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Submissions
Electricity Authority
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To Whom It May Concern

RE: USE OF THE LOSS & CONSTRAINTS EXCESS TO OFFSET TRANSMISSION CHARGES

1 INTRODUCTION

The Electricity Authority (Authority) is conducting a review of the Transmission Pricing Methodology (TPM). As part of that review it has issued a working paper on the use of the loss and constraints excess (LCE) to offset transmission charges (the "LCE Working Paper").[1]

This submission is prepared as an independent expert submission, not funded by any market participant. I have made this submission because I am concerned at the level and quality of analysis in the LCE Working Paper, in particular the lack of the intellectual rigour that should reasonably be expected from professional economists.

I am one of three people that were involved in Transpower's original decisions on allocation of the LCE. The other two people are Mike Moy who is sadly no longer with us, and Gareth Wilson who is generally constrained from commenting by virtue of his position as Manager of Energy Markets Policy at the Ministry of Business, Innovation & Employment. A copy of my curriculum vitae is included as an appendix.

This submission is structured as follows:

- Section 2 sets out the economic and logical basis for allocation of the LCE;
- Section 3 examines the claim that direct allocation of the LCE to parties that pay for a transmission asset will distort or mute the marginal price signal;
- Section 4 examines the claim that direct allocation of the LCE gives rise to gaming risk;
- Section 5 addresses the question of how the LCE should be returned to the parties paying for transmission, including when the LCE is used to fund FTRs;
- Section 6 comments briefly on the EA's proposals; and
- Section 7 provides some concluding comments.

1 Electricity Authority, *Transmission pricing methodology: Use of LCE to offset transmission charges*, Working Paper, 21 January 2014.

2 Economic and Logical Basis for Allocation of LCE

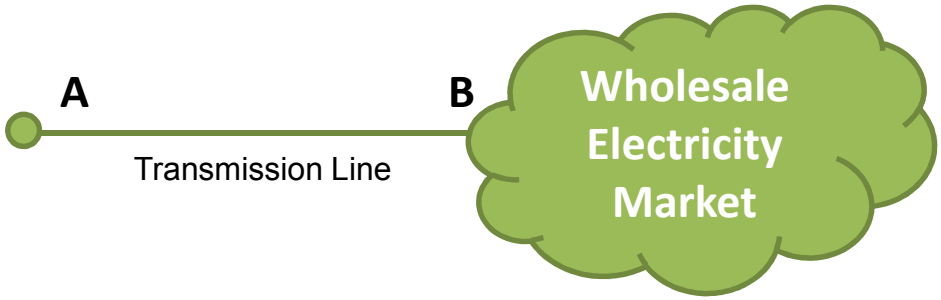
The logic that underpinned the original decisions on the allocation of the LCE was based on the consideration of a transmission connection asset that could be owned by either the customer or by Transpower. From an economic perspective, the allocation of the LCE arising on that asset should not alter the customer's decision between owning the asset or paying Transpower.

Assume, for example, the situation shown in Figure 1:

- The market participant is located at Point A;
- There is a transmission line from Point A to Point B;
- Point B represents the wider wholesale electricity market.

If Transpower owns the transmission line then the market participant purchases wholesale electricity at Point A; if the market participant owns the transmission line then they purchase wholesale electricity at Point B.

Figure 1: Simplified Transmission Connection Example



It is straightforward to see that if the market participant owns the transmission line, then they will purchase electricity from the wholesale market at Point B, and incur the cost of actual losses (not marginal) across the transmission line A-B. Furthermore, the market participant will be able to fully internalise the cost function for the losses incurred on the transmission line. The market participant may be sufficiently small relative to the market that the optimal price at Point B is the price based on marginal cost, but the effective price at Point A is something different.

It is helpful now to extend the example to include some numbers. Assume that the market participant is a load, and the power flow exiting the transmission line at Point A is 5 units. Assume further that the loss function on the line is given by the simple quadratic function:

$$\text{Total Losses} = 0.006x^2$$

where x is the power flow exiting at Point A.

