
Submission to the Electricity Authority

on

**Transmission Pricing
Methodology: LRMC charges**

Made on behalf of 22 Electricity Distribution Businesses

*PwC Submission on
behalf of 22 EDBs*

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Word Version

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Glossary

AIC	Average Incremental Cost
CBA	Cost Benefit Analysis
EA	Electricity Authority
EC	Electricity Commission
EDB	Electricity Distribution Business
GIT	Grid Investment Test
Grid	Transpower's national transmission grid
HVDC	High Voltage Direct Current
LRIC	Long Run Incremental Cost
LRMC	Long Run Marginal Cost
NAaN	North Auckland and Northland
NPV	Net Present Value
Part 4	Part 4 of the Commerce Act 1986
RCPD	Regional Coincident Peak Demand
RCPI	Regional Coincident Peak Injection
SPD	Scheduling, Pricing and Dispatch
SRMC	Short Run Marginal Cost
TPAG	Transmission Pricing Advisory Group
TPM	Transmission Pricing Methodology
TSLRIC	Total Service Long Run Incremental Cost

Submission on Transmission Pricing Methodology: LRMC Charges

1. This paper forms our submission on the Electricity Authority's (EA) working paper, "Transmission Pricing Methodology: LRMC Charges" released on 29 July 2014 (the Working Paper). This submission has been prepared by PricewaterhouseCoopers (PwC) on behalf of the following 22 Electricity Distribution Businesses (EDBs or distributors):
 - Alpine Energy Limited
 - Aurora Energy Limited
 - Buller Electricity Limited
 - Counties Power Limited
 - Eastland Network Limited
 - Electra Limited
 - EA Networks
 - Electricity Invercargill Limited
 - Horizon Energy Distribution Limited
 - MainPower New Zealand Limited
 - Marlborough Lines Limited
 - Nelson Electricity Limited
 - Network Tasman Limited
 - Network Waitaki Limited
 - Northpower Limited
 - OtagoNet Joint Venture
 - ScanPower Limited
 - The Lines Company Limited
 - The Power Company Limited
 - Top Energy Limited
 - Waipa Networks Limited
 - Westpower Limited.
2. These businesses together supply 30% of electricity consumers, maintain 48% of total distribution network length and service 72% of the total network supply area in New Zealand. They include both consumer owned and non-consumer owned businesses, and urban and rural networks located in both the North and South Islands. In the year to March 2013 these distributors incurred approximately 20 per cent of Transpower's 2013 transmission revenue.
3. In October 2012 the EA consulted on a proposal for a new Transmission Pricing Methodology (TPM), in its consultation paper, "Transmission Pricing Methodology: issues and proposal" (the October Issues Paper). This paper proposed a beneficiaries-pay approach for pricing selected interconnection and HVDC transmission assets to be set with reference to the estimated wholesale market benefits which grid users receive from these assets.
5. Submissions received in response to the October Issues Paper suggested that more mainstream approaches to pricing for network services based on Long Run Marginal Cost (LRMC) approaches should also be considered alongside other options. The Working Paper responds to this suggestion

by exploring options and issues for setting HVDC and interconnection charges using an LRMC approach.

6. Based on submissions received on the Working Paper, the EA will consider the need to develop more detailed LRMC options in a further working paper. If the EA decides to propose an LRMC charge, a specific proposal would be provided in a Second Issues Paper together with a detailed cost-benefit analysis of the proposal relative to the status quo.
7. The Working Paper acknowledges that a LRMC approach should in principle be better at promoting economic efficiency than a beneficiaries-pay approach, depending on its design and the accuracy of inputs and assumptions. However, the Working Paper also suggests that a LRMC approach:
 - a. will be complex to apply relative to the status quo, with many practical difficulties to overcome
 - b. could send perverse price signals by incentivising grid customers to bring investments forward, in order to lower the LRMC charge they incur.
8. This submission responds to key matters raised in the Working Paper.

