Transmission Pricing Methodology: Connection charges

Working paper

13 May 2014

1 Executive Summary

1.1 The Electricity Authority (Authority) is reviewing the transmission pricing methodology (TPM), which specifies the method for Transpower New Zealand Limited (Transpower) to recover costs of operating, maintaining, upgrading and extending the transmission grid.

1.2 Following consideration of submissions on the October 2012 issues paper and feedback from the May 2013 TPM conference, the Authority decided to develop a TPM second issues paper (second issues paper). The Authority also decided to prepare this working paper to better understand whether there are efficiency problems with existing connection charges. In particular, this paper examines:

(a) whether there is potential for connection assets to be inefficiently classified as interconnection assets_whether the asset component of the connection pool charge, which is based on applying average depreciation to all connection pool assets, is efficient

(b) whether the connection pool cost allocation methodologies for the recovery of maintenance, operating and overhead costs, are efficient.

Connection charges under the current TPM

1.3 The current TPM adopts a 'deep connection' approach to specifying connection assets. This involves identifying the assets that exist to connect a party's electrical assets with the ~~core~~ grid (i.e. the grid connection service).

1.4 The 'deep connection' approach is based on a physical definition of connection assets, whereby the key distinguishing feature is that there are no 'loop flow' effects on the assets and so power always flows in one direction, making it possible to identify beneficiaries of the asset.

1.5 Where there is a requirement on Transpower to undertake an investment to meet the Grid Reliability Standards (GRS), the costs of the connection assets to meet the GRS are included within a pool of connection assets (connection pool). Charging for connection pool assets falls within the jurisdiction of the TPM.

1.6 While Transpower is subject to a revenue cap, which is regulated by the Commerce Commission[1], the TPM determines how Transpower allocates its charges to different customers. TPM connection charges[2] recover Transpower's costs of providing connection services to its connection customers.

1.7 Under the Code, a connection charge is calculated for each connection asset. The charge is the sum of the following components: an asset component~~costs~~, a maintenance component, ~~and~~ an operating component~~costs~~ and, for injection customers, an overhead component~~costs~~[3].

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1 At a high level, Transpower's return over a twelve month period is its Weighted Average Cost of Capital (WACC) multiplied by its Regulatory Asset Base (RAB).

2 Addressed in clauses 8-27, Schedule 12.4 of the Code.

3 The connection charge for injection customers (generators) includes a share of overhead costs (i.e. indirect costs such as head office). Off-take customers (distributors and grid-connected major users) are charged for overhead costs through the interconnection charge.

Asset ~~charges~~component

1.8 The asset ~~charge~~ component of the charge ("asset charge") provides Transpower with a return on capital for connection pool assets. Under the current connection charge, the asset charge ~~component~~ is calculated on the basis of applying average depreciation to all connection pool assets (average replacement cost (ARC)).

1.9 The ARC-based charge effectively averages the rate of depreciation across the pool for the purposes of calculating connection charges. This effectively flattens connection pool charges across each asset's life.

1.10 The alternative is to calculate the asset charge based on the depreciation of each individual asset (depreciated replacement cost (DRC)). A DRC-based charge is considered to be a more accurate proxy of actual cost as it reflects the asset's depreciation over its life. Under DRC-based charging, charges follow a saw-tooth profile over time where charges are highest at replacement date, and reduce over time as an asset depreciates.

1.11 ARC-based charges are not expected to equal DRC-based charges over time because:

(a) for each connection pool asset, ARC-based charges are partially influenced by the Asset Return Rate which is influenced by all assets in the connection pool, not just the individual asset

(b) if a connection customer seeks and receives more regular replacements than other connection customers (for like-for-like assets), the customer will not meet the full cost of those more regular replacements but, instead, the additional cost will be socialised within the connection pool.

Operating expense charges

1.12 There are separate maintenance, operating and overhead components (operating expenses) to connection charges. At a high level, charges are calculated through cost allocators rather than on actual cost. The cost allocators used were considered to be a good proxy for actual cost at the time the current TPM was developed.

Whether there is an efficiency problem where connection costs are shifted into the interconnection charge

1.13 In relation to the potential efficiency problem of connection costs being shifted into the interconnection charge, two potential issues have been identified:

(i) whether parties are inefficiently incentivised to have connection assets configured within a transmission loop so that connection assets are inefficiently reclassified as interconnection assets

(ii) if asset commissioning is staged, whether there are incentives to commission assets in a way that connection costs are inefficiently shifted into the interconnection charge during the commissioning process.

1.14 In relation to 1.13(i) above, while connection charges relate to the costs of providing a connection to the grid and are paid for by the party seeking the connection, the costs of interconnection assets are smeared across all load

customers. This disparity between who pays connection charges and who pays interconnection charges provides incentives for connection customers to seek to shift connection costs to interconnection charges.

1.15 Under the current TPM one way this can be achieved is to seek to connect within a loop, or to seek to have connection assets configured in a way that creates a loop. This approach incentivises parties to prefer locations that offer loop configurations to minimise transmission charges. This can reduce dynamic efficiency.

1.16 These inefficient location incentives suggest that there is a problem with either the connection charge or the interconnection charge. Since the connection charge is targeted and the interconnection charge is highly smeared, improved targeting of the interconnection charge could partially address inefficient incentives in relation to the connection charge. The Authority will consider this matter further in its second issues paper.

1.17 In relation to 1.13(ii), it appears that the existing TPM does not explicitly deal with the potential implications of the staged commissioning of transmission assets, and parties may seek to inefficiently reclassify connection assets as interconnection assets (for example, by seeking exemptions). Accordingly, the Authority is considering developing a new policy~~, which would involve a change to the TPM,~~ to explain the Authority's preferred approach to any future exemption applications that are a consequence of the staged commissioning of transmission assets.

However, the Authority considers that incentives to inefficiently reclassify connection assets as interconnection assets could be reduced by amending the TPM. The policy referred to above would be developed in addition to (and separate from) any such amendments to the TPM. The nature and content of the policy will naturally be influenced by the effectiveness of the changes to the TPM in addressing the issue described in paragraph 1.13(ii). ~~However, the Authority considers that incentives to inefficiently reclassify connection assets as interconnection assets could be reduced by amending the TPM.~~

~~1.17~~1.18

Whether moving to depreciated replacement cost would improve efficiency

~~1.18~~1.19 Reasons for moving to DRC-based charges would be:

(a) flattened charges are not necessarily required for service-type charges. Connection charges are very different in nature to service-type charges that are typically flattened, such as bank fees, e.g. connection asset service levels vary considerably over an asset's life, connection assets are capital intensive, and connection assets are difficult to relocate

(b) ARC-based charges create greater credit risk and stranding risk as the risks are higher if customers pay less now and more later than if they paid more now and less later

(c) there is inefficient cross-subsidisation between connection pool customers, which impacts allocative efficiency i.e. customers using old pool assets cross-subsidise customers using new pool assets. These costs do not balance out perfectly over time. In addition, connection customers will not

face the full cost of more frequent replacements or upgrades as the additional cost will be largely socialised within the connection pool

(d) under DRC-based charges, connection customers would face step changes to charges following asset replacements and upgrades undertaken on their behalf. Therefore connection customers would be incentivised to further scrutinise Transpower's proposed connection investments made on their behalf. Under current ARC-based charges, connection customers are not incentivised to seek to have replacements or upgrades deferred even where it was efficient to do so. Further, Transpower's wide discretion for interpreting the GRS means investment efficiency might be promoted if investments proposed on the basis of the GRS received additional scrutiny from connection customers. However, improved investment incentives from DRC-based charges might be weaker for connection customers that are Commerce Commission-regulated distributors for whom transmission charges, including connection charges are a pass-through cost

(e) given Transpower's income increases when its regulated asset base (RAB) increases, Transpower appears to have an incentive to own newly commissioned transmission assets. Transpower follows a contestable process in selecting an independent contractor to undertake new investments on its behalf. A connection customer will likely have specialist knowledge as to the required investment (if any), so rather than Transpower financing, building and owning the asset, the customer could elect to do this, subject to meeting Transpower's minimum contractor requirements. This promotes efficient investment as it gives the customer the option to undertake investments themselves if they do not consider Transpower's investment proposals to be efficient

However, since Transpower can offer a flattened charge profile for connection assets (ie ARC-based charges) required to meet the GRS under the connection pool, it has a competitive advantage over connection customers who would face "saw-tooth" charges (ie DRC-based charges) if they invested in the assets themselves. Accordingly, although Transpower follows a contestable process in selecting a contractor, the existence of the flattened charges in the pool make Transpower ownership of assets a more attractive proposition than the connection customer building and owning connection assets. This potentially undermines investment efficiency

(f) under DRC-based charges, connection customers that are aware of the potential of future stranded assets would be better incentivised to efficiently oppose asset replacements or upgrading of those assets

(g) if Transpower does not replace assets once they are fully depreciated, assets in the connection pool will be depreciated by more than 100%, which causes connection charges for individual assets to exceed actual costs, causing further inefficient cross-subsidisation within the connection pool.

(h) The possible reasons for continuing with ARC-based charges are: introducing DRC-based charges may increase administration costs, in particular:

(i) increased administration costs to Transpower for securing approval for capital expenditure required to meet the GRS due to increased

connection customer scrutiny. However, the Authority's view is that increased scrutiny over Transpower's investments will promote efficiency

~~(ii)~~ increased administration costs from applying depreciation individually to connection pool assets. This includes increased administration costs from applying a new methodology to determine the age, and depreciation levels, of assets which have had multiple partial replacements and refurbishments over time. However, given that Transpower already applies depreciation individually to assets for tax purposes, the increased administration costs in moving to DRC-based charges should not be excessive.

~~(iii)~~(ii)

(i) There could be a further efficiency advantage of the current process in that Transpower manages a portfolio of assets of different ages, and is thus able to provide a flattened charge profile without incurring a finance cost premium. Specifically, some connection customers are perhaps unable to create a flattened charge without incurring a finance cost as they generally don't have a large portfolio of assets of differing ages from which to construct a flattened charge profile. However, the finance cost is not forgone by connection customers under the connection pool's smoothed charges. The finance cost for providing a smoothed charge profile over time is met through cross-subsidisation within the connection pool. Namely, connection customers with older assets cross-subsidise the higher annual cost of newer assets. Despite this, Transpower may be able to offer a flattened charge to its customers at a lower cost than customers through providing the service without a premium to reflect the borrow/lend spread that banks would charge. This would promote productive efficiency.

~~1.19~~1.20 There appears to be both advantages and disadvantages of preserving ARC-based charges in the connection pool. While DRC-based charges would create a more efficient investment signal, which promotes dynamic efficiency, moving to DRC-based charges would potentially give rise to increased administration costs. Dynamic efficiency usually dominates both allocative and productive efficiency in terms of impact on overall efficiency, so this suggests there would be net benefits from moving to DRC-based charges.

Whether there is an issue of cross-subsidisation of operating expenses in the connection pool

~~1.20~~1.21 Ideally, connection charges allocated to connection customers at a connection location would be Transpower's actual costs in relation to providing, maintaining, and operating the connection assets at that location. For example, it would be reasonable to expect maintenance costs to be apportioned separately to individual assets so that Transpower is able to determine if an issue is arising with a particular asset. However, the Authority considers that accurate allocation of operating expenses to individual assets may be difficult to achieve where costs are common across multiple assets and where the increase in administration costs could make this inefficient.

~~1.21~~1.22 ~~However, t~~The Authority was advised by Transpower that certain operating expenses, such as selected maintenance costs, are already applied to individual

assets for taxation purposes. The Authority considers that while a change to the TPM to reflect an actual cost-based methodology might involve changes to existing Transpower processes in relation to calculating transmission charges under the TPM, given the individual cost allocations that are already available, the administration costs of a change to the TPM should not be excessive.

1.221.23 The Authority considers that an actual cost-based methodology is more efficient for allocating operating expenses to connection customers, and invites submitter views on the issue.

Cost benefit analysis

1.231.24 The Authority has not attempted to quantify net benefits of changes to status quo connection charging arrangements at this stage. Rather, the Authority is seeking feedback on this paper to assist it to decide whether or not there are net benefits in:

(a) addressing incentive problems resulting from the disparity between connection and interconnection charges

(b) moving from ARC-based asset charges to DRC-based asset charges for connection pool assets

(c) moving closer to an actual cost-based methodology for the allocation of operating expenses within the connection pool.

Contents

Tables

Figures

2 Introduction

Background to process

2.1 The Electricity Authority (Authority) is reviewing the transmission pricing methodology (TPM), which specifies the method for Transpower New Zealand Limited (Transpower) to recover costs of operating, maintaining, upgrading and extending the transmission grid.

2.2 The Authority considers that the current TPM can be improved so as to better meet the Authority's statutory objective of promoting competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers.

Working papers

2.3 The Authority has decided to advance the process of reviewing the TPM by developing a second TPM issues paper (second issues paper) following consideration of submissions on the October 2012 TPM issues paper (October issues paper) and information provided at the TPM conference held in Wellington on 29-31 May 2013.

