paper. ARTC intends to apply these guiding principles (as applicable) in determining Indicative Access Charges and Charges for other Services following approval of the FIS and until 30 June 2016 in order to maintain the existing level of pricing transparency and certainty.

8.2 Developing The FIAC

8.2.1 Maintenance Considerations

In relation to maintenance impacts, speed and axle load are generally regarded as drivers of maintenance costs. Cost formulae developed (often in overseas jurisdictions) generally relate higher speed and higher axle load to higher track degradation and hence higher maintenance expenditure, with speed having a greater impact. As such, higher speed trains generally give rise to a higher maintenance impact. Differentials in maximum or average axle loading also give rise to different maintenance impacts as do other engineering factors such as wheel profiles and bogie configuration.

The maintenance impact may manifest in either variable or fixed maintenance cost (or both) and as such, ARTC would expect the differential to manifest to varying extents in the non-TOP component and TOP component.

To determine a basis for differentiation between the FIS and other Services, ARTC has contemplated relative axle load and speed characteristics.

In considering the impact on maintenance cost of the axle load, it is likely that the average axle load (as opposed to maximum axle load) would mainly affect variable maintenance cost which largely forms the non-TOP component of the Charge, whereas the maximum axle load (driving a certain track standard) would affect fixed maintenance, assumed to be included in the TOP component of the Charge.

In any event, it could be assumed that these services operate with an average axle load at the maximum when loaded, and at an average axle load of wagon tare/no. of axles when empty (plus the locomotive mass which is assumed to be constant throughout the cycle). Also, given the high volumes carried by the Network, it could be expected that the proportion of maintenance expenditure that could be considered variable with usage would be relatively high (in the order of 50-60% on average, though this will vary from year to year dependent on the timing of major periodic maintenance). This is consistent with evidence in relation to the variability of maintenance cost with usage for networks carrying gross volumes of in excess of 30-50MGTpa.[17]

It is also likely that the average speed (as opposed to maximum speed) would mainly affect variable maintenance, which largely forms the non-TOP component of the Charge; whereas the maximum speed (driving a certain track standard) would affect fixed maintenance, assumed to be included in the TOP component of the Charge.

[17] Queensland Competition Authority, 'Draft Decision on QR's Draft Undertaking, Working Papers (December 2000)', Working Paper 2, 'Usage-related infrastructure maintenance costs in railways', p22

A review of findings on various historical studies undertaken in the area of cost variability[18] suggests that measures of cost variability developed in the UK[19] with regard to various types of vehicles, as being the most thoroughly researched, and that these provide a general guide for assessing incremental maintenance costs.

The UK study suggested that:

- the variability of infrastructure maintenance cost with axle load is estimated at 45%; and
- the variability of infrastructure maintenance cost with speed is estimated at 50%.

Axle load comparisons relevant to the FIS and other Services commonly operated in the Hunter Valley would focus around 30T axle load v 25T axle load. With regard to speed, under the Initial Indicative Service, a number of services operated at 80 kph compared to the Initial Indicative Service 60 kph maximum speed in Pricing Zones 1 and 2. However, with the adoption of a timetable to reflect the planned change to the Pricing Zone 3 FIS maximum speed of 60 kph, the differential of speed, while still applicable, will have a lesser impact than previously. ARTC does not intend offering Train Paths for loaded Coal Trains above 60 kph.[20] For the purposes of differentiating prices, it is assumed that trains will have a maximum loaded speed of 60 kph even though, technically, the 25 TAL trains could operate at 80 kph. Nevertheless, this factor is still applied using the same methodology. In the example calculations below, the relevant parameters for the two train configurations are set out in Table 7. For the purpose of demonstrating the calculation, it is assumed that Service X does have a differential loaded speed, notwithstanding that ARTC is not intending that this could be scheduled.

Table 7: Train Configurations For Example Calculations

Parameter	FIS	Service 'X'
Maximum axle load (tonnes)	30.0	25.0
Actual axle load loaded (tonnes)	30.0	25.0
Actual axle load empty (tonnes)	6.4	6.7
Maximum speed loaded (kph)	60	80
Maximum speed empty (kph)	80	80
Average speed loaded (kph)	47	57
Average speed empty (kph)	66	66

[18] ibid

[19] Report to Office of the Rail Regulator, Railway Infrastructure Cost Causation, November 1999

[20] Were ARTC to attempt to timetable coal Services at a mix of 60 and 80 kph, this would create significant rigidities into the scheduling process that would have detrimental impacts on Capacity and Coal Chain Capacity, particularly in Pricing Zone 3 and would also impact on the productivity of the various types of train set.

Axle Load Factor

The axle load factor is applied as follows:

- For the TOP component of Charges, the cost impact is on the standard to which ARTC is required to maintain the track, ie the fixed costs. Therefore, the maximum axle load is used. The following calculation would be used:

  1 + (25/30 – 1) * 0.45 = 0.925

  The 25 TAL service would impact fixed maintenance cost by a 7.5% reduction compared to the FIS.

- For the non-TOP component of Charges, the actual axle load in each direction is used. This is to reflect actual track degradation caused and hence variable costs incurred from the operation of a different axle load configuration to the FIS. The calculation would be:

  Empty 1+((6.7/6.4)-1)*0.45 = 1.021

  Loaded 1+((25/30)-1)*0.45 = 0.925

Speed Factor

The speed factor is applied using a similar calculation as follows:

- For the TOP component, reflecting the fixed maintenance cost, based on track standard required, the higher maximum speed (in either direction) would result in an impact calculated as:

  1 + (80/60 – 1) * 0.50 = 1.167

  The variation applicable to the TOP Charge component of 16.7% reflects maximum speed differential.

- For the non-TOP component (reflecting the variable maintenance cost), the higher average speed would result in an impact calculated as:

  Empty 1+((66/66)-1)*0.5 = 1.00

  Loaded 1+((57/47)-1)*0.5 = 1.11

Combining The Factors

The individual components are then combined to provide a relative difference to the TOP and non-TOP Charges:

TOP fixed axle load * fixed speed

0.925 * 1.167 = 1.079

ie, the maintenance component of the TOP Charge would be 7.9% higher.

non-TOP (variable axle load empty * variable speed empty +

variable axle load loaded * variable speed loaded)/2

(1.021 * 1.00 +0.925 * 1.11)/2 = 1.02

i.e., the maintenance component of the non-TOP Charge would be 2.0% higher.

The above example is indicative of the calculations that have been carried out by ARTC for variations from the Initial Indicative Service in respect of charges in 2012, 2013 and 2014. The same methodology has been used in the initial evaluation to determine the estimated FIAC and is consistent with the guiding principles referred to in section 8.1. However, this methodology may change over time, should better information on the variation of maintenance costs become available, or if ARTC determines that other cost components should be taken into consideration.

ARTC has calculated the differentiation factors that would apply to all Final Indicative and Initial Service configurations of the currently contracted Services in Train Path Schedules. The results are shown in Table 8 for the non-Top component and Table 9 for the TOP component.

Table 8: Non-TOP Component Maintenance Factors

Pricing Zone	Final Indicative Service Indicative Service PZ1 96 wagon	Final Indicative Service Indicative Service PZ3 82 wagon	Non-Indicative Service Initial Service PZ3 82 wagon 25 TAL
1	1.000	1.009	0.978
2	1.000	n/a	n/a
3	n/a	1.000	0.969

Table 9: TOP Component Maintenance Factors

Pricing Zone	Final Indicative Service Indicative Service PZ1 96 wagon	Final Indicative Service Indicative Service PZ3 82 wagon	Non-Indicative Service Initial Service PZ3 82 wagon 25 TAL
1	1.000	1.000	0.925
2	1.000	n/a	n/a
3	n/a	1.000	0.925

8.2.2 Capacity Considerations

In accordance with HVAU section 4.15(c), when considering Capacity differentials, ARTC will determine Capacity consumption associated with the utilisation of configurations other than the FIS having regard to the Capacity consumption of the FIS.