Applying LRMC in principle

9. We welcome the release of the Working Paper and consideration of LRMC-based options. In our submission on the beneficiaries-pay working paper¹, we expressed concern that no non-SPD alternatives were considered in detail. In our view, traditional approaches to pricing network services based on established economic concepts such as LRMC were dismissed too quickly in favour of an approach, which if adopted, would be a world first.
10. In principle, we agree with the Working Paper that a LRMC approach is likely to generate more efficient outcomes than a SPD based approach. It is also relevant that LRMC approaches are well entrenched in network and regulatory economics and have been adopted in overseas jurisdictions, including in other sectors, with success.
11. We acknowledge that there are practical difficulties in applying a LRMC approach to network pricing, particularly compared with the status quo. We note the status quo is relatively simple and stable and signals, to some extent, the cost of future capacity upgrades.
12. However, as many submitters have already highlighted, the proposed SPD-based approach has its own complexities and practical difficulties, which while different in nature to LRMC, are no less challenging. We therefore do not consider that the complexity involved in implementing an LRMC approach is unique, and it should not be considered to be a disadvantage relative to SPD based options. Accordingly, it is our view that LRMC should not be dismissed because of the complexities involved, and if complexity is the defining criteria, then the proposed SPD approach should also be dismissed, on the same basis.
13. The EDBs which support this submission consider that the method for determining transmission charges should generate charges which are:
 - a. Simple - to apply and understand
 - b. Stable - recognising the long life of transmission assets
 - c. Enduring – to challenge and industry change

¹ PwC submission on behalf of 21 EDBs, Submission to the Electricity Authority on Transmission Pricing Methodology: Beneficiaries-Pay Options, 25 March 2014

- d. Efficient –from economic and operational perspectives.
14. There are trade-offs which need to be balanced in meeting these objectives. We consider that:
- a. a **LRMC approach** could, depending on specification, be most efficient and enduring given it is aligned to fundamental network economics.
 - b. the **status quo**, with possible modifications to enhance efficiency outcomes, provides a simple and stable alternative.
 - c. a **SPD-based approach**, is unlikely to be simple, stable, or enduring (based on industry opposition so far), and there are serious concerns as to whether it will promote economic efficiency.
15. We do not necessarily support an LRMC approach at this stage, given a proposed option has not been put forward in the Working Paper. However, we support more detailed scoping and analysis of a LRMC-based option along-side other alternative options in the forthcoming second issues paper. The relative trade-offs of each should be assessed at this point, accompanied by robust cost benefit analysis.

Safeguards provided by Part 4 and GIT

16. We note that the TPM is not the only mechanism which promotes the efficiency of transmission charges. Regulation under Part 4 of the Commerce Act provides comfort that overall revenues are efficient and consistent with the needs of end-consumers, consistent with the Part 4 Purpose Statement. Furthermore, transmission charges are set within a workable competition framework, consistent with the EA’s statutory purpose.
17. The focus of the TPM review should therefore, in our view, be on the efficient allocation of Transpower’s revenue requirement (as specified under Part 4 regulation) to grid users, in order to send appropriate pricing signals regarding the current and future use of the grid.

Applying LRMC in practice

18. The Working Paper focuses on the practical details of how to specify an LRMC approach. We respond to key topics discussed in the Working Paper below. This is provided to assist the EA in scoping an LRMC option for further consideration.

Defining LRMC

19. Section 6 of the Working Paper sets out the following generally accepted LRMC approaches:
- a. **Marginal Incremental Cost (MIC):** equals the Net Present Value (NPV_t) of the next capacity upgrade in the year the investment is made (j), less the NPV of costs in the following year (j+1), divided by the change in demand:

$$MIC_t = \frac{NPV_t(\text{expenditure}_j) - NPV_t(\text{expenditure}_{j+1})}{\Delta\text{demand}}$$

This method is considered to be the most efficient. It generates prices that rise as spare capacity falls, resulting in saw-toothed prices over time, in response to capacity investments

- b. **Average Incremental Cost (AIC):** equals the NPV of the next capacity upgrade divided by the change in demand

$$AIC_t = \frac{NPV_t(\text{expenditure})}{\Delta\text{demand}}$$

This method is more smoothed, representing an average cost.

- c. **Long Run Incremental Cost (LRIC)**: equals the annuity of the cost of the next capacity upgrade (or series of upgrades) divided by change in demand:

$$LRIC_t = \frac{\textit{Annuitised expenditure}}{\Delta\textit{demand}}$$

This method is simple to apply and relatively smoothed, but is viewed as somewhat problematic given uncertainties over demand assumptions and likely patterns of generation.

