

## Memo

To: Ralph Matthes - MEUG  
From: David de Boer  
Date: 20 March 2015  
Subject: Input Methodologies review – Commission scope letter

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### What is this memo about?

1. The Commerce Commission has issued an open letter that sets out their intention to bring forward the review of the Input Methodologies that was scheduled for completion in 2017 to an earlier completion by end 2016. The review is a statutory requirement to be undertaken each 7 years. The open letter seeks comments from interested parties on the Commission views regarding the scope, process and timing of the review.
2. This memo provides MEUG and its members with NZIER combined comments on the Commission letter. We provide particular evidence and in-depth commentary on why we think that the review is very timely and that the scope should be somewhat wider than the narrow focus that the Commission is proposing.
3. *A health warning:* this memo should not be read as NZIER views of either the problems or the solutions to the problems that we perceive exist with the current IM arrangements or with the regulation of gas, electricity and airport companies under Part 4 of the Commerce Act. It is simply an initial commentary to do with the context for the IM review and it sets out some of our thinking about why this review is a very timely event.
4. While a lot has happened in these industries since the IMs were developed prior to 2010 and put in place at that time, we believe that there are forces in play, especially in the electricity industry, that have the potential to cause considerable disruption to business models and to the economics of the industry ‘systems’ through the introduction of emerging technologies. These disruptions specifically affect supplier incentives for investment in new technology and industry participants’ exposure to the cost of stranded assets. They also could generally undermine and change the established distribution of risks and costs across consumers and service providers. It is the acceptance of the established risk distribution that enables the existing IMs to operate as a simplified representation of the drivers of lines company costs and indicate average movements in the price for lines company services that would reflect the outcomes from a competitive market.
5. We would observe at this point that the existing IM regime and information disclosure in general appears to have led to improved network management practices. However we would also note that for distribution networks, all but one appear to be comfortable to run with their DPP rather than apply for a CPP. This suggests to us that the DPP levels could be too generous.
6. The regulatory system as well as the tools rules and processes used, including their management, must be fit for purpose to deliver the outcomes desired from Part 4.

7. One of the results of the disruptions (change in demand growth or location of electricity generation) is that the forms of regulation and the tools used by the Commission to actively regulate these industries may even now be not fit for purpose and therefore less so in the near future. A key question for the regulators is the extent to which the IMs affect consumers' access to innovation while, at the same time, managing the risk to consumers of the allocation of the costs of stranded assets or failed innovation. In times of step changes in demand patterns or disruptive technology changes, this question becomes more important.

## Context for the IM review – the energy eco-system

8. Back when the IMs were being developed, there was little prospect of the electricity industry being subject to the sorts of disruption that is now taking place. The potential for change was talked about but the IMs were developed in an energy system where nearly all electricity was generated far from the point of use, transported by the grid and offered for sale and purchased in the wholesale market. Demand growth of both energy and capacity was steady and positive and investment in improvements to the distribution grid was likewise steady and predictable. Investment in the transmission grid was somewhat lumpier with a steep increase in capex from 2007.
9. The mechanisms, including the IMs, through which the Commission can achieve its objective of ensuring the pricing charged by distribution companies delivers long term benefits to consumers are indirect in the sense that Commission decisions are silent on how network costs are allocated between consumer groups, between fixed and variable and on the make-up of variable charges, peak load or use of the network charges. This attenuates an important link between the overall revenue cap and line company pricing signals to consumers. It does not consider the question of whether lines company pricing overall is efficient. As an example we note that the approaches used by lines companies for retail variable charges, range from a charge per kilowatt hour of energy consumed to various forms of peak demand or capacity charges. In the near future, when consumers participate as both consumers and suppliers, it will be critical that pricing is efficient and that barriers are reduced to competition in the provision of network capacity (e.g. from new distributed battery technologies for peak demand reduction).
10. The building block methodology may work for the expenditure and asset base investment that is presently in place<sup>1</sup>, as well as for what distribution companies plan to invest, but has limited scope to independently consider:
  - best practices for lines company efficiency or innovation nor for the type of services customers want and how much they are willing to pay for those services.
  - how to anticipate and respond to disruptive innovation such as solar PV and batteries that potentially changes the link between assets required to meet peak load and the volume of electricity supplied as well as potentially creating revenue streams for lines companies that fall outside the regulated asset base but affect the utilisation of the regulated asset base.
  - how to signal and encourage the rationalisation of grid assets if the load decreases and how to allocate the costs of those assets. This will be the case if distributed technologies can reduce the few system peaks that cause the greatest need for

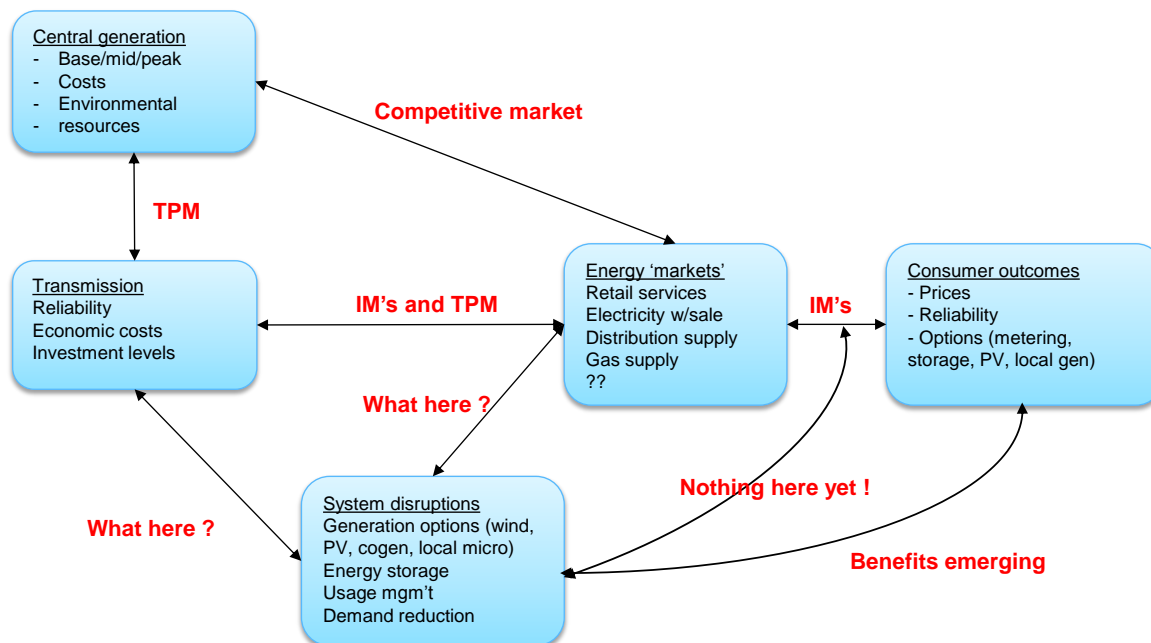
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<sup>1</sup> We refer here to the overall methodology rather than the individual IMs, over which there has been much legal debate!