Under the HVAU, Capacity relates to the capability of the Network (track) for Services. As such, the most appropriate basis for comparing and differentiating Capacity is the train and its operating characteristics. ARTC considers that Capacity consumption of a train, as it relates to the consumption of Train Paths is

primarily driven by the average speed of that train and by the maximum length of that train (to the extent that train length exceeds crossing loop lengths on single track).

The identification of the FIS proposed by ARTC had regard to infrastructure constraints expected to exist up until HVAU expiry and all configurations equal to, or shorter than, the FIS in the relevant Pricing Zone operated at a length that would not exceed any crossing loop where relevant. As such there is currently little basis for differentiation based on train length. Note, however, that should any train configuration be given access to the Network by ARTC that is in excess of the lengths of the proposed FIS (in the relevant Pricing Zone), it may be appropriate to reconsider this position.

As well as length, train speed may have an impact on the consumption of Capacity. Historically, the 25 TAL Services could nominally operate at a higher average speed than the 30 TAL Services, suggesting that there may be some justification for differentiation with respect to consumption of Capacity, between the 30 TAL and 25 TAL Services in Pricing Zone 1 based on the modelled performance of the configurations. However, at the time of the Initial Indicative Service development, ARTC concluded that in order to maximise track capacity in Pricing Zone 1 and deliver other wider coal chain benefits, certain operational outcomes such as more uniform running between different train configurations were desirable. As such, speed differentials between configurations that might be predicted as being achievable through modelling are likely to overstate differentials as they may occur in practice, i.e. the train configurations that could in theory operate at 80 kph would, in amongst Coal Trains that are predominantly operating 60 kph also effectively operate at 60 kph just by the nature of the functioning of the Coal Chain. It was therefore difficult to justify the application of differentiation with respect to Capacity based on speeds that may be achievable as modelled.

With the planned introduction of 30 TAL operation on Pricing Zone 3 hauls and the choice of a 30 TAL FIS for Pricing Zone 3 (and therefore a '60 kph' timetable for Pricing Zone 3 and for these trains when operating in Pricing Zone 1), even fewer trains will have the potential to operate at differential speeds. This further justifies ARTC's previous approach to the consideration of speed in determining the consumption of Capacity. Therefore ARTC has developed FIAC in 2015 on the basis that all Coal Train configurations tested will consume the same amount of Train Path related Capacity in each Pricing Zone, i.e. each Service will be assumed to consume a single Train Path regardless of size.

The other aspect of pricing differentiation is the conversion of the 'price per Train Path' into the unit of pricing used, i.e. gtkm. Without this conversion, the 'cost' of the use of a Train Path by an Access Holder would differ with differing train sizes. This becomes clear with an example. Table 10 sets out the parameters of a fictitious FIS and a train of a half its size.

Table 10: Example Parameters

	FIS	Train 'X'
Tare mass (t)	1,000	500
Payload (t)	8,000	4,000
Total Cycle Gross Mass (t)	10,000	5,000
Distance travelled (km)	100	100
gtkm generated	1,000,000	500,000
Differentiation factor	1.0	0.5

Both trains consume a single Train Path, but as pricing utilises a gtkm pricing unit, unless the prices were differentiated, the cost of the Train Path to Train X (i.e. at the same rate per gtkm) would be half that which applied to the FIS. To remedy this, a differentiation factor is applied. In this example, the 0.5 factor would be applied to Train X: Capacity Factor/(500,000/1,000,000) = Capacity Factor x 2.

The above example is indicative of the calculations that have been carried out by ARTC for variations from the Initial Indicative Service in respect of charges in 2012, 2013 and 2014. The same methodology has been used in the initial evaluation to estimate the FIAC and is consistent with the guiding principles referred to in section 8.1.

8.2.3 Coal Chain Capacity Considerations

Under the HVAU, Coal Chain Capacity means the system wide capacity of the Hunter Valley Coal Chain, including below rail, above rail and port services. As such, the most appropriate basis for comparing and differentiating Coal Chain Capacity is the tonnes of coal delivered to terminals. The question that is asked in comparing and differentiating on the basis of Coal Chain Capacity is: How much Coal Chain Capacity does a tonne carried on one Coal Train configuration consume compared to that on another Coal Train configuration?

On the basis that the FIS has been selected as the most efficient train configuration given certain System Assumptions, one would expect that a tonne carried on the FIS configuration would consume the least Coal Chain Capacity compared to other configurations. One would also expect that as Coal Chain Capacity (throughput) is measured with reference to the Hunter Valley Coal Chain (system) as a whole, there is little justification for differentiating between Pricing Zones.

Table 11 below summarises delivered coal throughput in relation to the FIS and Initial Service configurations and scenarios as modelled by the HVCCC. Table 11 also shows the resulting differentiation factors for tonnes carried by each train configuration.

Table 11: Modelled Coal Chain Capacity, Scenario 3 Restricted Queue

Service Name	Payload (t)	Coal Chain Capacity (mtpa)	Coal Chain Capacity Differentiation Factors
Final Indicative Service 1 (Indicative Service PZ1)	9,400	191.2	100.0%
Final Indicative Service 2 (Indicative Service PZ3)	8,000	172.1	90.0%
Non-Indicative Service 4 --- Initial Service PZ3	6,053	163.0	85.3%

The above calculation is indicative of what has been carried out by ARTC for variations from the Initial Indicative Service in respect of charges in 2012, 2013 and 2014. The same methodology has been used in the initial evaluation to determine the FIAC and is consistent with the guiding principles referred to in section 8.1.

8.2.4 Combining The Factors

Once each of the three factors has been calculated, they need to be combined to generate the differential proportion to the TOP and non-TOP Charges in comparison to the FIS in each Pricing Zone on some reasonable basis.

The proportion of each factor in the TOP Charge varies according to proportion of maintenance costs compared to the total economic cost of the Pricing Zone.

To calculate estimates of 2015 differentiated prices, ARTC has applied the differentiation factors in accordance with weightings as follows:

- Differentiation based on maintenance impacts were weighted by reference to the proportion of maintenance expenditure forecast in Economic Cost for each Pricing Zone in 2015. The differential was applied across the non-TOP and TOP components on the FIAC. These proportions are 20% (Pricing Zone 1), 31% (Pricing Zone 2) and 19% (Pricing Zone 3) as forecasted in 2015.
- The remaining weightings in each Pricing Zone (representing other operating costs, capital costs and returns) were allocated equally to the Capacity and Coal Chain Capacity factors.
- The above weightings were determined on a consistent basis to that carried out by ARTC for variations from the Initial Indicative Service in respect of charges in 2012, 2013 and 2014. The same determination has been used in the initial evaluation to determine the FIAC and is consistent with the guiding principles referred to in section 8.1.
- These weighting were then applied to the TOP and non-TOP Charges in ARTC's pricing model. These formed the base from which revenue could be varied for each Service type while retaining the proportional differences between the non-indicative Services and the FIS, while at the same time conforming to the Ceiling revenue limit (where applicable).

The weightings in each Pricing Zone for each of the three factors discussed above is shown in Table 12.