2.4 Prior to developing a second issues paper, the Authority is developing and further considering key aspects of a revised TPM proposal through a series of working papers, which will provide key inputs into the second issues paper.

Background to this working paper

2.5 Following consideration of submissions on the October issues paper and the responses of parties to the Authority's questions at the May 2013 TPM conference, the Authority decided to prepare a working paper to better understand whether there are efficiency problems with existing transmission connection charges.

Purpose of this working paper

2.6 The purpose of this working paper is to assist the Authority to better understand whether there are efficiency problems with existing connection charges. The matters this paper examines are:

(a) whether there is potential for connection assets to be inefficiently classified as interconnection assets, and in particular:

  (i) whether parties are inefficiently incentivised to have connection assets configured within a transmission loop so that connection assets are inefficiently reclassified as interconnection assets

  (ii) if asset commissioning is staged, whether there are incentives to commission assets in a way that connection costs are inefficiently shifted into the interconnection charge

(b) whether the asset component of the connection pool charge, which is based on applying average depreciation to all connection pool assets is efficient

(c) whether the connection pool cost allocation methodologies for recovery of maintenance, operating and overhead costs, are efficient.

Other working papers

2.7 Other working papers the Authority has completed or will complete include:

(a) Cost benefit analysis (CBA) – This paper outlined a revised approach that the Authority intends to apply to the cost-benefit analysis of a revised TPM proposal that will be included in the second issues paper. (Submissions closed)

(b) Definition of sunk costs – This paper examined the extent to which the costs involved in the provision of electricity transmission services are actually "sunk" and the implications for transmission pricing. (Submissions closed)

(c) Avoided cost of transmission (ACOT) – This paper considered the efficiency implications of changes to the TPM that may reduce the quantum of ACOT payments, assuming the current ACOT payment policies are maintained. (Submissions closed)

(d) Use of loss and constraint excess (LCE) to offset transmission charges – This paper explored submitter suggestions that the proposed use of LCE to offset transmission charges would distort the otherwise efficient wholesale market signals. (Submissions closed on 4 March 2014)

(e) Beneficiaries-pay approach – This paper examined options for applying a beneficiaries-pay charge. (Submissions closed on 25 March 2014)

(f) Approach to residual charge - This paper will consider the most efficient approach to residual charges, including whether it may be efficient to levy any residual charge on the basis of congestion rather than load during peak demand periods. (To be released)

Decisions on the TPM

2.8 Section 32(1) of the Electricity Industry Act 2010 (Act) requires that provisions in the Electricity Industry Participation Code 2010 (Code) must be consistent with the Authority's statutory objective.

2.9 The TPM is part of the Code, so any provision or amendment to the TPM must be consistent with the Authority's statutory objective.

2.10 In order to assist the Authority to make decisions about the TPM consistent with its statutory objective the Authority developed a decision-making and economic framework[4]. The Authority applied this framework to derive the proposal for the TPM that is set out in the October issues paper[5]. After considering submissions on the October issues paper and the responses of parties to the Authority's

[4] Available from http://www.ea.govt.nz/our-work/programmes/priority-projects/transmission-pricing-review/.

[5] Available from http://www.ea.govt.nz/our-work/consultations/priority-projects/tpm-issues-oct12/.

questions at the May 2013 TPM conference, the Authority has decided to develop and release a second issues paper. This will include a revised TPM proposal and draft guidelines (as referred to in clause 12.89 of the Code) to be followed by Transpower in developing a new TPM.

2.11 In developing the second issues paper, the Authority will continue to be guided in its decisions by its TPM decision-making and economic framework.

2.12 The Authority will make decisions about the development of the TPM according to its Code amendment principles and the Authority's statutory objective.

2.13 The Authority's Consultation Charter[6] sets out guidelines relating to the processes for amending the Code and the Code amendment principles that the Authority must adhere to when considering Code amendments.

[6] Available from http://www.ea.govt.nz/about-us/documents-publications/foundation-documents/.

3 Submissions on this working paper

3.1 The purpose of this paper is to consult with participants and persons that the Authority thinks are representative of the interests of persons likely to be substantially affected by the TPM.

3.2 The Authority's preference is to receive submissions in electronic format (Microsoft Word). It is not necessary to send hard copies of submissions to the Authority, unless it is not possible to do so electronically. Submissions in electronic form should be emailed to submissions@ea.govt.nz with *Working Paper – Transmission pricing methodology: Connection charges* in the subject line.

3.3 If submitters do not wish to send their submission electronically, they should post one hard copy of their submission to the address below.

Submissions
Electricity Authority
PO Box 10041
Wellington 6143

3.4 Submissions should be received by 5pm on ~~17~~ 24 June 2014. Please note that late submissions are unlikely to be considered.

3.5 The Authority will acknowledge receipt of all submissions electronically. Please contact the Submissions Administrator if you do not receive electronic acknowledgement of your submission within two business days.

3.6 Your submission is likely to be made available to the general public on the Authority's website. Submitters should indicate any documents attached, in support of the submission, in a covering letter and clearly indicate any information that is provided to the Authority on a confidential basis. However, all information provided to the Authority is subject to the Official Information Act 1982.

4 Connection charges under the current TPM

A ‘deep connection’ approach to the definition of connection assets

4.1 The current TPM adopts a ‘deep connection’ approach to specifying connection assets by identifying the assets that exist to connect a connecting party’s electrical assets with the grid. In broad terms, a~~A~~ connection asset is ~~defined as~~:[7]

(a) at a connection node, any grid asset, other than voltage support equipment that is for grid voltage support purposes~~,~~ that has not been installed at a customer’s request

(b) at an interconnection node:

(i) any grid asset that is specifically required to connect a customer

(ii) any grid asset that is used both to connect a customer and for grid operation generally

(iii) a proportion of the land and buildings at the connection location

(c) any grid asset that is a connection link.

4.2 The ‘deep connection’ approach is based on a physical definition of connection assets. The key distinguishing feature of c~~C~~onnection assets ~~are~~ is that they ~~deemed to be transmission assets that~~ have no ‘loop flow’ effects on them. Hence, power always flows in one direction which, as the Electricity Commission noted when it decided on applying a deep connection definition, makes it possible to identify “causers” or ”users” of the asset.[8] If there are multiple connection parties using particular connection assets, then, as with any shared asset, some form of cost apportionment is required.

4.3 Thus, the nature of the connection service is that Transpower, or other parties authorised by Transpower, build, maintain and operate a ring-fenced set of connection assets in a configuration that meets a connecting party's requirements for capacity and reliability at a particular location, and in certain circumstances, meets the GRS. These assets provide a point-to-point electrical interface between the connecting party's assets (i.e. a generator, distribution network or a large industrial site) and a suitable node on the interconnection part of the grid. These two points may be immediately adjacent or, in some cases, many kilometres apart, requiring sections of transmission line to connect them.[9]

4.4 Transpower’s natural counterparty for a connection service is the party that owns the assets for which the grid connection is sought. This party will derive a private benefit from connection of their assets to the grid and will have the information, incentive and capability necessary to determine price/quality trade-offs (within the

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7 See the definition in c~~C~~l 6(1), Schedule 12.4 of the Code.

8 Electricity Commission, February 2005, The Commission’s Statement of Reasons in Relation to the Proposed Guidelines for Transpower’s Pricing Methodology, pages 18-19.

9 Clause 4.26, page 48, Transmission Pricing Methodology: issues and proposal, 10 October 2012.

limits imposed by the GRS provided in the Code) and agree on service levels. Connection is thus a service that is practical to arrange through bilateral negotiation between Transpower and a single connecting party (or at most possibly two or three parties where it is efficient to share connection assets at a particular location).

4.5 Connection is potentially a contestable service, and thus market-like, in that the connecting party could theoretically choose to develop much of the investment themselves. However, in practice, Transpower is frequently chosen by the connecting party to undertake significant portions of the required asset investment, particularly where 220 kV and 110 kV assets are required.

Connection Pool or Customer Investment Contracts (CICs)

4.6 Transpower enters into two types of connection arrangements[10]:

(a) **Connection pool.** Where ~~there is a requirement on~~ Transpower ~~to~~ undertakes an investment to meet the GRS, the costs of the connection assets to meet the GRS are included within a connection pool (that is, connection assets that are included in the RAB, and in respect of which Transpower imposes connection charges under the TPM).[11]

(b) **Customer Investment Contracts (CICs).** For connection assets that are not part of an investment ~~not~~ required to meet the GRS, customers are generally considered to be able to provide connection assets themselves.[12] CICs are thus seen to be a competitive service, and are outside the scope of both the Commerce Commission's price-quality regulation and the TPM. Accordingly, CICs are outside the scope of the TPM review and this working paper. Where a connection customer requires a level of service beyond what is required by the GRS, Transpower negotiates CICs with those customers.

The Commerce Commission is responsible for the appraisal of connection investments

4.7 The Commerce Commission is responsible for approval of capital expenditure (capex) for pooled connection assets.[13] The Transpower Capital Expenditure Input Methodology Determination 2012 (capex IM) sets out the approval process for proposed electricity transmission capital investments.

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10 Prior to the current TPM, Transpower contracted with connection customers through a variety of contractual arrangements, such as input connection contracts, new investment contracts and notional embedding contracts.

11 Transpower has advised that there are some older assets within the connection pool that were not required by the GRS. If connection pool assets are not required by the GRS, Transpower's practice in relation to those assets is that when they are replaced they are moved out of the pool and administered through CICs. See further paragraph 7.22.

12 Subject to Transpower authorising connection customers to use their own contractors to provide connection assets.

13 Where connection assets are administered through CICs, the arrangements are arguably contestable, and market-like, and therefore fall outside of the Commerce Commission's regulatory jurisdiction.

4.8 The capex IM distinguishes between base capex and major capex:

(a) base capex includes asset replacement, asset refurbishment, business support and technology assets. Base capex requires ex ante approval prior to the regulatory period. Substitution between years and across categories is permitted. Base capex is subject to a materiality threshold[14]

(b) major capex is incurred to meet the GRS or provide a net electricity market benefit (NEMB). Major capex must be considered on a project-by-project basis and can be submitted for approval at any time.

The Commission's Capex incentives promote identification and realisation of efficiencies

4.9 The Commerce Commission adopted an incentive regime to ensure that Transpower has incentives to pursue efficiencies. Incentive rates are administered through the calculation of revenue adjustments.

4.10 The incentive rates apply to both capex and operating expenditure. Included within the incentives are output frameworks, which are designed to ensure that efficiencies are not realised at the expense of reduced quality levels.[15] However, if Transpower can realise efficiencies in either its Commerce Commission approved capex or operating expenditure budgets, *and* achieve its minimum required service levels, then Transpower will realise a share of the efficiencies it identifies, with the balance of savings being realised by Transpower's customers through adjustments to charges.

4.11 The capex incentives for both base and major capex will apply from Regulatory Control Period 2 (RCP2).[16] Under the capex incentives, where Transpower completes a capex project for less than its Commerce Commission approved budget, Transpower will retain 33% of the amount under-budget with the remaining 66% being allocated to customers.[17] Where Transpower exceeds its approved budget, it is required to meet 100% of those costs, unless Transpower applies for and is granted an amendment to its approved budget. When considering whether to approve an amendment, the Commerce Commission will consider whether the additional costs were reasonably foreseeable, and were outside Transpower's control.

Connection pool charges

4.12 While Transpower is subject to a revenue cap which is regulated by the Commerce Commission[18], the TPM determines how Transpower allocates its

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14 For regulatory control period (RCP2), projects of less than $20 million are proposed to be base capex and projects which are greater than $20 million are proposed to be major capex.

15 This is achieved through setting the grid output incentive rate. The grid output incentive rate is an amount that Transpower may recover or must bear as a result of differences between grid output and the grid output target.

16 From 1 March 2015.

17 Commerce Commission, Transpower Capital Expenditure Input Methodology reasons paper, 31 January 2012, p. 63.

18 At a high level, Transpower's return over a twelve month period is its Weighted Average Cost of Capital (WACC) multiplied by its Regulatory Asset Base (RAB).

charges to different customers. TPM connection charges[19] recover Transpower's costs of providing connection services ~~to its connection code customers~~.

4.13 Under the Code, a connection charge is calculated for each connection asset. The charge is the sum of the following components: asset costs, maintenance and operating costs and, for injection customers, overhead costs[20]:

$$\text{Connection charge} = (A_{conn} + M_{conn} + O_{conn} + IO_{conn}) \times CA_{conn}$$

A_{conn}	is the asset component for the connection asset.
M_{conn}	is the maintenance component for the connection asset
O_{conn}	is the operating component for the connection asset
IO_{conn}	is the injection overhead component for the connection asset (if the customer is an injection customer).
CA_{conn}	is the customer allocation for the connection asset.

Calculation of the asset charges

4.14 The asset ~~charge~~ component of the connection charge ("asset charge") provides Transpower with a return on capital for connection pool assets it has invested in on behalf of its connection customers.