capacity. If this occurs, there is potential for significant headroom in network capacity to be created.

- the potential for consumers and other service providers to compete with networks to provide capacity and ancillary services opens an opportunity for new markets to form and replace the old infrastructure regulated monopolies. To achieve this, consideration needs to be given to the removal of ‘guaranteed’ payments to existing network providers and the lifting of any barriers to competition.
11. So what does the energy eco-system look like in New Zealand? The following schematic illustrates a view of the regulatory system model that is currently applied to the electricity supply chain.
  12. The regulatory system for the electricity sector is complex with the industry affected by; the Commission and the Authority. These organisations both have a statutory objective to promote the long term benefits of consumers:
    - in the case of the Commerce Commission by ‘promoting outcomes that are consistent with outcomes produced in competitive markets’
    - in the case of the Electricity Authority to promote competition in, reliable supply by, and the efficient operation of, the electricity industry for the long-term benefit of consumers.
  13. This system is designed to deliver to consumers the benefit of competitively priced electricity supply and distribution services by:
    - ensuring workable competition between providers at both ends of the supply chain (generators and retailers) – the responsibility of the Electricity Authority
    - regulating the price/revenue of ‘natural monopoly’ suppliers - Transpower and the lines companies, so that they deliver outcomes that would be delivered if a competitive market existed. This is the responsibility of the Commerce Commission.
    - ensuring that the quality of the services, including availability and reliability of supply, meet stakeholder expectations – a responsibility that is shared between the Authority and the Commission, where the allocation of the responsibility between these regulators is defined as issues, such as reliability standards, arise.
  14. This regulatory approach ‘works’ if the activities of providers in the supply chain remain within the boundaries set by the regulation (especially the IMs) so that the scope of each regulators task is clear and separate. We suggest in the following diagram that this regulatory approach:
    - is already under pressure to deliver its consumer benefit objective because of a mismatch between supplier plans for network investment and the flattening of electricity demand as well as the lack of evidence of the contribution of investment to network reliability or consumer willingness to pay for reliability.
    - is likely to face increased difficulty in achieving this objective as disruptive generation and demand management technology increases the risk of stranding network assets while some network pricing practices send consumers mixed signals about the relative costs of existing and disruptive electricity supply options.

Figure 1 Energy eco-system – where do the IMs fit?



Source: NZIER

15. Although the Commission and the Authority focus on different groups of suppliers, from the consumers' point of view these suppliers combine and price their services into a single service package. This raises two questions:
  - How effective are the Commission's decisions about lines company prices in promoting long term benefit to consumers given that these pricing decisions are passed to the next layer of the supply chain? and
  - What mechanisms exist to co-ordinate Commission and Authority decision-making that affect the allocation of regulated supplier costs (that is Transpower and lines company costs) between consumers groups?

## Twin pressures – flattening demand and disruptive supply-side change

16. Declining demand growth for energy, climate change concerns, strong growth of renewable local generation of electricity, energy storage systems and demand management as well as the use of smart technology in the operational management of grids have all combined to jump start what is now regarded as potentially the most profound changes to the energy industries since the initial development of the networks. These changes appear to be neither short term nor cyclical. They are structural, long term and are changing the economics of this energy 'eco-system'. It will get more complex and messy. Interestingly, disruption is not limited to the energy industry but is also visible in a number of others, including finance and telecommunications.
17. Overseas, questions are now being asked about whether electricity markets regulated or not, are meeting today's consumer needs and what sorts of changes are required to meet future outcomes. There is concern that if each of technology, markets and

regulation do not keep pace with the accelerating rate of change then suboptimal outcomes for all concerned could well result. We share these concerns and believe that the timing of the IM review is the appropriate and provides the opportunity for us all, to take stock of whether the existing IMs will limit the benefits to consumers that will flow from these changes. We believe that greater benefit will arise from a deliberate ‘re-tooling’ of the IM regulatory structures that currently appear to favour certainty over improved consumer outcomes.

18. Regulators in other countries are examining in detail how their energy sectors are performing and whether changes to regulations are required in light of this disruption – we believe that this is the opportunity for the Commission to do the same – a wider rather than a narrow review is required.