20. While MIC is deemed to generate the most efficient prices, we are concerned that it may be difficult to apply in practice and is expected to result in volatile prices over time. We therefore prefer the more simple approach (eg such as LRIC), which is likely to yield more stable prices over time, without the same degree of complexity.

Practical experience

21. Section 7 of the Working Paper summarises New Zealand and international experience in applying LRM based pricing. In particular, the Working Paper highlights:
- a. previous work undertaken by the Electricity Commission (EC) and Transmission Pricing Advisory Group (TPAG) on specifying the following three LRM based approaches:
 - i. tilted postage stamp
 - ii. bespoke location preferences
 - iii. load flow analysis
 - b. LRM based approaches used in the UK (excluding Northern Ireland) and the all-island market in Northern Ireland and the Republic of Ireland
 - c. Similar approaches applied in telecommunications in New Zealand, such as Total Service LRM (TSLRM).
22. No clear conclusions were drawn about the usefulness of previous work undertaken by the EC and TPAG. Nevertheless, we consider that this experience is valid and should be used or expanded upon to assist to define potential options (in detail) and consider the pros and cons of each of them. This experience also includes relatively simple LRM approaches (eg tilted postage stamp) which could be adopted.
23. The approaches adopted in the UK and Ireland transmission sectors should also be considered more closely. In particular, the international experience suggests that the practical difficulties identified in introducing an LRM approach are not insurmountable.

Recovery of residual costs

24. Charges based on LRM are likely to under-recover Transpower's annual revenue requirement as these charges only represent marginal costs and not sunk costs. Like the beneficiaries-pay proposals, residual costs will need to be recovered through another tariff mechanism.
25. In assessing options for a residual charge, the Working Paper indicates that the next preferred option under the EA's decision-making and economic framework is a beneficiaries-pay approach (such as the SPD-based proposals)². The Working Paper notes that applying an LRM and SPD based charge at the same time would be a complex outcome. We agree and would not support a hybrid LRM and SPD pricing approach applied as a two part tariff. Our greatest concern is that this could potentially lead to double counting of liability for charges. Furthermore, both

² LRM is ranked higher as it is a market-like approach which is considered most consistent with pricing in workably competitive markets.

approaches are relatively complex compared to the status quo, meaning the costs of applying both would potentially outweigh the benefits.

26. We submit that a residual charge based on Regional Coincident Peak Demand and Injection (ie RCPD and RCPI), similar in concept to existing interconnection charges, is appropriate to complement a LRMC or SPD based approach.
27. Should the EA proceed with a hybrid LRMC and SPD approach, then we suggest that LRMC could be marked up to recover total costs, similar to Ramsay pricing concepts. This could be based on willingness to pay considerations potentially using a stripped back version of the SPD approach, run irregularly (ie once every 2-3 years), to reveal the benefit attributed to different grid users. However, to reiterate our primary stance, we do not support a full SPD approach being applied alongside a LRMC approach.

Nodal versus zonal pricing

28. The Working Paper discusses whether it is appropriate to apply LRMC to grid nodes or to zones (incorporating a number of nodes).
29. Given the long life of grid assets, future capacity upgrades may not always be identifiable at each grid node. This suggests there may be insufficient and infrequent information on future capacity upgrades at each node. This limits the ability to apply a LRMC approach in a stable manner to each node. A zonal approach, while potentially being more contentious, may be more practical to apply as capacity upgrades could be grouped, thus resulting in smoothed charges over time. It may also better reflect operational conditions on the grid, such as bottle-necks that reduce the capacity of an entire zone.
30. We note that in the United Kingdom, the National Grid's LRMC approach calculates charges on a zonal basis, based on peak conditions at each node. We support further investigation of this approach.
31. We also note that zones could be developed to minimise local loop-flow effects. The specification of zones could also draw on previous work undertaken by the EC and TPAG (ie the tilted postage stamp proposal) or under the 'within-zone' and 'zone-interconnectors' approach, which is a feature of the proposed SPD zonal option.

Should LRMC be applied on basis of peak of congestion?