4.15 The ~~Asset charges are a product of the~~ asset return rate is used to calculate the asset charge payable in relation to each connection asset. The asset return rate is ~~, the sum of annual depreciation of all connection assets and~~ the WACC multiplied by the regulatory asset value of all connection assets plus the total depreciation (in dollars) of those assets, divided by the total replacement cost of ~~all connected~~ those assets. The asset return rate is then multiplied by the replacement cost of the connection asset in question to provide annual charges for that connection asset.[21]

4.16 The customer allocation component is used to allocate portions of charges where more than one customer uses a connection asset. Charges are principally allocated according to customers' anytime maximum demand or anytime maximum injection.[22]

4.17 The formula described in paragraph 4.15, effectively averages the rate of depreciation across the pool for the purposes of calculating connection charges. Accordingly, for the charge, each asset is depreciated according to the average

19 Addressed in clauses 8-27, Schedule 12.4 of the Code

20 The connection charge for injection customers (generators) includes a share of overhead costs (i.e. indirect costs such as head office). Off-take customers (distributors and grid-connected major users) are charged for overhead costs through the interconnection charge.

21 Cl 10-12, Schedule 12.4 of the Code.

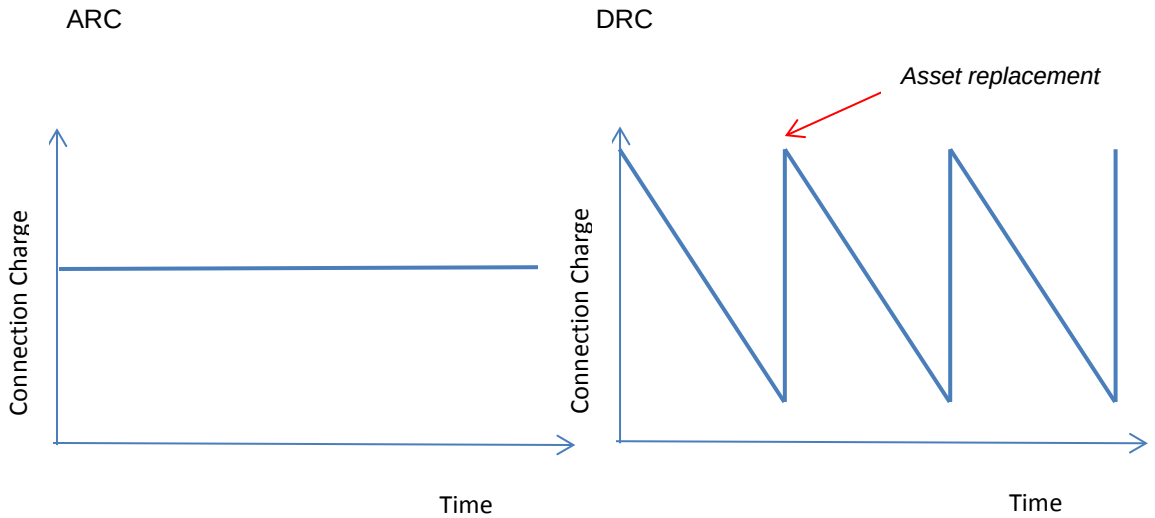
22 Cl 25, Schedule 12.4 of the Code.

rate of depreciation of the combined assets in the pool. For example, if all assets in the pool are, on average, depreciated by 55%, then each asset within the pool is assumed to be depreciated by 55%.

4.18 The method of averaging rates of deprecation in the pool effectively flattens the value of each pool asset across its life. For example, if the pool was, on average, 50% depreciated, then a pool asset with a value of $1 million, would be deemed to have a value of $500,000 for the purposes of calculating asset charges. Since this value is then multiplied by a rate to calculate charges, the effect of averaging rates of depreciation in the pool is to have a flattened asset charge over the life of the asset.[23]

4.19 The method of calculating charges based on average rates of the depreciation in the connection pool is described as Average Replacement Cost (ARC). The charge profile for ARC-based charges is illustrated in Figure 1 below. An alternative charging method, which is a more accurate proxy for cost-based charging, is where depreciation is calculated separately for each asset. This alternative method is described as Depreciated Replacement Cost (DRC). As illustrated in Figure 1 below, DRC-based charges follow a 'saw tooth' profile, whereby DRC is higher in the early years following commissioning of an asset. The DRC reduces as the asset depreciates over time, until replacement, when the DRC increases sharply to reflect the new, non-depreciated asset.

Figure 1 ARC versus DRC charges



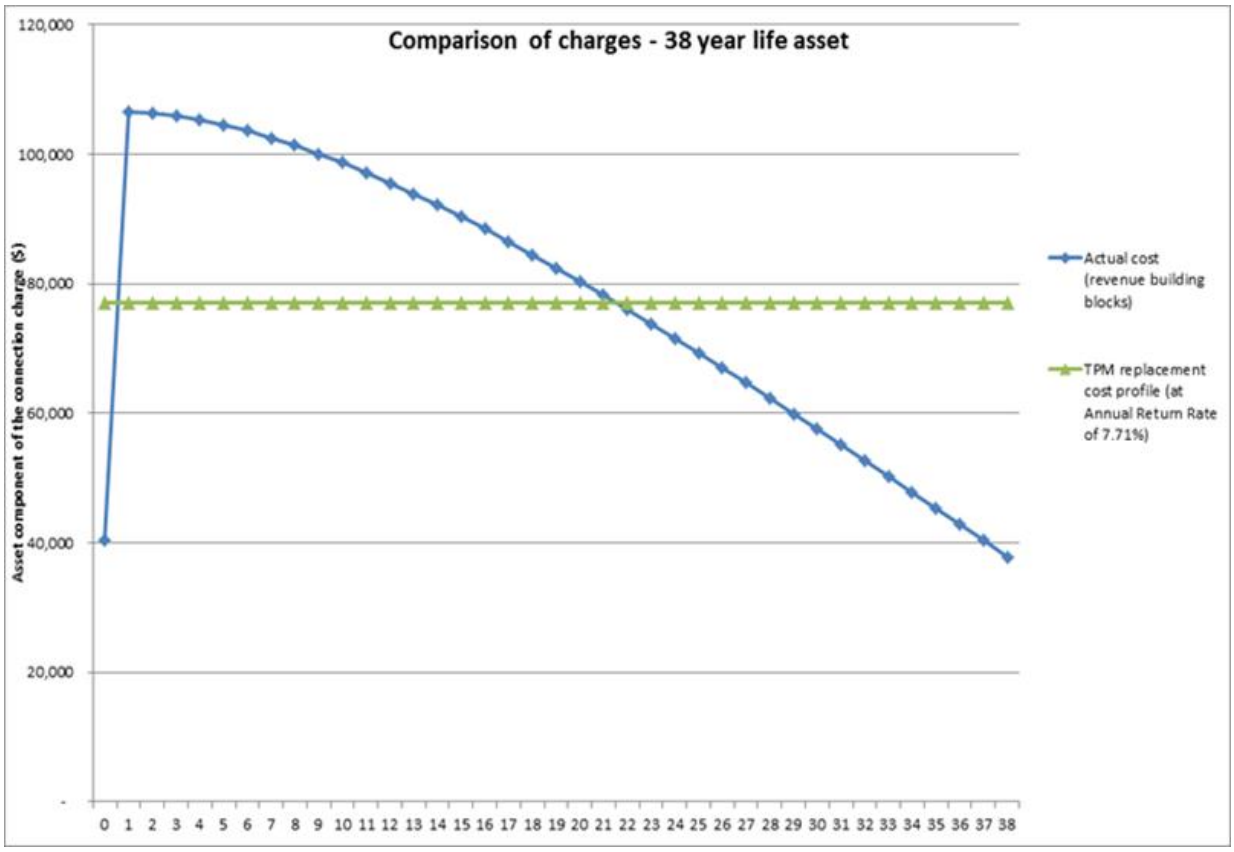
Source: Electricity Authority

4.20 Figure 2 below illustrates the difference between DRC and ARC-based charges over an asset's life cycle by modelling a hypothetical replacement programme of an asset worth $1 million with an asset life of 38 years, assuming an annual

[23] However, connection pool charges will change slightly over an asset's life, for example, as the maintenance component of charges changes, or new assets are added to the connection pool changing the average rate of depreciation in the pool.

return rate of 7.71%.[24] Note that under the ARC-based approach, the annual asset charge component of the connection charge[25] was $78,000 p.a. for each year of the assets' life, while under a DRC-based charge, the asset charge component was $108,000 p.a. at commissioning, reducing down to $38,000 p.a. at the end of the asset's life.

Figure 2 Comparison of ARC (current TPM) and DRC (actual cost-based) charges for a $1 million asset with a 38 year life



Source: Transpower

4.21 Under the example above, if pool charging was changed from ARC to DRC-based charges, depending on the age of the assets, there would be an immediate adjustment to the charging regime and costs would be somewhere between $38,000 p.a. and $108,000 p.a. At the time assets were to be replaced, the charge would move from $38,000 p.a. up to $108,000 p.a., a single increase of $70,000 p.a. or 184%.

4.22 This example shows that under DRC-based charges a significant price increase will occur when assets are replaced, as the connection charge will move from its lowest level to its highest level upon replacement.

Whether ARC-based costs will equal DRC-based costs over time

[24] Transpower employs an annual return rate of 7.71%. Clause 3 of the TPM (Schedule 12.4 of the Code) requires that the annual return rate is calculated using the pre-tax nominal WACC for that pricing year.

[25] Not including maintenance and overhead cost components which would not likely be substantially different under either approach.

4.23 While an ARC-based approach might be expected to equal a DRC-based approach over time, charges based on ARC will not equal DRC perfectly over time because the charge for each asset in the pool is a product of the asset return rate, which is influenced by all assets in the pool. If there was, for example, a sudden boost in new connection assets, the "asset return rate" would rise and so would the connection charge of all pool assets even though there may have been no investment at a particular customer's connection point. For this same reason, the asset charge will not be completely flat as suggested in Figure 1 but it will change as new assets are added to the pool or old assets are retired or as assets age over time. However, since there are many assets in the pool, changes to the average age of pool assets are smoothed, and so in practise the charge is fairly steady over time.

4.24 Another reason ARC-based charges will not equal DRC-based charges over time is where some connection customers seek more regular replacements than other connection customers. This means the connection customer receiving the more regular replacements will not meet the full cost of those regular replacements as its asset charge will reflect the average age of assets within the pool, and not the actual age of its assets. As a result, those seeking more regular replacements will have some of their connection assets cross-subsidised by those receiving less regular replacements. This does not appear to be efficient.

Calculation of connection pool operating expense ~~charges~~components

4.25 There are separate maintenance, operating and overhead components to connection charges. At a high level, each component includes a rate[26] which is multiplied by a volume. The total cost for each of the components is allocated according to the cost allocators described below:

(a) Maintenance ~~charges~~component.[27] The maintenance component has separate cost allocations for substations and lines.

(i) Substation maintenance ~~charges~~ costs are allocated on the basis of replacement cost of the connection substation in question, compared to the replacement cost of all connection substations.[28]

(ii) Line~~s~~ maintenance ~~charges~~ costs are allocated on the basis of the length of the connection line in question, compared to the length of all connection lines.[29]

(b) Operating ~~charges~~component.[30] Operating ~~charges~~ costs are allocated on the basis of the number of switches that form part of the connection asset in question, compared to the number of all connection asset switches.~~.~~

26 maintenance recovery rate, operating rate, and injection overhead recovery rate

27 Cl 13-17, Schedule 12.4 of the Code

28 Charges are also averaged over the preceding four year period.

29 Costs are also separately allocated to three different types of line: 220kV or higher voltage lines; other tower lines; and pole lines. Charges are also averaged over the preceding four year period.

(c) Overhead ~~charges~~component.[31] Only injection customers pay an overhead ~~charges~~ component since offtake customers pay overheads through the interconnection charge, which injection customers do not pay under the current TPM. The component covers the proportion of overhead costs that are attributable to injection customers.

(d) Costs are allocated to specific connection assets on the basis of the replacement cost of the connection injection asset in question compared to the replacement cost of all connection injection assets.[32]

4.26 Where more than one customer uses a connection asset, customers are allocated a portion of the charges. Charges are principally allocated according to customers' anytime maximum demand or anytime maximum injection.[33]

4.27 The current method of assigning ~~operating expenses~~the cost of maintenance, operation and overheads is based on cost allocators as opposed to an actual-cost based methodology. ~~i.e~~For example~~,~~ line maintenance costs are assigned to each connection line as a proportion of the length of that particular line compared to the length of all lines, not how much was actually spent to maintain that particular line.

4.28 The advantages and disadvantages of using standardised cost allocators instead of an actual-cost based methodology are discussed later in the paper.

30 Cl 18-20, Schedule 12.4 of the Code

31 Cl 21-24, Schedule 12.4 of the Code

32 Charges will be apportioned where only a portion of a connection asset is used by an injection customer.

33 Cl 25, Schedule 12.4 of the Code

5 The October issues paper and submitter feedback

Authority proposed three 'minor' changes to connection charges

5.1 Through its investigation of connection charges in the October 2012 issues paper, the Authority considered the current market-like charging arrangements for connection were generally efficient. Therefore, the Authority proposed to retain the essential components of the current charging approach in its October issues paper.

