Output 2: Using EDB AMP forecasts under a DPP framework

A REPORT PREPARED FOR THE ELECTRICITY NETWORKS ASSOCIATION OF NEW ZEALAND

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Executive summary

Frontier Economics has prepared this report for the Electricity Networks Association of New Zealand (ENA) as part of our advice to the ENA on the appropriate approach to setting capital and operating expenditure allowances for the next Default Price-Quality Path (DPP) reset of electricity distribution businesses (EDBs).

The economic efficiency rationale for utilising EDBs' forecasts to help set their DPP expenditure allowances is the superior quality of information that EDBs have about the likely future costs relative to the information known to the Commerce Commission (the Commission). However, like other regulators, the Commission has to date been reluctant to rely heavily on EDBs' cost forecasts for the purposes of setting allowances under a DPP framework. This reluctance has partly been due to a concern that EDBs might have an incentive to inflate their forecasts in order to secure larger cost allowances. One of the areas the ENA has sought advice from us on is ways in which these concerns may be assuaged, such that EDBs' AMP expenditure forecasts could be used to set expenditure allowances under the DPP approach to regulation. We have investigated a few options for making some use of EDBs' forecasts.

The first option is the detailed evaluation of EDB forecasts in the manner of the regulatory approaches adopted in jurisdictions such as Great Britain and Australia. In these jurisdictions, the regulator examines businesses' forecasts and approves or accepts forecast levels of expenditure that have been appropriately justified as reasonable. However, such an approach would not be feasible under the 'low cost' requirements of a DPP approach.

The second option would be for the Commission to set allowances based on a weighted-average of its own internally-generated forecasts and the EDBs' AMP forecasts. This would balance the benefits of drawing on EDBs' superior information about their costs while maintaining some checks on businesses' incentives to inflate their forecasts to game the regulator. The approach to weighting the Commission's and EDBs' forecasts could vary. The simplest approach would be a 50-50 weighting between the two forecasts. A more sophisticated alternative would be to reward EDBs with a history of accurate forecasting with a greater weighting on their forecasts and a lower weighting on the Commission's forecast, with the reverse to apply to EDBs with poor forecasting records. However, whilst promoting accuracy, this option would not ensure that forecasts reflect *efficient* expenditures and would still be open to gaming.

A third option would be for the Commission to allow EDBs' AMP forecasts to determine their expenditure allowances so long as a business's forecast fell within a certain band around the Commission's forecast. The first issue with this option is whether the EDBs' forecasts should be accepted if they fall within a band that

applies symmetrically above *and below* the Commission's forecast. The second issue is the choice of the width of the band – a narrow band negates the benefit from this option while a wider band potentially invites EDBs to inflate their forecasts, particularly if they know how the Commission's forecast will be derived.

A fourth option would be to implement the 'twin tracking' scheme used by Ofgem in Great Britain. Under this approach, a company that submits a 'well-justified' cost forecasts would receive fast-track status. This means that its regulatory reset would be concluded more quickly than those of slow-tracked companies, and with relatively less scrutiny and modification of the plans and forecasts. Fast-track status is also associated with a substantial upfront financial reward. The main drawback of twin-tracking is that to incentivise desirable behaviours on the part of the EDBs, there would need to be a credible threat of firms with poorly justified forecasts being slow-tracked. Such a threat is largely undermined if it is well-recognised that the regulatory framework, by design, requires low-cost action on the part of the regulator. This effectively rules out twin tracking as a means of encouraging reliable forecasting by EDBs.

The final option we examined is 'menu regulation'. Menu regulation would involve offering EDBs a choice between alternative 'packages' of allowed expenditures and incentive sharing rates in order to promote both:

- Truthful revelation by the businesses their view of achievable minimum costs; and
- Cost efficiencies during the regulatory control period.

Menu regulation has been applied for multiple regulatory price resets in Great Britain by regulators Ofgem and Ofwat. There is evidence that under the IQI approach applied by Ofgem, businesses have invested more effort in developing efficient and accurate forecasts.

In our view, menu regulation is compatible with the low-cost requirements of a DPP framework. Whilst menu regulation has limitations, by incentivising EDBs to develop and submit accurate forecasts, it offers the best prospects for rendering EDBs' expenditure forecasts a useful basis on which the Commission can set DPP cost allowances.

1 Introduction

Frontier Economics has prepared this report for the Electricity Networks Association of New Zealand (ENA) as part of our advice to the ENA on the appropriate approach to setting capital and operating expenditure allowances for the next Default Price-Quality Path (DPP) reset of electricity distribution businesses (EDBs).

This report represents our Output 2 deliverable to the ENA. The objective of Output 2 is to provide the ENA with advice on the potential for forecasts *contained within EDBs' asset management plans (AMPs)* to be utilised by the Commerce Commission (Commission) in setting capital and operating expenditure allowances under a DPP reset.