Given this formula, at a power flow of 5 units the total losses are 0.15, the average loss per unit of power flow is 0.03 (i.e. 3%), and the marginal loss rate is 0.06 (i.e. 6%).[2] The power that must enter the transmission line at Point B is 5/(1-0.03) = 5.155 units.

2 Average losses are $0.006x^2 / x = 0.006x$. With x = 5 average losses are therefore 0.006 x 5 = 0.03. Marginal losses are given by the derivative of the loss function, so are equal to $0.012x$. With x = 5 marginal losses are therefore 0.012 x 5 = 0.06.

Assume also that the price at Point B is P_B = \$70. If the transmission line A-B is part of the market (i.e. is owned by Transpower rather than the participant) then the price at Point A is the price at Point B multiplied by 1 plus the marginal loss rate, i.e. $P_A = P_B \times (1+0.06)$ = \$74.20.

With a consistent set of quantities and prices we can now calculate the cost of electricity to the market participant based on ownership of the line. The table in Figure 2 shows the calculation of the cost to market participant in the two scenarios. If the market participant owns the transmission line it purchases 5.155 units of power at Point B, incurring a cost of \$360.85. If Transpower owns the transmission line, the market participant purchases 5 units of power at Point A, incurring a cost of \$371.00.

Figure 2: Calculation of Electricity Purchase Cost

Line Owned by	**Transpower**	**Participant**
Electricity Purchased at	Point A	Point B
Price	74.20	70.00
Quantity	5.000	5.155
Purchase Cost	371.00	360.85

We can readily assume that the economic cost of the line is the same regardless of who owns the line, so the decision on whether to own the transmission line or pay transmission charges for a Transpower asset comes down to the cost of electricity to the market participant. Given the example, there is a clear benefit to the market participant of owning the transmission line and removing it from the market: because electricity is priced using marginal loss factors but only actual losses are incurred, it will always be cheaper to own the transmission line.

It cannot be the case that it is inefficient for the market participant to own the transmission line A-B: the line is simply a fixed asset that is part of their "plant". As with any other part of the market participant's plant, the asset can be owned by the market participant, or it can be rented or leased from a third party. It also cannot be that it is necessarily inefficient for Transpower to own the transmission line. Rather, the use of marginal pricing on the transmission line A-B creates a distortion in favour of the market participant owning the transmission line.

The distortion in favour of transmission line ownership can be eliminated by appropriate allocation of the LCE. In a general sense, the LCE is the difference between the price x quantity paid by consumers and the price x quantity paid to generators. If Transpower owns the transmission line, then the price x quantity paid by consumers is the \$371.00 at Point A. The price x quantity at Point B is the amount conceptually paid to generators at that point, i.e. \$360.85. The LCE arising on transmission line A-B is \$371.00 – \$360.85. Paying the LCE to the market participant that pays for the transmission line removes the distortion in favour of ownership.

At no point does the LCE Working Paper consider the logic set out above, even though such logic has underpinned Transpower's methodology since the inception of the NZEM in 1996 (i.e. the last 17 years). A quote from a paper by Hogan in 1991 about the use of the LCE for FTR settlement is insufficient to overturn this logic. Indeed, for all of Hogan's seminal work about locational marginal pricing and the use of FTRs, at least one conjecture made in Hogan's work of that era has since proven to be wrong. For example, for a long time Hogan conjectured that electricity markets employing locational marginal pricing would display a characteristic known as "convexity" and as a consequence the LCE would always be adequate to settle FTRs (this

principle is known as "revenue adequacy"). However, it was demonstrated theoretically in 2005 that such markets could not generally be assumed to be convex, and hence revenue adequacy could not be guaranteed.[3] This theoretical prediction has shown to be correct. Hogan may have contributed much, but it is important to distinguish between conjectures that seem logical and robust demonstrations of fact.