Table 12: Proportion Of Charges Applicable To Each Factor

Pricing Zone	Maintenance	Coal Chain Capacity	Capacity
1	20%	40%	40%
2	31%	34%	34%
3	19%	41%	41%

The FIAC have been determined by the application of the differentiation factors determined earlier and these weightings.

Table 13: FIAC

Segments	Non-TOP $/gtkm (ex GST)	TOP $/gtkm (ex GST)	Indicative Service Characteristics
Pricing Zone 1			
Indicative Service 1	1.011	9.487	30 tonne maximum axle load 60 kph maximum speed (loaded) 80 kph maximum speed (empty) 96 wagon train length 1,543 metres maximum train length section run times as per applicable Hunter Valley standard working timetable
Indicative Service 2	1.020	10.603	30 tonne maximum axle load 60 kph maximum speed (loaded) 80 kph maximum speed (empty) 82 wagon train length 1,330 metres maximum train length section run times as per applicable Hunter Valley standard working timetable
Pricing Zone 2			
Indicative Service 1	1.693	7.958	30 tonne maximum axle load 60 kph maximum speed (loaded) 80 kph maximum speed (empty) 96 wagon train length 1,543 metres maximum train length section run times as per applicable Hunter Valley standard working timetable
Pricing Zone 3			
Indicative Service 1	1.592	11.255	30 tonne maximum axle load 60 kph maximum speed (loaded) 80 kph maximum speed (empty) 82 wagon train length 1,330 metres maximum train length section run times as per applicable Hunter Valley standard working timetable

9 ARTC CONSIDERATION OF THE APPROPRIATENESS OF GTKM AS A PRICING UNIT TO ENCOURAGE EFFICIENT CONSUMPTION OF CAPACITY

9.1 Background & Context: Relevant Development Of ARTC's 2011 HVAU

During stakeholder consultation leading to the ACCC's acceptance of the 2011 HVAU, stakeholders expressed some concerns with the use of the gtkm unit to express the take-or-pay component (**TOP**) of Interim Indicative Access Charges forming part of the 2011 HVAU. Specifically, some stakeholders were concerned that use of the gtkm unit in this manner would not deliver efficient outcomes for the Hunter Valley coal network. In response, the ACCC recognised these concerns and sought ARTC to incorporate a review of the appropriateness of the gtkm as a pricing unit to encourage efficient consumption of Capacity (**Review**). The Review was incorporated in the 2011 HVAU as part of the determination of the Indicative Service (efficient train configuration) contemplated at Section 4.18 of the 2011 HVAU. The Review process and greater detail as to earlier stakeholder consultation is provided later in this section.

The 2011 HVAU was subsequently varied by ARTC and accepted by the ACCC on 17 October 2012 to become the 2012 HVAU. This variation did not have any substantive impact on ARTC obligations in relation to the Review other than to rename the Indicative Service contemplated at Section 4.18 of the 2011 HVAU to Final Indicative Service for clarity.

9.2 Relevant ARTC Obligations Under Section 4.18 Of The 2012 HVAU

Relevant ARTC obligations under Section 4.18 of the 2012 HVAU are to, within 30 months of the Commencement Date (1 July 2011):

- Consult with Access Holders, Operators and the Hunter Valley Coal Chain Coordinator (HVCCC) on whether gtkm is the appropriate pricing unit to encourage efficient consumption of Capacity.
- Having regard to submissions arising from the consultation above, if ARTC considers that gtkm is not an appropriate pricing unit to encourage efficient consumption of Capacity, submit to the ACCC an alternative pricing unit that ARTC considers will encourage efficient consumption of Capacity.
- Seek the approval of the ACCC to vary the 2012 HVAU to provide for the adoption of the alternative pricing unit (if any).

9.3 Relevant Earlier Consultation And Learning

9.3.1 Development of the 2011 HVAU

The 2011 HVAU contemplated, at Section 4.19(c), Interim Indicative Access Charges to apply to Interim Indicative Services as at the Commencement Date

(1 July 2011) for the period until Indicative Access Charges (or Initial Indicative Access Charges under the 2011 HVAU) approved by the ACCC came into effect. This period was anticipated at the time to be around 12-18 months.

At the time, and in the absence of any existing robust modelling of the impacts of different Coal Train configurations on cost and capacity, and to maintain some broad continuity with existing pricing relativities for an interim period following the 2011 HVAU coming into effect, ARTC proposed Interim Indicative Access Charges (expressed on a $/000gtkm basis) that would be applied to all Coal Train configurations in a Pricing Zone (including Coal Train configurations that were not Interim Indicative Services).

Under this interim pricing approach, a Coal Train configuration carrying half as many gross tonnes (and close to half as many net tonnes) as another Coal Train configuration would attract a TOP component of the Access Charge that was approximately half. Essentially, a gross or net tonne would attract approximately the same TOP component of the Access Charge irrespective of the size of the Coal Train configuration (gross tonnes) that the tonne was carried.

At the time, a number of stakeholders expressed in submissions a view that the use of larger Coal Train configurations would result in more efficient consumption of Network and Coal Chain Capacity. Consequently, the interim pricing approach and expression of Interim Indicative Access Charges on a $/000gtkm basis would not provide any incentive to use larger Coal Train configurations to deliver more efficient consumption of network and coal chain capacity.

At the time, ARTC maintained a position as follows:

- ARTC supported the identification of what constituted efficient utilisation of Network and Coal Chain Capacity and access pricing that would incentivise efficient utilisation of that capacity.
- There was an absence of any reliable Network or Coal Chain Capacity modelling at the time that would enable access pricing (in particular pricing differentials) that would incentivise efficient use of capacity to be determined with any confidence.
- The introduction of access pricing based on incorrect assumptions and modelling could result in pricing signals that delivered adverse outcomes for the industry.
- Whilst ARTC accepted that applying the same Interim Indicative Access Charge (expressed on a $/000gtkm basis) to all Coal Train configurations in a Pricing Zone would not encourage to use of bigger Coal Train configurations as sought by a number of stakeholders, ARTC considered that the circumstances as described above meant that the use of such a pricing approach on an interim basis only, and until pricing incentives could be determined in a reliable and robust manner, was reasonable.
- The approach to apply the same Interim Indicative Charge (expressed on a $/000gtkm basis) to all Coal Train configurations in a Pricing Zone removed any incentive. The mere expression of the Interim Indicative Access Charge on a $/000gtkm basis, by itself, however, did not have any effect on the incentives.

- Irrespective of the basis in which access pricing was expressed, as long as the resultant TOP component of the Access Charge applied to the Coal Train configuration was reflective of the relative cost and capacity consumption of that Coal Train configuration, then appropriate incentives would exist. This would occur over time through the development of the Indicative Service and Indicative Access Charges (at the time).

In its December 2010 Position Paper , the ACCC broadly acknowledged ARTC's position by accepting that the use of gtkm as a pricing unit may be appropriate in the short term, but subject to the implementation of longer term price signals to run efficient trains. The ACCC did not express a view as to what pricing unit would be appropriate to meet that aim.

The ACCC considered that:

- the determination of the efficient train should also involve a determination of the pricing approach that will enable and incentivise efficient consumption of network capacity;
- the Hunter Valley Access Undertaking should ultimately provide for the efficient use of infrastructure by ensuring that users pay charges reflective of their consumption of capacity; and
- the outcome of the review process, ie efficient train determination, should resolve the issue of whether calculating access charges by reference to gtkm units promotes efficiency, or whether another approach is optimal.

The 2011 HVAU, as accepted by the ACCC, incorporated provisions at Section 4.18 that addressed the ACCC's considerations in this regard.

