Transmission Pricing Advisory Group

Transmission pricing discussion paper

Section 6 only – Assessing options for deeper or shallower connection (version 2)

5 May 2011

Note: This paper only section 6 of version 4 of the discussion paper. It should be read in conjunction with Version 4 of the paper.
The assessments and observations given in this paper are presented for TPAG discussion only and do not represent TPAG's views nor TPAG's deliberations to date as TPAG has not considered these options in detail. For this reason the assessment section of this paper is, for the most part, square bracketed.

Note: This paper has been prepared for discussion with TPAG. Content should not be interpreted as representing the views or policy of the Electricity Authority or of TPAG.

The following sections precede section 6 in version 4 of the discussion paper.

6 Assessing Options for Deeper or Shallower Connection

6.1 Introduction

6.1.1 This section:

a) provides contextual background for consideration of whether a deeper or shallower connection definition should be considered, including submissions on the stage 2 consultation paper and TPAG's views on submissions;

b) considers issues arising with the current definition of connection assets, and possible efficiency gains that could be achieved in remedying them;

c) considers possible alternative options; and

d) assesses the relative costs and benefits of the options and follows the analysis framework set out in section 4.

6.1.2 The Stage 2 consultation paper identified a number of options (such as specific and general bespoke, Flow Tracing and "But For" options) to provide additional signals to defer reliability-driven transmission investments. It also identified a number of issues with the current definition of deep connection assets.

6.1.3 In submissions:

a) Todd Energy, Contact and Powerco agreed that there are opportunities to improve incentives to defer reliability-driven transmission investment.

b) Transpower commented that there will only be a net benefit if the incentive leads to investment in peaking generation or demand side management that is more cost effective than the transmission investment it is displacing. It also doubted that a simple bespoke generator credit pricing mechanism could deal with issues related to investment timing and reliability necessary for local peaking generation to be an effective alternative to transmission.

c) Meridian and Genesis commented that delays in investing in transmission should not occur if the result is reduced competition in the energy market.

d) 3 large users wanted more work on "But-For" and saw similarities with flow trace.

e) Contact, EECA and Meridian wanted more work on flow trace but Todd Energy, Northpower and Transpower did not support it (citing issues such as complexity, legality, audit ability, instability, threshold distortions, unclear benefits, inadequate handling of 'stand-by' [security?] assets and contractual issues).

6.1.4 TPAG considered these options and concluded that there was negligible additional benefit in pursuing the specific or general bespoke pricing options to access these deferment benefits. The existing RCPD approach to allocating interconnection charges already provides a stronger signal for peak demand management in regions with growing net demand, and the Commerce Commission regulated transmission alternatives process already enables generation or demand side options to be commercially contracted for by Transpower where these are efficient.

6.1.5 TPAG supports improvements to the transmission alternatives regime if this is possible and justified but considers that this should be addressed by the Commerce Commission, rather than through theTPM . TPAG also recognises that there may be benefit in fine-tuning the RCPD allocation approach,

but introducing other general/specific bespoke transmission pricing options is unlikely to provide additional benefits, and risks conflicts with the existing mechanisms.

6.1.6 However TPAG has considered the potential benefits of using flow tracing or "but for" options to modify the boundary between connection and interconnection assets as a means to deal with boundary issues relating to the current deep connection definition and as a mechanism to apply beneficiary pays approach to make the definition deeper (i.e. further into the grid).

6.2 Issues with the Status Quo definition of Connection Assets

6.2.1 Currently the TPM separates the grid into connection, interconnection and DC assets. The current definition of connection is considered deep as it includes assets at connection points and assets "required" by individual customers. Some connection assets are shared between connected parties with the costs allocated between connected parties in proportion to the anytime maximum demands or injections. Rentals derived from specific connection assets are allocated back to customers who pay for those assets.

6.2.2 Connection costs are currently approximately $122m per annum, or 20% of the total AC revenue requirement. It is estimated that around $22m of the connection costs relate to connection assets, that would not be included if a more shallow definition was applied.

6.2.3 The following issues were raised in relation to the current definition of connection by submitters to the Stage 2 Pricing Review:

a) Transpower suggested that a move to a shallow definition would avoid the costs associated with exploring uneconomic augmentation options (ensuring the augmentation is an interconnection asset) requested by parties seeking to avoid Transpower charges due to the current definition of connection resulting in those parties paying. The shift to a shallow definition would only affect 4% of HVAC revenue ($22M).

b) TrustPower raised concerns, with respect to the how contestable the provision of connection assets were as Transpower appeared to required a lower configuration standards for connection assets owned by it.

c) Todd Energy considered it unreasonable for a generator to contribute connection assets shared between load and generation built to a higher reliability standard than required by the generator.

6.2.4 While resolving boundary issues with the Status Quo connection definition would be beneficial, TPAG was more interested in exploring alternative mechanisms for extending the application of a beneficiary pays approach to more assets on the grid in order to improve efficiency, explained further in paragraph 6.3.1 below.

6.3 Options Considered

6.3.1 Drawing on earlier work of the Commission and the Authority, and its own analysis, TPAG has identified the following possible alternatives to the status quo ,as summarised in Table 1, with the primary rationale to find a means of allocating transmission costs in a manner that:

a) better incentivises participants to provide good quality information to the Transpower's planning and Commerce Commission investment approval processes and promote commercially-driven investment where possible;

b) provides incentives to defer reliability-driven investments when it is economic to do so; and

c) delivers a better method to deal with boundary issues between connection and interconnection.