This report focuses on measures that may be implemented over the longer term that would allow EDBs' forecasts to be used by the Commission when setting expenditure allowances. It is unlikely that the preferred measure recommended in this report, menu regulation, can be implemented immediately, in time for the next DPP reset in 2015. Hence, it may be necessary to introduce some alternative interim measures, with a view to transitioning towards more ideal arrangements for future resets. Our Output 3 report, which will follow on from this report, will explore some possible options for transitional arrangements that might be deployed over the shorter term.

This report is intended to be read in conjunction with our Output 1 report to the ENA. That report considers approaches for setting capital and operating expenditure allowances that are independent of EDBs' AMP forecasts.

1.1 Background

Economic regulation is commonly applied to firms operating in industries with natural monopoly characteristics, where competition is either impracticable or unlikely to yield economically efficient outcomes. The provision of electricity distribution services has strong natural monopoly characteristics, principally due to large economies of scale.

The purpose of economic regulation of electricity distribution network services is to promote:

- Productive efficiency: Minimising the cost of delivering a given quantity of services
- Allocative efficiency: Encouraging the provision of services up to the point where the cost of provision just equals the willingness of consumers to pay for the services

- Dynamic efficiency: Promoting the responsiveness of network businesses to meeting consumer's wants over time through investment and innovation.

The application of economic regulation to electricity distribution services needs to have regard to both:

- the incentives of EDBs to maximise profits – by minimising costs and/or maximising revenues
- the information asymmetry between regulators and regulated firms (EDBs) – firms have better information about their actual and potential costs than the Commission as economic regulator.

Incentive regulation is a form of economic regulation that seeks to recognise and harness these factors to promote the efficiency outcomes outlined above. Incentive regulation involves the regulator setting an allowed level of revenue or prices for a business to apply for a defined time period referred to as a regulatory control period.

The business is then left free to manage its service provision and costs for the duration of the control period. To the extent that a business can reduce its costs, it is able to retain some of the benefits of such savings until the next control period. If the business exceeds its allowed costs, it bears the cost of the overspend. At the end of the period, the regulator sets a new revenue or price allowance for the subsequent control period, which may or may not be based on the business's revealed costs in the just-completed period. In this way, incentive regulation rewards businesses for identifying and effective potential cost savings while meeting stipulated service delivery metrics. Incentive regulation is often described as 'CPI-X' regulation, with the 'X' reflecting the negative rate of change in real prices or revenues over time.

A key question that arises under incentive regulation is how to set revenues and or prices in such a way that preserves the incentives of businesses to minimise costs while sharing some of those benefits over time with electricity consumers. One approach is through the use of 'building blocks', where each element of the building block represents a component of the cost of network services. This is the approach used by the Commission within its DPP framework.

The basis of the building block approach is the establishment of forward looking estimates of the costs of providing the relevant service. Each cost category – operating expenditure, return on capital, deprecation and tax – is combined to derive a forward looking estimate of the revenue required to operate the network business on an efficient basis during the regulatory period. Two key elements of the building block approach used in the DPP are allowed forecast capital and operating expenditures.

As part of their disclosure obligations under the *Electricity Distribution (Information Disclosure) Requirements* 2008 and the *Electricity Information Disclosure Handbook* 2004,

EDBs are required to submit AMPs to the Commission for its review. AMPs provide information on how the EDBs intend to manage their network assets to meet the requirements of customers. This includes forecast capital and operating expenditures. This report considers ways in which these AMP forecasts can be used to set EDBs' capex and opex allowances.

Importantly, the implementation of DPP regulation involves setting price-quality paths that apply to all relevant EDBs. This means that unlike the case in jurisdictions employing approaches more akin to customised price-quality regulation (such as Australia and the UK), the way in which AMPs may be used needs to be general rather than specific, and relatively low cost in terms of regulatory burden.

1.2 Report structure

The structure of the report is as follows:

- Section 2 investigates the challenges associated with using EDBs' AMP forecasts directly for the setting of EDB expenditure allowances.
- Section 3 considers the options for overcoming these challenges and making use of businesses' AMP forecasts in the setting of expenditure allowances.
- Section 4 extends the discussion of menu regulation, providing a case study of an application in Great Britain and an analysis of its applicability in the New Zealand regulatory context.

2 Direct application of AMP forecasts

One approach to setting forecast capital and operating expenditure allowances is to apply the EDBs' forecasts as set out in the AMPs. As noted above, a key challenge that arises under any regulatory regime is the information asymmetry between the regulator and the regulated business. An EDB typically has much better information than the regulator about:

- the business's potential future efficient costs;
- the cost-quality trade-offs involved in delaying expenditure; and
- the trade-offs available between capital and operating expenditure.