9.3.2 2012 Determination Of The Initial Indicative Service & Initial Indicative Access Charges

In order to address the concerns of some stakeholders that the delay in the delivery of efficient outcomes inherent in the determination of the Indicative Service and Indicative Access Charges was too long, the 2011 HVAU accepted by the ACCC, at Section 4.17, also included provision for an earlier determination of the Initial Indicative Service and Initial Indicative Access Charges intended to move some way towards the delivery of efficient outcomes but recognising the existing constraints of the existing Hunter Valley infrastructure and existing coal chain modelling.

This determination was undertaken in the second half of 2011 and concluded in 2012. The determination made way for the introduction of the Initial Indicative Service and Initial Indicative Access Charges to apply in late 2012, and 2013, that for the first time with respect to Hunter Valley coal access, introduced pricing that differentiated between different Coal Train configurations and reflected cost and capacity impacts to the extent that the above constraints reasonably permitted.

In particular, the determination established non-TOP and TOP components that reflected the different impacts of the use of a particular Coal Train configuration on track maintenance cost, Capacity and Coal Chain Capacity. This differentiated pricing was intended to provide initial pricing incentives to encourage more efficient coal operations in the Hunter Valley. The non-TOP and TOP component of

the access pricing was still expressed in terms of $/000GTK as was the case for Interim Indicative Access Charges. Differential pricing (and the attendant incentives) arose because the non-TOP and TOP components of access pricing were now different for each Coal Train configuration determined as an Initial Indicative Service, Interim Indicative Service and non-Indicative Service. This re-enforces ARTC's initial position that the expression of the TOP component of Charges does not, by itself, impact on incentives for more efficient utilisation of Capacity and Coal Chain Capacity.

In general, longer and heavier Coal Train configurations were determined as Initial Indicative Services and the cost of access (per tonne or gtkm) for Initial Indicative Services was less than for other Services.

2012 Charges

The Initial Indicative Access Charges were accepted by the ACCC in 2012, to apply for a short period towards the end of 2012.

ARTC subsequently published Charges for Interim Indicative Services and non-Indicative Service categories in accordance with Section 4.17 of the 2011 HVAU.

In order to increase transparency and certainty with respect to Charges beyond 2012, ARTC developed guiding principles for determining Initial Indicative Access Charges, Interim Access Charges and Charges for non-Indicative Services that it intended to apply until the Final Indicatives Services were approved. These principles were set out in a subsequent revision to ARTC's application to vary the 2011 HVAU, and are provided at Annexure A to this paper.

2013 Charges

The Initial Indicative Access Charges and Charges for Interim Indicative Services and non-Indicative Service categories for the 2013 calendar year were determined on largely the same basis as 2012 Charges, and published in accordance with Section 4.20 of the 2012 HVAU.

2014 Charges

The Initial Indicative Access Charges and Charges for Interim Indicative Services and non-Indicative Service categories for the 2014 calendar year were determined on largely the same basis as 2012 and 2013 Charges, and published in accordance with Section 4.20 of the 2012 HVAU.

Characteristics of these Charges

Subject to some exceptions , the Initial Indicative Access Charges and Charges for Interim Indicative Services and non-Indicative Services have been determined using the following broad principles:

- factors considered most relevant, at the time, in relation to differentiating pricing for coal services in the Hunter Valley, were:
  - maintenance considerations, impacting ARTC's costs;

- Capacity considerations impacting ARTC investment; and
- Coal Chain Capacity considerations, reflecting efficient use of the Coal Chain, and considered important by the industry;

- a methodology based on the best available information was used, at the time, to determine relative impacts of relevant Coal Train configurations in relation to each of these factors;
- any other practical aspects were considered at the time in determining, along with the above differential impacts, the basis for differentiating prices in relation to each of these factors; and
- a basis for weighting the relativity importance/impact of each these factors, at the time, in determining overall pricing differentials was used.

Broad assumptions adopted to determine the Initial Indicative Access Charges and other relevant Charges, at the time, were:

- With respect to maintenance considerations, different Coal Train configurations were assessed on the basis of impact on ARTC variable and fixed maintenance cost of applicable average and maximum train speeds and axle loads relative to the configuration of the Initial Indicative Service.
- With respect to Capacity considerations, due to practical considerations, all train configurations were assumed to consume the same Capacity relative to the configuration of the Initial Indicative Service.
- With respect to Coal Chain Capacity, differentials had regard to the coal chain throughput arising from utilisation of different Coal Train configurations relative to the configuration of the Initial Indicative Service as modelled by HVCCC coal chain modelling tools and infrastructure constraints at the time.
- Weightings with respect to variable maintenance (to apply to the non-TOP component) and fixed maintenance (to apply to a portion of the TOP component) were determined on the basis of maintenance cost with respect to overall ARTC full economic cost in each Pricing Zone.
- The remaining weightings to Capacity and Coal Chain Capacity impacts were determined on a 50/50 basis, as approved by the ACCC.

Capacity aspects of the TOP component of the Access Charge

Of particular relevance to this review is the application of price differentiation with respect to consumption of Capacity. That part of the TOP component of the Access Charge intended to apply differentiation with respect to Capacity has the following characteristics:

- Access revenue resulting from the application of that part of the TOP component applicable to the Coal Train configuration to the gtkm for that Coal Train configuration represents around 45-55% of the access revenue derived from the TOP Charge in total, depending on Pricing Zone. This results from the weighting afforded to that part of the TOP component.
- Access revenue resulting from the application of that part of the TOP component applicable to the Coal Train configuration to the gtkm for that Coal Train configuration will result in the same access revenue

irrespective of the Coal Train configuration. This results from the assumption made that all Coal Train configurations consume the same amount of Capacity in a Pricing Zone.

- As such, the access revenue arising from application of this part of the TOP component is independent of the pricing unit (in this case gtkm), and is dependent only on the assumptions made with respect to the relative consumption of Capacity by a Coal Train configuration compared to the configuration of the Initial Indicative Service.

In Summary

ARTC recognises the basis for concerns expressed by some stakeholders during the development of the 2011 HVAU around the use of gtkm as a pricing unit. ARTC believes that these concerns may have stemmed from the broader approach that sought to apply the same non-TOP and TOP Charge for all Coal Train configurations in a Pricing Zone as an interim measure, which in its own right resulted in no incentive to operate bigger heavier Coal Train configurations.

On the other hand, ARTC maintains its position that the use of gtkm as a pricing unit, in itself, plays no role in providing incentives to use Capacity more efficiently. Gtkm merely acts as a basis for expression of, an application of the Access Charge for a particular Coal Train configuration.

With the development of the Initial Indicative Service, further insight was provided to stakeholders in relation to the development, direction and magnitude of coal access pricing differentials and incentives in the Hunter Valley. ARTC believes that this may have served to better inform stakeholders as to the drivers of access pricing differentials, the application of access pricing to drive efficiencies in the consumption of Capacity, and the implication (or lack of it) of the use of gtkm as the pricing unit for the expression of access pricing.

ARTC considers that that the adoption of Indicative Access Charges and the price differentiation inherent in Interim Access Charges and Charges for non-Indicative Services in 2012, 2013 and 2014 have already resulted in more efficient choices being made. An increase in average train size in 2013, facilitating volume increases without additional track infrastructure is noted in ARTC's 2013-2022 Hunter Valley Corridor Capacity Strategy published in ARTC's website.

This has been achieved whilst the expression of the TOP component of the Initial Indicative Access Charges and Charges for non-Indicative Services using a gtkm pricing unit has been maintained.