Table 1 Options for deeper or shallower connection

Option	Description	Rationale for Change
Status Quo	The TPM separates the grid into connection, interconnection and DC assets. The deep connection charging regime includes assets at connection points and assets "required" by individual customers. The cost of connection assets are shared in proportion to peak demands. Rentals on connection assets are returned to customers who pay. There is scope to negotiate mutually beneficial arrangements as the provision of connection assets is contestable.	
Shallow connection	This would revert to a shallow definition of connection assets.	Disincentivise parties lobbying Transpower to investigate interconnection options versus more economic connection options to avoid charges.
Flow Tracing	Allocate shares of transmission assets to loads according to a flow tracing with a cut-off threshold which dynamically defines the boundary between allocated and postage stamped interconnection assets. Customers would continue to receive rentals on assets they pay for as now.	To introduce an ongoing flow tracing for allocating the costs of assets deeper into the grid to reduce boundary issues and to improve participation and outcomes in grid investment decision making.
But-For	One-off identification of the "beneficiaries" of new "deep" connection assets when these are approved under the GIT. Beneficiaries only pay for capacity that they require, but Transpower could build more and socialise the cost. Customers would receive rentals for share of investments they pay for.	To extend the beneficiary pays approach to new assets when they are required to improve participation and outcomes in grid investment decision making.

6.3.2 The options are described in more detail in the following sections, and evaluated by applying the assessment framework described in section 4.

Flow Tracing design

6.3.3 Flow Tracing has been prototyped and tested to an extent by the Authority. This has provided some confidence that the approach is workable and has allowed variations in the key design parameters and issues such as pricing stability to be explored.

6.3.4 Flow Tracing would be applied to loads only and it would be possible to exclude assets accounted for under commercial arrangements or non-interconnection parts of the TPM (e.g. connection, deep connection, new investment agreements, HVDC, or potentially "But-For" agreements etc).

6.3.5 A key parameter in the Flow Tracing is the cut-off threshold. It has been proposed that this be based on an Asset Concentration Index (ACI) based on the Herfindahl-Hirschman Index, essentially measuring the number of customers sharing the asset. An ACI of 10,000 denotes a dedicated asset and by varying the ACI threshold the percentage of AC assets that were allocated or postage stamped can be determined. The table below indicates the expected split in 2015 under 3 alternative thresholds. An ACI of less than 4,000 would substantially reduce the level of postage-stamping relative to the status quo.

Table 2 Percentage of HVDC costs Allocated under the Flow Trace Option

Option	Threshold	Connection & Allocated Costs	Postage Stamped Interconnection
Status Quo		17%	83%
Shallow Flow Tracing	ACI >8000	37%	63%
Medium Flow Tracing	ACI >6000	58%	42%
Deep Flow Tracing	ACI >4000	80%	20%

6.3.6 The Flow Tracing calculations would require data from SPD and be assessed every trading period. This would enable the ACI cut-off and flow shares to be determined dynamically every half hour and/or averaged over a longer time frame such as a month or year. Transmission pricing is likely to be based on accumulated annual flow shares.

6.3.7 The ACI cut-off could be based on total customer shares for each asset, but it may be better to use a regional rather than company defined assessment to avoid giving distribution companies an incentive to restructure or to embed generation to influence the cut-off[1] (gaming behaviour).

6.3.8 It may be possible to provide a transition to Flow Tracing by gradually reducing the ACI threshold over time. An alternative transition might be provided by only applying the approach to "new" assets as they are built. Note that that this would require an objective basis for determining what was a "new" transmission asset compared with one that was refurbished or replaced.

But-For design

6.3.9 Minimal work has been completed on how the "But-For" option would apply in New Zealand. In order for this option to operate in practice there would need to be some guidelines as to how Transpower and the Commerce Commission would indentify beneficiary shares when investments are approved. For loads it may be possible to use Flow Tracing as a mechanism to assist in this regard. An objective basis for determining which assets are "new" (i.e. not required to service organic growth and solely

[1] For example a large distribution company may be tempted to split into 2 separate, but related, distribution companies in order to reduce the measured ACI and hence the cut-off so as to avoid being allocated a greater share of inter connection assets.

attributable to a particular party's demand or generation) would also be required. In addition there may be an investment cost threshold below which the approach would not be applied.

6.3.10 It may be possible for the indentified beneficiaries to enter long term contracts with Transpower (this would involve issues relating to term, performance promises etc). Alternatively the Commerce Commission might agree to approve fixed asset cost shares or a methodology for allocating costs as part of the TPM.

6.3.11 The "But-For" approach might replace existing connection arrangements or could be an alternative.

6.4 Assessment of the options against the efficiency considerations

Efficiency consideration 1: Beneficiary pays

6.4.1 [TPAG supports the application of the beneficiaries approach as discussed in section 4 and considers that there may be material benefits to the investment decision-making process where beneficiaries can be readily identified.

6.4.2 The "But-For" approach links the identification of beneficiaries to the investment process and as such it allows for a more gradual targeted phasing in of a beneficiary pays approach as and when it is likely to have the greatest benefits in respect to efficient grid investment decision-making.

6.4.3 However it does require a case by case assessment of beneficiaries which involves the practical issues and transactions costs involved in identifying beneficiary shares of new investments and boundary issues on each major investment. This will involve forecasts of load and other factors and the scope for dispute will inevitably increase the deeper into the interconnected grid. It would also require an objective basis for distinguishing between "new" assets and other capital expenditure (e.g. replacement or refurbishment)[2].