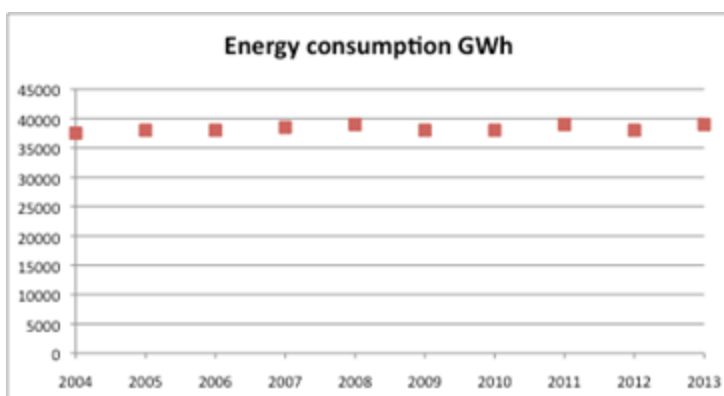
### Weak adjustment to demand side changes

19. The following charts indicate that while total demand for electricity has flattened and average demand per household has fallen, there does not seem to have been a decrease in the investment intentions of either Transpower or the lines companies. The current IM approach does not seem to challenge supplier plans for investment expenditure that is well above recent actual levels on a network that is not facing expanding total or peak demand.

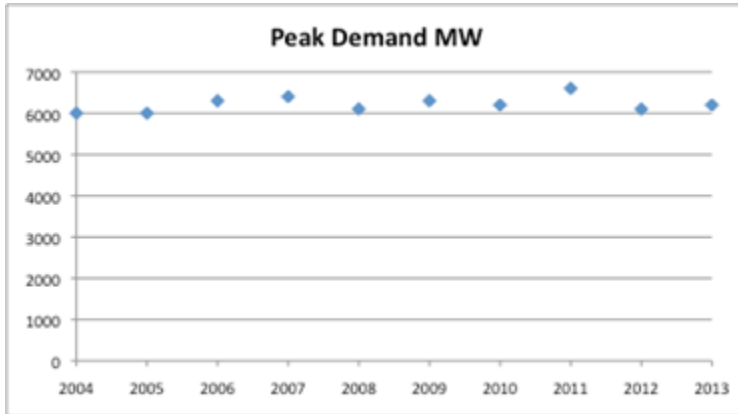
### What outcomes do we observe from the existing IMs?

20. Another health warning: this data is not intended to highlight specific problems but has been assembled as examples of what sort of outcomes could (and can) be considered as indicators of regulatory performance. The data was sourced from Transpower RCP2 material, from MBIE price survey reports and from Commission information disclosure reports.