32. The Working Paper explores the use of either peak demand or congestion for determining per unit LRMC. It is suggested that congestion is a more accurate measure of capacity utilisation and therefore is better at signaling future upgrades than peak demand.
33. We agree that congestion is likely to be a better measure of capacity utilisation than peak demand. However, peak demand will be easier to apply and is likely to send clearer pricing messages. Under normal conditions, we also would expect peak demand times to align with congestion periods. We recognise that congestion does occur outside of peak periods, but we consider this is mainly due to short to medium term factors that are unlikely to affect the long run costs of investing in capacity, such as:
 - a. unplanned events – such as an actual or expected loss of supply or unavailability of a circuit
 - b. planned events – where assets are out of service for maintenance or commissioning or due to temporary reconfigurations of the grid.
34. We note that RCPD as a peak demand pricing tool has proved effective at signaling transmission peaks to distributors. It is well understood and distributors manage load on their networks to respond to it.

Should LRMC be applied on basis of capacity or energy?

35. The Working Paper discusses whether charges should be levied on utilisation of capacity or energy usage.
36. In principle, we prefer the use of a capacity related charge (ie a demand charge like RCPD). Capacity in the core grid is the key service provided by interconnection assets. Capacity based charges are dynamically efficient as they reduce the long run cost of providing capacity in the network by placing downward pressure on peak usage.
37. The benefit of an energy charge is that it aligns transmission charges to existing retail and generation pricing structures (ie per kWh charge). Energy charges would act to reduce overall usage, but would be poor at reducing utilisation of peak capacity. For example, generators could be incentivised to reduce off-peak demand to minimise transmission charges whilst ensuring generation units can be run at the peak, when wholesale prices are typically high.

Who should pay?

38. LRMC charges should be levied on grid users that exacerbate future investments in capacity. This includes generators (eg for usage of the HVDC or Wairakei ring etc), direct connect consumers, and distributors. The allocation between generation and load is likely to be the most contentious issue, as found in the UK and Ireland.

What is an appropriate approach to forecasting?

39. One of the key concerns expressed in the Working Paper relates to the forecasts required for the LRMC approach, particularly demand and cost forecasts and the forecast period.
40. We support the Working Paper's proposal to use Transpower's ten year expenditure and demand forecasts, which are published as part of the Part 4 regulatory regime. This avoids unnecessary work and cost in creating new forecasts for the purpose of determining LRMC prices. It also defines a reasonable time period over which LRMC can reasonably be assessed. While 10 years is a short period for assessing further capacity upgrades, to go beyond Transpower's own forecasts is likely to increase concerns regarding subjectivity and forecast error.
41. Two key arguments made against LRMC pricing in the Working Paper relate to forecast error and that the parties that are subject to LRMC charges may differ from those that benefit. A specific concern is that technology cost savings may not be taken account of in forecasts. However, forecasts are affected by a range of assumptions and inputs, including input cost inflation, movements in exchange rates and regulatory and legal requirements. The future role of the grid in an environment of disruptive technology (eg small scale distributed generation, electric cars) also creates uncertainty over future capacity investments. We therefore acknowledge that there are uncertainties in any approach which relies on forecasts.
42. However, we consider that this issue is somewhat overplayed in the Working Paper. Within the context of price regulation under Transpower's Individual Price-Quality Path (IPP), TPM reform should be less concerned with determining the absolute levels of price and more so with identifying efficient allocations of Transpower's revenue requirement. That is, grid consumers already have some comfort that overall transmission revenues are reasonable. It is the relativity of charges, and the fairness therein, that is at the heart of the TPM.
43. Within this context, the concerns over forecasting accuracy need to be tempered against simplicity and cohesion of tariff design. For instance, connection charges are based on high-level allocation assumptions (eg number of AC switches, line length, replacement costs etc), which are generally deemed to be non-contentious.

Would LRMC charges provide perverse price signals?

44. Another key concern expressed in the Working Paper is that LRMC will reduce to zero as soon as a new investment is made. It is suggested that this will provide perverse incentives for grid users to

lobby to bring forward investments, in order to lower their transmission charges. The Working Paper does not consider the same issue arises with a beneficiaries-pay approach, as under the SPD-based approach, beneficiaries incur costs after an investment³.