With further improvements in coal chain modelling anticipated through the Section 4.18 review (Final Indicative Service), Indicative Access Charges may become even more refined and effective in driving behaviour towards efficient consumption of Capacity.

9.4 Appropriateness Of gtkm As A Pricing Unit

9.4.1 Wider price differentiation considerations

Section 4.18 of the 2012 HVAU requires ARTC to develop, in consultation with the HVCCC, and seek to incorporate into the 2012 HVAU, the Final Indicative Service intended to represent what ARTC considers will deliver optimum utilisation of Coal Chain Capacity given certain System Assumptions. The development is intended to be based on a more robust modelling exercise than that used for selecting the Initial Indicative Service and include scenarios in which System Assumptions are varied in addition to Coal Train configurations.

Section 4.18 was incorporated in the 2011 HVAU so as to ensure that efficient utilisation of the Capacity and Coal Chain Capacity could be encouraged through the 2011 HVAU.

During consultation on the 2011 HVAU, the ACCC recognised that the determination of an 'efficient train configuration' goes only part of the way to ensure efficient utilisation of the Hunter Valley coal network, and that the fundamental concern was to ensure efficient consumption of network capacity, and the provision of pricing signals to ensure this outcome.

ARTC considers that effective pricing signals to ensure efficient consumption of Capacity arise when the cost of access to the Network to a user reflects the cost and capacity impacts of that use. This would manifest in a unit of consumption (where in the coal industry broadly, and across the coal chain, this may be seen as a tonne) costing more where the nature of the utilisation of Capacity results in greater consumption of that Capacity by the unit, than another utilisation of that Capacity resulting in less consumption of Capacity by the unit.

The nature of utilisation of Capacity in relation to the Hunter Valley coal network is generally seen as the Coal Train configuration contracted by the user to transport the unit (tonne) on the Network. As ARTC has indicated in section 3 of this paper, part of the TOP component of the Access Charge under the existing approach to access pricing for coal in the Hunter Valley seeks to provide incentive for more efficient consumption of Capacity.

This part of the TOP component of the Access Charge represents around 45-55% of the TOP component, and around 35-45% of the total Access Charge (including the non-TOP component). These proportions result largely from the approach to determining the relative weightings (importance) of different factors in driving efficient outcomes for the Network and coal chain. Factors considered appropriate in the development of Initial Indicative Access Charges include maintenance cost, Capacity and Coal Chain Capacity.

ARTC strongly believes that factors other than consumption of Capacity also play a role in delivering efficient outcomes and therefore attract some weighting in price differentiation considerations. Such other factors as described above played a role in price differentiation when developing Initial Indicative Access Charges.

ARTC also believes that pricing signals in relation to consumption of Capacity should form part of the TOP component of the Access Charge. Inefficient

consumption of Capacity generally manifests in the provision of Additional Capacity that may otherwise not be necessary or could be deferred. The cost of Additional Capacity is normally recovered through the TOP component of the Access Charge. Price signals to encourage efficient consumption of Capacity were dealt with in the TOP component of the Access Charge during development of the Initial Indicative Access Charges.

The appropriateness of the factors identified in price differentiation, the basis for, and assumptions underpinning, the determination of relative impacts of different Coal Train impacts, and the weightings afforded to the various factors used to differentiate overall pricing were the subject of much discussion during the development of the Initial Indicative Access Charges.

As such, this paper does not seek to consult stakeholders on this basis. Stakeholders will be given an opportunity to more directly address these matters during ACCC consultation on the Indicative Access Charges provided under Section 4.18 of the 2012 HVAU.

The gtkm pricing unit

It is ARTC's view that two part pricing is appropriate for coal on the Hunter Valley network. Under current arrangements the non-TOP component of the Access Charge ($/000gtkm) is applied to actual gtkm (based on contracted nominal weights) operated in a period by the access holder to result in non-TOP revenue. The TOP component of the Access Charge ($/000gtkm) is applied to the contracted gtkm in a period arising from the Coal Train configuration operated and the number of Base Path Usages for the period to determine TOP revenue that is fixed for the period irrespective of actual utilisation of Base Path Usages throughout the period.

As such, two part pricing including a TOP component, by itself, results in certain efficiency benefits including incentives to invest in Additional Capacity and to utilise contracted Capacity.

Given the above basis of application of the TOP component of the Access Charge, to determine a fixed amount of TOP revenue for a period, the choice of pricing unit would not appear to be material. A number of alternative pricing units would deliver the same outcome. Examples of applications of two alternative pricing units (net tonne kilometre (**ntkm**) and train kilometre (**tkm**)) are provided below.

Example 1 (ntkm) - The TOP component of the Access Charge ($/000ntkm) is applied to the contracted ntkm in a period arising from the Coal Train configuration operated and the number of Base Path Usages for the period to determine TOP revenue that is fixed for the period irrespective of actual utilisation of Base Path Usages throughout the period.

Example 2 (tkm) - The TOP component of the Access Charge ($/tkm) is applied to the contracted tkm in a period arising from the Coal Train configuration operated and the number of Base Path Usages for the period to determine TOP revenue that is fixed for the period irrespective of actual utilisation of Base Path Usages throughout the period.

The important aspect, in terms of pricing signals to encourage efficient consumption of Capacity, is that the TOP revenue for the period is such that when applied to the units of consumption (tonne of coal) for the period results in a higher per unit consumption charge if a less efficient Coal Train configuration is used. This outcome is supported by the modelling of differential pricing.

In developing the Initial Indicative Access Charges (and other relevant Charges) in 2012, 2013 and 2014, ARTC has assumed for that part of the TOP component intended to impart a pricing signal with respect to Capacity, that all Coal Train configurations consume the same Capacity in a Pricing Zone. ARTC intends to maintain this approach in developing Indicative Access Charges (and other relevant Charges) to apply in 2015 and beyond.

As such, gtkm arising from the use of a Coal Train configuration that generates half as many gtkm as another Coal Train configuration would attract a price ($/000gtkm) for that part of the TOP component of the Access Charge that was double that for the higher gtkm generating Coal Train configuration. Where, for example, rolling stock was also used that produced a less efficient (higher) gross tonne to net tonne ratio, the differential on a per tonne of coal basis would be more than double. Table 14 demonstrates this.

Table 14: Example Calculation Of TOP Price Component

	Coal Tonnes	GT:NT Ratio	000gtkm Per Train	Relevant Part Of TOP Component ($/000gtkm)	Relevant TOP Revenue Per Train	Relevant TOP Revenue Per Coal Tonne
Coal Train Configuration 1 (100km)	3,000	1.8	540	$2.00	$1,080	$0.36
Coal Train Configuration 2 (100km)	6,353	1.7	1080	$1.00	$1,080	$0.17

It should be noted that this does not mean that the entire TOP component of the Access Charge will necessarily be double as other factors such as fixed maintenance and Coal Chain Capacity are considered and have certain weightings in the calculation.

ARTC maintains its position described earlier as to the question of the appropriateness of using gtkm as a pricing unit to encourage efficient consumption of Capacity. That is, the encouragement of efficient consumption of Capacity derives from the appropriate settings with respect to non-TOP and TOP component pricing differentials rather than the choice of pricing unit that is used to express the price itself. ARTC recognises that Interim Indicative Access Charges under the 2011 HVAU did not incorporate pricing differentials designed to achieve more efficient consumption of Capacity, as intended for an interim pricing measure. ARTC considers that the pricing approach adopted for development of pricing differentials for Initial Indicative Access Charges and other relevant Charges was appropriate in the circumstances contemplated for that development. ARTC also considers that the pricing approach that it has adopted for development of pricing differentials for Indicative Access Charges and other relevant Charges

under Section 4.18 of the 2012 HVAU is appropriate in the circumstances contemplated for that development The use of gtkm as a pricing unit, by itself, is not intended to play a role in achieving efficient consumption of Capacity.