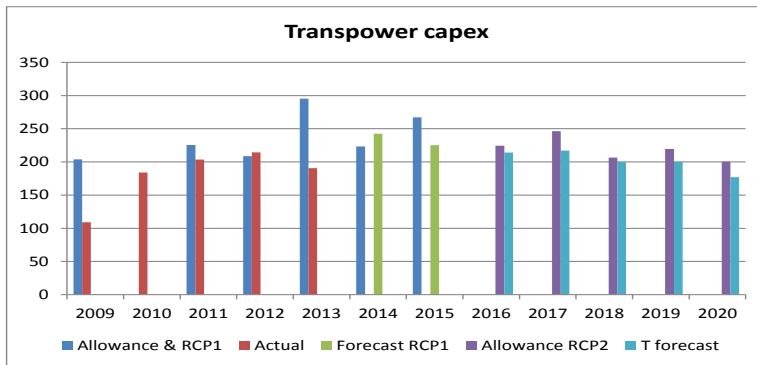
#### Demand is flat



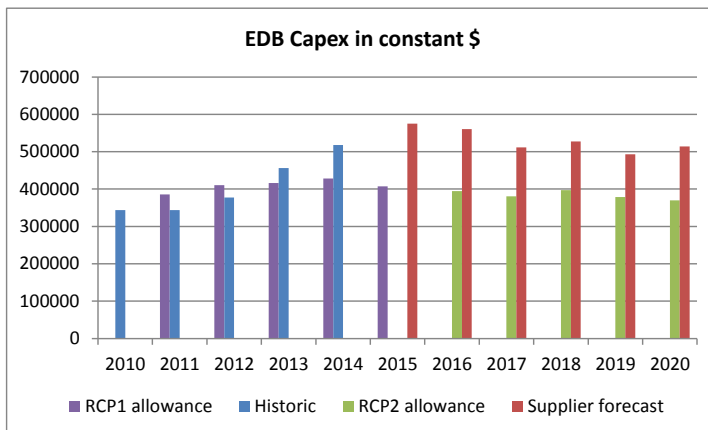
Peak demand is also flat



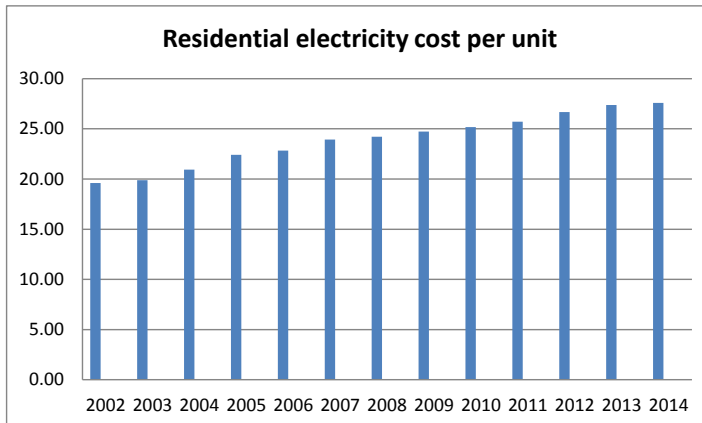
Transpower keeps spending



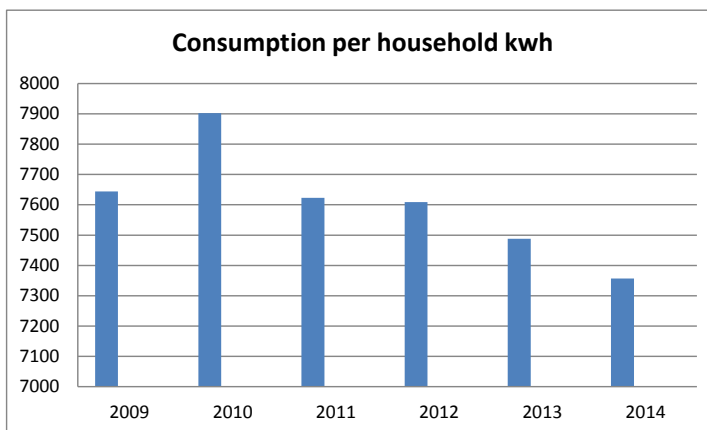
So do the EDBs



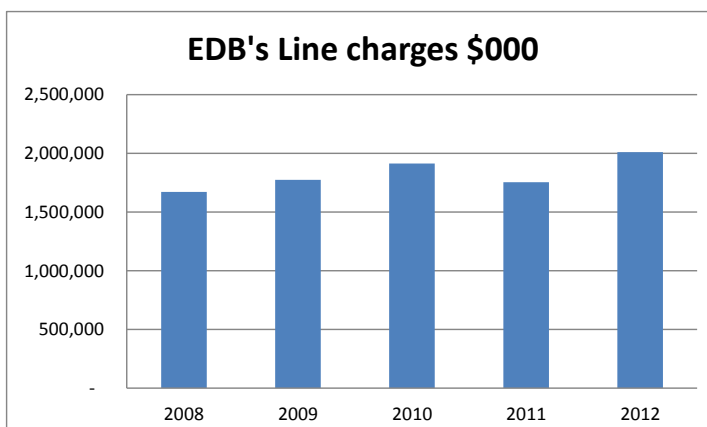
And all that spending ends up here



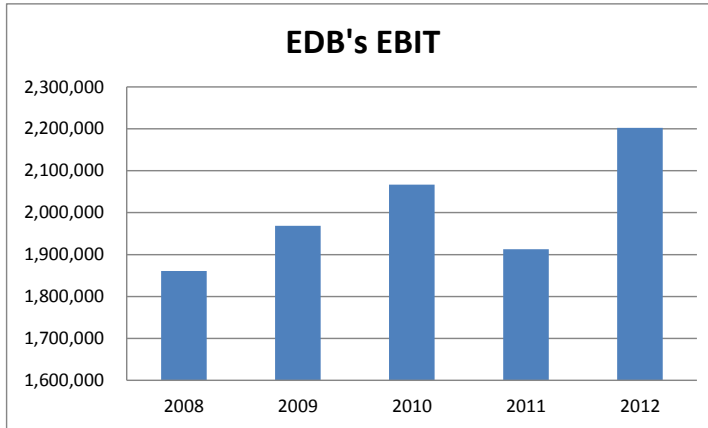
Which, when mixed with the declining usage by domestic consumers ...



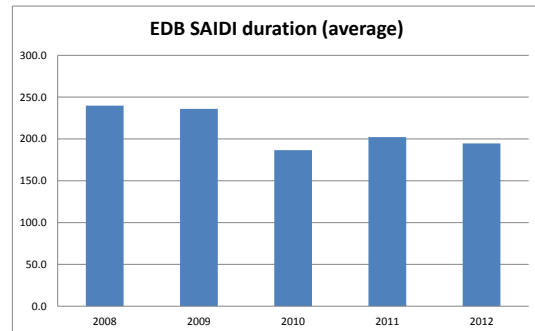
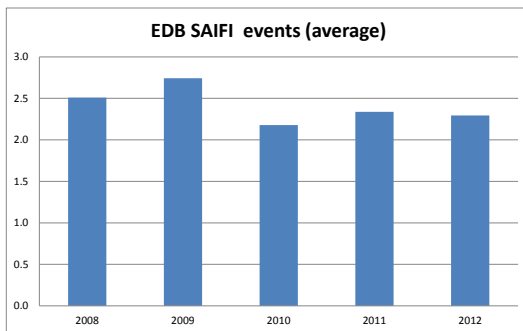
And the ramping up of fixed line revenues



## Props up regulated returns



21. In the meantime quality and reliability hasn't been too bad! We have however commented in previous submissions to the Commission<sup>2</sup> about the:
- apparent disconnect between the lines companies assertion that additional network investment was required to improve reliability and our analysis that the causes of many of the outages would not be affected by additional investment
  - limited evidence regarding the level of reliability expected by consumers or the variation in willingness to pay for additional reliability across different consumer segments.



## Disruptive technology – challenges for IMs

22. The purpose of the IMs in the current electricity ecosystem is to provide a framework for estimating the pricing, quality of service and revenue outcomes for monopoly lines companies (Transpower and distributors) that would be delivered if these companies operated in a competitive market rather than as local monopolies. To make this examination tractable and reduce compliance cost, the Commission seems to reframe the question about “competitive market outcomes” as an assessment of whether the operational expenditure and investment plans of each regulated entity reflect the average prices and aggregate levels of expenditure that would occur if Transpower and lines companies were constrained by competitive pressure.

<sup>2</sup> Refer NZIER advice to MEUG on WACC uplift 2014.