3 Distortion or Muting of the Marginal Price Signal

It is argued by some paying the LCE to the market participant that pays for the transmission line either "distorts" or "mutes" the marginal price signal. That may be correct, but the argument fails to recognise that the marginal price signal is not always the correct signal. The efficiency of a marginal price signal is established in a theoretical model of a market where there is a homogenous set of atomistically small buyers,[4] a homogenous set of atomistically small sellers, and no economies of scale. This theoretical model is known as perfect competition. Under the conditions that prevail with perfect competition it is indeed true that the marginal price signal should not be distorted. Setting price equal to marginal cost is optimal in a market where participants cannot alter the cost structure of the product, because the price signal accurately reflects the cost of consuming or using a single extra unit.

The price equal to marginal cost rule does not necessarily hold when the assumptions of perfect competition are relaxed. For example, if there are economies of scale then price equal to marginal cost is no longer efficient unless there is a lump sum subsidy paid to each producer. If such a subsidy is not paid then the producers will go out of business (and the market disappear) unless they are able to price above marginal cost. With homogenous consumers the optimal price will include a mark-up so that, in equilibrium, price is equal to average cost but greater than marginal cost. If consumers are no longer homogenous, but can be segregated into groups based on some characteristic, then the mark-up over marginal cost need not even be the same between consumer groups: instead, the optimal mark-up should be set in inverse proportion to the price elasticity of demand of the various groups (i.e. Ramsey pricing). In this situation the even the simple rule of price equal to average cost no longer applies (although it is true in terms of weighted average prices).

The situation we are faced with in the wholesale electricity market is a very long way from perfect competition, and some departure from the marginal signal is desirable for optimal economic outcomes. Bearing in mind that the losses and constraints are part of the cost structure of the market, the situation we are actually faced with is one where a participant may be able to significantly impact the cost structure of the market (locally) by choosing to alter consumption or production decisions. In the context of the earlier example, the market participant at Point A was able to materially alter the level of losses on transmission line A-B, and hence the cost structure of the local market, because they were the sole user of that transmission line. If these decisions are made on the basis of marginal cost at a particular level of output or consumption then they will be wrong because changing output or consumption will change the cost of electricity. A market participant with significant ability to shift the cost structure (and hence prices) needs both the information on how the cost structure will change

3 Bernard C. Lesieutre and Ian A. Hiskens, "Convexity of the Set of Feasible Injections and Revenue Adequacy in FTR Markets", *IEEE Transactions on Power Systems*, 20(4):1790-1798, November 2005.

4 When a market participant is "atomistically small" they are so small that they are unable to affect the market price.

and the incentive to optimise their position relative to that change in cost structure. The later condition requires that the relevant part of the cost function is internalised by the relevant market participant(s), which in turn means that they should either own the relevant transmission assets (and remove them from the market), or should receive the relevant portion of the LCE.

4 Gaming Risk

This, then, brings us to the topic of gaming risk. The discussion above identified that a market participant may be able to significantly affect the cost structure of the market, at least at the local level. This suggests, but does not in any way prove, that market participants may have incentives to "game" prices (and hence the LCE).

The working paper contains the allegation that if generators were in direct receipt of the LCE on relevant assets, then they might adjust their bidding behaviour to game the LCE on those assets. The logic underpinning this allegation appears extremely shaky. Increasing LCE means either increasing losses on an asset or taking an action that causes a constraint. Both of those potential sources of gaming should be explained and examined in much greater detail before the allegation is accepted as correct.

The only way to increase losses on most assets is to increase power flow. If the relevant assets are connection assets, the only way to increase power flow is for the generator to increase its generation. That can only happen by offering more generation into the market at the same or lower prices. The best the generator can hope for is that the market price is unchanged, but the increased losses will ensure that the effective price received by the generator will decrease. This hardly seems to be an incentive to game the LCE.

It is disingenuous of the EA to suggest that generators may game the LCE on relevant assets, and that is a reason for changing the method of LCE allocation, but to ignore the much higher likelihood that generators will seek to game the allocation of transmission asset charges under the EA's proposed TPM. If potential gaming is a reason to change the method of LCE allocation, then it is a reason to abandon the EA's TPM proposal.

