Response to Electricity Authority Transmission Pricing Methodology: Sunk Costs Working Paper

19 November 2013

1 Introduction and Summary

The Electricity Authority's Transmission Pricing Methodology (TPM) Sunk Costs Working Paper contains a theoretical and abstract discussion of the distinctions between sunk and fixed costs. The paper appears to conclude that transmission costs are fixed, and not sunk. However, the relevance of this characterisation for transmission pricing is unclear. The main point that we draw from the working paper is that regardless of whether transmission assets are fixed or sunk, all transmission costs need to be recovered through transmission prices. This cost-recovery is assured by the regulatory regime, and would also be found in unregulated sectors that need to attract new investment.

We have been asked by Contact Energy, Genesis Energy, Mighty River Power and Trustpower to respond to the Authority's sunk costs working paper. In particular, we have been asked to consider whether the Authority's interpretation of the economics literature on sunk costs invalidates the concerns raised by industry participants about the static and dynamic efficiency impacts of transmission pricing. The major concern that has been raised is that moving from a fixed demand-based transmission charge (the status quo) to a variable transmission charge that incorporates a beneficiary pays component (the October 2012 TPM proposal) would risk incurring static efficiency losses for an uncertain (and loosely articulated) dynamic efficiency gain.

In our view, the only relevance of the Authority's work on sunk costs is how different pricing approaches allow Transpower to recover its capital costs (whether sunk or fixed) would influence behaviour. At a conceptual level, transmission prices could change the behaviour of Transpower on new investments, and could also change the way that transmission users (generation and load) make use of the grid. It is these changes in behaviour from the status quo to an alternative charging regime that might change economic efficiency (either positively or negatively).

We see two main ways that behaviour could change under a beneficiary pays pricing approach like the one proposed by the Electricity Authority in October 2012. In summary, such an approach might:

- **Influence Tranpower's behaviour in proposing future investments, or the Commerce Commission's decisions to approve those investments.** This could only occur if the beneficiary pays pricing approach provides stronger incentives to bring new information to the project development and approval process, and this new information led to a different investment outcome. Transpower's investment plans could also be changed if grid users alter their electricity consumption decisions because they face different

transmission charges. This might change the need or timing of a particular investment. These effects are evaluated in Section 2, which concludes that increased scrutiny alone is unlikely to alter transmission investment decisions and the prospect of new information being provided is unclear.

- **Influence the way grid users utilise transmission assets that have been commissioned.** A beneficiary pays approach could change users' investment decisions (for example through load and generation making different decisions on location, plant sizing, or fuel choices), and could also affect their operational decisions (through different generator bidding and end-user consumption decisions). These effects are evaluated in Section 3, which concludes that a beneficiary pays approach can risk decreasing efficiency by failing to explicitly link prices to the demand characteristics of different users (unlike Ramsey pricing, which is expressly linked to demand characteristics).

The working paper also points out that as long as marginal transmission prices are set at the willingness to pay of the marginal user, then economic theory provides no definitive tests for the prices paid by other (infra-marginal) users. While this is true as a general proposition, implementing differentiated pricing approaches is not straightforward. To promote efficiency, beneficiary pays transmission charges would need to have a clear link to the willingness to pay of grid users that are asked to pay those charges. Otherwise, the parties identified as beneficiaries will be charged more, but may choose to reduce their use of the grid rather than pay higher transmission prices.

We think that the discussion of infra-marginal pricing in the working paper reflects (but does not resolve) the core disagreement between the Authority and submitters throughout the TPM review process. That is whether there can be material dynamic efficiency gains from changes in behaviour by reallocating transmission costs, and whether those gains would outweigh any material static inefficiencies.