23. However, using the expenditure and investment plans of each entity as the starting point for the assessment tends to tacitly accept continuation of the current potentially inefficient structure (i.e.: 29 electricity distributors) including past pricing and investment practices and it biases the scope of the assessment to consider what the regulated entity expects to happen. It does not encourage examination of the following issues:
- whether the level and method of charging different groups of consumers for the lines company service are efficient i.e. do they recover the cost of the service provided?
  - linking revenues and prices to services actually required by and delivered to customers
  - the development of competitive markets for the provision core service delivered by networks (i.e. capacity)
  - consumer willingness to pay for their chosen service levels that are expected to be delivered by the investment plans of the regulated entity
  - impacts of the change in the use of network assets on how the cost of existing network assets or the recovery of future costs of investment decisions made within the current regulatory period should be allocated across consumers
  - the extent to which investment decisions made by regulated entities can alter their business models and expand unregulated revenue streams that impact the use of the regulated assets.
24. During periods of predictable ‘simple’ change the IM approach can arguably be adapted to consider the questions above. However during periods of disruptive change where the outcomes are difficult to predict, the challenge for the IMs is how to set appropriate constraints on pricing and investment plans for business as usual, without creating perverse incentives for regulated entities. Examples of these would be to over-investment in business as usual capacity that may not be required, or allowing the recovery the cost of the existing infrastructure on groups of consumers thereby encouraging inefficient investment. In the following sections we provide examples of disruptive technology that may potentially radically alter how the network is used.
25. We suggest that these disruptive technologies create distinct challenges for the Commission if they continue to use the existing IM approach to deliver its objective of ‘promoting outcomes that are consistent with outcomes produced in competitive markets’:
- The transition period of disruptive change is not particularly well described by standard perfect competition models. The Commission may want to consider outlining a set of principles about how it will consider allocation of the costs and risks of disruptive change between monopolies and consumers and also perhaps a materiality threshold for considering the effects of disruptive change.
  - Disruptive technologies generate new distributions of benefits and costs for both monopolies and consumers. To increase the likelihood that monopolies and consumers are sending and receiving pricing signals that encourage ‘efficient’ adoption of disruptive technology, the Commission may wish to consider:
    - the efficiency of the different pricing practices currently followed by lines companies and in particular how well the different menus of fixed-capacity (based on peak demand) and variable (based on the total amount of electricity supplied) reflect the cost of the services provided by lines companies .

- how network pricing should be set for consumers that remain connected to the network but substantially reduce either the total amount of electricity consumed or change the profile of their peak demand
- Disruptive change can ‘strand’ assets however it is difficult to predict what assets will be stranded and when. The Commission may wish to prepare for this eventuality by considering:
  - the assumptions about demand growth in lines company investment plans and requesting specific comment on the lines company planning assumptions for disruptive technology or sensitivity analysis of the investment requirements
  - scenarios for how the risks and costs of stranded or underemployed assets should be allocated between network service providers and consumers.
  - what tests the Commission would apply to determine if lines company investment in disruptive technologies would or would not be within the scope of the regulated asset base.

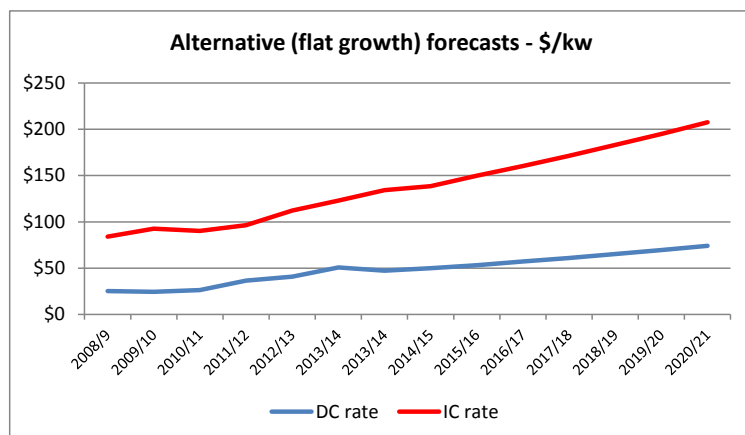
## These disruptions are already real

26. Centralised generation is no longer a given – smaller scale local generation is now economic and growing in a number of places, which makes the task of regulating and pricing the transmission and distribution grids more complex and for us it calls the ‘efficient grid’ regulatory objectives into question. It is predicted that localised energy storage and electric vehicles will add to the significant complexity in an increasingly diversified energy eco-system.
27. The economics of moving central generation to market via the transmission grid is also changing which will accelerate the viability of local generation resources – transmission costs are simply getting more expensive on the back of rising grid costs and flat demand. The pool of grid costs is going to be spread over a smaller consumer base. We could imagine a scenario, Figure 2 below, where flat demand growth persists for some years resulting in an interconnect rate that grows through the next RCP period to be more than twice today’s rate. The trigger point for local generation options grid parity will change because of this.<sup>3</sup>

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<sup>3</sup> We used Transpower RCP2 forecasts of demand and revenue requirements and simply flattened the demand growth to illustrate the impacts of getting forecasts about the future wrong. Transpower demand forecast is flatish to 2017 and then climbing a little and has the IC rate peaking at \$170/kw in 2021.

Figure 2 Transmission interconnection pricing – a scenario?



Source: NZIER from Transpower RCP2 data

28. This situation is not unique to New Zealand. Developments in technologies and the economics of local generation appear to have moved ahead of grid technology/economics in many parts of the world prompting similar questions. It seems that the technology and costs of renewable energy, distributed generation and micro-grids warrant immediate consideration, such that a change away from the traditional regulatory models for electricity networks are being considered as necessary in the near future.
29. The disruptive potential of solar PV is now real in a number of countries (for example Queensland where the equivalent capacity of one and a half Clyde dams has been added through household PV systems in a very short time). The electricity sector represents a fascinating example of the potential for significant ongoing disruption as PV costs fall, even though solar scale remains relatively small.
30. Although solar accounts for only less than half a percent of electricity generation in the US, the business model for US utilities depends not so much on the current generation base as on installations of new capacity. Solar could seriously threaten the latter because its growth undermines the utilities' ability to count on capturing all new demand, which historically has fuelled a large share of annual revenue growth. (Price increases have accounted for the rest.)
31. Depending on the market, new solar installations could now account for up to half of new consumption (in the first ten months of 2013, more than 20 percent of new US installed capacity was solar). By altering the demand side of the equation, solar directly affects the amount of new capital that electricity utilities can deploy at the regulated return on their RAB.
32. The incremental penetration of variable energy production, the growing trade of electricity and new demand patterns indicate that energy storage will play an increasing role in the energy system. Even where benefits are measured against alternative solutions – such as demand-side management, back-up generation and flexible loads, its role is evident in the value chain, from end-user to distribution, transmission, and markets. In particular, batteries offer cost-efficient solutions for innovative models of decentralized energy systems. They can foster the development of micro-grids, while the home storage market combined with PV allows for an increase in self-consumption.