To this end, ARTC's preference is to retain gtkm as a pricing unit for Coal Access Rights under the Hunter Valley Coal Network Access Undertaking.

9.5 The Appropriateness Of An Alternative Pricing Unit

On the basis that the encouragement of efficient consumption of Capacity rests with the appropriateness of price differentials between different Coal Train configurations rather than the pricing unit in which prices are expressed, the choice of pricing unit is therefore not critical in this regard.

As such, ARTC considers that the minimisation of the complexity to aid understanding and transparency of access pricing becomes an important characteristic of an efficient pricing regime. This has been consistently applied in the consideration of pricing structure across the ARTC network.

Other possible pricing units which have arisen from the 2011 HVAU consultation or from a review of applications in other similar jurisdictions are:

- Train path or train kilometre (**tkm**), arising from stakeholder submissions during the 2011 HVAU consultation.
- A combination of gtkm, train path, net tonne kilometres (**ntkm**) inherent in the multi-part reference tariffs applied for coal use of the Central Queensland Coal Network.

This list is by no means exhaustive and ARTC acknowledges that there are likely to be a number of other possible pricing units that could be utilised. This paper will consider only those alternatives described above given their proximity to consultation in relation to the Hunter Valley coal network.

The train path or tkm pricing unit

These pricing units were proposed in some stakeholder submissions during 2011 HVAU consultation as being a superior pricing unit to gtkm, in the context of encouraging efficient consumption of Capacity.

ARTC considers that, of these two pricing units, tkm would be more appropriate as it recognises the train journey length. The TOP component of the Access Charge expressed on a train path basis would require a separate price to be prescribed for each load point on the network (assuming terminals are considered the same for pricing purposes). This is similar to the historical net tonne pricing in the Hunter Valley which was load point specific. The introduction of a further dimension for different Coal Train configuration as well would result in myriad of different prices (several prices for each load point).

The TOP component of the Access Charge expressed on a tkm basis would simplify matters as only a price for each Coal Train configuration would be needed.

ARTC has sought to demonstrate in section 9.4 above that, as long as appropriate price differentiation to encourage efficient consumption of Capacity exists in the TOP component of the Access Charge, the choice of pricing unit in which prices are expressed plays an immaterial role in this regard.

If this is accepted, then the question as to the appropriateness of a pricing unit to encourage efficient consumption of Capacity ceases to be material.

The question of appropriateness then becomes more one of simplicity, ease of understanding and administration.

Given the immateriality of the question of an appropriate unit to encourage efficient consumption of Capacity, ARTC considers that the use of tkm as a pricing unit for the TOP component of the Access Charge is unlikely to deliver any substantial benefits in relation to encouraging efficient utilisation of Capacity. Changing the pricing unit in this regard is, however, likely to result in significant (although not insurmountable) adjustments to the 2012 HVAU and IAHA, as well as adjustments to train path schedules in existing Access Holder Agreements (**AHA**s) and require modifications to ARTC's existing billing systems. The changes to AHAs would need to be negotiated with Access Holders in due course.

Multi-part pricing and the use of a combination of pricing units

Coal access reference tariffs approved for relevant parts of the Central Queensland Coal region (CQCR) managed by Aurizon are multi-part in nature (as opposed to the two part pricing currently applied in the Hunter Valley, ARTC's interstate network and a number of other jurisdictions in Australia).

ARTC understands that the structure of CQCR coal reference tariffs to be a partial or full combination of the components below as applicable to certain parts of the CQCR network (each CQCR system) and applicable to a prescribed reference train for that system.

- AT1 - Incremental maintenance component levied on gtkm for the reference train;
- AT2 - Incremental capacity component levied on reference train path (**rtp**);
- AT3 - An allocative part of the reference tariff levied on ntkm for the reference train;
- AT4 - An allocative component of the reference tariff levied on net tonnes (**nt**) for the reference train;
- AT5 - Electric access tariff levied on egtkm[21] for the reference train;
- EC - electric energy charge levied on egtkm for the reference train; and
- QCA levy levied on nt for the reference train.

[21] egtkm = electrically hauled gross tonne kilometres

For each CQCR system, the reference train (in broad terms) is specified in terms of the following criteria:

- Maximum speed;
- Maximum axle load;
- Maximum length;
- Maximum separation;
- Specified section run times; and
- Specified load/unload times.

The reference tariffs also incorporate take-or-pay provisions applicable to the AT2, AT3 and AT4 components that are applied to the quantum of the respective pricing units (rtp, ntkm and nt) associated with annual contracted entitlements, less entitlements not made available due to Aurizon's cause.

In broad terms, it would seem that the multi-part approach used for coal in the CQCR consists of a number of parts that are applied with respect to the consumption of resources for a prescribed reference train configuration operated, such as gtkm, ntkm, net tonnes and egtkm (where applicable) as well as an incremental capacity related charge for that reference train.

The reference tariff would appear to be determined with respect to a notional reference train in the circumstances intended to represent some form of optimal utilisation of assets. In its proposal for reference tariffs to apply to the GAPE system , Aurizon proposed an optimal train configuration for the GAPE system that contemplated several objectives including meeting the annual demand profile as provided by the coal industry, minimising capital costs, lowering total cost of ownership, and system availability, maintainability and reliability.

With respect to train configurations operated in the CQCR with characteristics that are different to the relevant reference train configuration, the relevant reference tariff may be varied to reflect differences in cost or risk to Aurizon for that train configuration compared to the reference train configuration. A specific variation related to the application of the rtp in determining the charge where the number of rtp's to which the reference tariffs applies in adjusted to reflect the relative consumption of network capacity of the train configuration compared to the reference train configuration as simulated. This application would relate to the AT2 component of the reference tariff.

Where the reference tariffs can be varied to reflect differences in cost and risk for various train configurations (including consumption of network capacity), there would appear to scope to ensure that pricing is reflective of the cost of relevant resources and network capacity, and so may act to encourage efficient consumption of network capacity, as long as differentials are appropriately set.

ARTC considers that, in broad terms, and where certain components that are not relevant to the Hunter Valley are ignored (AT5, EC and QCA Levy), the application of multi-part pricing in the CQCR and the application of two part pricing in the Hunter Valley is not substantively different, and indeed shares a number of common characteristics including:

- A variable component of the charge (AT1 component (CQCR), non-TOP component (Hunter Valley)) intended to reflect the variable or incremental cost of maintenance and differential impacts of different train configurations;
- A take-or-pay component of the charge (AT2, AT3, AT4 component (CQCR), TOP component (Hunter Valley)) intended to reflect and recover other (fixed) aspects of cost such as fixed maintenance, overheads and the cost of network capacity where differentials are based on relative network capacity consumption impacts and cost and risk impacts of different train configurations.

Key differences between the two pricing structures would seem to be:

- *Application of the TOP component of the charge.* The multi-part pricing in the CQCR would seem to apply certain parts of the TOP component of the charge separately (AT2, AT3 and AT4) and on the basis of three different pricing units (rtp, ntkm and nt respectively). It is not clear to ARTC whether these separate components are intended to separately recover different aspects of the Aurizon cost base. AT2 would seem to be aimed to recover the unit cost (per rtp) of providing Additional Capacity and AT3 and AT4 would seem to be aimed at recovering the remaining cost base (fixed maintenance, overheads, existing capital costs) as allocated to a train configuration on a ntkm or nt basis.