5.2 However, the Authority identified two relatively minor problems with the existing arrangements that it considered could result in inefficient transmission pricing outcomes:

(a) in principle, service and cost responsibility boundaries can create inefficient incentives where different cost allocation rules apply on either side of an asset boundary and one set of rules is more favourable to a connection party than the other

(b) the potential for connection customers to seek to inefficiently shift connection costs into the interconnection charge by refusing to agree to an investment contract with Transpower for the replacement of connection assets.

5.3 In order to address the concerns identified above, the Authority proposed to:

(a) add a provision to the TPM that requires current connection assets to be treated as connection assets until they are eventually replaced or decommissioned

(b) add a new provision that replacement assets are valued for charging purposes at actual replacement

(c) add referral provisions to allow the Authority to deal with special cases or to deal with situations where a connection customer disputed their connection charges following an asset replacement. This would include a mechanism to deal with any changes required to transmission charges as a result of the Authority's determination.

Submissions on the connection charge proposal

5.4 A summary of submissions and cross submissions on the Authority's connection charge proposal in the October 2012 issues paper, and a full transcript of the May 2013 conference discussion are available at the Authority's TPM review project webpage.[34]

[34] Available from http://www.ea.govt.nz/our-work/programmes/priority-projects/transmission-pricing-review/.

5.5 The following provides an overview of key criticisms of the connection charge proposal that the Authority presented in the October issues paper and provides suggestions for improvements to it or recommends alternatives.

5.6 There were twenty-three (23) submissions providing feedback on the Authority's connection charge proposal: with 13 indicating support or partial support; and 10 against.

Transpower's submissions

5.7 Transpower submitted that it currently undertakes two types of connection arrangements: arrangements for including connection assets in the connection pool and CICs.

5.8 Transpower submitted that if it is required to undertake a connection investment to meet the GRS, the respective connection assets are included within a connection pool. For assets within the pool, connection customers pay a flattened cost, based on the average life of assets within the pool. Transpower submitted that the flattened charge is consistent with a service type charge and that it allows Transpower to employ a fleet management strategy for the purposes of managing the connection assets charged through the pool.[35]

5.9 Transpower further submitted that where a connection asset is not required to meet the GRS, Transpower is not compelled to build the asset but would be willing to negotiate a CIC with the relevant connected customer(s).

5.10 Transpower submitted that assets required by the GRS were added to the connection pool at full replacement value, and not the (now outdated) ODV handbook, as the Authority had previously incorrectly supposed, and that accordingly there was no issue of connection costs being inefficiently transferred into the interconnection pool.

The Authority's response to industry submissions

5.11 The main concerns with the connection charge proposal and the Authority's responses are summarised in Table 1 below.

[35] Comments by Transpower at the TPM conference, TPM Conference transcripts, 1 May 2013, p. 84.

Table 1: Submitter comments and Authority response

Pooled (average) charges versus actual charges

Submitter comment	Authority response
The historic building block values used to assess a customer's charges are only used as a way of allocating charges within the connection pool. The overall size of the connection pool is based on the aggregate regulatory asset value of all connection assets. This means there is no material problem caused by building block values being lower than current replacement costs. Full connection asset costs are recovered from connection customers.	The Authority notes submitter comments that assets enter the connection pool at replacement cost and not the outdated historic ODV building block values and that accordingly there does not appear to be a problem of connection costs being transferred into the interconnection pool. Therefore this does not appear to cause a problem with the value of the connection pool in aggregate.

Submitter comment	Authority response
Connection charges are operating efficiently and effectively. The issues highlighted by the Authority are generally immaterial and amendments are not required.	Connection charges are socialised within the pool as the pool calculates a flattened charge profile (using ARC) for each connection asset based on the average level of depreciation of all assets in the pool. The Authority has modelled connection charges to determine whether there is cross-subsidisation of costs from one customer to another within the pool, both within the asset charge and in allocation of operating expenses.
A more robust approach, in both longevity and efficiency terms, would be to have connected parties face the full costs of the assets used to connect them.	The Authority assesses whether moving away from pool-based charges to asset charges based on DRC, and also by allocating operating expenses according to an actual cost-based methodology, could provide net benefits in the following sections of this working paper.
The Authority should use updated asset values in place of asset values provided in the building blocks.	Updating the assets values in the ODV handbook would only partially address potentially inefficient asset charges within the pool. Connection charges are socialised within the pool as the pool calculates a flattened charge profile (using ARC) for each connection asset based on the average level of depreciation of all assets in the pool. There is also a potential problem with the way operating expenses are allocated.
If connection customers are required to face actual costs rather than average costs, it is reasonable that connection customers have the right not to approve enhancements to existing assets and instead opt to bear the lower reliability.	In principle, connection customers that are required to meet costs of an investment should be able to influence the nature and timing of the investment. However the Authority notes Transpower's comments that increased scrutiny could adversely affect Transpower's ability to meet its GRS obligations.

Submitter comment	Authority response
Customers would experience 'rate-shock', going from a pool charge, to a new asset charge, when, to maintain service levels, Transpower carries out end of life asset replacements. This may mobilise opposition to such replacements, which would hinder Transpower's ability to maintain services using rational asset management decision criteria.	If customers receive a benefit from an asset replacement, even if it causes a substantial price increase, they should be willing to pay for it up to the level of benefit received. Hence, charging on the basis of DRC provides incentives for asset replacements when they're efficient. However, if there is any inefficiency for some reason, this needs to be weighed against inefficiency caused by smearing of costs within the pool under the status quo.
The connection cost allocation method used by the TPM in effect 'under-recovers' the asset return on newer assets and 'over-recovers' the asset return on older assets, with the net effect being NPV neutral over the full lives of the assets.	The concept of applying an ARC to each asset may incentivise more regular upgrades or replacements than what is efficient since connection customers will not face the full costs of more frequent upgrades or replacements. It will also discourage contestability in the provision of connection assets by impacting on the risks of stranding borne by connected parties. i.e. if customers pay more now and less later the credit risk is lower than if customers pay less now and more later. This protects Transpower from competition in providing connection assets as they are able to socialise the risks of stranding which undermines efficiency. A non-regulated entity cannot avoid stranding risk in the same way.
Many 'like for like' connection asset replacements are not done under CICs and the replaced assets consequently remain in the connection asset pool.	The Authority is advised by Transpower that replacements or upgrades that are allocated to the pool are undertaken to meet the GRS and if there is no GRS requirement, the enhancement or replacement will be administered through a CIC.

Issues around connection charges being inefficiently reclassified as interconnection

Submitter comment	Explanation and action
There are still material boundary issues regarding whether assets are classified as connection or interconnection.	If the Authority moves to a more efficient charging basis for interconnection assets, there may no longer be a material advantage from having connection assets reclassified as interconnection assets. More efficient charges would likely limit the benefit from shifting costs to other charging pools as the party taking such actions is more likely to bear the costs themselves. For example, under a beneficiaries-pay arrangement, a party benefiting from an interconnection asset would be required to pay for it up to their private benefit. Furthermore, as discussed in section 6, there may be an issue whereby parties are inefficiently incentivised to have connection assets configured in such a way that they are inefficiently classified as interconnection assets. There may also be an issue, also discussed in section 6, whereby parties are inefficiently incentivised to seek to have assets commissioned in a way that they are temporarily classified as interconnection assets during a staged commissioning process.
‘Locking-in’ connection asset status may unnecessarily restrict Transpower's ability to efficiently reconfigure the grid in the future. There is a risk that the proposed change could have perverse or unintended consequences if a situation arose where it legitimately made sense for assets to change from connection to interconnection.	The Authority accepts that 'locking in' connection asset status without any exceptions might be overly restrictive. If more efficient charges were applied for interconnection costs, this would reduce incentives on parties to inefficiently seek to have connection assets reclassified as interconnection assets.

Referral of connection related disputes to the Authority

Submitter comment	Explanation and action
Individual referral to the Authority may lead to a greater number of disputes. Referral of disputes to the Authority would put the Authority back in the position of a second transmission investment regulator, which is counter to the intent of the reforms that led to its creation. The Commission already regulates expenditure on asset replacements.	The intention for referral of disputes was to ensure that charging was efficient, and not to regulate transmission investment. However, submissions on this proposal suggest the costs of this proposal may exceed the benefits.

6 Whether there is an efficiency problem where connection costs are shifted into the interconnection charge

6.1 The Authority considers that it has identified two problems where connection costs might be inefficiently shifted into the interconnection charge:

(a) where parties are inefficiently incentivised to have connection assets configured within a transmission loop so that connection assets are inefficiently reclassified as interconnection assets

(b) if asset commissioning is staged, where assets are commissioned in a way that connection costs are inefficiently shifted into the interconnection charge during the commissioning process.

6.2 The two potential problems are addressed separately below.

Inefficient incentives to have connection assets configured within a transmission loop so that connection assets are inefficiently classified as interconnection assets

6.3 Under the TPM a party is required to pay connection charges for connection assets at the points where they are connected to the grid, whereas charges for interconnection assets are spread among offtake customers.

6.4 Since connection charges are highly targeted and interconnection charges are socialised among all offtake customers, parties are incentivised to seek to have connection assets classified as interconnection assets. This is particularly the case for generators who would face connection costs but do not face the interconnection charge.

6.5 The Authority considers that the dissimilarity between connection and interconnection charges creates an incentive to shift costs into the interconnection pool. The following discussion examines whether the existing TPM counteracts this incentive, and whether an inefficient shift of assets from the connection pool to the interconnection pool actually occurs in practise.

6.6 Paragraph 4.2 describes deep connection as being where there are no ‘loop flow’ effects, and so power always flows in one direction. This makes it possible to identify the beneficiaries of an asset. Under deep connection, an interconnection node is a node connected to two or more nodes in a “loop”, other than a “small regional loop”. A small regional loop is where a loop path exists between any group of nodes (excluding nodes at Benmore and Haywards) with only a single link from the loop back to the next node that is outside the loop.[36]

6.7 Figure 3 below illustrates the classification of assets with and without the existence of a loop flow. In Example 1, the existence of asset F and its connections with assets C and E creates a loop which causes assets E and F to be classified as interconnection assets. The costs of those interconnection assets are therefore smeared across Transpower’s offtake customers in accordance with the current interconnection charge. However, in Example 2, asset F is connected to asset B rather than asset C, which creates a regional loop. Assets

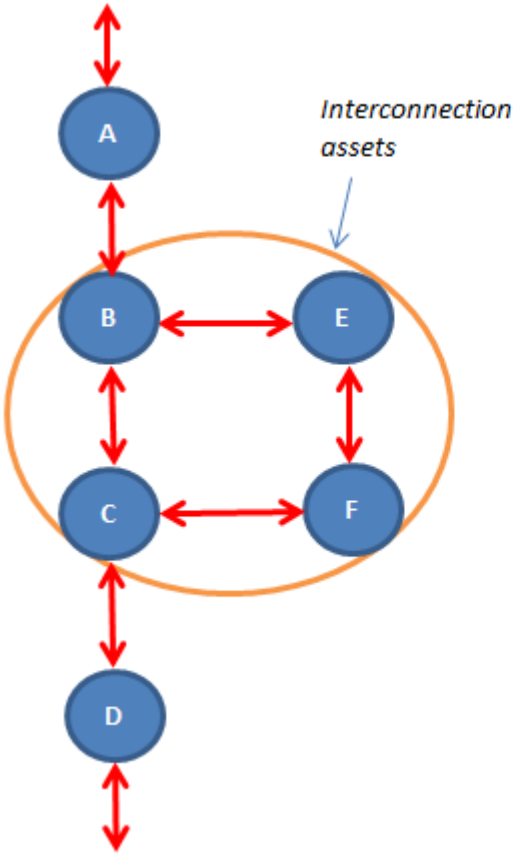
[36] Cl 5, Schedule 12.4 of the Code

E and F are therefore connection assets and connection customers pay more targeted charges for those assets according to cost allocation arrangements within the connection pool.

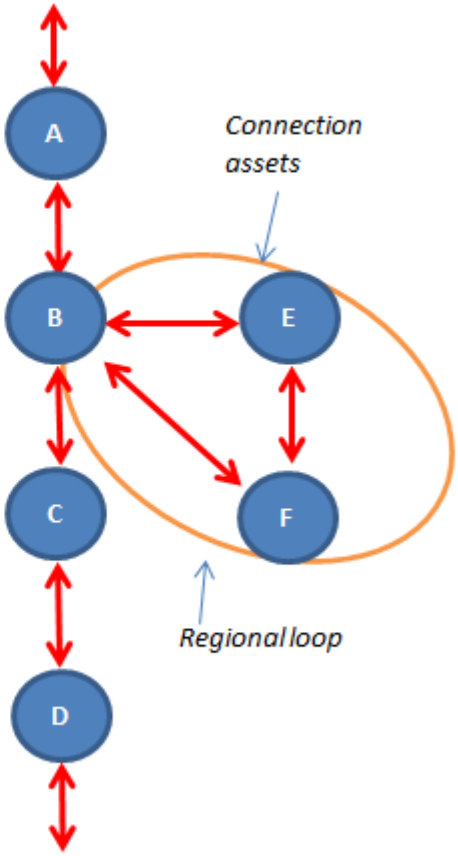
6.8 Since the charging regime for an asset is significantly different depending on whether the asset is connection or interconnection, the Authority considers that there is a risk that parties are incentivised to seek connection arrangements that create loops which may not be efficient. The Authority considers that this creates a problem where more efficient connection alternatives are forgone in favour of connection configurations that create loop flows.