33. Distributed energy storage has the capacity to create massive reductions in peak demand levels on electricity networks. This is because it can remove the few peak periods that create the need for much of the capacity. Not only will energy consumption fall but so will the need for network capacity. Replacing and augmenting existing networks is a very risky business because those investments are at significant risk of being stranded in the future. It is also likely that, in the future, networks will shrink, as off-grid alternatives to long lines in remote areas will become more affordable and reliable
34. These disruptive changes have become influential in the US, to the point that Brattle Group has changed their approach to modelling electricity grids systems<sup>4</sup>. Previously they modelled the grids separately and independently from the wholesale market however they recently moved to modelling the whole system in a dynamic approach to accommodate the broader influences of these disruptions. We also understand the FERC is now considering a proposal that a system operator could soon be needed in a number of local US distribution networks to link the supply and off-take of electricity across those networks. One of the concerns is that in certain places they can see the growth of local generation heading towards the 40% point and are concerned that this level is above the threshold at which grid control could be lost.

## The scope that the Commission proposes

35. We would argue that the Commission's proposed scope for the IM review is simply too narrow and that there is compelling evidence that there needs to be a well-structured review (a stocktake of sorts) of the existing IMs that has a focus on whether they adequately cover the matters that have emerged from system disruptions to date but more especially how the IMs would need to evolve to remain fit for purpose through to the next review in 2023.
36. In paras 26 to 31 of their open letter regarding the IM review the Commission set out their preliminary thoughts on the focus for the review. Encouragingly, in para 30 they state their view that the review would focus on the IMs that would promote the purposes of s52A and 52R, as well as reduce compliance costs and complexity.
37. Paras 27 and 28 describe a narrow approach to the Commission thinking regarding the scope of the review and they state their view that the scope of the existing IMs is sufficient going forward (we presume that this means no new IMs are needed to accommodate changes in the way the sector is regulated).
38. Paragraph 31 goes on to describe a mixed bag of topics that the Commission has gleaned from discussions with interested parties, some very specific in nature and others very general. We note that the Commission includes the impact of disruptive technology in this list but only suggests consideration of depreciation and indexation of asset values.
39. We are somewhat disappointed with this approach to the scope of the review. It seems to us that a 14 year period between reviews in the energy sector (7 years since IM introduction and 7 years to come before the next review) warrants a wider and more structured scope than the Commission propose. Based on our brief commentary

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<sup>4</sup> Brattle made reference to their re-engineering of the network models because of this emerging situation late in 2014 at a symposium on the changes that these disruptions were forcing already.

regarding the energy eco-system above we feel sure that the changes yet to come in the next 7 years will see the existing IMs as inadequate.

40. The Commission seem to be proposing a narrow scope that is more about tuning the existing IMs rather than examining their overall fitness for purpose. Throughout the consultation regarding the amendment to the WACC percentile in 2014, NZIER persistently argued that there are a growing number of tools available to the Commission to deliver the outcomes of s52A while application of 52R needs to be considered in the context of the rate of change in the sector. We argued that the existing IMs represent a limited set of generic tools and rules, that the form of regulation and that sector specific considerations really matter. We provided several illustrations of alternative approaches that could better deliver Part 4 outcomes.

## Focus on outcomes

41. Outcomes for consumers are front and central to the objectives of sector regulation. We argued this throughout the WACC consultation, consumer welfare is paramount.
42. Section 52A objectives are described as being enabled by promoting outcomes from regulation that are consistent with outcomes that are produced in competitive markets. The regulatory system and the IMs must mimic the outcomes seen in a workably competitive market and strive to deliver the economic performance that such a market would deliver. The evidence that we described earlier regarding outcomes to date, suggests to us that the current IMs may not be having the desired effects.
43. What outcomes are therefore important for energy consumers? This should be properly examined and not generalised as 'reliable energy supply' or 'fair prices' because different consumer groups in different regions will rank outcomes differently. Understanding these preferences is how success is delivered in a competitive market and should also be so in a regulated market. Of course consumers want the lights kept on and of course they want reasonable prices but the trade-offs made by the regulator and the tools they use to deliver outcomes for specific consumer groups need to be fit for purpose. We question whether the current IMs represent the best in class tools to deliver on these outcomes for consumers.
44. Of course outcomes for industry regulated entities also matter, but as we again argue they are not the priority - 52R describes the objectives for IMs as promoting certainty for monopolies in relation to the rules, requirements and process that apply to the regulations. To our minds this suggests that a degree of certainty needs to apply around how the Commission will regulate a sector but does not suggest that risks and returns and conditions around potential disruptions should have uncertainty removed for monopolies. Suppliers of services in a competitive market have no certainty and need to compete for success. They are subject to uncertainty – regulated entities should be treated likewise.
45. We have previously cautioned regarding how regulated entities are included within the regulatory performance equation.

*Producer surplus matters but its importance is subject to conditions. For example, producer surplus is welfare decreasing (in aggregate) if the surplus is invested in rent-seeking or gold-plating of regulated assets. More generally, maximisation of producer surplus is what*

*motivates regulation in the first place. If we measure welfare gains in terms of producer surplus we can just as easily end up with a sub-optimal monopolistic outcome if we are not careful.*<sup>5</sup>

46. Our concerns at that time were based on a limited analysis of evidence regarding WACC uplift within the WACC IM. Our preliminary scan of performance under the wider existing IMs that we described earlier leaves us with similar concerns – we wonder if consumers are getting the best deal possible when considering the outcomes from a competitive market.