6.4.4 The benefit of the Flow Tracing approach is that it applies a formulaic approach to assessing beneficiary shares which is likely to be less costly to operate once it is established, and potentially less subject to costly disputes. On the other hand flow tracing assumes that benefit is proportional to allocated flow shares, which may not be reasonable in all cases. The assumption may be more reasonable if the flow trace is only applied to loads and the threshold is not set too deep. There may be issues if costs of reliability-driven assets are allocated to direct customers and distribution loads with different requirements for security.

6.4.5 The current connection regime is contestable[3] and this provides a basis for customers to negotiate mutually beneficial arrangements with Transpower. Although the concerns has been raised about higher connection standards being imposed by Transpower than those applied when it is the owner of the assets. It is possible that a similar approach might be applied as an optional alternative to either the Flow Tracing or "But-For" options, although this raises the risk of hold-out once several parties need to agree.]

Conclusion on beneficiary pays

6.4.6

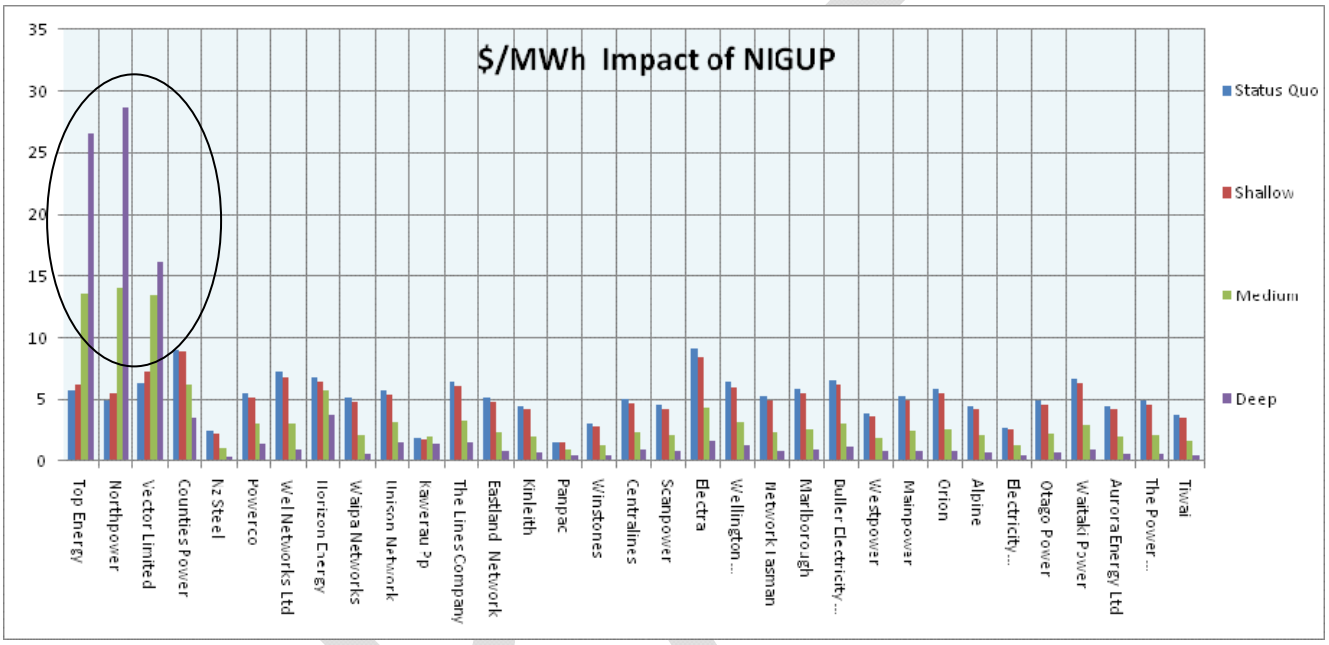
[2] These practical issues are canvassed in Page 71 of Appendix 2 "Further analysis of Stage 1 options", Electricity Commission July 2010.

[3] It is contestable in the sense that customers have the opportunity to discuss their requirements with Transpower and in some cases can consider alternative connection arrangements that might involve assets provided and owned by the customer.

Efficiency Consideration 2: Locational signalling

6.4.7 A primary objective of both the Flow Tracing and "But-For" options is to provide stronger incentives for loads to seek out cheaper options for additional load control or flexible generation [4] to delay or avoid new grid investments that they would have to pay for. The following Figure 1 illustrates the potential size of the additional location signal[5] that would have been provided had Flow Tracing had been in place prior to the approved North Island Grid Upgrade Plan investments in the upper North Island grid (NIGUP).

Figure 1: Impact of NIGUP on Customer Transmission Charges



6.4.8 Figure 1 also shows that under a medium or deep Flow Tracing, Vector, North Power and Top Energy would have been faced with a $14 to $27/MWh increase in their transmission charges attributable to the NIGUP and NAaN (North Auckland and Northland) investments in the AC grid, compared with only $5/MWh under the status quo or shallow flow tracing. The prospect of this paying these charges would have provided strong incentives for these companies to provide good quality information to Transpower and the Commerce Commission when the investments were being approved and to delay or avoid the grid investments by encouraging cheaper transmission alternatives if possible.