Under incentive regulation, using the EDBs' own capital and operating expenditure forecasts to set DPPs has the advantage of holding businesses accountable for those forecasts – EDBs are rewarded if they reduce costs below what they forecast and are penalised if they spend more than they forecast. At the last electricity distribution reset, the Commission used forecast data from 2009/10 AMPs to set EDBs' capex allowances.

The risk with using EDBs' AMPs forecasts to set forecast capex and opex allowances is that forecast costs may systematically deviate from *efficient* costs. As discussed below, on average, businesses' AMP forecasts have not even accurately predicted EDBs' *actual* costs. Moreover, there could be a concern that regulated businesses might inflate their forecasts intentionally, above levels that they anticipate privately, in order to secure higher cost allowances for the next regulatory period. If an asymmetry of information exists between the regulator and the businesses, the regulator may not be able to detect such behaviour.

2.1 Track record of AMP forecasts

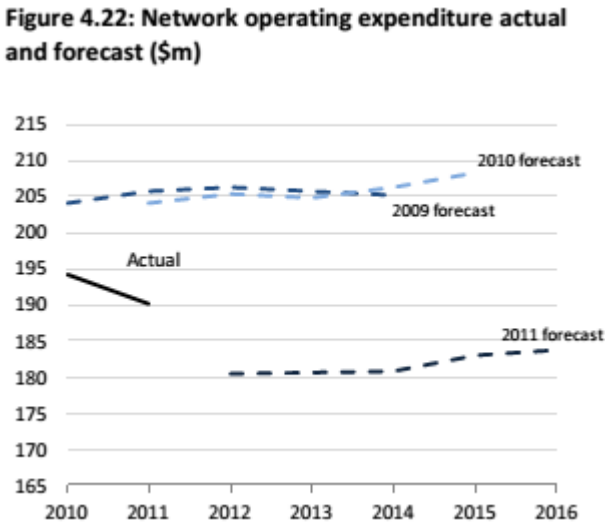
In its 2013 review of EDBs' performance from 2008 to 2011, the Commission presented some analysis comparing aggregate EDBs' actual network opex and capex for 2010 and 2011 against forecasts contained in the 2009 and 2010 AMPs.

This analysis showed that, in general, EDBs' forecasts have tended to overstate actual expenditure. Specifically, as **Figure 1** and **Figure 2** show:

- Actual network opex for 2010 was significantly lower than the 2009 forecast;
- Actual network opex for 2011 was significantly lower than the 2009 and 2010 forecasts; and
- Actual network capex for 2011 was significantly lower than the 2010 forecast.

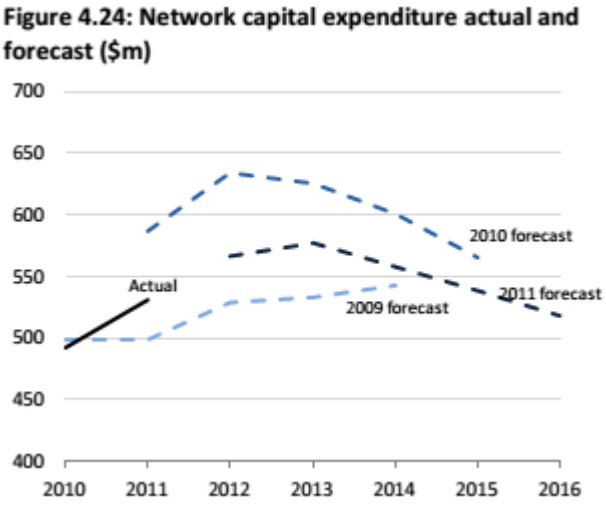
However, network opex and capex forecasts from 2011 were significantly lower than those made in 2010.

Figure 1. Network opex



Source: Commerce Commission, 29 January 2013, pp.33-34.

Figure 2. Network capex



Source: Commerce Commission, 29 January 2013, pp.33-34.

The most recent (2012) data on actual network expenditure indicates that (excluding Orion):