## What needs to be in the IM review

47. We are not sure simply because there is no readily observable example of competing electricity networks against which to assess whether the outcomes we describe are desirable, efficient, to the long term benefit of consumers and are indeed the sorts of outcomes that we could expect from a competitive and efficient regulated energy sector. They are what they are which is hardly good enough because we need to know whether these outcomes are good, bad or in-between.
48. As a suggestion, it would be most useful if we were to develop a scenario that describes what a competitive and efficient energy sector looked like and how it performed so that we have a benchmark to refer to throughout the IM review.
49. For instance we may find that the greater use of performance based regulation can improve the efficiency of the distribution system and the quality of supplier investments – including in the transmission network. As we will argue below the near term future will likely see the impacts of the disruptions we described earlier. There are varying views about the timing of when the impacts will be felt but the consensus is that they will be well visible before 2023.
50. One thing is for sure – the limited scope that the Commission propose for the review is not adequate and that attention needs to be directed to a broader scope that is structured around whether the IMs are fit for purpose in delivering s52A outcomes. We believe that the greatest impacts on the eco-system will be seen in the distribution and transmission networks and will quite quickly see a flattening of the load curves in these networks from a combination of:
  - demand side responses to peak loads
  - local generation resources that become cheaper and more efficient than the central generation/transmission/distribution model of the electricity system
  - energy storage systems that will be installed at various place in the network
  - digital intelligence, including smart meters, that is already being installed in distribution networks
  - electric cars that use off-peak electricity to recharge
51. The conversations about the impacts of these forces in markets, on the regulatory systems and for generation resources are already being held in other countries and it is our belief that this IM review is the ideal time for New Zealand energy regulators to open the discussion here, 2023 is too late.

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<sup>5</sup> From NZIER report to MEUG regarding the WACC percentile change 2014.

## The future matters more than the past

52. The views are likely to be quite diverse regarding how the disruptions will develop into the future and the effect that they will have on outcomes for consumers (and to a lesser extent monopolies). Therefore they need to be structured around a set of key issues/subjects so that the review is conducted in an objective manner for the betterment of NZ Inc. For example:
- Demand forecasts for both grid supplied and locally generated energy is one of the essential inputs to the process – a good start point could be to use Transpower forecasts for RCP-2 (but also do scenarios of alternative outcomes).
  - A key consideration will also be what the forecast scenarios mean for usage and pricing of current distribution and transmission networks.
  - Innovative network technologies such as we set out here may require new regulatory approaches to encourage experimentation and efficient deployment, especially when their costs are uncertain and their benefits involve enhancing the performance of the transmission or distribution system rather than merely expanding its capacity.
53. We are not trying to identify and present solutions for the issues that we feel could be included as part of the IM review but rather we seek to argue the need for such a review, suggest a possible set of matters that need consideration and propose a high level process for going about the task.
54. These disruptions potentially increase the mismatch between the requirements in the grid for peak capacity compared to average volume, the location of the load and the size and composition of the group of consumers over which these charges can be spread. The uncertainty about the effect of disruptive technology arises from the:
- Rate of adoption of the innovation which is affected by the perceptions of potential ‘investors’ in the innovation. (In the case of solar PV and energy storage the perceived benefits are mix of environmental benefits, reduced dependency on the network as well as potential saving on energy costs)
  - Approach taken by service providers to adjust their business models to accommodate both the disruptive technology and continuing to provide business as usual services to consumers that have not adopted the disruptive technology.
55. Household solar PV can be used as an example to illustrate how this disruptive technology might affect the drivers of grid and network investment. So far the take-up of solar PV has in New Zealand has been modest. Other markets such as Australia demonstrate how rapid the take-up can be and how difficult it is to predict the tipping point for widespread adoption of a new technology (we understand that 3 years ago in Queensland actual PV generation was very small but is now in excess of 1500MW). However, we suggest that an important consideration for the review is to ensure that the IMs are not biased in favour in continuation of business as usual and therefore encourage investment in distribution assets that may not be required.
56. The key issues with residential household solar PV generation are with respect to the physical requirement for grid investment the:
- Mismatch between when electricity is generated by residential consumers and when they consume power. This requires the electricity to be either stored in batteries on site or sold into the network for use by other consumers or storage at some point in the network.

- Decision on where in the network to use or store solar PV generation exported by households into the network. Options could include substituting solar PV electricity for electricity supplied by other generators (probably hydro) or storing the electricity in batteries managed by lines companies.
- Generation capacity of the residential solar PV compared to total residential electricity use. This determines household reliance on the network for electricity supply. Household reliance can be represented on a continuum that could range from zero (disconnect from the network) through reliance for contingency backup only, to the household exporting small amounts of electricity into the network during periods of low demand.



Table 1 Assessing disruptive technology impact

Question	Effect on use of grid	Connection impact	Effect on grid cost recovery and investment
How much of the consumers demand is generated?	All	Disconnect from the grid	Stranded network connection
	Most	Remain connected for peak use and contingency	Wide gap between variable c/kWh charge and fixed connection cost Risk of stranding if price of PV falls or other back –up options such as battery become more efficient. Need capacity charge and contingency charge to recover connection cost.
	Some	Remain connected for peak use and bulk of supply	Widening gap between variable c/kWh charge and costs Move to capacity charge to recover connection costs
	Minor amount	Remain connected for normal supply	Current model continues. Exposure to stranded assets costs that are not recovered from other groups
Where is the generated electricity used?	On-site as generated	Reduces volume of electricity delivered- does not flatten peaks	Reduced demand –off-peak – widens gap between variable c/kWh charge and fixed connection cost
	Stored in battery on site and used on site	Flattens peaks and reduces volume of electricity sent through the grid	Reduced peak demand and reduced use of the network.
	Sent into the lines network as generated and used by other consumers	Localises the supply of electricity but does not affect requirements for peak capacity	Reduced volume of electricity transported through the grid without a reduction on dependence for grid to meet peak charges
	Sent into the lines network and stored in batteries	Peaks are flattened for the grid but not the lines network	Flattened peak demand and reduced electricity transport for the grid but not for lines company networks. Battery storage is a new business stream for lines companies.