6.4.9 Both the Flow Tracing and "But-For" options provide very strong "ex-ante" incentives to promote options which can delay or avoid new grid investments before they are committed, however once a lumpy grid investment has been approved and becomes part of the fixed cost-recovery it is relatively

[4] The generation needs to be sufficiently flexible (can locate anywhere and fast start) and reliable to delay/avoid the grid investment, and can be either embedded or grid connected. Typically it is diesel generation

[5] This chart was estimated by the EA using the prototype flow trace model. It used historical demand data scaled up to 2015, and simulated the difference in transmission prices with and without the $400kV line to Auckland and the North Auckland and Northland grid investment.

hard to avoid[6]. This means that the incentive to actively manage load is strongest prior to a large grid investment, but then is reduced. This is sensible from an economic perspective if large investments result in a short term surplus of grid capacity.

6.4.10 On the other hand, the existing RCPD allocation method already provides an ongoing signal to manage load and to promote local embedded generation in regions where net demand is growing. In this case the incentive to control peaks is even greater following a new investment. This is reasonable where there is a series of small new grid investments required to meet growing demand but is not ideal where the investments are infrequent and large as the need for demand control is likely to be lower following a major investment. This issue might be addressed, under the status quo, by increasing the number of trading periods used to define the RCPD to 100 so as to blunt the incentive for load control while there is surplus capacity.

6.4.11 If the load customer is a distributor the incentive to reduce transmission costs will depend on how the Commerce Commission treats different expenditures in its regulation of distribution prices. If transmission charges are a pass-through then there may be diluted incentives for distributors to promote transmission alternatives, particularly if any costs incurred in procuring alternatives were not also a pass-through. The Commerce Commission is looking at various ways to give distributors the incentive to reduce transmission costs. In this case it will be important that treatment of transmission costs and the cost of transmission alternatives are treated equally in distribution price regulation.

Interaction with the Transmission alternatives regime

6.4.12 [Transpower is already required to consider transmission alternatives when seeking approval for a grid investment and if the transmission alternative is approved, its costs can be recovered in the same way as a transmission asset (via the TPM). The transmission alternatives regime enables Transpower to enter Grid Support Contracts (GSC) which provide payment for demand management and possibly local generation to defer reliability-driven investments..

6.4.13 In this situation the distributor who is paying for a major investment has a strong incentive to promote or to offer transmission alternatives to Transpower in order to delay or avoid the grid investment if the cost of the alternative (which it will have to pay for) is less than the cost of the grid investment that it would otherwise pay for. If the distributor uses the transmission alternatives regime as a mechanism to delay grid investments then it can be sure that costs it is allocated as a result are treated by the Commerce Commission on the same basis as other transmission charges.

6.4.14 It should be recognised that there are some issues associated with the transmission alternatives regime. For example:

a) Transpower requires a very high level of reliability, which would probably imply multiple unit configuration (with higher costs) or significant demand-side response to ensure well in excess of the actual MW required;

b) Transpower may be reluctant to enter GSCs with peaking generation if this interferes with the wholesale market;

[6] The cost shares may be fixed under the "but-for" approach, and are likely to be relatively insensitive to peak demand management under Flow Tracing. There may however be an unintended incentive to encourage local base-load generation to influence the threshold and hence the flow trace allocations in some situations.

c) Transpower may want to only enter into short-term GSCs to reserve transmission alternatives as a risk management tool (to mitigate delays in grid construction, higher demand growth or asset failure) rather than a primary means of delaying or avoiding new grid investments.

6.4.15 These issues are matters for the Commerce Commission to assess, but they could limit the extent to which Transpower is prepared to recommend alternatives to transmission investment.

Potential value from improved locational signals to loads

6.4.16 [Both the Flow Tracing and "But-For" options involve significant additional costs, so it is important to estimate the potential value from transmission alternatives delaying or avoiding new reliability-driven grid investments.

6.4.17 A number of major investments have already been approved and committed. Any potential value from new options can only therefore arise from new uncommitted reliability-driven investments. The Electricity Commission attempted to estimate the value from improved locational signals to load for the Stage 2 consultation and identified a potential gross value of $200-$300m NPV.

6.4.18 This estimate is considered to be high because it is based on 2010 SOO estimates of DSM and peaking plant which have since been revised downwards. It also assumed that all DSM and peaking generation investment could be relocated to avoid future reliability investments, whereas a portion of this value is likely to be achieved through the existing RCPD allocation method.

6.4.19 The total NPV of uncommitted reliability investments in the period 2015 to 2040 is estimated to be around $300m[7] (at an 8% pre tax real discount rate). This is based on assumed peak demand growth of around 150MW per year.

6.4.20 The updated SOO scenarios have a peak demand growth of around 130MW/yr and around 18% of this is met by Demand Side Management (DSM) and around 13% by diesel peakers (the most flexible plant in terms where it can locate)[8].

6.4.21 It seems likely that the existing RCPD derived charges under the status quo would provide incentives for some of the DSM options and embedded peakers, but there is scope for grid connected diesel peakers (which are needed to meet energy demand) to be located in those regions which are requiring reliability-driven grid investments. Given that these peakers were going to be built anyway (i.e. wholesale electricity prices are sufficiently high to pay for them), the cost of locating them appropriately to avoid grid investments as well is likely to be relatively low.

6.4.22 It should be recognised that both the Flow Tracing and "But For" options will reduce the level of postage stamped interconnection costs, and hence the level of the RCPD derived charge. Under the status quo the average real RCPD derived rate is expected to increase from around $70/kW/yr to around $90/kW/yr for the period 2015-2020. This provides a relatively strong incentive to control peaks in the upper North and upper South islands. With a medium flow tracing option this would reduce to around $45/kW/yr. The reduction would be less in the But-For option as the allocation of shared costs would only be applied on new assets as they were built.