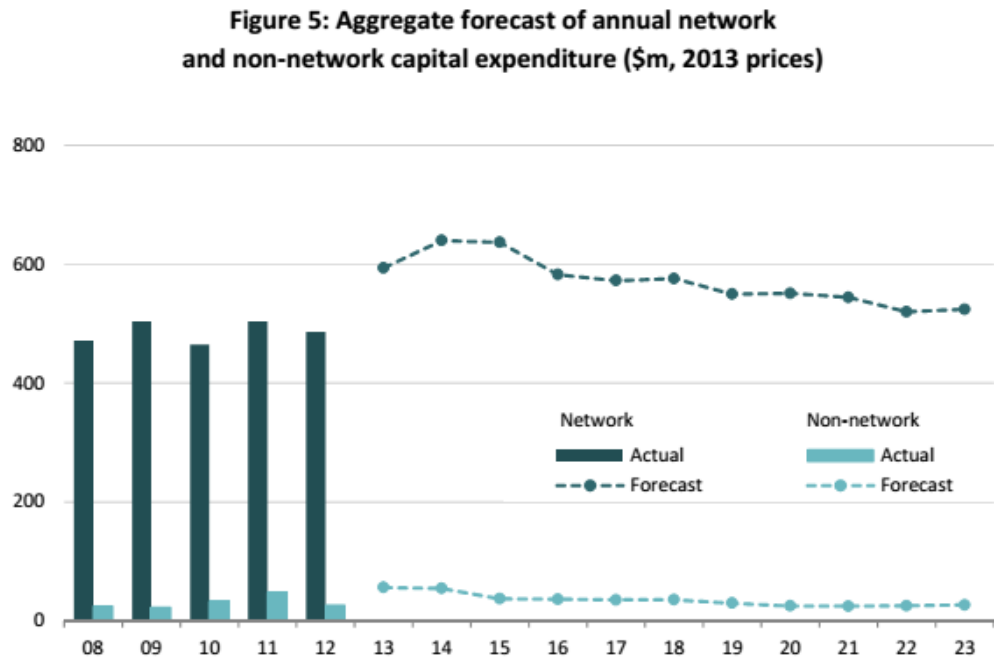
- Network opex increased slightly in 2012 after falling in 2011:
  - Actual network opex in 2012 was $181 million (2012$)

- The 2011 forecast for 2012 network opex was $184 million (2011$)

- Network capex fell in 2012 and was below the levels forecast in 2010 and 2011:
  - Actual network capex in 2012 was $486 million (2012$)
  - The 2011 forecast for 2012 network capex was $578 million (2011$)

The Commission's most recent summary analysis shows that the 'bow wave' of network capex that was apparent in the 2010 and 2011 forecasts has been deferred again. Excluding Orion, network capex is now expected to peak in 2014 at $640m, followed by $637m in 2015 and $583m in 2016. Including Orion, network capex is expected to peak in 2015 and then fall substantially.

Figure 3. Network and non-network capex (excl. Orion)



Source: Commerce Commission, 29 November 2013, p.10

We consider it would be even more informative if this analysis were conducted over a longer time period (i.e. over a full regulatory period or more), as more data become available.

2.2 Reasons why AMP forecasts may turn out to be incorrect

Actual outcomes may differ from the expectations embodied in AMPs for a variety of reasons. One possibility is that after submitting their forecasts and

receiving their regulatory expenditure allowances, businesses have identified and implemented genuine cost savings or deferrals. To the extent this occurred, it could explain many instances when EDBs' actual expenditures were below their original AMP forecast expenditures.

There are four other reasons why actual expenditures may fall below forecasts:

1. **Forecasting errors** – errors may be due to chance or a lack of skill in forecasting. An AMP reflects an expectation based on a central scenario or on a weighted-average of scenarios. As such, in any given year, the surrounding circumstances may be quite different to those that have been assumed. This can lead to outcomes that differ from those in the AMP despite the business having taken reasonable steps to manage uncertainty. At the same time, if the forecasting methodology used by an EDB is unbiased, we would expect forecasting errors to be roughly symmetrically distributed, with over-forecasting just as likely as under-forecasting, *other things being equal.*
2. **Changed business and/or network conditions** – such as changed input costs or legal obligations. Lower input costs than anticipated would reduce outturn expenditures. For example, the unexpected introduction of legal obligations (such as health and safety or environmental regulations) should increase outturn expenditures. In addition, changes to network conditions could occur that make investment deferral efficient. For instance, if demand turns out to be lower than anticipated, planned network augmentation to meet previously forecast volumes could be delayed optimally.[1]
3. **Changed outputs** – such as changes to reliability performance. To the extent an EDB decides to deliver higher or lower quality services in a given year, outturn expenditures may be different from those forecast. For example, upon receiving a regulatory expenditure allowance well below its forecast, an EDB may decide to reduce service quality to avoid incurring a financial penalty for over-spending its allowance.
4. **'Gaming'** – the business has convinced the regulator to accept a higher forecast than the business expected to achieve at the outset.

If forecasts exceed actuals due to one of the first three reasons above, regulators should generally be unconcerned. However, some regulators may be reluctant to set expenditure allowances because of the possibility of gaming by the businesses. Unfortunately, it is difficult for a regulator to identify precisely which of these

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[1] Deferral of this kind would benefit consumers because the capital expenditure avoided would not be rolled into the regulatory asset base until the investment is made at some point in the future. This would result in lower prices than if the EDB had proceeded with the capacity expansion, notwithstanding lower than forecast demand.

reasons are most responsible for any mismatch between actual and forecast expenditure.