45. In our view, a zero LRMC outcome is dependent on the specification of the LRMC approach. For instance, a LRIC approach or one similar to that applied by National Grid in the United Kingdom (where MIC based charges continue 7 years after the investment is made) potentially would not result in a zero price outcome.
46. We also consider that this concern is potentially flawed for the following reasons:
 - a. reducing the LRMC charge to zero incentivises utilisation of the new capacity. This is efficient as it reduces average cost to serve per unit of demand. Furthermore, as usage rises, LRMC increases, thereby reducing the incentive to use the remaining capacity, that would otherwise signal further investment. This outcome is allocatively and dynamically efficient
 - b. Transpower is unlikely to make investments, nor would the Commerce Commission likely approve them, without existing assets being constrained (ie: a business case for investment). It would therefore be very difficult for a connected party to lobby for a capacity upgrade which is not justified from an operational perspective
 - c. the analysis does not recognise that once the investment is commissioned it will largely be recovered through a residual charge where LRMC is zero.
47. We also disagree with the assertion that the SPD-based approach does not produce perverse outcomes. One of our concerns with the SPD-based approach is that it disincentivises usage of new investments by overcharging for these assets. This is highlighted in the preliminary modelling of SPD-based options⁴, which suggests that the balance of transmission charges will fall on Auckland and Northland load for the NAaN and NIGU projects as a result of these recent grid upgrades. This increase in charges disincentivises use of this new capacity, potentially increasing prices for all users and compromising the business case for investing in new capacity.

Cost and benefits

48. We agree with the Working Paper that the key benefit of the LRMC approach is that it is likely to be more efficient, depending on its specification, because:
 - a. charges are set in relation to the cost of future investments
 - b. it is durable as all interconnection assets (HVDC and AC) are charged on the same basis
 - c. avoidance of use of the grid is only incentivised where the benefit from the use of peak capacity is less than the cost of next capacity investment.
49. Other key benefits over the SPD-based approach include:
 - a. LRMC has been applied elsewhere in similar sectors. This provides information which we can draw on, which assists in minimising learning and development costs and informs the debate regarding its use.
 - b. The LRMC approach is grounded in fundamental network economic principles. While the SPD-based approach is based on revealed benefit concepts, it has never been applied and thus is subject to significant debate.

³ Working Paper - Paragraph 5.20

⁴ Electricity Authority, Beneficiaries-Pay Working Paper, 21 January 2014, Figure 36-37

50. We agree with the generic costs identified in the Working Paper, including that there will be implementation and ongoing operating costs for Transpower and other participants. However, we do not agree that the following costs are necessarily material or likely:
- a. **Inefficient dispatch of generators at peak:** In our view, the primary focus of the TPM should be on setting efficient transmission charges. Consideration of wholesale market efficiency is secondary. Wholesale markets are already relatively efficient, as they are based on SRMC. So long as transmission is priced efficiently and transparently then transmission costs become a cost input into formulating bidding strategies (ie no different to fuel costs).
 - b. **Over-signalling of LRMC due to poor cost forecasts:** As discussed above, forecasting error does not necessarily over-signal costs. It may also under-signal LRMC, for example if cost input inflation exceeds cost reductions from technology.
 - c. **Charging future users of the grid for current usage is not sustainable:** We disagree as current usage of capacity creates the need for the next increment of investment. Furthermore, the TPM only allocates Transpower's existing costs, as determined under Part 4 regulations, so current users only pay for existing costs.

Concluding statement

51. In conclusion we submit that:

- a. Any method for determining transmission charges should generate charges which are simple, stable, enduring and efficient
- b. While we do not necessarily support an LRMC approach at this stage, given a detailed proposal has not been put forward, we do support further work and consultation on more detailed LRMC-based options to address and scope out the practical implementation considerations identified in the Working Paper
- c. LRMC based pricing methodologies are grounded in network economics and are therefore likely to be more efficient when compared to a SPD-based charge
- d. We recognise the complexity and practical difficulties involved in implementing an LRMC approach, but do not believe these are insurmountable as international experience has shown
- e. LRMC should not be dismissed because of these complexities, and if complexity is the defining criteria, then the proposed SPD approach should also be dismissed, on the same basis
- f. A LRMC options should be included alongside other alternative options in the Second Issues Paper, accompanied by appropriate cost benefit analysis.

52. We trust this submission provides useful input in reviewing the TPM. We would be happy to answer any questions you may have regarding this paper.

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