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7 This is estimated from Figure 3 on page 36 in the Stage 2 consultation paper, which indicates an average of around $300m for each 5 year block from 2020. The present value of this is around $300m in 2011, because uncommitted expenditure between 2011 and 2020 is much lower.

8 These could be either OCGTs or reciprocating diesels.

6.4.23 If it is assumed that 50-75% of the DSM and 25-50% of the diesel peakers will be located in regions with growing net demand as a result of the RCPD allocation method, then there may be scope for savings of up to 10-20% of the total reliability investment cost as a result of the Flow Tracing or But-For options. This implies a maximum potential NPV value of $30-$60m NPV, substantially lower than the Electricity Commission's earlier estimate of $200-$300m NPV.

6.4.24 Some or all of this potential gain might be available through the transmission alternatives regime as operated by Transpower under the status quo. It is also likely that the risks of high nodal prices may induce investors in peaker generation to preferentially locate in regions which are subject to occasional transmission constraints. Thus the net additional value from the medium or deep Flow Tracing or "But-for" options *might* be in the range $15 to $40m. The nature of the analysis set out above, means these benefits are high level estimates only, and even these benefits may be available through an effective transmission alternatives regime.]

Conclusion on locational price signalling

6.4.25

Efficiency Consideration 3: Unintended efficiency impacts

6.4.26 [As with any practical cost allocation methodology there is the risk of creating perverse incentives for customers to reconfigure their networks, or to enter into arrangements with generators or loads simply to alter their allocation of transmission costs.

6.4.27 There are some anecdotal examples of this occurring under the status quo (to adjust the boundary between deep connection and interconnection assets), but this does not appear to be a significant issue, and is unlikely to be an issue under the shallow connection option.

6.4.28 There is scope for some perverse incentives arising from the Flow Tracing and "But-For" options. Under the flow trace option there may be incentives for distributors to restructure themselves to influence the ACI cut-off threshold, but this could be addressed by basing the ACI measure on regional groupings of GXPs rather than distribution company ownership. Even so some loads may have incentives to spend resources to influence load or generator behaviour simply to reallocate cost shares.

6.4.29 Under the "But-For" option loads will have strong incentives to dispute the identification of new assets and beneficiaries simply to reduce their assigned asset shares. This may delay necessary investments. This and the disputes will involve some economic cost.]

Efficiency Consideration 4: Competitive Neutrality

6.4.30 All options are largely neutral with respect to impacts on wholesale electricity market but there is potential for distortion in all options when money obtained in the regulated market is transferred to participants in the competitive sector. In this respect, the exact details of the transmission alternatives and But-For regimes become very important.

Conclusion on competitive neutrality

6.4.31

Efficiency Consideration 5: Implementation and operating costs

6.4.32 [The cost of implementing the shallow connection option is likely to be low or negligible.

6.4.33 The flow trace methodology has been prototyped by the Authority and this exercise indicates that the approach is workable but would require process and software development and testing.

6.4.34 TPAG estimates that the set up cost could be in the region of [$2-4m] and the ongoing incremental costs could be up to $1m per year, including administration, maintenance, audit, data management, processing, disputes etc. This is $10-$12m NPV.

6.4.35 The costs of the "But-For" option relate to the process of identifying beneficiary shares when new assets are approved and the costs of administering the cost allocations subsequently. This could be of the order of millions per annum depending on the number of new investments that it was applied to and the number of disputes that might arise. For this indicative analysis it is assumed to be $5-15m NPV.]

Conclusion on unintended efficiency impacts

6.4.36

Efficiency consideration 6: Good Regulatory Practice

Price impacts and wealth transfers

6.4.37 [In TPAG's view any changes that result in wealth transfers should be justified by clear efficiency improvements. Given this it is relevant to explore the price impacts relative to the status quo.

6.4.38 Figure 2 shows the estimated average transmission charges in 2015 by customer under the status quo, based on scaled up demands from 2004 to 2008.

6.4.39 This is provided as a basis for comparing with the impact of implementing Flow Tracing. Note that under the status quo there is already a reasonable variation in average transmission charges between customers. This partly reflects different connection costs, but relates mainly to different effective load factors. The load factor is the average MW demand divided by the RCPD for each customer. Some customers are able to actively manage their contributions to the RCPD and hence achieve load factors greater than 100% (this appears to be the case for some of the major direct customers and some distributors with uncorrelated summer load patterns. Others have peakier and less controllable loads and hence have much lower load factors (most distributors). Note that there is also a degree of year to year variability in transmission charges, presumably mainly driven by fluctuations in load factor.