Figure 3 Examples of how connection and interconnection assets are classified

<u>Example 1</u>: Interconnection example



<u>Example 2</u>: Connection example



6.9 The Authority understands that Meridian Energy's Project Aqua, which would have involved the diversion of water from the Waitaki River through a canal with several generation stations, may have involved a configuration similar to Example 1 in Figure 3. If this was the case, the resulting charges to Meridian would have made the project more commercially viable. However, the assets were not constructed.

6.10 The Authority does not have the information available to it to determine whether the proposed arrangement was the most efficient. This example simply illustrates how connection charges might be taken into account in configuration decisions given the current definition of connection assets in the TPM.

6.11 The example suggests that the substantial disparity between the connection and interconnection charges in the existing TPM could cause perverse incentives on parties to either seek connection arrangements that create loops.

6.12 The Authority is interested to hear whether submitters consider that the disparity between connection and interconnection charges creates inefficiencies or any other perceived problems within the transmission network. The Authority is also interested in potential solutions to any problems identified by submitters in their submissions.

Connection assets inefficiently classified as interconnection assets during sStaged commissioning of assets ~~where connection assets are inefficiently classified as interconnection assets during commissioning~~

6.13 During commissioning, connection assets may be inefficiently classified as interconnection assets.

6.14 A recent exemption application demonstrated the incentives on parties to seek to have connection assets reclassified as interconnection assets during commissioning.

~~6.13~~6.15 The Authority ~~recently~~ declined to grant Transpower an exemption from the TPM in relation to the Albany to Penrose section of the North Auckland and Northland (NAaN) grid upgrade project.[37] The application arose from Transpower's decision to stage the commissioning of the NAaN project, which meant certain NAaN assets would be temporarily configured as connection assets, though these assets were intended to be interconnection assets once the staged commissioning of NAaN was complete. The exemption proposed that those assets be recognised as interconnection assets during the staged commissioning. This would have the effect of socialising the cost of those assets temporarily configured as connection assets and providing connection services through the interconnection charge. This meant Vector, as the connection customer receiving the connection services, would avoid the requirement to pay most of the connection costs even though it would receive connection services.

6.16 The Authority's final decision not to grant an exemption rested on balancing the possible short-term operational inefficiencies resulting from a decision to decline the exemption versus possible long-term gains in investment efficiency.

~~6.14~~6.17 In summary, the Authority decided that, on balance, since a loss in the short term operational efficiency from declining the exemption was likely to be small or negative, the promotion of future investment efficiency was the greater consideration in terms of overall efficiency of the electricity industry for the long term benefit of consumers.

~~6.15 The Authority considered that the benefits from signalling that parties receiving connection services when new grid assets are commissioned will pay connection charges for the period they receive the services would outweigh any reduction of administrative and compliance costs if the exemption were granted.~~

~~Potential change to TPM to address the issue identified through the NAaN exemption~~

[37] Electricity Authority, *Exemption application from Transpower New Zealand Limited for considering connection assets as interconnection assets for transmission pricing, final decision*, 29 October 2013

6.176.18 The Authority's analysis of this exemption is identified that the existing TPM does not explicitly deal with the potential implications of the staged commissioning of transmission assets, and so parties seek to inefficiently reclassify connection assets as interconnection assets (for example, by seeking exemptions).

6.19 Outside of the TPM review process, theThe Authority is also therefore considering developing a new policy to deal with , which would involve a change to the TPM, to explain the Authority's preferred approach to any future applications for exemptions of this type, which is to take into account future investment efficiency effects (while also ensuring appropriate consideration of those operational efficiency impacts that can be demonstrated), for the purposes of achieving the Authority's statutory objective.

6.186.20 However, the Authority considers that incentives to inefficiently reclassify connection assets as interconnection assets could be reduced by amending the TPM.

6.196.21 It is unclear whether Vector deferred investments it would have otherwise undertaken to upgrade the reliability of its own network in the expectation, or hope, that Transpower would undertake the NAaN grid upgrade, and reduce the need for it to invest.

6.206.22 What the example illustrates is that the distinction between who pays under the current TPM for connection assets and who pays for interconnection assets potentially affects efficiency. The current definitions and TPM could readily result in material dynamic inefficiency through encouraging inefficient investment.

The substantial disparity between the targeting of connection charges and the socialising of interconnection charges creates inefficient incentives

6.216.23 Feedback on the October 2012 issues paper suggested that the potential for inefficient shifting of connection costs into the interconnection charge was not as problematic as the Authority originally proposed, because:

(a) information in submissions showed that replacement cost, rather than the outdated Optimised Deprival Value (ODV) handbook, is used to allocate connection assets to the connection pool. Accordingly, the total value of assets in the connection pool should reflect full cost. Note, however, that some of the other issues discussed in this paper suggest that the costs allocated to individual assets in the pool do not always equal full cost

(b) if a more efficient charge was introduced for interconnection, the ability of parties to inefficiently shift connection costs on to others should be reduced. E.g. if a beneficiaries-pay regime was introduced for recovering costs of interconnection assets, then a party that benefits from those assets will have to pay the charge and so will have much less incentive to seek to shift costs to others. In other words, the costs of interconnection assets would no longer be smeared across all customers to the same extent that is currently the case, and this should reduce parties' incentives to seek to inefficiently reconfigure connection assets as interconnection assets.

6.226.24 However, a hypothetical TPM is not the correct counterfactual for assessing potential problems with the connection charge. The correct counterfactual for assessing the efficiency of connection charges is the current TPM.

6.23~~6~~.25 While connection charges relate to the costs of providing a connection to the grid and are paid for by the party seeking the connection, the costs of interconnection assets are smeared across all load customers. The resulting disparity between who pays connection charges and who pays interconnection charges under the current TPM creates an inefficient incentive to seek to connect within a loop, or to seek to have connection assets configured in a way that creates a loop. Charge disparity incentivises parties to prefer certain locations over others to minimise transmission charges, as opposed to an incentive to select the most efficient location. This can reduce dynamic efficiency.

6.24~~6~~.26 Inefficient incentives caused by a disparity between connection charges and interconnection charges suggest that there is either a problem with the connection charge or the interconnection charge. The Authority considers that improved targeting of the interconnection charge may address inefficient incentives in the connection charge. The Authority will consider this matter further in its second issues paper.

7 Whether moving to depreciated replacement cost would improve efficiency

7.1 The Authority considered whether there are efficiency problems with the calculation of the asset charges within the connection pool. The methodology for calculating asset charges is described in paragraphs 4.14 to 4.20.

7.2 In brief, the current TPM calculates asset charges based on the ARC methodology. ARC, which is described in paragraph 4.17 to 4.19, effectively averages the rate of depreciation across the pool for the purposes of calculating connection charges. Accordingly, connection charges assume each asset is depreciated according to the average rate of depreciation of the combined assets in the pool. For example, if all (combined) assets in the pool are, on average, depreciated by 55%, then each asset within the pool is assumed to be depreciated by 55%.

7.3 The Authority investigated moving to charging based on DRC, a method described in paragraph 4.19. In brief, this involves calculating asset charges based on the depreciated replacement cost of each separate asset. The Authority examined whether DRC, being an actual cost-based methodology, was a more efficient way of adjusting for depreciation of connection pool assets in determining connection charges.

7.4 In comparing ARC and DRC, the following represents the Authority's views:

(a) flattened charges do not appear to be a perquisite for service-type charges

(b) DRC-based charges provide a more efficient investment signal

(c) DRC-based charges are likely to have higher administration costs

(d) Transpower may be better placed to provide flattened charges than its customers.

7.5 These four points are described in detail below.

Service-type charges need not be flattened ARC-based charges

7.6 Transpower submitted that the flattened ARC-based charge profile provided through the pool is prevalent for service-type charges, whereby a customer pays a flat charge in return for a consistent level of service. An example of this type of service arrangement is bank fees where a customer normally pays a standard monthly charge.

7.7 Under a service-type charge, where a connected customer pays a flat charge over the life of the asset(s) providing the service, theoretically at least, over time that charge should trend toward actual cost. That is because a customer receiving a service-type charge will pay a lower amount than full cost at the beginning of the life of the assets delivering the service, but more than full cost toward the end of the assets' life, when the assets are largely depreciated.

7.8 Thus, over time, there should not be a large difference between ARC-based charges and DRC-based charges. This is, of course, subject to certain assumptions, such as whether assets are replaced at the same time under the two approaches.

7.9 The Authority does not agree that connection assets constitute a service-type charge similar to the example of bank fees. Connection asset service levels are likely to reduce over time, with service levels being lower when assets are older, particularly at the point that asset upgrading or replacement is being considered. As an asset ages, there is a general expectation that the maintenance cost of that asset will increase, and that increasing maintenance costs should be taken into consideration when making upgrading or replacement decisions.

7.10 While the maintenance ~~charges of assets~~component of the connection charge is ~~are~~ highly standardised in the current TPM, and ~~are~~ is based on cost allocators rather than actual cost, the Authority does not believe that this methodology is necessarily efficient. The Authority reviews the use of cost allocators for the maintenance ~~charges~~ component and other operating ~~expenses~~ components later in this working paper.

7.11 Connection assets are capital intensive assets, which are difficult to relocate. The Authority considers signalling the efficient timing, nature and location of connection investments, which is discussed in the next section, is likely to outweigh any advantages of having flattened service-type charges.

7.12 The Authority is interested in hearing whether submitters consider there is an efficiency rationale for connection assets to be subject to flattened service-type charges, like bank charges, or whether it would be more efficient for connection charges to reduce as connection assets age, and service levels decrease.

DRC-based charges provide a more efficient investment signal

7.13 The Authority considers that dynamic efficiency is promoted where parties face the full cost of assets that are made available on that customer's behalf. This ensures that parties are incentivised to make efficient investment decisions, or where investment decisions are made on an administrative basis, as with regulated transmission investment, parties will be incentivised to make representations to ensure that efficient investment decisions are made on their behalf.

7.14 However the Authority is also mindful that signals that promote efficient investment can impact on static efficiency. For example, where a party has a highly elastic demand profile, a move from a postage stamp type price to a targeted charge, that can increase to better reflect costs, can incentivise the party to alter their use of an asset to avoid the charge, which may be statically inefficient. That said, dynamic efficiency benefits accrue over much longer time frames than static efficiency benefits so are usually significantly larger in magnitude.[38]

Additional connection customer scrutiny on connection pool investments

7.15 Under current ARC-based charging arrangements there is a risk that, since connection customers are not faced with the full cost of upgrades or replacements in the early years of an investment, customers may be inefficiently incentivised to seek more frequent replacements or upgrades as the additional costs would be socialised in the connection pool.

[38] See *Interpretation of the Authority's statutory objective,* February 2011, for further discussion on the preference the Authority gives to dynamic efficiency relative to static efficiency..

7.16 Further, despite multiple regulatory overlays that are in place to scrutinise Transpower's investments, discussed in paragraphs 4.7 to 4.11, investment efficiency would be promoted if Transpower's customers had incentives to provide more robust scrutiny to Transpower's proposed investments. Where connected customers face flattened ARC-based charges, it is likely that those customers will be more ambivalent toward Transpower's proposed upgrades and replacements. For example, if a customer considers that Transpower is replacing an asset before it needs to be replaced, if the customer is facing ARC-based charges it will not be as incentivised as otherwise to communicate this to Transpower as its costs will not change significantly on account of the replacement.

7.17 Charging according to DRC would likely provide strong incentives for additional customer scrutiny over connection investments, as connection customers would be faced with a more accurate proxy for actual cost.

7.18 However, distributors' ability to pass through any increases in connection charges to consumers probably limits their incentives to scrutinise costs, which may counteract to some degree the benefits from more efficient charging.

Additional connection customer scrutiny may cause customer hold-out on investments required to meet Grid Reliability Standards

7.19 As was noted in paragraph 4.6(a), new connection assets are included within the connection pool only where an investment is required to meet the GRS. Where customers require connection assets which exceed Transpower's requirement under the GRS, Transpower will undertake such an investment via a Customer Investment Contract (CIC).

7.20 Transpower considers that,[39] if connection pool charges were based on DRC, and connection customers faced a significant increase in asset charges directly following a connection asset replacement or upgrade, this would mobilise opposition to investments that Transpower is required to undertake in order to meet the GRS. For example, if a connection customer's charges were to increase five-fold on account of an asset replacement, that customer might prefer to accept a lower level of reliability than is required by the GRS. A greater level of opposition to Transpower's investments could significantly increase Transpower's administration costs of having an investment approved and, if those investments were successfully opposed by customers, Transpower might not be able to meet the GRS.