To resolve this disagreement the Authority needs to fully explore and clearly articulate all of the ways that efficiency can be gained or lost through transmission pricing, and explain how those changes in efficiency will be investigated through the TPM review. This has not been done in either of the working papers released by the Authority to date (dealing with the approach to cost benefit analysis and sunk costs), but is essential before releasing another TPM proposal. It is clearly not sufficient to hold the view that dynamic efficiency gains (however uncertain) will outweigh any loss in static efficiency. Such an approach has been used in the past to justify poor policy decisions that reduce overall welfare.[1]

This note explores these economic efficiency impacts further, in a way that we hope provides greater clarity on what the debate on transmission pricing is really about, which is not whether transmission assets can be defined as either fixed or sunk.

[1] For example, early support for import-substitution policies were based on the claim that although free trade was superior from a "static resource allocation" viewpoint, dynamic efficiencies (through investment and innovation in nascent industries) would outweigh any static efficiency losses. See Krueger (1998) "Why Trade Liberalisation is Good for Growth", The Economic Journal, Vol. 108, No. 450 (Sep, 1998), 1513-1522 at p1517-1518.

2 New Transmission Investment

This section investigates how transmission pricing might change Tranpower's behaviour in proposing future investments, or the Commerce Commission's decisions to approve those investments. We start by summarising the existing process for approving transmission investment—for the TPM to improve efficiency the outcome of this process would need to change. We then investigate two ways that the outcome of the transmission investment approval process might change—either if new information is brought to the process that improves decision-making, or if users of the transmission grid respond to the prospect of higher transmission charges to change the need for new transmission investment.

While both of these changes are possible, in our view they are unlikely to change transmission investment decisions. Generators and loads already have incentives to provide information into the investment approval process. Even if better information was revealed, it is unclear whether such information would change the outcome of the net market benefits test used to approve transmission investments.

Summary of the current decision-making process for new transmission investment

The Investment Test in Schedule D of the Capital Expenditure Input Methodology is the current basis for approving major new transmission investments proposed by Transpower.[2] The Investment Test applies a net electricity market benefits test that considers the costs and market benefits of any major transmission project. Transpower is required under the Investment Test to demonstrate to the satisfaction of the Commerce Commission that the proposed transmission project has the highest net benefits of a range of feasible options that have been identified.

The benefits of transmission investment proposals that respond to a clear emerging shortage of transmission capacity are clear—the cost of unserved load that would otherwise occur are reduced or eliminated. The Investment Test also considers other benefits, including efficiency benefits that are likely to occur from relieving transmission congestion or from ensuring least cost dispatch in the wholesale market.

As a result, while the Investment Test considers all of the likely benefits of a transmission project it does not specifically identify beneficiaries. The Investment Test may identify loads at a GXP level where unserved energy might increase, but this is only a subset of the wider beneficiaries that would be identified by a beneficiary pays approach to transmission pricing. The Investment Test does not attempt to estimate possible electricity price impacts for affected grid users. The results of the Investment Test also do not have any influence on the recovery of the costs of the project. Once a project is approved by the Commerce Commission and constructed by Transpower, then the approved expenditure is deemed to be prudent and efficient, and the cost is added to the Regulatory Asset Base (RAB). That cost is then recovered through the transmission pricing methodology, allowing Transpower to recover the costs of the project.

Under the Investment Test, where there is a clear need for the project and thus a relatively defined benefit, the debate tends to focus on two issues:

[2] See NZCC 2/12 available online at: http://www.comcom.govt.nz/regulated-industries/input-methodologies-2/transpower-input-methodologies/current-documents-that-apply-2/

- **The timing of the project.** Given that there can be reasonable disagreements about future demand and consumption of electricity, particularly at the regional level applicable to many transmission projects, stakeholders may agree that new capacity is needed but will suggest it can be delayed beyond Transpower's proposed implementation without undue risk; or
- **The technical option chosen.** Even when it is clear that an upgrade of transmission capacity is needed and there is reasonable consensus on timing, there can be debate as to the best technical option. Typically, customers may view the proposed best option as too ambitious and not the least cost solution. They may then argue for a lower cost and more limited solution that may also have less strategic or option value.