Figure 2: Estimated Average Transmission Charges under the Status Quo in 2015

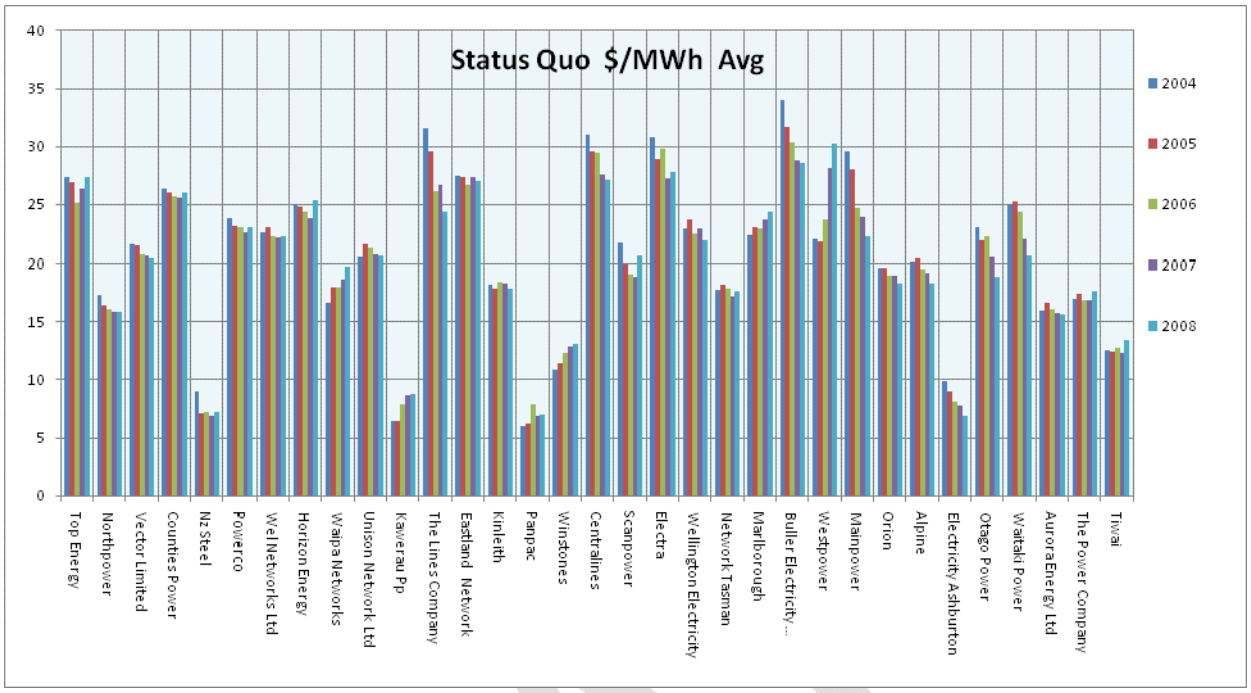
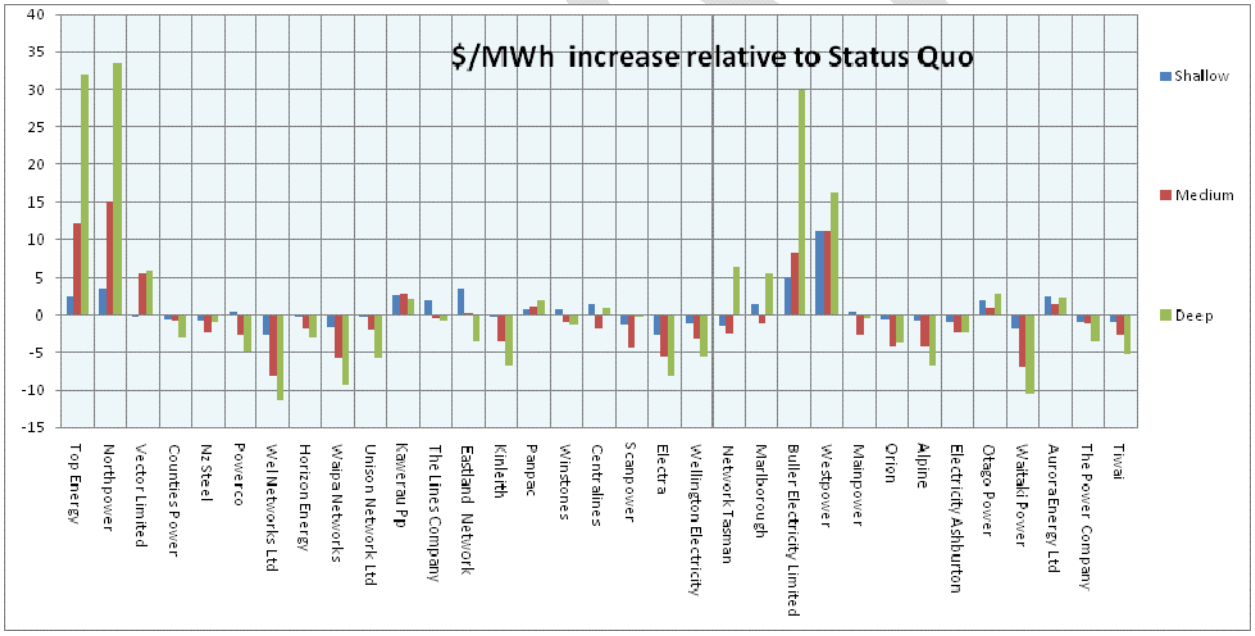


Figure 3: Estimated Price impact of Flow Tracing in 2015.



6.4.40 Figure 3 shows the impact on average transmission charges from a move to Flow Tracing. As can be seen the price and value impacts are potentially very significant with a medium and deep flow tracing methodology. Some customers would see an increase of over $30/MWh with a deep flow trace, for example. The impact is less with a medium Flow Tracing option, but still involves price changes in the range of +$15/MWh to minus $10/MWh. Note that the impact is variable with customers in the upper

North Island and the West Coast of the South Island being most adversely affected. There are also some significant winners. These are substantial wealth transfers and would require significant efficiency gains to justify. Note that a component of the value impact relates to the cost of the large NI grid investments which have been recently approved. These are committed and so the potential efficiency gains from improved investment decision-making in respect of these investments are no longer available.