7.21 The purpose of the GRS is to provide a basis for Transpower and other parties to appraise opportunities for transmission investments and transmission alternatives.[40] Through part 12 of the Code, the Authority has oversight of the GRS.

7.22 While the Code provides regulatory oversight for situations where Transpower seeks to reduce service reliability levels,[41] there is no specific oversight or scrutiny (by the Authority) in situations where Transpower seeks to exceed the

[39] Based on discussions with Transpower.

[40] Schedule 12, Clause 2(1) of the Code.

[41] Schedule 12, Clause 2 of the Code.

GRS requirements.[42] There is also no current Code requirement for Transpower to only include investments required under GRS in the connection pool. Therefore it appears to be, at least theoretically possible, for Transpower to include non-GRS related investments in the connection pool.

7.23 Under the Code, the grid will~~Transpower~~ meet~~s~~ the GRS requirements if:

(a) "the power system is reasonably expected to achieve a level of reliability at or above the level that would be achieved if all economic reliability investments were to be implemented, and

(b) with all assets that are reasonably expected to be in service, the power system would remain in a satisfactory state during and following a single credible contingency event occurring on the core grid".[43]

7.24 Transpower is required under the Code to identify whether the grid will meet the "n-1 criterion", which is not the same as the "n-1 safety net" set out in the second limb of the GRS.[44] Transpower is required to consider investments to meet the reliability standard.

~~7.24~~7.25 ~~The requirement on Transpower to meet the GRS in the Code is not intended to be prescriptive.[45] For example, discretion is provided to Transpower to determine what is 'reasonable' in the requirements listed in points (a) and (b) above.~~ Transpower has discretion under the Code to determine what is included in an investment proposal. It is ~~therefore~~ not a straightforward matter for Transpower to determine which assets should be replaced, with what assets, and when, based on the "n-1 safety net" ~~" redundancy~~ requirements ~~outlined in point (b) above~~. When assets become older they might initially breakdown sporadically, and reliability would gradually worsen. To an extent, Transpower is required to weigh up a trade-off between increasing maintenance costs and the additional capital expenditure requirements of a replacement or upgrade.

~~7.25~~7.26 Increased consumer scrutiny on Transpower's investments could lead to customers opposing~~customer hold-out on~~ investments that Transpower ~~is required to~~ undertakes, and this might lead to higher administration costs. However, given the wide discretion available to Transpower in determining how to meet the GRS, further customer scrutiny could improve efficiency. The Authority considers that efficient pricing of connection services could assist this by providing incentives on connection customers and Transpower to make efficient decisions.

~~7.26~~7.27 The Authority further considers that the Commerce Commission's investment approval process provides for the Commerce Commission to take all relevant matters into consideration when considering whether to approve investments, and that active participation from customers to assist this process should be encouraged and not discouraged.

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42 Clause 12.8 of the Code.

43 Schedule 12.2, Clause 2 of the Code

44 See the definition of "n-1 criterion" in Part 1 of the Code.

45 ~~The non-prescriptive definition of GRS could also be reviewed by the Authority at any time as could any other part of the Code.~~

7.277.28 The Authority also acknowledges that additional customer scrutiny may cause increased administration costs, but this must be considered against the benefits from increased scrutiny on Transpower's investments. The Authority's view is that the benefits from increased customer scrutiny over Transpower's investment proposals are likely to exceed the increased administration costs that the change may cause.

7.287.29 The Authority is interested in hearing whether submitters consider that there is currently sufficient connection customer scrutiny over Transpower's investments that are required to meet the GRS. Do submitters consider that Transpower's investment in connection pool assets is efficient? Do submitters consider that moving to DRC-based costs would improve customer scrutiny over Transpower's connection pool investments? Or do submitters consider that moving to DRC-based charges would cause too much customer scrutiny and result in ~~inefficient~~ customer ~~hold out on~~opposition to investments that Transpower ~~is required to~~ undertakes to meet the GRS?

ARC-based charges reduce the ability of other parties to compete with Transpower for the provision of assets required for the GRS

7.297.30 Given Transpower's income increases when it's regulated asset base (RAB) increases, Transpower appears to have an incentive to own newly commissioned transmission assets.

7.307.31 Transpower follows a contestable process in selecting an independent contractor to undertake new investments on its behalf. A connection customer will likely have specialist knowledge as to the required investment (if any), so rather than Transpower financing, building and owning the asset, the customer could elect to do this, subject to meeting Transpower's minimum contractor requirements. This promotes efficient investment as it gives the customer the option to undertake investments themselves if they do not consider Transpower's investment proposals to be efficient.

7.317.32 However, since Transpower can offer a flattened charge profile for connection assets (ie ARC-based charges) required to meet the GRS under the connection pool, it has a competitive advantage over connection customers who would face "saw-tooth" charges (ie DRC-based charges) if they invested in the assets themselves. Accordingly, although Transpower follows a contestable process in selecting a contractor, the existence of the flattened charges in the pool make Transpower ownership of assets a more attractive proposition than the connection customer building and owning connection assets. This potentially undermines investment efficiency.

7.327.33 The Authority is interested in submitter's views as to whether what is seen as a potential problem actually occurs in practise or might occur on account of current ARC-based charging arrangements.

Flattened asset charges could promote efficient fleet management

7.337.34 Transpower advised in discussions with the Authority that it operates a fleet management strategy. According to Transpower, making investment decisions across the fleet, as opposed to decisions around separate assets, can raise productivity and lower the costs of the fleet overall. Transpower advised the Authority that the current ARC-based (flattened) charging arrangements

promotes efficient fleet decisions and that charges based on DRC will require Transpower to move away from a fleet-based strategy and consider its fleet on an asset by asset basis.[46]

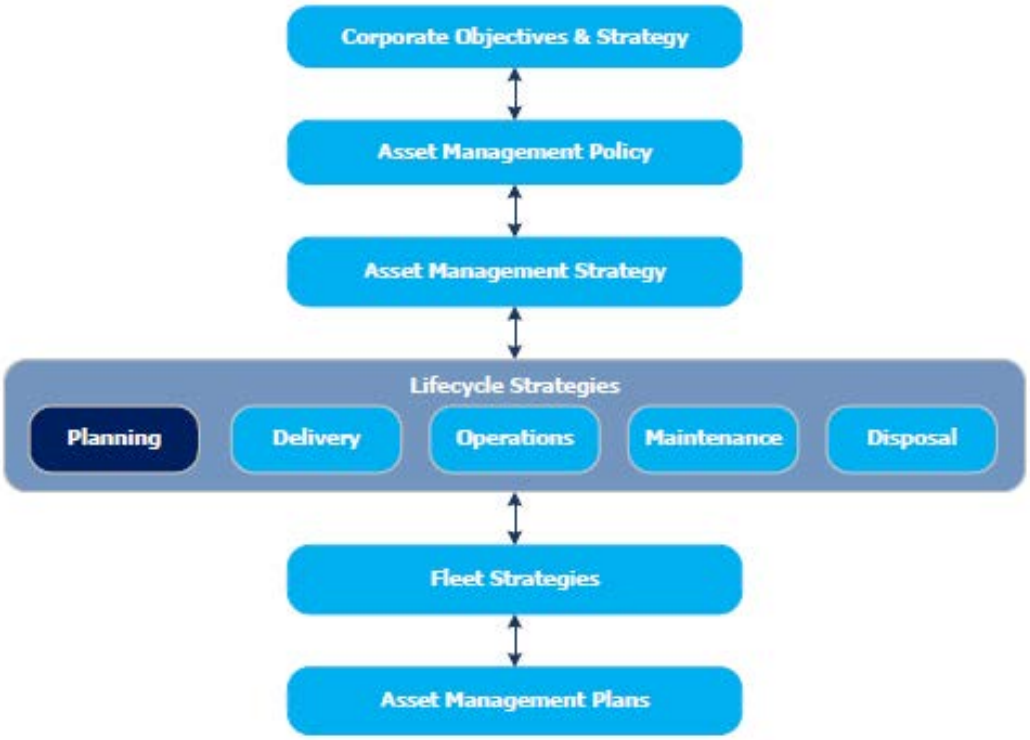
~~7.34~~7.35 Transpower indicated it takes, amongst other things, fleet failure rates into consideration when making decisions about individual assets. Transpower advised the Authority that, if it moved to DRC-based charging, this could mobilise opposition to some of Transpower's capital expenditure programmes which are designed to optimise the fleet. Transpower advised that it is likely to have better information around fleet efficiency than many of its connected customers.

~~7.35~~7.36 For example, Transpower noted that the need to ensure safety for staff and the general public can lead to the need for new, replacement or refurbished assets. One example is the plan to replace existing 33 kilovolt (kV) outdoor switchyards with indoor switchgear. While the conversions from outdoor switchyards to indoor switchgear will improve reliability and decrease maintenance requirements, if connection customers were required to face DRC, some customers might resist replacements on the basis that the performance of the existing assets is adequate. This could significantly increase administration costs and could, in fact, prevent Transpower from completing the replacement programme across its entire fleet.

~~7.36~~7.37 A diagram illustrating the role of fleet management within Transpower's overall asset management hierarchy is provided in Figure 4 below. The fleet strategies provide detail on how the Lifecycle Strategies are applied to individual fleets.

[46] Paragraph 6, page 374, Day 3, TPM conference Transcript , http://www.ea.govt.nz/about-us/news-events/events-calendar/transmission-pricing-methodology-conference/

Figure 4 Fleet strategies within the Transpower Asset Management Hierarchy



Source: Transpower[47]

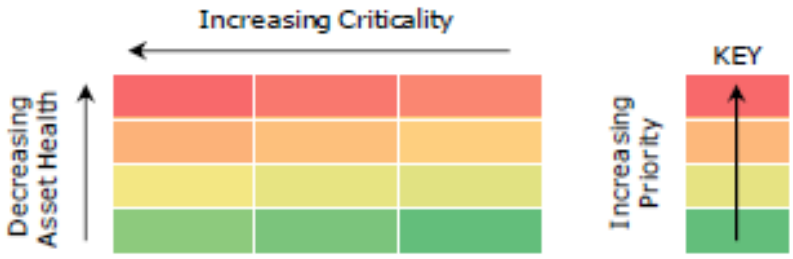
Project integration

~~7.37~~7.38 For integrating projects across Transpower's organisation a range of potential projects are prioritised within fleet portfolios. This is based on factors such as relative asset criticality and impacts on asset health. A project integration stage includes the optimisation and prioritisation of expenditure in asset portfolios. This is done using a range of techniques to assign relative priorities to the individual projects. The methods used to prioritise projects will vary by fleet and are discussed in the relevant fleet strategy.

~~7.38~~7.39 For those fleets with asset health indices, Transpower uses sensitivity analysis to compare the future health of whole fleets based on alternative investment scenarios. Asset health is used predominantly as a driver for the timing of asset renewal across fleets. When applied in conjunction with criticality, Transpower uses it to prioritise its expenditure within portfolios. This is depicted in the Prioritisation Matrix in Figure 5 below.

[47] Transpower, Lifecycle strategy planning, 7 October 2013, p. 7

Figure 5 Transpower's project integration prioritisation matrix



Source: Transpower[48]

7.397.40 It is likely that Transpower is able to access both economies of scale and scope benefits from managing its assets on a fleet rather than an individual basis, which is consistent with promoting overall investment efficiency.

7.407.41 Fleet approaches to asset renewal regularly involve setting a level of use or an age when an asset will be replaced, irrespective of its condition. The approach is often used in relation to transport equipment like motor vehicles, ships, and aircraft – where firms have a fleet of similar transport assets. The fleet approach can be efficient as it can save on monitoring costs.

7.417.42 A key question for this paper is whether it is necessary to charge on a fleet basis, through a flattened charge, in order for Transpower to effectively manage its assets as a fleet rather than on individual assets.

7.427.43 Transpower's approach could be likened to that of a firm that has a fleet of Corolla cars for its sales force with some cars brand new, some fifty years old and the balance of various ages between these extremes.

7.437.44 To assess whether it is efficient to charge on a fleet basis, it is relevant to contemplate what would happen if the firm "levied" its sales force a standard charge for use of every Corolla, irrespective of age, when working out the profit share payments to its sales force. Obviously, the firm would quickly face strong demands from its sales force to replace older vehicles with new ones. There is no incentive on the sales force to stretch the economic life of the cars, or tolerate older, less reliable ones. There would certainly be very few sales staff arguing that the life of older Corollas should be extended. To the individuals, the cost is the same irrespective of the age, but the convenience and "quality" of service they receive will be different. The almost inevitable outcome of such an arrangement will be over-investment in replacement of cars.

7.447.45 This suggests that Transpower's charging on a fleet basis may actually create inefficient investment incentives. Further, it is not clear that Transpower is required to undertake a fleet-based approach to connection charging (via ARC-based charges), to realise the potential benefits of efficient fleet management.

7.457.46 The Authority's view is that ARC-based charges are not required in order to adopt a fleet approach and that an efficient fleet-based approach can be maintained regardless of the charging methodology for the assets in that fleet.