5 How Should the LCE be Returned the Party Paying for Transmission?

Section 2 clearly demonstrated that the LCE should be returned to the party paying for transmission. Section 3 argued that the resulting "muting" of the marginal price signal is not a concern from an economic perspective. Section 4 examined the claimed gaming risk and concluded it is unlikely to exist. How, then, should the LCE be returned to the party paying for transmission?

Our original solution at Transpower was to identify the LCE arising on each grid element, map those grid elements to the transmission assets paid for by transmission customers, and then provide a monthly LCE rebate to the transmission customer.

The calculation of transmission charges was always kept separate from the LCE so that the underlying level of transmission charges would always be visible. The LCE can change significantly from year-to-year due to changes in hydrology (and other factors), and this should be kept separate from the relatively stable charges required to recover the cost of transmission assets.

5.1 LCE and FTRs

It was always intended that part of the LCE would be used to fund FTRs. However, this was subject to the following principles:

1. When any part of the LCE is auctioned off, the specific grid elements on which that LCE arises should be identified;
2. The parties that pay for the grid elements should receive the auction proceeds for the LCE arising on those elements;
3. An allocation of FTRs should correspond to a feasible dispatch, and therefore should map (via the dispatch software) to the relevant grid elements.

The important point for the current consultation is that if part of the LCE is used to fund FTRs then the auction proceeds from the FTRs should be returned to those transmission customers paying for the relevant assets.

6 THE AUTHORITY'S PROPOSALS

In the LCE Working Paper the Authority suggests three proposals for allocating the LCE:

a) crediting LCE against the maximum allowable revenue (MAR) in bulk (option 1);

b) classifying LCE by asset class and applying LCE originating from connection assets against charges for individual assets. Under this alternative, the remaining LCE would be credited against the MAR in bulk (option 2);

c) classifying LCE by asset classes and applying LCE originating from connection assets against charges for individual assets. Crediting LCE from other asset classes against the MAR by asset class (option 3).

The Authority indicates a preference for option 2.

There is actually no need to group the LCE by asset class and then allocating the aggregate total amongst the assets in a class (i.e. Options 2 and 3). The grouping of LCE with that earned on other connection assets, and then allocating out an "averaged" amount across the connection assets will distort the price signal received by the parties that pay for transmission connection assets. In the context of the example in Section 2, the LCE received by the market participant at Point A would only be partially related to that participant's use of the transmission line A-B, with the price signal received and "own vs pay Transpower" signal both having a significant random element. The introduction of unpredictable randomness never improves efficiency, but can only ever reduce it.

7 CONCLUSION

The LCE Working Paper lacks rigorous economic analysis. Statements and allegations are presented as fact without being subject to adequate economic scrutiny.

The LCE should continue to be allocated on a link-by-link basis. This may have the effect of altering the strict marginal price signal, but there are sound economic reasons why this is acceptable and even desirable. Logical examination also reveals that continuing with a link-by-link allocation does not give rise to any gaming risk on the part of economically rational generators. The proposed SPD-based TPM, on the other hand, would appear to give rise to significant gaming risk.

Finally, if the Authority elects to ignore this submission, then whatever methodology is chosen for allocation of the LCE should be capable of being applied regardless of the TPM that applies at the time. The Authority should not assume that its proposed TPM is a *fait accompli*, but should instead ensure that the LCE methodology is specified as a set of principles that could apply under the current TPM, under the Authority's proposed TPM, or under an unspecified alternative.

Yours faithfully

Andrew Shelley
Director
Andrew Shelley Economic Consulting Limited

APPENDIX A: : CURRICULUM VITAE

ANDREW SHELLEY

Consultant

MA (first class honours) Economics
Massey University

B.B.S. Information Systems
Massey University

Andrew Shelley is a regulatory economist with 17 years' experience analysing complex economic and regulatory issues for energy-intensive, network and infrastructure industries. His recent work focuses on analysing the firm's response to regulation, including the impact of New Zealand's proposed emissions trading scheme on energy-intensive and emissions-intensive firms, and the impact of formal price control on utility revenues, cash flows, and investment.