The incentives and ability of businesses to game the regulator arise from the same two factors that influence the structure of economic regulation more broadly: profit maximisation; and information asymmetry. In particular, regulated businesses have incentives to supply the regulator with inflated forecasts of costs in the knowledge that the regulator would face difficulties or significant costs in verifying the accuracy of these forecasts. By achieving a higher default price-quality path, an EDB can increase its profits for any given level of actual expenditures.

Realising this, a regulator may err on the side of caution and disregard the businesses' forecasts when setting allowances. This is potentially wasteful because, as noted earlier, regulated businesses often have better information about their own costs than does the regulator so, in principle, should be able to project expenditures more accurately. The following sections consider alternative ways in which EDBs' expenditure forecasts could be utilised by the Commission when resetting DPPs.

3 Options for using AMP forecasts

This section briefly explores the potential options for utilising EDBs' AMP forecasts in DPP resets in light of the incentives businesses have to 'game' the regulator. The following section discusses the option of menu regulation in more detail, this being the approach we consider most promising in terms of addressing the source of any incentive incompatibility problems for the longer term.

The potential options for making use of EDBs' AMP forecasts we have investigated are the following:

- Detailed evaluation of EDB forecasts (section 3.1);
- Placing some weight on EDB forecasts in the setting of expenditure allowances, with the size of the weight potentially increasing for EDBs with a history of accurate forecasting (section 3.2);
- Using EDB forecasts to set allowances if they fall within a specified band around the Commission's forecasts (section 3.3);
- 'Twin-tracking' (section 3.4); and
- Menu regulation (section 3.5).

3.1 Detailed evaluation of forecasts

One approach to utilising AMP expenditure forecasts is to use them as the basis for setting capex and opex allowances, subject to detailed evaluation by the Commission. This is effectively the approach used by regulators in Australia and to some extent Great Britain. Under this approach, the regulator typically appoints technical consultants to help assess whether the businesses' expenditure forecasts can be justified according to a range of criteria including cost minimisation, service quality, legal obligations and safety.

We understand that a detailed evaluation approach would not be consistent with the application of DPP regulation. Under part 4 of the Commerce Act, DPP is intended to set price-quality paths for regulated businesses in a low-cost manner. Detailed evaluation of *overall forecasts* would only available under customised price-quality path (CPP) regulation. Individual firms have the option to apply for CPP regulation to better meet their circumstances. Orion applied for, and was granted, a CPP following the Canterbury earthquake.

However, it may be possible to undertake detailed evaluation of particular components of EDBs' forecasts in a way that is consistent with a DPP approach. For example, it may be reasonable for the regulator to assess defined 'step changes' to expenditures and use this analysis to adjust top-down forecasts.

3.2 Weighting EDB forecasts in setting allowances

Perhaps the most straightforward way to utilise EDBs' AMP forecasting in setting expenditure allowances is for the Commission to take a weighted-average of its own internally-generated forecasts and the EDBs' AMP forecasts.

The motivation for this approach is that the EDBs presumably have superior information about their future costs than the Commission, so placing some weight on their forecasts means that the allowances are more likely to accurately match actual future expenditures than if the businesses' forecasts were ignored.[2] Further, maintaining some weight on the Commission's forecasts ensures that the businesses are subject to some checks on any attempts to game the regulator.

The approach to weighting the Commission's and EDBs' forecasts could vary. The simplest approach would be a 50-50 weighting between the two forecasts. A more sophisticated alternative would be to reward EDBs with a history of accurate forecasting with a greater weighting. This could involve comparing the track records of different EDBs' AMPs against outturn expenditures over multiple years and placing greater weight on the forecasts produced by EDBs with more accurate forecasting records and correspondingly less weight on the Commission's alternative forecasting approach(es). Conversely, those EDBs with a poor history of forecasting accurately could have their allowances set principally using the Commission's forecasts, with correspondingly little weight given to the EDBs' forecasts.

There are several issues with any approach that involves placing some weight on EDB forecasts to set capital and operating expenditure allowances.

The key problem is that although placing some weight on EDBs' forecasts may increase the likelihood that expenditure allowances match accurately future expenditures, such future expenditures may not be entirely efficient. The idea underpinning building block incentive regulation is that businesses are allowed to recover efficient costs but no more. If a business forecasts its expenditures to be (inefficiently) high and then incurs those high expenditures, it would have produced accurate forecasts, but it would not be penalised for spending inefficiently. This would be inconsistent with the objectives of incentive regulation. Placing a greater weight on the projections of those EDBs with a track record of forecasting accurately would not overcome this problem because those businesses may simply be more adept than others at incurring the inefficiently high levels of expenditure they have forecast.

Even assuming that EDBs cannot simply incur whatever level of expenditure they forecast, it would be difficult to prevent EDBs gaming the way in which their forecasts were used. For example, assuming a DPP reset every five years,

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2 This, of course, presumes that EDBs' revealed forecasts are truthful.

only every fifth AMP expenditure forecast could be used to help set expenditure allowances. Knowing this, EDBs could accurately forecast efficient costs for the four interim years that had no influence on DPP allowances and then forecast very high – and inefficient – expenditures in the fifth year used for the reset, knowing that those forecasts may turn out to be inaccurate, but that they would enable the EDB to receive high expenditure allowances for the current regulatory period.