  The TOP component of the Access Charge in the Hunter Valley separates the fixed maintenance component of the cost base from the remainder and seeks to differentiate the relative consumption impacts of different Coal Train configurations on fixed maintenance (on the basis of train axle load and speed) and remaining cost separately (on the basis of weighted Capacity and Coal Chain Capacity consumption impacts). The relative cost and consumption impacts of the Coal Train configuration on the basis of these three separate aspects is them combined into a single TOP component and expressed on a gtkm basis.

  As long as price differentials for different train configurations (which are considered separately under both the CQCR and Hunter Valley pricing structures and from the perspective of the train or train path) appropriately reflect the relative cost and consumption impacts, the mere expression and application as a single TOP component using a single pricing unit such as gtkm is unlikely to substantively alter incentives for efficient consumption of Capacity. Once again, the appropriateness of differential treatments and aspects of cost and capacity considered is more likely to create these incentives.

  Indeed, it is not entirely clear to ARTC as to the rationale behind the use of the ntkm and nt pricing units to recover costs through the AT3 and AT4 components of the charge under the CQCR multi-part pricing structure.

- *Differentiation through the TOP component of the charge on the basis of relative consumption of Coal Chain Capacity.* In developing price differentials through the TOP component of the Access Charge, ARTC explicitly has regard to impacts of a Coal Train configuration on consumption of Coal Chain Capacity. This explicit recognition of Coal Chain Capacity in access pricing differentials under the 2011 HVAU was

sought by industry in order to provide incentives to use Coal Chain Capacity efficiently.

ARTC recognises that it is arguable as to whether pricing with respect to one part of the Hunter Valley Coal Chain (the rail network) should be used to provide incentives to use Coal Chain Capacity efficiently. Coal Chain Capacity incorporates system resources outside of ARTC's rail network and it could be argued that incentives to utilise Coal Chain Capacity efficiently should be more appropriately addressed in pricing across the all elements of the Hunter Valley Coal Chain and with respect to the consumption of the capacity of those specific elements of the Hunter Valley Coal Chain. For example, it is not clear to ARTC that pricing with respect to the use of the terminals, nor above rail resources, is differentiated having regard to consumption of Coal Chain Capacity.

Nevertheless, it is not clear that price differentiation under the CQCR multi-part pricing structure has regard to consumption of coal chain capacity. Indeed, variations to the reference tariffs for train configurations other than the reference train configuration would seem to explicitly consider only cost and risk impacts to Aurizon and consumption of network capacity.

As such, it is not clear to ARTC whether the adoption of a multi-part pricing structure with a number of different pricing units would deliver any substantive benefits in relation to providing incentives for efficient consumption of Capacity over the two part pricing structure expressed in terms of gtkm currently used in the Hunter Valley.

In addition, the adoption of a more complex pricing structure as used in the CQCR is likely to result in cost and time impacts associated with substantial re-development of ARTC billing systems, and is also likely to result in significant adjustments to the 2012 HVAU and IAHA, as well as adjustments to train path schedules in existing AHA's. These would need to be negotiated with Access Holders in due course.

9.6 Stakeholder Consultation

9.6.1 October 2013 Consultation

Under Section 4.18 of the 2012 HVAU, ARTC is obliged to:

- Consult with Access Holders, Operators and the Hunter Valley Coal Chain Coordinator (HVCCC) on whether gtkm is the appropriate pricing unit to encourage efficient consumption of Capacity.
- Having regard to submissions arising from the consultation above, if ARTC considers that gtkm is not an appropriate pricing unit to encourage efficient consumption of Capacity, submit to the ACCC an alternative pricing unit that ARTC considers will encourage efficient consumption of Capacity.

In order to meet these obligations, ARTC circulated a consultation document in October 2013 to the HVCCC, Access Holders, Operators and some other relevant

stakeholders in relation to the appropriateness of gtkm as a pricing unit to encourage efficient consumption of Capacity. The content of the consultation document is substantively consistent with that provided in this section and is provided at Attachment G to the Application.

ARTC forwarded the gtkm Pricing Consultation Paper to the stakeholders listed in Table 3 above along with the FIS Consultation Paper. ARTC initially sought stakeholder submissions by 22 November 2013. This due date was subsequently extended to 29 November.

Submissions, specifically in relation to pricing were received from the relevant stakeholders shown in Table 15 below.

Table 15: Respondents To gtkm Consultation Paper

Access Holder	Idemitsu Anglo American Hunter Valley Energy Coal (BHP Billiton) Centennial Coal Whitehaven Coal Rio Tinto Coal & Allied Glencore Vale Peabody Energy Australia
Train Operator	Asciano Aurizon
Other	Port Waratah Coal Services

To the extent that stakeholders have confirmed that ARTC is able to make submissions public, ARTC has provided separate submissions at **Attachment H** to ARTC's application to the ACCC for consent to vary the 2012 HVAU. Where separate submissions in relation to pricing were not provided, but where views were expressed in a combined submission in relation to the FIS development, such submissions are provided at **Attachment F** to the Application.

9.6.2 ARTC Response

Views expressed by stakeholders in submissions covered a range of matters and concerns many of which, in ARTC's view, were directed at broader aspects of coal pricing in the Hunter Valley, and not specifically relevant to the question as to whether gtkm is an appropriate pricing unit to encourage efficient consumption of Capacity, as is sought to be examined under Section 4.18 of the 2012 HVAU. Such matters included:

- Pricing transparency;
- Grandfathering provisions; and
- Price differentiation.

As such, ARTC has only responded to submissions to the extent they are relevant to the question as to the appropriateness of gtkm as a pricing unit to encourage

efficient consumption of Capacity, as required under Section 4.18 of the 2012 HVAU.

Relevant ARTC observations from submissions

ARTC has provided its observations in relation to relevant stakeholder views expressed in submissions in Table 16 below.

Table 16: Observations On Stakeholder Responses To The gtkm Consultation Paper

Aspect of the development	ARTC's Observation
GTK pricing unit	The use of GTK as a pricing unit seemed to be supported by a number of stakeholders. It was recognised by many that efficiency and incentives arose from the differentiation between service configurations rather than the pricing unit that was used.
Multi-part pricing (CQCR approach)	ARTC did not note any significant support. It was seen by some as unnecessary and may complicate pricing.
Train km pricing unit	ARTC did not note any significant support.
Other approaches	A stakeholder supported use of GTK for non-TOP component of pricing and net tones for the TOP component of pricing on the basis that this recognises throughput is the key driver of coal chain capacity and maximising train payload was more important than train mass.

From the submissions, it would seem that the process undertaken to establish the Initial Indicative Service and the attendant differentiation in prices have alleviated earlier concerns in relation to the appropriateness of gtkm as a pricing unit to encourage efficient consumption of Capacity. The earlier concerns may have stemmed from the interim pricing prescribed in the 2011 HVAU that was not differentiated.

In relation to a stakeholder's view that TOP pricing should be based on net tonnes, ARTC assumes this means basing TOP component on a net rather than gross basis. The current price differentiation approach (Coal Chain Capacity component of differentiation) is based on coal chain throughput (net tonnes). The other components of TOP differentiation (being fixed maintenance and Capacity) are related more to train gross mass and train path respectively, where GTK is simply utilised as the pricing unit.