Andrew has particular expertise in the electricity and telecommunications industries. He has advised on electricity transmission and distribution regulatory issues such as asset valuation, cost of capital, revenue requirements, pricing structure, and cash flow modelling. In addition to providing regulatory advice he has appeared as an expert witness in commercial arbitrations relating to New Zealand's electricity market, and developed expert evidence for a number of court cases. He has also advised firms in industries such as gas transmission and distribution, forestry, postal services, and rail networks.

Andrew's previous employment includes the positions of Principal at CRA International, Senior Consultant at PHB Hagler Bailly Asia Pacific Ltd, Costing & Economics Manager at Telecom New Zealand Ltd, and Strategic Analyst and Pricing Analyst at Transpower New Zealand Ltd. Mr Shelley is located in Wellington, New Zealand.

Andrew is a member of the New Zealand Institute of Directors and a member of the New Zealand Safety Council.

PROFESSIONAL HISTORY

2013 – **current**	President, Fly DC3 New Zealand Inc Director, Flight 2000 Ltd
2010 – **current**	Director, Aviation Safety Management Systems Ltd Senior Consultant, The Lantau Group
2008 – **current**	Director, Andrew Shelley Economic Consulting Ltd Senior Consultant, Oakley Greenwood Pty Ltd
2008 – 2010	Consultant, CRA International
2001 – 2008	Senior Associate, Associate Principal, and Principal, CRA International
1999 – 2000	Senior Consultant, PHB Hagler Bailly – Asia Pacific Ltd
1998 – 1999	Costing and Economics Manager, Network Group, Telecom New Zealand
1995 – 1998	Pricing Analyst and Strategic Analyst, Transmission Services, Transpower New Zealand Ltd
1995	Analyst Programmer, Foodstuffs (Wellington)
1993 – 1994	Study for Master of Arts

1990 – 1993 Analyst Programmer, Farmers' Mutual Insurance Group

CONSULTING EXPERIENCE

Utility Price and Revenue Regulation

- Advising Vector Ltd on various aspects of pricing for electricity distribution and gas transmission and distribution.
- For Contact Energy, preparation of a report analysing whether the balance of Transpower's "economic value" (overs and unders) account was consistent with what would be expected in a workably competitive market.
- Advising Unison Networks Ltd in its responses to the New Zealand Commerce Commission's implementation of the price control provisions contained in the Commerce Amendment Act. This has included preparation of advice in respect of, and preparation of submissions and expert reports in response to the Commission's consultations on "Regulatory Provisions of the Commerce Act", "Input Methodologies", regulatory taxation, asset valuation, and cost allocation.
- For Energex distribution network (Brisbane), development of a cost-based pricing model for regulated distribution services. This project also included the provision of advice on pricing policy, particularly with regard to developing prices that reflected the impact of demand growth on capital expenditure. Delivery of the pricing model also included provision of a user guide, technical documentation, and user training.
- On behalf of Unison Networks Ltd, preparation of a submission in response to the New Zealand Commerce Commission's initial proposals for resetting the price path and quality thresholds in 2009.
- Advising Vector Ltd on economic issues arising from the New Zealand Commerce Commission's draft decisions on price control for gas distribution services.
- For the Electricity Networks Association, preparation of a submission to the New Zealand Electricity Commission on Transpower's proposed transmission pricing methodology, and on proposed changes to the Benchmark Transmission Agreements.
- Advising a New Zealand generator on the principles of utility revenue requirements.
- Advising a New Zealand utility on issues of cost allocation related to setting regulated prices.
- For Vector Ltd, a detailed financial analysis of the implications of placing Vector under formal price control.
- For a New Zealand electricity lines business, development of a financial model to assess the relative performance of all electricity lines businesses under the Commerce Commission's CPI-X price path vs formal "building block" revenue regulation.
- Preparation of a series of expert reports for Unison Networks Ltd in response to the New Zealand Commerce Commission's draft intention to declare control of Unison, and for use by Unison in its subsequent Administrative Settlement negotiations. This work included analysis of the cost of capital, cash flows, financial ratios, and capital expenditure under various price control scenarios, as well valuation issues.