One way to address this issue would be to use EDBs' current (2013) AMP forecasts one time only, for the forthcoming reset, on the basis that the EDBs were unaware when they made their forecasts that they would be used in this way. In any case, this approach would not provide a long-term solution.

3.3 Allowing EDBs' forecasts within a band

Another option raised in consultation with the EDBs is for the Commission to allow EDBs' AMP forecasts to determine their expenditure allowances, so long as the AMP forecasts fall within a certain band or range around the Commission's forecasts. For example, if an EDB's capital expenditure forecast for the next reset period was less than, say, 5% more than the Commission's forecast, the EDB's forecast could be used to determine its allowance. As with the option of placing some weight on the businesses' forecasts, the motivation for this option would be the superior information that EDBs have about their own future costs.

The two key questions or issues that arise with this option are as follows:

- Whether EDB forecasts within a band *below* the Commission forecast are to be used as well as EDB forecasts within a band above the Commission's forecast. Faithfulness to the rationale for this approach – the superior information of EDBs about their own costs – would suggest the band should be symmetrical.
- The choice of the width of the bands (in percentage terms around the Commission's forecast) will necessarily be arbitrary:
  - The drawback of adopting a narrow band is that there may be limited benefit in adopting an EDB's forecast if it is very close (in percentage terms, if not in absolute dollar terms) to the Commission's forecast.
  - The drawback of adopting a wider band is that it would increase the risk of providing EDBs with inefficiently large expenditure allowances and encouraging EDBs to forecast high to game the regulator. This risk would be particularly high if the EDBs had a good understanding of how the Commission was planning to derive its expenditure forecasts. For example, if the Commission published details of the forecasting methodology it intends to use to set allowances, and provided this

approach is replicable by the EDBs, the EDBs could make forecasts equal to the Commission's expected forecast plus an uplift slightly below the value of the permitted upper band.

3.4 Twin tracking

The energy regulator in Great Britain, Ofgem, has introduced recently a 'fast track, slow track' approach to utilising network businesses' capex and opex forecasts in the setting of regulatory allowances. Under the twin tracking approach, a company that submits a sufficiently 'well-justified' business plan receives fast-track status. This means that its review is concluded more quickly than those of slow-tracked companies, and with relatively less scrutiny and modification of the plans and forecasts. Fast-track status is also associated with a substantial financial reward, which has been set at 2.5% of allowed revenues for the RIIO-ED1 review. [3]

Amongst other things, well-justified plans would need to demonstrate:

- the efficiency of the cost proposals;
- that customers and other stakeholders have been engaged and have had input into the development of the plan (so as to ensure that the outputs delivered by the businesses are in line with those desired by customers and stakeholders);
- that the distribution network operators (DNOs) have thought clearly about the outputs they will deliver and the associated costs, as well as making commitments to deliver these outputs; and
- that new and innovative approaches to delivering network services, increasing capacity and improving quality of service had been considered and factored into the plans where they represent value for money.[4]

In simple terms, if the DNOs submit convincing enough cost and output forecasts, Ofgem would allow fast-track status. Once fast-tracked, the DNO is given the green light to deliver the plan it has set out.[5] Slow-tracked companies,

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3 RIIO-ED1 is the first price control for the electricity distribution networks conducted under RIIO, due to cover the period 2015-2023. The review was launched in February 2012 and is set to conclude for fast-tracked companies in February 2014, and for slow-tracked companies in November 2014.

4 Further detail on the guidance Ofgem published and the criteria for meeting the well-justified standard can be found in Ofgem's March 2013 RIIO-ED1 Strategy document, including in particular the annex on "Business Plans and Proportionate Treatment" here: https://www.ofgem.gov.uk/sites/default/files/docs/2012/09/riioed1sconbusinessplans.pdf

5 In addition to more timely price control settlements, fast-tracked companies also receive upfront additional revenues of 2.5% of total expenditure, in lieu of rewards from Ofgem's Information Quality Incentive mechanism (discussed further in section 3.5). Ofgem has committed to ensuring

on the other hand, are asked to resubmit their plans and are more likely to see aspects of their plan revised and modified by the regulator.

The fast-tracking reward therefore provides a clear incentive for the companies to offer as much evidence as possible that they have developed robust costs forecasts, so as to convince the regulator of the efficiency of their plans. If a company's own forecast is convincing, there is no need for the regulator to modify it or provide further scrutiny.