Ways that grid investment decisions could be improved through beneficiary pays pricing

While the Investment Test considers all of the benefits of a project, the Investment Test approach is relatively high level and looks forward over the economic life of the proposed investment. The Investment Test also does not identify the specific beneficiaries of any investment, and instead takes an overall market view.

The introduction of a beneficiary pays pricing mechanism that is applied to future transmission projects might improve Investment Test outcomes. We see two ways that the additional process of identifying beneficiaries and quantifying the likely magnitude of their future transmission charges might change Investment Test outcomes:

- Increased scrutiny by potential beneficiaries including revelation of better information on future electricity demand and consumption, and
- Actions by beneficiaries to reduce the impact of increased transmission charges.

These possibilities are explored under the following headings.

2.1 Increased Scrutiny and Better Information

The prospect of higher differential transmission charges to a specific group of users—the beneficiaries of transmission—might reasonably be expected to attract their attention, and cause them to get more involved in the Investment Test process than would otherwise be the case.

Increased scrutiny alone is unlikely to alter transmission investment decisions

Gaining the interest of beneficiaries might result in greater scrutiny of the Transpower proposal. For example, simply by having more parties aware of the cost implications of new transmission might generate more testing of the assumptions and methodology of the Investment Test.

However, it is not clear that simply more scrutiny alone will result in any different outcome. This is because such actions would only result in different outcomes if there were flaws and weaknesses in the current process, or a lack of sufficient scrutiny—that is, that the timing or technical approach of projects that have been approved should not have proceeded, and this outcome was the result of a lack of grid user involvement.

We fail to see how simply having more users interested and making submissions is likely to change the outcomes of the Investment Test process, and therefore generate any change in the efficiency of transmission investment.

Revealing new private information could change decisions, but the presence of new information is unclear

As well as applying greater scrutiny to transmission investment decisions, users could reveal additional private information that might change the project, its timing, or even lead to its cancellation. As a hypothetical example, if a beneficiary or small group of beneficiaries revealed that they either planned to reduce their energy demand (by decreasing production or using higher efficiency equipment) or would do so in response to beneficiary pays transmission charges, then that could materially change the proposal.

For this behavioural response to be viable, the actions by beneficiaries to reduce their energy demand or consumption would have to come at a lower cost to them than any projected increase in transmission charges if the project proceeded. While this is theoretically possible, this seems unlikely for at least three reasons:

- It is unlikely that a single user or small group of users would be able to reduce their demand or consumption sufficiently to make a material difference to the timing of the transmission project
- If there is a large group of users, how would the aggregation of the potential demand reduction be managed and co-ordinated such that it all occurred? If this is not done effectively, then a "first mover disadvantage" will apply—users will not offer to spend private funds for a wider public benefit until other users commit. This means that it is likely that users will hold off revealing information and implementing demand management projects
- Given that Transpower has an obligation to adopt the least cost solution and consider non-network alternatives under the Investment Test, why have potential material demand management options been overlooked? This seems to be the case given that under a Transpower initiated demand management option, Transpower (not users) would initially pay for the demand management expenditure directly if the costs were lower than the transmission augmentation option.

We understand that the demand management process in the Investment Test has not always been seen as effective in eliciting demand management proposals from users. However, Transpower has undertaken several successful demand response activities in the recent past, which appear to have remedied many of the earlier concerns. If any problems remain, then these should be addressed directly rather than through the imposition of a beneficiary pays TPM.

It is also possible that during the Investment Test process generators may come forward with proposed expansion plans that may reduce the need or alter the timing of the project. Again, it would seem unlikely that such information would not be presented to Transpower during the options analysis phase of the Investment Test consultation. We can see no reason why generators would withhold that information, particularly because generators that can show that their actions defer the need for the investment would be entitled to avoid cost of transmission (ACOT) revenue. This would be a more certain source of revenue than attempting to defer the project to avoid paying higher transmission charges.