Source: NZIER

## What’s missing from the scope?

57. We recall here a quotation from the NZIER August 2014 report to MEUG regarding changing the WACC percentile:

*Sector specific regulatory issues were not the focus of the consultation/search for evidence but, to ensure that they are given appropriate attention, they should be addressed as part of the overall IM review – as the Commission points out, trade-offs of price/quality/investment/risk are not the same across all regulated sectors. In the meantime the safest intellectual course is to move to the mid-point while the work is being done.*

58. We believe that the Commission assessment of the IMs fitness for purpose in light of the disruptions and issues that we comment on here could easily include a number of meaty subjects that have the potential to impact the structure and efficiency of the energy ecosystem, for instance:

### The distribution system

59. The distribution system appears to us to be inefficient and is likely costing consumers dearly. If this is so the inefficiencies will get worse as these disruptive technologies flatten load curves and render current asset management plans redundant. There could be large scale spare capacity in these networks and in the transmission network.
60. Thinking about the distribution 'system' further – electricity distribution around New Zealand is handled by 29 EDBs and a number of community trusts. These entities all have governance and management structures that consume resources and create costs that are passed through to consumers. We have little understanding at this time as to whether these costs and inefficiencies are necessary or whether there are better alternatives to the management of energy distribution. We need to find out and find out soon.
61. We could then imagine a process whereby international standards for competitive energy distribution networks could be benchmarked and that analysis used to establish an efficient baseline for regulated assets and revenues. This could be overlaid with the likely consequences from the disruptions we discuss above and appropriate adjustments made to accommodate their impacts. Defining an efficient distribution network would provide a baseline revenue cap for the wider network that is then allocated across whatever networks are required to manage energy distribution regionally. The current IMs would not fit well with this type of thinking.
62. Conceptually, consumers should only pay the costs that an efficient electricity distribution industry would charge. This 'notionally efficient' distributor should be the benchmark against which the current structure is measured. Currently each distributor is assessed individually. One option is to use the notionally efficient distributor as the overall revenue/price cap. The use of a notionally efficient supplier as a benchmark is a standard benchmarking method used by regulators.

### Pricing energy services

63. In a similar manner to the distribution system, in light of the technology disruptions we need to think about how energy services are defined and priced at both wholesale and retail level. Tuning up the current inefficient (energy and capacity) services and prices that we discussed earlier may serve the very short term but will soon become a binding constraint on having a flexible and efficient approach to setting regulated revenues and prices. Two way energy flows from local generation for instance will have an impact on how ancillary services are defined and how they are efficiently priced.
64. The diversified energy network capacity itself will still matter but it will be short term capacity that counts rather than longer term regional peak capacity assessments. Short term use of the distribution network capacity for different periods for different types of services suggests to us that pricing could be time based, under a services specific structure that reflects the performance and quality of the capacity service that the consumer requires. For example the capacity service provider, including the network business, only gets paid for the capacity that is actually used. We think of this as 'smart'

distribution pricing that can accommodate known disruptions and adapt as new service offerings are developed. It would be helpful and sensible to attend to this sooner rather than later as it will impact not only the Commission IMs review but also the way the EA will go about its efficient pricing project.

65. Interestingly, at the time when energy use was growing distributors enjoyed the income generated for them through variable consumption linked pricing. As demand has levelled, and is now predicted to at most remain flat in the medium term, distributors would no doubt welcome the safe haven of a fixed capacity based charge and secure revenues linked to fixed asset values. Yet this desire indicates that competition is dawning for electricity networks just as it has for telecommunications and more appropriate market based pricing is needed. This will require careful consideration of what services networks actually provide and the economic value that they create.

### Shrinking networks

66. As noted earlier we could also easily imagine that energy networks will 'shrink'. By this we see that the need to replace a material amount of old assets in existing distribution and transmission networks will disappear as cheaper alternatives to distribution lines will emerge from these technology disruptions. Micro generation for local communities and good old PV and energy storage come quickly to mind. This phenomenon has parallels in telco's local copper networks where investment and cost recovery of the traditional incumbent monopolies copper networks has been replaced with open access to high-speed fibre and mobile networks. (There is a very recent ACCC decision in Australia on this very subject which said that Telstra could not continue to charge for recoveries of the copper network costs, only for the services/assets that people used).

### Our overall views

67. Our key observation is that the scope of the IM review needs to be expanded to consider the risks of stranded assets posed both by the slow response to the flattening of electricity demand and the potential for disruptive technologies to shift load patterns in the network. We suggest that the Commission expand the scope of the IM review to consider:
  - outlining a set of principles about how it will consider the allocation of the costs and risks of disruptive change between monopolies and consumers and also a materiality threshold for considering the effects of disruptive change.
  - increase the likelihood that monopolies and consumers are sending and receiving pricing signals that encourage 'efficient' adoption of disruptive technology by:
    - reviewing the efficiency of the different pricing practices followed by lines companies and in particular how well the different menus of fixed , capacity (based on peak demand) and variable (based on the total amount of electricity supplied) reflect the cost of the services provided by lines companies.
    - Initiating discussion on how network pricing should be set for consumers that remain connected to the network but substantially reduce either the total amount of electricity consumed or change the profile of their peak demand
  - prepare for the eventuality of stranded or under used assets by:
    - examining the assumptions about demand growth in lines company investment plans and requesting specific comment on the lines company planning assumptions for disruptive technology or sensitivity analysis of the investment requirements

- considering scenarios for how the risk and costs of stranded or underemployed assets should be allocated between network service providers and consumers.
- consider what tests the Commission would apply to determine if lines company investment in disruptive technologies would or would not be within the scope of the regulated asset base.