Ofgem's initial decision on fast-tracking for RIIO-ED1 was published in November 2013.[6] Ofgem has provisionally decided to fast-track the four licensees under the ownership of Western Power Distribution (WPD). The remaining 10 licensees (which fall under a further five ownership groups) have not been fast-tracked.

Overall, Ofgem stated that the RIIO approach has *"produced a sea change in how companies approach price controls, with all companies producing a very high standard of business plan that have customers at their heart"* and noted that the companies had found over £2 billion in cost reductions since their initial forecasts in 2012, which was *"driven in part by the potential to be fast-tracked"*.[7] Ofgem is also likely to have benefited from some less quantifiable effects of fast-tracking. In particular, fast-tracking was seen as a stepping-stone towards a more mature and less adversarial relationship with the DNOs, which appears to have been accomplished. It is also well-recognised within the industry that twin-tracking has introduced an element of competition between DNOs (e.g. to engage more effectively with customers, and develop plans that will deliver outputs that customers value) that otherwise would not have existed.

Despite the potential benefits of twin-tracking, there are two main reasons why we consider such an approach may be unworkable within a DPP framework. First, in order for a twin-tracking mechanism to incentivise desired behaviours on the part of the EDBs, there needs to be a credible threat of firms with poorly justified business plans being slow-tracked (alongside a credible promise of firms with well-justified forecasts being fast-tracked). Such a threat is largely undermined if it is recognised that the regulatory framework, by design, requires low-cost action on the part of the regulator and the regulator cannot force firms to be slow-tracked (eg go down the CPP path). Another issue that would need to be resolved is how a twin-track process might work in harmony with any other incentives on EDBs. In Great Britain, the interaction of twin-tracking with the

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that a fast-tracked firm "does not secure a settlement that means they were worse off" than had they been slow-tracked.

6 https://www.ofgem.gov.uk/publications-and-updates/riio-ed1-business-plan-assessment-and-fast-tracked-consultation

7 https://www.ofgem.gov.uk/press-releases/ofgem-requires-electricity-network-companies-deliver-more-less

Information Quality Incentive (IQI) form of menu regulation (discussed below) has given rise to some concerns about their compatibility. In any case, fast-tracking is essentially an extension of the same type of principle as embedded in IQI, and is intended to achieve the same regulatory objective.

3.5 Menu regulation

The final and, in our view, most promising approach for making use of EDBs' AMP forecasts over the longer term is through the use of menu regulation.

Menu regulation is a regulatory tool that is simultaneously potentially 'light handed' while placing some weight on each business's expected efficient costs in determining the appropriate price-quality path. In this way it may be able to meet the requirements of the DPP provisions and avoid the costs and effort of a CPP process, while still making some use of EDBs' expenditure forecasts.

Menu regulation involves offering the regulated business a choice between alternative 'packages' of allowed expenditures and incentive sharing rates in order to promote both:

- Truthful revelation by the business of its view of its achievable minimum costs; and
- Cost efficiencies during the regulatory control period.

Menu regulation has been applied for multiple regulatory price resets in Great Britain by regulators Ofgem (through the Information Quality Incentive (IQI) mechanism) and Ofwat (through the Capital Incentive Scheme (CIS)) and is discussed in detail in the next section.

4 Menu regulation

As noted in section 3.5, menu regulation offers the potential of making some use of EDBs' expenditure forecasts without incurring the time and costs of a CPP-style process by incentivising businesses, through financial rewards, to submit forecasts that are as accurate as possible.

4.1 What is menu regulation?

The origins of menu regulation can be traced to pioneering academic work by Laffont and Tirole.[8] This work demonstrated that in response to the information asymmetry it faces regarding the businesses it regulates, a regulator can design a menu of different types of regulatory 'contract' in such a way that businesses will self-select into the contract that incentivises the revelation of its private information truthfully (eg by supplying forecasts that are as accurate as possible).

In the simplest example, two firms — one with high costs and another with low costs — are presented with two options for the regulatory contract. The regulator offering these contracts cannot distinguish between the two types of firms in advance, so it uses the revealed choices of the firms to discriminate between them. The two types of contract offered are the following:

- A moderate fixed-price contract, where the company can keep any additional profits it makes if its costs are lower than the regulated price – providing strong incentives for productive efficiency, although without extracting the benefits of this for customers; and
- A cost pass-through contract, where the price flexes to meet the outturn cost of the company so that no additional profits can be earned for under-spending, but the business experiences no loss for over-spending. This provides better alignment of prices and costs (ie better allocative efficiency) but weaker incentives to reduce costs (ie achieve productive efficiency).