As a result, it also seems unlikely that any revelation of material private information by either generation or loads due to a beneficiary pays pricing would provide a significant gain in the efficiency of transmission investment decisions.

2.2 Avoidance of Higher Transmission Charges after Investment

Our view is that while the existence of the beneficiary pays TPM is unlikely to materially influence transmission investment decisions ex ante, it is more likely to have an influence on transmission utilisation ex post.

This is because the natural and logical result of higher transmission prices that will flow to beneficiaries once a project is completed is that users will take action to reduce electricity demand and consumption because they now have a material financial incentive to do so. In fact, the only way that the beneficiary pays approach could affect efficiency is to send pricing signals to certain users that will incentivise them to change their behaviour.

Loads that are deemed by the TPM to be beneficiaries of a new project will rationally be prepared to spend up to the value of the higher transmission charge to reduce their electricity usage or demand. Generators similarly would be prepared to forgo margin on additional production up to the value of the higher transmission charge.

Paradoxically, despite the good intentions of the beneficiary pays approach, this leads to the worst of both worlds. Transpower will commit (or perhaps sink) the capital and construct and commission the project. Those users that see higher prices in proportion to their benefits now have financial incentives to reduce their electricity consumption and demand (discussed further in Section 3 below).

3 Decisions made by Transmission Users

The investment and operational decisions made by electricity generators and end-users will have a major impact on the efficiency of any TPM. While the dollars invested in transmission are large, the core function of transmission is to enable more efficient transactions between generators and consumers (or retailers as their representatives). The October 2012 TPM proposal identifies that the electricity sector earns $6.5 billion in annual revenues. The transmission network helps to ensure that those revenues reflect the efficient cost of supplying electricity. It is therefore understandable that the industry would be concerned about the risk that changes in transmission pricing might introduce inefficiency in transporting electricity from generators across the transmission grid.

This section considers the ways that decisions made by transmission users might change with a variable transmission charge that incorporates a beneficiary pays component. We find that the concerns raised by industry participants about potential static efficiency losses remain valid, whether transmission assets are fixed or sunk.

Transmission users are unlikely to change their investment decisions

At a conceptual level, a beneficiary pays transmission pricing approach could change the investment decisions made by generators and load. For example, if a generator knew that a decision to locate on a particular part of the grid would attract higher transmission charges, it would factor this cost into its location decision. In the same way, if a new load knew that it could avoid transmission charges through its plant sizing or fuel choice decisions, then the impact of beneficiary pays charges would be factored in up front.

In reality, the investment decisions of transmission users are unlikely to be strongly influenced by transmission charges. This is because other factors are more likely to determine supply or demand-side asset characteristics such as location, plant size, and fuel choice. The best evidence on this point remains the modelling carried out by the Electricity Commission in 2009 in the Stage 2 Options paper for its Transmission Pricing Review. That modelling showed little benefit to locational signals for generators when considering options for transmission investment. The Commission attributed this finding to the fact that generator location decisions are driven more strongly by factors other than transmission costs, such as fuel costs, fuel availability, and resource consents.[3]

Any locational transmission prices are around an order of magnitude less than the locational signals that arise from the fully nodal priced wholesale energy market. This also suggests that this small additional locational signalling through transmission charges is unlikely to have any impact on the investment decisions of transmission users.

Transmission users are more likely to change their operational decisions

While the investment decisions of grid users are unlikely to change, transmission prices are likely to influence the operational behaviour of generators and end-users. Users will change their behaviour when the prices they are charged can be avoided at minimal cost to the user (so that the benefit to the user of avoiding the transmission charge exceeds the cost, including any foregone generation output or enjoyment of the use of electricity).

One of the major concerns expressed about the Authority's October 2012 proposal was that it could change the use of transmission assets in ways that reduce efficiency for two reasons.

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[3] See *Transmission Pricing Review: Stage 2 Options*, Electricity Commission, July 2010 at page 9 of Appendix 3

- Once a transmission asset is commissioned, making use of that asset clearly increases efficiency. Participants are concerned that a beneficiary pays charge might discourage grid usage.
- Efficiency can also be reduced if charges are redirected towards users that respond by lowering their use of the transmission grid (avoiding this efficiency loss is commonly known as Ramsey pricing).