[48] Transpower, Lifecycle strategy planning, 7 October 2013, p. 17

~~7.46~~7.47 The Authority is interested to hear submitter's views on whether flattened ARC-based charges are necessary in order for Transpower to promote efficient fleet decisions (assuming fleet-based management is efficient).

~~7.47~~7.48 Further, given that efficient replacement and upgrading decisions promote efficient prices, the Authority is interested in understanding the extent that submitters consider asset replacements or upgrade decisions should be based on the condition of an individual asset, and the extent that those decisions should be based on the condition of an overall fleet. In other words, the Authority is interested in increasing its understanding as to what constitutes efficient replacement and upgrading decisions. The Authority will then seek to ensure that the pricing arrangements it puts in place promotes efficient replacement and upgrading decisions.

Potential problems with over-depreciating connection pool assets

~~7.48~~7.49 Under DRC-based charges, once an asset is fully depreciated, customers may no longer be required to pay a capital charge, or asset charge, for that asset, and will only be required to pay maintenance and other operating expenses. Once the asset is fully depreciated, the owner of the asset would have effectively had its capital returned to it (via depreciation expense), and can therefore, theoretically, fund the replacement asset. Transpower does not require a return on capital for a fully depreciated asset.

~~7.49~~7.50 However, under the current ARC-based charges, the asset portion of the charge is based on the average life of all assets in the pool. Customers effectively pay an asset charge based on the average level of depreciation in the pool as described in Section 4.

~~7.50~~7.51 Since the connection pool effectively applies an average level of depreciation each year for each asset when calculating asset charges, if Transpower does not replace an asset after it is fully depreciated, i.e. after its useful life of 50 years, the connection customer will continue to pay asset charges based on the average level of depreciation in the connection pool. i.e. Transpower would have retrieved its capital yet the connection customer would continue to pay asset charges for that asset. i.e. more than 100%.

~~7.51~~7.52 While this implies that Transpower financially benefits from delaying replacement of connection assets in the connection pool, Transpower is subject to a Commerce Commission revenue cap, and operating expenditure allowances which suggest that Transpower would be ambivalent to whether it over depreciates an asset or not.

~~7.52~~7.53 Furthermore, if assets are older than their expected life, this will increase the average age of the pool, and accordingly reduce the pool's asset charges overall, and so, to an extent, all connection customers will benefit a little.

~~7.53~~7.54 However, the connection customer with a fully depreciated asset will pay more than that asset's actual cost. This causes inefficient cross-subsidisation between connection customers in the pool. i.e. the benefits of an asset with a useful life longer than its expected life accrue to all connection pool customers rather than the relevant connection pool customer.

ARC-based charges enables inefficient investment signals where there is a risk of asset stranding

7.547.55 Under existing ARC-based charging arrangements, if connection pool assets become stranded, Transpower accelerates depreciation on those assets and the associated costs are socialised within the connection pool. This has the effect of increasing connection pool costs for the remaining connection customers.

7.557.56 Given Transpower is permitted to make a return on its assets under Commerce Commission regulation, unless Transpower opted to forgo a return on stranded assets, the costs would need to be met in some way. The Authority considers that the current practise of charging these costs to the connection pool is preferable to transferring the cost to the interconnection pool because costs are more effectively targeted when met within the connection pool.

7.567.57 However, the Authority identified a potential problem with stranded assets that relates to investment incentives. More specifically, where a connection customer is aware of the potential for asset stranding, under ARC-based charges, that customer will not be incentivised to take action to prevent Transpower from replacing or upgrading those potentially stranded assets.

7.577.58 For example, where a customer is considering moving location or shutting down their business, the connection assets that this customer uses might be scheduled for replacement. In the customer's view those assets might still be fit for purpose, at least until the customer makes its decision about whether to continue to operate at that location or whether to shut down, and cause connection assets to become stranded.

7.587.59 If Transpower chose to replace those assets, if the connection customer in question were paying DRC-based charges, it would face a substantial charge increase following replacement. However, under ARC-based charges, the customer would not face any substantial cost increase on account of the replacement.

7.597.60 The Authority considers that by moving to DRC-based charges, the connection customer, in its preference to avoid increased costs, may have a greater incentive to advise Transpower that an investment might be inefficient and oppose its replacement. However under the current ARC-based charge, connection customers will not be incentivised to oppose the investment as they would not face increased costs after replacement.

7.607.61 Further, given that under DRC-based charges, the connection customers pay a higher portion of an asset's charges in the earlier years than under ARC-based charges, DRC-based charges reduce stranding risk. i.e. if customers pay more now and less later the credit risk is lower than if customers pay less now and more later. Therefore moving to DRC-based charges would reduce stranding risk.

7.617.62 The Authority's view is that moving to DRC-based charges would reduce both the probability (via improved scrutiny over investments) and impact (via recovering a greater portion of an asset's cost in the earlier years following an investment) of asset stranding and thus reducing the amount of cost socialisation within the connection pool.

7.627.63 The Authority is interested to hear whether submitters consider that moving to DRC-based charges would reduce both the probability and impact of asset

stranding, thus reducing the amount of cost socialisation within the connection pool.

DRC-based charges have higher administration costs

7.637.64 The Authority considers that introducing DRC-based charges will result in increased administration costs due to increased customer opposition to Transpower's proposed replacements and upgrades, and the increased administration costs of applying depreciation to assets separately. Each will be discussed in turn below.

7.647.65 Transpower advised the Authority that increased connection customer scrutiny would increase Transpower's administration costs in securing approval for capital expenditure programmes that it requires to meet the GRS. For example, where customers dispute Transpower's decision, this could cause delays and increase Transpower's dispute resolution costs, which Transpower considers could be potentially very significant.

7.657.66 The Authority understands that DRC-based charging was applied during the 1990s but customer hold-out meant Transpower was unable to replace some assets, so Transpower reverted to ARC-based charging. The Authority notes, however, that this occurred in a context where Transpower's transmission investments were not subject to regulatory approval. This is different from the present situation where Transpower is able to proceed with investments for which it has regulatory approval from the Commerce Commission even if the customer disputes the investment.

7.667.67 Given the change in incentives on connection customers that would result from DRC-based charging, the Authority considers that DRC-based charges will incentivise Transpower to engage with customers over connection investments in a manner more consistent with promoting efficient investment.

7.677.68 A change to DRC-based charges will require depreciation to be applied to each connection asset separately. In particular, it would be necessary to determine the useful life and age of each asset in the connection pool. In assessing the life of connection pool assets, the Authority identified a problem whereby if a replacement is for a component of an asset but not a whole asset it would be difficult to determine at what point the asset becomes a new asset. This issue is probably best illustrated using the analogy of 'granddad's axe' which has had three new handles and two new heads fitted over time. There is a question as to how such replacements should be reflected on the asset register. While the Authority understands the concern, the Authority considers that this is a common issue for asset managers. In order to move to DRC-based charges, a methodology would be required to estimate the life of assets which have had multiple replacements over time. An age-weighted register may be a viable approach for accounting for multiple partial replacements. A materiality threshold would likely be required for estimations of asset life. For example, it would not be efficient to calculate the depreciation separately for every replaced nut and bolt.

7.687.69 However, Transpower has advised the Authority that it already applies depreciation individually to assets for tax purposes. Accordingly, the Authority considers that the increased administration costs in moving to DRC-based charges should not be excessive. Changing to DRC-based charges would likely

only involve applying information that is already available, to TPM connection charge calculations.

Transpower is better placed to provide flattened charges than its customers

7.697.70 As described in Section 4, the TPM provides for ARC-based charges, whereas DRC-based charges are considered to be a more accurate proxy for actual-cost. In order for Transpower to earn its return on capital it calculates its charges by multiplying the average replacement cost by Transpower's WACC.

7.707.71 Under ARC-based charges, while Transpower earns its WACC, connection customers with older assets, who pay averaged charges, cross-subsidise connection customers with newer assets, who pay charges that are below average cost.

7.717.72 Thus, while Transpower is not adversely affected by ARC-based charges, ARC causes cross-subsidisation between connection pool customers which the Authority considers to be potentially allocatively inefficient.

Financing can be used to construct a flattened charge profile

7.727.73 One potential argument for charging on a pooled basis is it enables a flattened charging profile. However, customers could effectively construct a flat charge themselves through financing.

7.737.74 Connected parties faced with actual 'saw tooth' DRC-based charges could construct a flattened charge profile by borrowing the difference between the flat charge and actual cost in the early years, and lending the excess in the later years of the asset's life when actual charges are below average cost. There will be a finance cost associated with this arrangement, as the borrowing in the early years has a higher time value than the money lended in the later years of an asset's life.

7.747.75 Based on a rough estimation of the finance cost, with an average capital expenditure of around $20,000,000 per annum being added to the connection pool, and assuming a 50 year asset life, the total cost of financing a flattened profile for all connection assets in the pool is estimated to be approximately $5.7 million per annum. This equates to a present value of $56.2 million over 20 years using a discount rate of 8%.

Charging for a portfolio of assets provides financing at no cost

7.757.76 If Transpower owned only a single connection pool asset, in order for it to receive an adequate return for that asset it would likely calculate its charges based on DRC as illustrated in Figure 6, Example 1 below (which provides a graph illustrating charges over time), or it would provide ARC-based charges and add a premium to meet its finance cost for providing the flattened charge.

7.767.77 However, since Transpower has a portfolio of connection assets in its connection pool, it has numerous assets of varying ages in the connection pool. As Figure 6, Example 2 below illustrates (showing charges over time), with a portfolio of only four assets of a range of ages, the total charge averages out to the flat red line which is the actual cost of the portfolio. This suggests that while a single asset would require a finance premium to create a flattened charge, since Transpower owns a portfolio of assets that range in age, it is able to take

advantage of this and offer a flattened charge without incurring any finance premium.

7.777.78 If all connection customers preferred flattened charges, it would be less costly for them to use Transpower's facility (where customers finance each other) than to have to borrow money at certain times and pay it back or lend money at other times to construct the flattened charge profile. If connection customers sourced finance through the financial markets separately, they would be have to pay the borrow/lend spread.

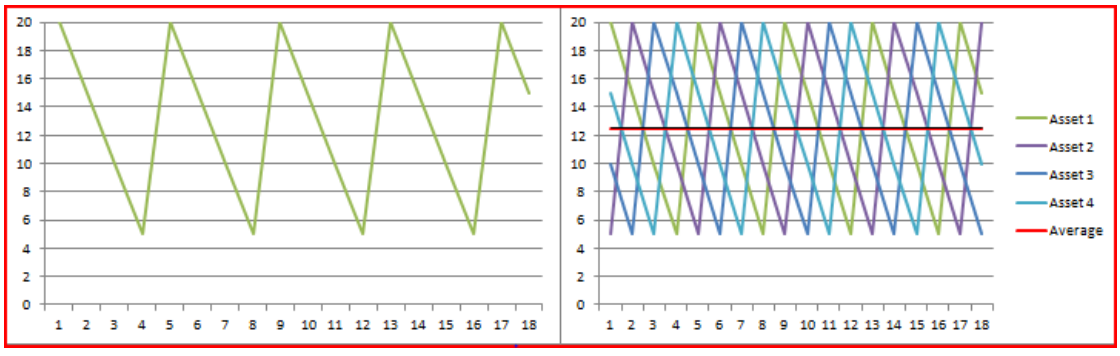
7.787.79 Thus there are potential productive efficiency benefits from Transpower providing a flattened charge profile compared to the alternative where connection customers face DRC-based charges use finance to provide a flattened charge profile for themselves.

7.797.80 While the flattened charge is provided at no cost to Transpower, it is not without any cost at all. Under ARC-based charges, at any point in time, some connection customers overpay while others underpay. Therefore the flattened charge is effectively provided by customers who are over-charged at a point in time, and not by Transpower. Effectively, connection customers with old assets are lending money to connection customers with newer assets at an interest rate of zero. As new assets age, the parties that were borrowing to construct a flat charge would become lenders, and as old assets are replaced, the parties with the replaced assets would switch from a lender to a borrower.

7.807.81 However, this does not change the point that if all connection customers wanted to flatten their asset charges individually, it would be more expensive for each party to do this separately than for Transpower to offer that service through the connection pool. While this may reduce financing costs (the borrow/lend spread) and could promote productive efficiency, the smearing of costs to connection customers caused by flattened charges is also allocatively inefficient.

Figure 6 The portfolio effect

Example 1 Example 2



Source: Electricity Authority

7.817.82 The Authority considers that the savings that can be achieved by Transpower providing a flattened charge on behalf of its customers are relatively moderate. Namely, Transpower provides the service without a borrow/lend spread.

However, the actual finance cost for providing flattened charges, which is far more significant, is not saved by connection customers. Connection pool customers with older assets pay the finance costs of connection customers with newer connection assets. i.e. connection customers cross-subsidise one another.

~~7.82~~7.83 The Authority is interested in submitter views on whether current arrangements, whereby connection customers within older connection assets cross-subsidise the costs of connection customers with newer connection assets, are appropriate. The Authority is also interested in whether submitters consider that there are net benefits in Transpower providing a flattened charge for connection pool assets in place of customers facing an actual-cost based methodology and selecting their own payment profile using the finance markets.