6.4.41 Using a shallow Flow Tracing option would avoid the price impact, but this is unlikely to provide significantly better incentives for improved grid investment decision-making.

6.4.42 It may be possible to provide for a transition (for example by increasing the depth of the Flow Tracing over time, or by applying it to "new" assets as they are approved), but even in this case there would be significant value impacts once the transition period has ended as there is unlikely to be significant offsetting value gains.

6.4.43 The value impacts from the "But-For" approach are likely to be eventually similar to flow tracing, depending on the rules for determining which new assets this applies to and the rules for identifying beneficiaries cost shares. The overall price impacts should be lower with But-For, since it only applies to new assets[9]. However there will still be very significant price impacts for the individual customers involved in each new investment. Both options may also create local price impacts when individual assets need to be refurbished or replaced.]

Consistency of application

6.4.44 [The Flow Tracing methodology has the advantage that it would apply consistently over the whole grid; old and new assets would be treated in a similar way.

6.4.45 The "But-For" option would be consistent in the sense that it was applied to all qualifying new grid investments, but it might result in some customers being treated differently simply because network assets in their region happened to be up for replacement or expansion. This may be efficient, but could be seen as arbitrary, and this could affect the acceptability and durability of the option and could result in costly disputes[10]. There may also be some scope for disputes over the definition and application of the cut-off in the Flow Tracing option.]

Price stability

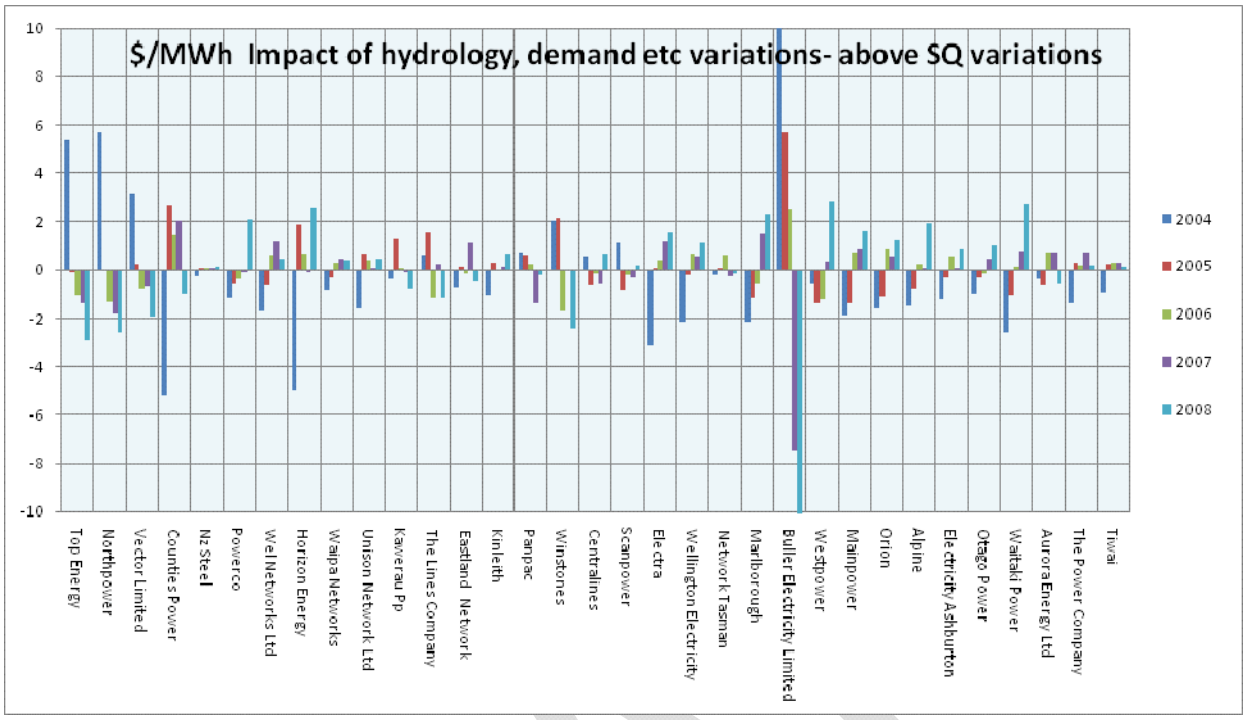
6.4.46 [An earlier attempt to use load flow to allocate costs resulted in significant year to year price fluctuations. While the new approach is fundamentally different and fluctuations are not necessarily bad per se, they can affect the acceptability and durability of on option, particularly if the fluctuations do not appear to serve any real signalling purpose and the earlier unfavourable reception to using load flow as an allocation method.

6.4.47 The Figure 4 illustrates the price fluctuations that might arise in 2015 with the medium flow tracing methodology over a number of years with different hydrology and demand. As can be seen the price fluctuations are relatively high for a few customers but are within the range ±$2/MWh for most customers. This would probably be acceptable as it is comparable with the fluctuations under the status quo.]

[9] Some of the biggest price impacts and wealth transfers arise from the major committed NI grid upgrades. These would not be included in the "But-for" option until they are replaced.

[10] The definition of "new" versus "old or replaced or refurbished" assets could be an issue in this regard.

Figure 4: Pricing Volatility under the Medium flow tracing option in 2015 with historical flow patterns



Workability and simplicity

6.4.48 [The status quo and shallow connection options score highly in terms of simplicity and workability. But the Flow Tracing and "But-For" options are substantially more complex.