In relation to the first point, efficient pricing generally requires that where transmission capacity is plentiful, prices should be low to signal that additional use of that capacity would generate economic efficiency. Where available transmission capacity is scarce, potentially requiring new investment to be made, transmission prices should be high to signal the efficiency gains of deferring the need for investment.

Transmission pricing typically results in exactly the opposite pricing outcomes. When spare capacity exists, high levels of fixed costs are recovered from lower levels of demand—resulting in higher prices. Just before major investments are made by Transpower, prices are relatively low because fixed costs are spread across higher levels of demand. Prices then rise after investments are made to recover new costs entering the regulatory asset base. These price trends will play out over the coming years if the current TPM was to remain in place.

A variable transmission charge that incorporates a beneficiary pays component does not appear to change this feature of transmission pricing. This is because:

- When initially commissioned, a project will have high costs and relatively few benefits—meaning that most of the cost of new assets would need to be recovered from another charging approach (the residual mechanism in the Authority's October 2012 proposal)
- Growth in utilisation over time will mean that a greater proportion of the cost will be recovered from the beneficiary pays charge. However, the growth in usage will mean that the amount assigned to each user may actually decrease
- In the long run, the benefits provided by transmission assets will likely decrease as the asset becomes a less material part of the network. For example, the estimated benefits of the first line into an area would presumably fall when a second line is constructed.

For these reasons, a variable beneficiary pays pricing approach is likely to continue to lead to higher charges than would signal efficient utilisation initially, but then as capacity becomes constrained would shift to providing prices that are lower than efficient levels. Effectively, a beneficiary pays pricing approach does not overcome the standard challenge in pricing regulated assets to signal their available capacity.

Asset utilisation can also be negatively affected if prices are directed towards those users of the transmission grid that are most likely to respond. Addressing a similar problem relating to taxation, Ramsey formulated the principle that an efficient mark-up of price over incremental cost would respond to different levels of price responsiveness.[4] This principle has subsequently been applied to natural monopolies because price mark-ups are needed for natural monopolies to recover fixed costs.[5]

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[4] Ramsey, F (1927). "A Contribution to the Theory of Taxation", The Economic Journal, Volume 37, Issue 145 (march 1927), 47-61

[5] Boiteux, M (1971). "On the Management of Public Monopolies Subject to Budgetary Constraints", Journal of Economic Theory, 3, 219-240

A variable transmission charge that incorporates a beneficiary pays component does not explicitly consider the demand characteristics of the party that pays. This risks moving further away from a Ramsey pricing approach—the parties that happen to benefit from a particular asset may in fact be those that are most responsive to price. Introducing a variable charge also risks having unintended consequences that reduce efficiency. For example, a volatile beneficiary pays transmission charge (such as that proposed in October 2012) would introduce new cash-flow risks for electricity retailers, and would therefore reduce retail electricity market competition.

Infra-marginal pricing under beneficiary pays may not promote efficiency

The working paper points out that as long as marginal transmission prices are set at the willingness to pay of the marginal user, then economic theory provides no definitive tests for the prices paid by other (infra-marginal) users.

The Authority seems to be applying the same insight that underpins the NZ Power proposal made by the Labour Party and the Greens—in that context, as long as the prices paid to developers of new generation reflect the long run marginal cost of generation, then infra-marginal prices do not need to reflect marginal cost.[6] The NZ Power proposal aims to lower the prices paid for infra-marginal electricity generation given that marginal costs are increasing. In contrast, a beneficiary pays approach to transmission pricing would presumably increase prices to infra-marginal grid users in an attempt to recover the fixed costs of transmission from infra-marginal users.