8 Whether there is an issue of cross-subsidisation of operating expenses in the connection pool

8.1 The Authority considered whether the current TPM method of allocating operating expenses to connection customers, which is described briefly in paragraphs 4.25 to 4.28, promotes efficiency.

8.2 The Authority considered that, ideally, connection charges allocated to connection customers at a connection location should be Transpower's actual costs in relation to providing, maintaining, and operating the connection assets at that location.

8.3 This is because if connected parties do not pay the actual costs that assets provided on their behalf incur, they will have very little incentive to take actions that will result in lower operating or maintenance costs for Transpower. Nor will they have incentives to monitor operating and maintenance activities to ensure they are performed efficiently.

8.4 An example is the motorist who pays the same amount to operate and maintain their car, irrespective of the manner in which he or she drives it. The outcome is likely to be higher operation and maintenance costs in total.

8.5 Under current arrangements, Transpower aggregates the total costs of each connection-related activity and allocates this total to each connection location using standardised cost drivers.[49] The result of using standardised cost drivers is a certain level of averaging of costs across all connection pool customers.

8.6 In reviewing the cost allocators briefly described in paragraph 4.25, the Authority considered that they appear to be reasonable allocators in that allocation differs in a way that may reflect operating costs, i.e. size of assets, quantity of assets, or levels of use. Further, the Authority recognises that a certain level of cost allocation would always be required. For example, overheads will require allocation using cost drivers, as would other common costs.

8.7 The Authority was advised by Transpower that certain operating expenses, such as selected maintenance costs, are already applied to individual assets. The Authority considers that while a change to TPM to reflect an actual cost-based methodology might involve changes to existing Transpower processes, given the individual cost allocations that are already available, the administration costs of a change to existing TPM processes should not be excessive.

8.8 The Authority's view is that an actual-cost based methodology for recovery of operating expenses would likely provide net benefits.

8.9 The Authority is interested in submitter views on the viability of charging operating expenses according to actual costs or other ways in which existing connection operating expense charge allocations might be improved.

[49] Causes 11-25, Schedule 12.4 of the Code

9 Cost benefit assessment

9.1 The Authority's investigation identified potential costs and benefits associated with:

(a) addressing incentives to shift connection costs into interconnection

(b) moving from ARC-based asset charges to DRC-based asset charges for connection pool assets

(c) moving closer to an actual cost-based methodology for the allocation of operating expenses within the connection pool.

9.2 The costs and benefits are discussed below. Note the Authority has not quantified the costs and benefits at this stage and will examine the costs and benefits further following feedback on this working paper and present its findings in the second issues paper.

Costs and benefits

9.3 Dynamic efficiency:

(a) Ensuring connection customers are not inefficiently incentivised to have connection costs shifted into the interconnection charge. This should improve the location signal for connection assets and better promote efficient investment incentives. (Section 6)

(b) Moving to DRC-based charges will improve incentives for increased scrutiny of connection investments, promoting more efficient investment. (Paragraphs 7.13 to 7.27)

(c) Moving to DRC-based charges will improve customer incentives to avoid or oppose inefficient upgrading or replacement of assets that risk stranding. (Paragraphs 7.55 to 7.61)

(d) Moving to DRC-based charges will improve investment decisions by removing an inefficient incentive of connection customers to have Transpower build and own connection assets required to meet the GRS as opposed to connection customers building and owning connection assets. (Paragraph 7.30 to 7.33)

(e) Moving to DRC-based charges *could* reduce static and dynamic efficiency by causing inefficient customer hold-out on investments required in order for Transpower to meet the GRS. It could also reduce Transpower's ability to operate an efficient fleet management strategy, which may also reduce productive and, potentially, dynamically efficiency. (Paragraph 7.34)

9.4 Allocative efficiency:

(a) Removing the ability of connection customers to inefficiently shift costs to interconnection charges will improve the efficiency of the allocation of transmission charges by reducing cross-subsidies from interconnection customers to connection customers, improving allocative efficiency. (Section 6)

(b) Moving to DRC-based charges will increase allocative efficiency by reducing the cross-subsidy between customers paying annual charges for

older assets and customers paying annual charges for newer assets.(Paragraph 7.54)

(c) In situations where assets are not replaced once they are fully depreciated, moving to DRC-based charges will increase allocative efficiency by ensuring that connection customers do not pay greater asset charges than the actual asset cost. (Paragraph 7.49)

9.5 Productive efficiency:

(a) Moving toward an actual cost methodology for the allocation of operating expenses could improve productive efficiency by promoting actions by customers to reduce operating costs and also incentivise customers to more actively scrutinise Transpower's operating costs. (Section 8)

(b) Moving to DRC-based charges will increase Transpower's administration costs in securing approval for capital expenditure required to meet the GRS due to increased connection customer scrutiny. (Paragraph 7.64)

(c) Moving to DRC-based charges will require that depreciation is individually applied to connection pool assets. In particular, there will likely be some increased administration costs in applying a new methodology to determine the age, and depreciation levels, of assets which have had multiple partial replacements and refurbishments over time. However, given that Transpower already applies depreciation individually to assets for tax purposes, the increased administration costs in moving to DRC-based charges should not be excessive. (Paragraph 7.68)

(d) Moving toward an actual cost methodology for the allocation of operating expenses will increase Transpower's administration costs of allocating operating expenses by creating multiple small cost centres. However, given Transpower already applies certain operating expenses, such as selected maintenance costs, to individual assets for taxation purposes, the additional administration costs in using this data to calculate actual cost-based connection charges should not be significant. (Section 8)

(e) Moving to DRC-based charges may reduce productive efficiency as some connection customers would incur a finance cost to flatten their charges whereas Transpower, because it manages a portfolio of assets, and can offer a flattened charge to its customers without incurring a finance charge. The maximum additional cost from customers financing their own flat charge would be the borrowing-lending spread that banks charge. (Paragraphs 7.70 to 7.83)

Net benefit

9.6 The Authority has not attempted to quantify the net benefits of changes to status quo connection pool charges at this stage but will potentially do so after considering submissions on this working paper.

10 Conclusion

Whether there is an efficiency problem where connection costs are shifted into the interconnection charge

10.1 Connection charges relate to the costs of providing a connection to the grid and are paid for by the party seeking the connection. The costs of interconnection assets are smeared across load customers. The resulting disparity between who pays connection charges and who pays interconnection charges under the current TPM creates an inefficient incentive to seek to connect within a loop, or to seek to have connection assets configured in a way that creates a loop. This means parties have incentives to prefer certain locations to minimise transmission charges, rather than selecting the most efficient location. This can reduce dynamic efficiency.

10.2 Inefficient incentives to prefer certain locations over others suggest that there is either a problem with the connection charge or the interconnection charge. Improved targeting of the interconnection charge may address inefficient incentives in the connection charge.

Whether moving to depreciated replacement cost would improve efficiency

10.3 The reasons for moving to DRC-based charges would be:

(a) flattened charges are not necessarily required for service-type charges, and connection charges are very different in nature to service-type charges that are typically flattened, such as bank fees, as service levels vary considerably over an asset's life, connection assets are capital intensive, and are difficult to relocate

(b) ARC-based charges create greater credit risk and stranding risk as the risks are higher if customers pay less now and more later than if they paid more now and less later

(c) there is inefficient cross-subsidisation between connection pool customers which impacts on allocative efficiency i.e. customers using old pool assets cross-subsidise customers using new pool assets. These costs do not balance out perfectly over time as charges for individual assets are partially determined by all other connection pool assets. Additionally, connection customers will not face the full cost of more frequent replacements or upgrades as this additional cost will be largely socialised within the connection pool

(d) under DRC-based charges, connection customers would face step changes to charges following asset replacements and upgrades undertaken on their behalf. Therefore connection customers would be incentivised to further scrutinise Transpower's proposed connection investments made on their behalf. Under current ARC-based charges, connection customers are not incentivised to seek to have replacements or upgrades deferred even where it was efficient to do so. Further, Transpower's wide discretion for interpreting the GRS means investment efficiency might be promoted if investments proposed on the basis of the GRS received additional scrutiny from connection customers. However, improved investment incentives from DRC-based charges might be weaker for connection customers that are

Commerce Commission-regulated distributors for whom transmission charges, including connection charges are a pass-through cost

(e) given Transpower's income increases when its regulated asset base (RAB) increases, Transpower appears to have an incentive to own newly commissioned transmission assets. Transpower follows a contestable process in selecting an independent contractor to undertake new investments on its behalf. A connection customer will likely have specialist knowledge as to the required investment (if any), so rather than Transpower financing, building and owning the asset, the customer could elect to do this, subject to meeting Transpower's minimum contractor requirements. This promotes efficient investment as it gives the customer the option to undertake investments themselves if they do not consider Transpower's investment proposals to be efficient.

However, since Transpower can offer a flattened charge profile for connection assets (ie ARC-based charges) required to meet the GRS under the connection pool, it has a competitive advantage over connection customers whom would face “saw-tooth” charges (ie DRC-based charges) if they invested in the assets themselves. Accordingly, although Transpower follows a contestable process in selecting a contractor, the existence of the flattened charges in the pool, make Transpower ownership of assets a more attractive proposition than the connection customer building and owning connection assets. This potentially undermines investment efficiency.

(f) under DRC-based charges, connection customers that are aware of the potential of future stranded assets would be better incentivised to advise Transpower of the potential stranding situation and would more likely efficiently oppose asset replacements or upgrading to those assets

(g) if Transpower does not replace assets once they are fully depreciated, those assets in the connection pool will be depreciated by more than 100%, which causes connection charges for individual assets to exceed actual costs, causing further inefficient cross-subsidisation within the connection pool.

(h) The reasons for continuing with ARC-based charges would be: introducing DRC-based charges will increase administration costs, namely there would likely be:

(i) increased administration costs to Transpower for securing approval for capital expenditure required to meet the GRS due to increased connection customer scrutiny. However, the Authority’s view is that increased scrutiny over Transpower’s investments will promote efficiency

(ii) increased administration costs from applying depreciation individually to connection pool assets. This includes increased administration costs from applying a new methodology to determine the age, and depreciation levels, of assets which have had multiple partial replacements and refurbishments over time. However, given that Transpower already applies depreciation individually to assets for tax purposes, the increased administration costs in moving to DRC-based charges should not be excessive

(i) There could be a further efficiency advantage of the current process in that Transpower manages a portfolio of assets of different ages, and is thus able to provide a flattened charge profile without incurring a finance cost premium. Specifically, some connection customers are perhaps unable to create a flattened charge without incurring a finance cost as they generally don't have a large portfolio of assets of differing ages from which to construct a flattened charge profile. However, the finance cost is not forgone by connection customers under the connection pool's smoothed charges. The finance cost for providing a smoothed charge profile over time is met through cross-subsidisation within the connection pool. Namely, connection customers with older assets cross-subsidise the higher cost of newer assets. Despite this, Transpower may be able to offer a flattened charge to its customers at a lower cost than customers through providing the service without a premium to reflect the borrow/lend spread that banks would charge. This would promote productive efficiency.

10.4 There appears to be both advantages and disadvantages of preserving ARC-based charges in the connection pool. While DRC-based charges would likely create a more efficient investment signal, which promotes dynamic efficiency, moving to DRC-based charges would potentially give rise to increased administration costs. Dynamic efficiency usually dominates both allocative and productive efficiency in terms of impact on overall efficiency, so this suggests there might be net benefits from moving to DRC-based charges.

Whether there is an issue of cross-subsidisation of operating expenses in the Connection Pool

10.5 Ideally, connection charges allocated to connection customers at a connection location should be Transpower's actual costs in providing, maintaining, and operating the connection assets at that location. For example, the Authority expects that maintenance costs would be apportioned separately to individual assets so that Transpower could determine if there was a particular issue arising with a particular asset. The Authority considers that accurate allocation of operating expenses to individual assets may be difficult to achieve where costs are common across multiple assets and where the increase in administration costs would make this inefficient.

10.6 However, the Authority was advised by Transpower that certain operating expenses, such as selected maintenance costs, are already applied to individual assets for taxation. The Authority considers that while a change to TPM to reflect an actual cost-based methodology might involve changes to existing Transpower processes in relation to calculating transmission charges under the TPM, given the individual cost allocations that are already available, the administration costs of a change to existing TPM processes should not be excessive.

10.7 The Authority considers that an actual cost-based methodology is more efficient for allocating operating expenses to connection customers although the Authority is open to receiving contrary views from submitters.

Cost benefit analysis

10.8 The Authority has not attempted to quantify net benefits of changes to status quo charging arrangements at this stage. Rather, the Authority is seeking feedback on this paper to assist it to decide whether or not there are net benefits in:

(a) addressing incentive problems resulting from the disparity between connection and interconnection charges

(b) moving from ARC-based asset charges to DRC-based asset charges for connection pool assets

(c) moving closer to an actual cost-based methodology for the allocation of operating expenses within the connection pool.