6.4.49 Although Flow Tracing may be relatively complex to setup, once developed it is formulaic and should be relatively straight forward to operate and apply over time. There are a few parameters that may be subject to dispute (such as the definition and application of the cut-off).

6.4.50 The "But-For" option is likely to be complex and may involve a number of specific issues concerning its application that may be disputed. These include:

a) Interpretation and rules over which new assets it applies to;

b) Interpretation of guidelines over how to asses beneficiary shares at the time of investment approval given that this will involve the definition of a counterfactual or baseline and a number of forecasts and assumptions;

c) Issues that arise if circumstances change significantly (e.g. change in grid connections, new loads, new local generators, etc);

d) Issues relating to what happens when a "new" asset needs to be replaced or refurbished.]

Durability

6.4.51 [The Status Quo and shallow connection options are likely to be durable. Both the Flow Tracing and But-For options present risks in this regard. Both involve significant wealth transfers initially, at least for some customers. If the more significant wealth transfer effects of the Flow Tracing approach are accepted, then it is may be more durable than the But-For option over time as it could be less susceptible to disputes over its application.]

6.5 Assessment against efficiency considerations

6.5.1 [Table 3 compares the main connection pricing options relative to the status quo. Where possible quantified benefits and cost estimates are included. Positive values indicate an overall efficiency gain in total NPV terms. Where it is not possible to quantify the benefits, a tick represents an improvement relative to the status quo.

6.5.2 The Flow Tracing option is assumed to be of medium depth for this assessment, as a shallow approach is unlikely to deliver significant efficiency gains, and a deep approach has more significant price impacts and wealth transfers.

6.5.3

Table 3: Assessment of the connection options relative to the Status Quo deep connection)

Efficiency consideration	Shallow connection	Flow Tracing (Medium)	But for
Locational Pricing	Negative?	$15-$40m	$15-$40m
Implementation & operating costs	$0m?	-$12-10m?	-$15-5m?
Quantified benefit (NPV 30yr)	**Negative**	**+$3 to $30m**	**+$0** to **$35m**
Beneficiary pays	x	✓[11]	✓✓[12]
Unintended efficiency impacts 1. Game boundary, cut-off and cost allocation	✓	*X*[13]	*X*[14]
Competitive neutrality	same	same	same
Good Regulatory Process 1. Wealth transfers 2. Price impacts 3. Consistency over grid 4. Consistency over time 5. Work ability simplicity 6. Durability (disputes)	 low low same same ✓[15] ✓	 ± $10/MWh ± $10/MWh[16] ✓[17] *XX*[18] *X*[19] *same-*	 ± $5/MWh[20] ± $5/MWh *X*[21] *XX* *XX* XX[22]

[11] Flow tracing applies to all assets but assumes that benefits are proportional to flows for loads which is not necessarily the case.

[12] But-For only applies to "new" assets but might use a more sophisticated assessment of benefits. A flow based assessment might be one element of this assessment.

[13] There would still be some incentives to influence demand or generation to alter cost shares with Flow tracing.

[14] There would be incentives to lobby to influence the allocation of beneficiary shares at time of approval. If fixed shares are not applied and a flow sharing methodology is approved then there will still be incentives to change behaviour to reallocate shares on an ongoing basis.

[15] Slightly simpler as it reduces issues and disputes regarding deep connection boundaries.

[16] It may be able to reduce the initial price impact by a transition application of flow tracing, either increasing depth over time, or only applying to "new" assets as they are built (like But-For).

[17] Flow tracing can be applied relatively consistently across the grid, and may be slightly more consistent that current approach.

[18] Both flow tracing and but-for represent a significant change from past pricing practice. Note that if the change from the past is accepted, Flow Tracing appears to be reasonably stable year on year, although there could be special cases where it is not.

[19] Flow tracing is complex to set up but could be much simpler and less contentious to operate than But-for.

[20] Only applies to customers benefiting from "new" assets.

[21] But for would treat old and new assets differently.

[22] Scope for disputes is high, and there is a different application to old and new assets.

Conclusions from assessment

6.5.4 [The "But-For" approach is attractive in that it extends the beneficiary pays approach in a targeted manner to new reliability-driven grid investments where the benefits in terms of locational signalling are likely to be greatest. However it may be costly to apply (depending on scope), and could give rise to a number of potentially contentious ongoing issues concerning its application.

6.5.5 The estimated efficiency benefits from the "But-For" option may not be certain enough to justify the significant wealth transfers and price impacts that would result.

6.5.6 **Alternative conclusion** - The "But-For" approach is attractive in that it extends the beneficiary pays approach in a targeted manner to new reliability-driven grid investments where the benefits in terms of locational signalling are likely to be greatest. Although it may be costly to apply (depending on scope), and could give rise to a number of potentially contentious ongoing issues concerning its application, the potential benefits of improved decision-making in respect of reliability-driven investments warrant further investigation of how this approach could be applied.

6.5.7 The Flow Tracing approach is attractive in that, once established, it may be simpler and less contentious to operate over time than the But-For option. However benefits are not always proportional to flow shares, and the price impacts and wealth transfers would be more widespread. These might be mitigated to an extent by providing a transition.

6.5.8 The estimated efficiency benefits from the Flow Tracing option may not be certain enough to justify the significant wealth transfers and price impacts that would result. More evidence of significant problems arising from the existing deep connection approach is required to justify a move to a shallow definition of connection assets. The costs and difficulties of identifying the beneficiaries of deep connection assets do not appear to be sufficient to outweigh the benefits of retaining this approach.]