The major risk in charging different prices (lower or higher) to marginal and infra-marginal users is if prices cause either group of users to inefficiently reduce their demand. For this reason, Ramsey pricing is widely regarded as the best method for differentiating price—because Ramsey pricing explicitly links prices to the demand characteristics of different users, it provides confidence that output will expand compared to a single, marginal price.

The working paper does not explain how a beneficiary pays approach might reflect users' willing to pay for transmission, and no clear link was drawn in the October 2012 TPM proposal. While conceptual links exist between a beneficiary pays charge and new transmission investment decisions (as discussed in Section 2), these conceptual links do not apply to existing assets. Instead, charging the beneficiaries of existing assets is more firmly based in notions of fairness and equity (rather than efficiency).[7] In effect, parties that are gaining a benefit from the grid "should" pay for the privilege of receiving that benefit. The same rationale applies to setting charges for public services in New Zealand, where Treasury has concluded that beneficiary pays is not necessarily efficient as a charging rule.[8]

This strongly suggests that to promote efficiency, beneficiary pays transmission charges need to have a clear link to the willingness to pay of grid users that are asked to pay those charges. Otherwise, the parties identified as beneficiaries will be charged more, but may choose to reduce their use of the grid rather than pay higher transmission prices.

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[6] See: http://www.labour.org.nz/nz-power and https://www.greens.org.nz/energy

[7] NERA, (2009), "New Zealand Transmission Pricing Project: A Report to the NZ Electricity Industry Steering Group", 28 August 2009

[8] Treasury (2002). "Guidelines for Setting Charges in the Public Sector". Available online at: http://www.treasury.govt.nz/publications/guidance/planning/charges/charges-dec02.pdf

4 Conclusion

Table 4.1 summarises the efficiency effects identified in this note of a variable transmission charge that incorporates a beneficiary pays component. This highlights that at a conceptual level, transmission prices can have dynamic and static efficiency effects. This makes it extremely important to credibly assess the magnitude and likelihood of those efficiency effects occurring in practice.

Table 4.1: Summary of Efficiency Effects of Transmission Pricing

		Possible efficiency gains	Possible efficiency losses	How impacts should be assessed
Dynamic	**Transmission investment**	▪ Increased scrutiny by potential beneficiaries and/or better information on future electricity demand and consumption ▪ Actions by beneficiaries reduce the need for transmission investment	▪ Absence of link between Investment Test and TPM leads to users responding after investment has been made	▪ Show some material failure in Investment Test process (such as evidence from previous incorrect approvals) ▪ Also show that the level of scrutiny or availability of information would have addressed this failure in the Investment Test
	Generation investment	▪ Factor in transmission charges to lower the total cost of new generation investment		▪ Show that transmission charges would change decisions on new generation (location, fuel, size, timing)
	Load investment	▪ Factor in transmission charges to lower the total cost of supplying electricity to new loads		▪ Show that transmission charges would change decisions on new loads (size, energy source, consumption patterns)
Static	**Generation use of grid**		▪ Generators bid out of merit order to avoid or minimise the transmission charge	▪ Show opportunity and incentive to change generator offers due to transmission charge ▪ Show impacts of any change in behaviour on efficiency of dispatch
	Load use of grid		▪ Retailers compete less vigorously if charge introduces new risks through volatility (particularly for small retailers)	▪ Link any new risks with transmission charges to competitive conditions in retailing ▪ Show impact that less competitive retail has on end user prices and efficiency

In summary, the only relevance of the Authority's work on sunk costs is how different pricing approaches to allow Transpower to recover its capital costs (whether sunk or fixed) would influence behaviour. This note articulates the ways that efficiency can be gained or lost through transmission prices based on a beneficiary pays logic (rather than the status quo). We have also summarised how any changes in efficiency might be assessed through the remaining papers released as part of the TPM review. We urge the Authority to focus its approach on investigating how changes in behaviour might lead to different efficiency outcomes—which we see as the only way to answer the question of whether the dynamic efficiency gains from any change in transmission pricing would outweigh static efficiency losses.