- An assessment of the costs and benefits of Transpower being placed under formal price control.
- Advising NGC on the calculation of excess profits, including detailed consideration of the theoretical basis for calculating excess profits, arguments on the treatment of gains on sale and the appropriate treatment tax effects.
- Advising a major Asian utility on recent developments in the regulation of infrastructure industries in selected countries.
- Developing a comprehensive financial model for an Australian Distribution Network Service Provider to analyse how the firm's financial performance would respond to different forms of regulation and price and revenue controls.
- Development of a comprehensive simulation model to assess the impact of a wide range of potential regulatory changes on a major Asian utility.

Cost of Capital

- Advising Unison Networks Ltd in its responses to the Commerce Commission's implementation of the price control provisions contained in the Commerce Amendment Act 2008, including advice on the appropriate weighted average cost of capital (WACC) for electricity distribution.
- For the Economic Regulation Authority in Western Australia, providing advice on the WACC to apply to a regulated railway.
- Advising various energy sector clients on the cost of capital appropriate for investment in electricity generation in Australia, Hong Kong, Malaysia, and the Philippines.
- Advising Transpower on the appropriate discount rate for use in the Grid Investment Test.
- Advising an Australasian transmission network owner on the appropriate asset beta for its WACC calculation.
- For an Australian telecommunications operator, advising on the cost of capital and method of asset value annuitisation for a submission to the Australian Competition and Consumer Commission.
- Assessment of the WACC for various activities of a major Australasian telecommunications firm, with particular emphasis on the impact of the regulatory regime. This included a detailed review and critique of approaches to setting regulated rates of return for telecommunications firms in Australia, North America and the United Kingdom.

New Zealand Electricity Market and Transmission

- For the Independent Electricity Generators Association of New Zealand, preparation of a report on Avoided Cost of Transmission (ACOT) payments for Distributed Generation.
- Advising two providers of DG in negotiations concerning prices with a distributor.
- Advising a New Zealand electricity retailer and generator on economic issues related to the Ministerial Inquiry into the Wholesale Electricity Market.
- For a New Zealand electricity lines business, providing expert testimony in a commercial contract arbitration on the relationship between transmission charges and embedded generation.

- Advising Transpower on the appropriate discount rate for use in the Grid Investment Test.
- For the Electricity Networks Association, preparation of a submission to the New Zealand Electricity Commission on Transpower's proposed transmission pricing methodology, and on proposed changes to the Benchmark Transmission Agreements.
- Advice on forecast prices in the New Zealand wholesale electricity market.
- For Meridian Energy, analysing the magnitude of the potential benefits that might arise from the Electricity Commission encouraging investment in transmission alternatives.
- For a New Zealand electricity generator, preparation of a report on the economic consequences of short notice extension of transmission outages.
- For a New Zealand electricity market participant, providing a review of the principles of electricity transmission pricing.
- Critique of Transpower's valuation and pricing for a small New Zealand electricity lines business. This work included a detailed revaluation of parts of the Transpower network based on an alternative engineering assessment of the required network assets.
- Development of "opportunity cost" valuations of the power generated by a hydro scheme. The valuations were based on the forecast cost of alternative generation schemes, and included the effects of potential carbon taxes or tradable emissions permits.

Other Projects

- For Pacific Steel, development of a financial model to assess the relative impact on competitiveness of the New Zealand Emissions Trading Scheme (NZETS) and proposals under Australia's Clean Energy Futures Plan (CEFP).
- For the Ministry for the Environment (MfE), quantifying the potential impact of the proposed New Zealand Emissions Trading Scheme on three energy-intensive businesses. This work included the development of spreadsheet-based financial models for each of the three businesses, including separate models for "manufacturing", "full import" and "importation of intermediate product".
- Advising the Inland Revenue Department on economic issues related to tax avoidance litigation.
- Provision of advice on the costs and benefits of converting plantation forestry to dairy farms, including valuation of the impacts on greenhouse gas emissions.
- Providing economic advice and analytical support to the New Zealand Commerce Commission in a Commerce Act s36 case.
- For the New Zealand Ministry of Health, collation and analysis of data on the operating costs of air ambulance services.
- Advising an Australian electricity generator on the market for renewable energy certificates (RECs).
- For the New Zealand Electricity Efficiency and Conservation Authority (EECA), quantifying the benefits of the direct use of natural gas.
- Assessment and valuation of strategic options (including sale and acquisition options) for a New Zealand electricity lines business.