Following consideration of the views expressed by stakeholders in submissions, ARTC considers that, whilst there may be other pricing units that could be used that would achieve the same or similar outcome to the use of gtkm, there would not seem to be any basis upon which to conclude that gtkm is not an appropriate pricing unit to encourage efficient consumption of Capacity, nor to propose an alternative pricing unit at this time. ARTC does not consider that an alternative pricing unit would deliver any significant benefit in encouraging efficient consumption of Capacity, but would result in additional complexity and administrative and systems cost to ARTC, and the industry, as well as amendment

to regulatory and contract documents requiring further consultation and negotiation.

ARTC considers that it has consulted with the HVCCC, Access Holders and Operators on whether gtkm is an appropriate pricing unit to encourage efficient consumption of Capacity in accordance with the provisions of Section 4.18 of the 2012 HVAU.

Having reasonable regard to submissions arising from the above consultation in accordance with Section 4.18(b)(ii) of the 2012 HVAU, ARTC considers gtkm is an appropriate to encourage efficient consumption of Capacity. On this basis ARTC is not proposing an alternative pricing unit as part of ARTC's application to the ACCC for consent to vary the 2012 HVAU.

10 FIS/FIAC PROPOSAL

ARTC has considered the characteristics of the FIS and whether gtkm is an appropriate pricing unit to encourage efficient consumption of Capacity following consultation with the HVCCC, Access Holders and other stakeholders in accordance with Section 4.18 of the HVAU.

In accordance with Section 4.18(b) of the HVAU, ARTC now submits to the ACCC the proposed characteristics of the FIS as detailed in Table 10 below.

It should be noted that following the ACCC's consent to vary the HVAU to incorporate the FIS and FIAC, the FIS will become Indicative Services and the FIAC will be Indicative Access Charges as contemplated under Section 4.14 of varied HVAU.

Table 17: Proposed characteristics of the FIS (Indicative Services)

Segments	Indicative Service Characteristics
In Pricing Zone 1	
Indicative Service 1	30 tonne maximum axle load 60 kph maximum speed (loaded) 80 kph maximum speed (empty) 96 wagon train length 1,543 metres maximum train length section run times as per applicable Hunter Valley standard working timetable
Indicative Service 2	30 tonne maximum axle load 60 kph maximum speed (loaded) 80 kph maximum speed (empty) 82 wagon train length 1,330 metres maximum train length section run times as per applicable Hunter Valley standard working timetable
In Pricing Zone 2	
Indicative Service 1	30 tonne maximum axle load 60 kph maximum speed (loaded) 80 kph maximum speed (empty) 96 wagon train length 1,543 metres maximum train length section run times as per applicable Hunter Valley standard working timetable
In Pricing Zone 3	
Indicative Service 1	30 tonne maximum axle load 60 kph maximum speed (loaded) 80 kph maximum speed (empty) 82 wagon train length 1,330 metres maximum train length section run times as per applicable Hunter Valley standard working timetable

In accordance with HVAU section 4.18(d) and in support of its Application, ARTC submits current estimates of FIAC to apply in 2015 based on existing forecasts with respect to costs and volumes for 2015. Estimates with respect to each FIS in each Pricing Zone are detailed in Table 18. ARTC reserves the right to submit FIAC for 2015 to form part of the Application following the annual review of Charges as contemplated at HVAU section 4.20.

Table 18: Current Estimates Of FIAC

Segments	Non-TOP $/gtkm (ex GST)	TOP $/gtkm (ex GST)
In Pricing Zone 1		
Indicative Service 1	1.011	9.487
Indicative Service 2	1.020	10.603
In Pricing Zone 2		
Indicative Service 1	1.693	7.958
In Pricing Zone 3		
Indicative Service 1	1.592	11.255

Following the ACCC's consent to vary the HVAU to incorporate the FIS and FIAC, the FIS will become Indicative Services and the FIAC will be Indicative Access Charges as contemplated under section 4.14 of the varied HVAU.

ARTC considers gtkm to be an appropriate pricing unit to encourage efficient consumption of Capacity, and therefore does not propose an alternative pricing unit, in accordance with Section 4.18(b)(ii) of the HVAU.

ANNEXURE A APPLICATION TO VARY THE HVAU TO INCORPORATE INITIAL INDICATIVE SERVICES -FURTHER INFORMATION PROVIDED IN RELATION TO THE DIRECTION AND MAGNITUDE OF DIFFERENTIALS THAT MIGHT ARISE FOR INTERIM ACCESS CHARGES AND CHARGES FOR NON-INDICATIVE SERVICES

During the Initial and Interim Periods, ARTC intends to determine IIAC, Interim Access Charges and Charges for non-Indicative Services on the following basis.

As a minimum, ARTC will consider:

- the relative consumption of:
  - ARTC's maintenance resource and cost; and
  - ARTC Capacity resource and cost,

  for the Service compared to the relevant Initial Indicative Service based on the relevant:
  - assumptions;
  - methodologies; and
  - any reasonable adjustments to reflect practical considerations similar to those;

  as indicated in supporting documents* to the Variation application.
- the relative consumption of Coal Chain Capacity for the Service compared to the relevant IIS where this is supported by available HVCCC modelling in the circumstances (or as contemplated under the 2011 HVAU) including the relevant
  - assumptions;
  - methodologies; and
  - any reasonable adjustments to reflect practical considerations similar to those,

  as indicated in supporting documents† to the Variation application.

In determining pricing differentials, ARTC will weight its consideration in relation to the above factors having regard to:

- its cost structure; and
- the importance placed by the industry on providing incentives for efficient utilisation of Coal Chain Capacity,

as indicated in supporting documents‡ to the Variation application.

---

* Attachment B to Variation application (1 Dec 2011), and ARTC response to the ACCC information request (February 2012).

† Ibid

‡ Ibid

In determining pricing differentials, ARTC:

- will incorporate the requirements of Section 4.15(a)(iii) during the Regulatory Transition Period;
- may consider other factors as contemplated at Section 4.15 including any variation to the terms and conditions incorporated in the Indicative Access Holder Agreement or Indicative Operator Sub-Agreement relevant to the Charge; and
- may alter the assumptions, methodologies or adjustments described above, but only where there is a reasonable basis for doing so.

The following outcomes could be expected to arise where the above basis for determining IIS, Interim Access Charges and Charges for non-Indicative Services is applied.

Where:

- all other material aspects of the terms and conditions of access are equal;
- there are no pricing impacts based on factors prescribed at Sections 4.15(a)(ii), 4.15(a)(iii); and
- there is no reasonable basis to adjust impacts based on practical considerations,

the following could be expected in a Pricing Zone:

- a negative(positive)[§] price differential will arise where a Service operates with a higher(lower) average or maximum axle load than the IIS due to variable and fixed maintenance impact;
- a negative(positive) price differential will arise where a Service operates with a higher(lower) average or maximum speed than the IIS due to variable and fixed maintenance impact;
- a negative(positive) price differential will arise where a Service operates with a lower(higher) gross mass than the IIS due to Capacity impact;[**]
- a negative(positive) price differential will arise where a Service is shown by available HVCCC modelling in the circumstances (or as contemplated under the 2011 HVAU) consumes more(less) Coal Chain Capacity;[††]
- an overall price differential will result from the weighted combination of the above differentials, but a Service consuming, on balance, more of ARTC's maintenance and Capacity resources, and Coal Chain Capacity will result in a negative price differential; and
- Services other than the relevant IIS will result in a negative price differential.

[§] A negative price differential is taken as leading to a higher price; a positive price differential is taken as leading to a lower price.

[**] This applies where resulting path requirements consume the same amount of Capacity.

[††] Higher Coal Chain Capacity consumption would normally be evidenced in available HVCCC modelling by lower coal chain throughput as a result of operating the Service compared to the IIS.