- For an Australian electricity generator, developing a framework for the valuation of easements used by electricity networks, including a review of the regulatory approach to easement valuation.
- For Telecom NZ Ltd, contributing to a number of public submissions to the New Zealand Telecommunications Commissioner, with particular emphasis on incentive effects of regulatory proposals and dynamic efficiency, cost recovery, reasonable rate of return on capital, funding of telecommunications service obligations (TSOs), and accounting for intangible benefits when calculating the cost of TSOs.
- Providing advice on how to adjust for differences in wage rates, cost of capital, and factor intensities in an international benchmarking study.
- Valuation and assessment of a proposed long-term contract for rail transportation, including a review of the approaches to rail price regulation in Australia.
- Review of the process and rules for the New Zealand Government's 2GHz radio spectrum auction.

SELECTED PUBLIC CONSULTING REPORTS

Avoided Cost of Transmission (ACOT) payments for Distributed Generation, Final Report, Prepared for the Independent Electricity Generators Association, 31 January 2014.

Cost of Capital and Leverage, Final Report, Prepared for Unison Networks Ltd, 2 September 2010.

Rents, Regulatory Commitment and the Role of Long Term Contracts, Final Report, Prepared for Unison Networks Ltd, 19 August 2010.

Regulated Returns for Australian and New Zealand Electricity Distribution, Final Report, prepared for Unison Networks Ltd, 15 August 2010.

Balance of the EV Account for Transpower's HVDC Assets, Prepared for Contact Energy, 8 August 2010.

Comments on Cost Allocation and the Regulatory Asset Base, Prepared for Unison Networks Ltd, 15 March 2010.

Implementing the Deferred Tax Approach, letter to Unison Networks Ltd, 26 January 2010..

Input Methodologies: Economic Issues, Prepared for Unison Networks Ltd, 13 August 2009.

with Anna Kleymenova and Tim Giles, *WACC for TPI's Iron Ore Railway*, Prepared for Economic Regulation Authority, 11 June 2009.

with Mike Thomas, *Regulatory Provisions of the Commerce Act*, Prepared for Unison Networks Ltd, 16 February 2009.

with Jeremy Hornby and James Mellsop, *Response to Commerce Commission's Discussion Paper: Threshold Reset 2009*, Prepared for Unison Networks Ltd, February 2008.

with Lewis Evans, Jeremy Hornby, and James Mellsop, *Comments on Commission's Draft Decisions Paper on Supply of Gas Distribution Services*, Prepared for Vector Ltd, 29 November 2007.

with Jeremy Hornby and Michael Thomas, *Discount Rate for the Grid Investment Test*, Final Report, prepared for Transpower NZ Ltd, 29 March 2007.

with Erik Westergaard, *Consultation on the Proposed Transmission Pricing Methodology*, Final Report, prepared for Electricity Networks Association, 2 February 2007.

with Jeremy Hornby and James Mellsop, *The Costs and Benefits of Regulating Transpower*, Final Report, prepared for Transpower NZ Ltd, 27 February 2006.

with Lewis Evans, Jeremy Hornby, and James Mellsop, *Cross Submission on the Intention to Declare Control of Unison*, Final, Prepared For Unison Networks Limited, 21 December 2005.

with Lewis Evans, Jeremy Hornby, and James Mellsop, *Review of the Commerce Commission's Intention to Declare Control of Unison*, Final Report, Prepared For Unison Networks Limited, 28 October 2005.

with Michael Thomas, *Net Benefits of Transmission Alternatives*, Final, Prepared for Meridian Energy Limited, 22 July 2005.