Laffont and Tirole showed that, given a sufficiently high regulated price, the low-cost company is better off opting for the fixed price contract, and investing effort to increase productive efficiency and reduce costs, thereby earning higher returns. The high-cost company is better off choosing the pass-through contract because it has poor prospects for limiting its costs to below the regulated price and a pass-through approach ensures that it will receive sufficient funding to remain viable. Meanwhile, the regulator achieves an improved outcome relative to a uniform contract across the firms in that:

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8 See J-J Laffont and J Tirole, A theory of incentives in procurement and regulation, 1993

- the low-cost company receives a lower price than if the regulator had set a uniform price high enough to enable recovery of the high-cost firm's costs;
- the low-cost company subsequently reveals the efficient level of costs; and
- the high-cost company does not have the opportunity to earn higher returns by marginally reducing its high costs.

By self-selecting into the different types of contract, the companies reveal information to the regulator that would not otherwise have been available (or would have been difficult or costly to obtain). A suitably designed menu will therefore allow the regulator to obtain better information and better outcomes than it would have achieved otherwise. However, the menu approach will only work to reveal private information if the regulator can offer incentives to the businesses. The most obvious and direct form of incentive is higher profits as a reward for certain behaviours.[9]

The example above highlights two extreme types of regulatory contract. The optimal contract is likely to fall somewhere in between these extremes: involving a profit sharing or 'sliding scale' regime where the price flexes partially in response to changes in realised costs and is partially fixed. Under this regime, any additional profits achieved by the company by lowering its costs are shared with customers. The degree to which profits are shared can be established *ex ante* by the regulator according to a percentage 'sharing factor'.[10]

A very simple form of menu regulation would be to offer the networks a range of different price paths, each associated with different sharing factors. Companies choosing a low price path will be rewarded with a higher sharing factor, so that they keep a greater share of any additional profits earned. Companies choosing a high price path will face a lower sharing factor. Each price path can also be combined with caps and collars on the total profits/losses that the company can earn/incur to reduce the prospect of windfall gains/losses and to reduce the risk exposure of the company.

Laffont and Tirole showed that the basic example described above generalises, so that the regulator can achieve better outcomes by offering a menu of cost-contingent regulatory contracts with different sharing factors.

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9 Under incentive regulation generally, and menu regulation particularly, regulated prices need not be cost reflective (as they would be under a pure pass-through, rate of return system of regulation). Nevertheless, menu regulation can, in principle, deliver better outcomes to society over the long-run than a uniform pass-through scheme because regulated businesses are incentivised to take actions that lower costs, and these savings can eventually be shared with customers.

10 Ofgem also refers to this as the incentive rate or marginal incentive rate. We use the term sharing factor in this note.

4.2 Application of menu regulation in Great Britain

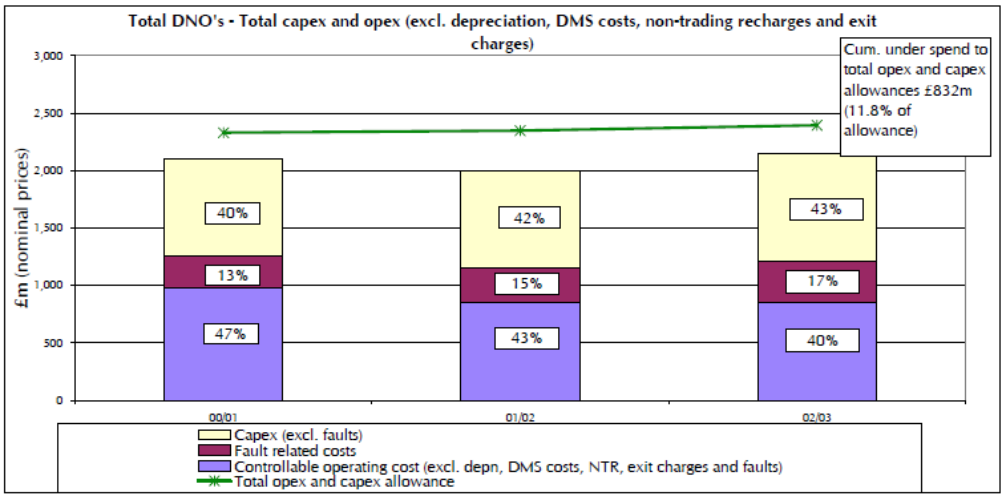
4.2.1 Development of the Information Quality Incentive

Ofgem introduced a sliding scale mechanism for the fourth price control review period for the electricity distribution networks (DPCR4), which ran from April 2005 to March 2010. At DPCR4, Ofgem was concerned that many of the companies had forecast significant increases in investment (collectively up to 40%) without providing convincing justification for the proposed increases. Ofgem stated that:

> *"Where companies' forecasts are less well justified, there is a greater risk that underspend is due to forecast error rather than efficiency, or that the company will need to spend more money than it has been able to justify. Ofgem is therefore proposing a sliding scale mechanism which would allow such companies to spend more than they have justified but receive lower returns for underspending. At the same time, companies submitting convincingly argued forecasts will be rewarded with a higher rate of return and a stronger incentive for efficiency."*[11]

At the same time, Ofgem also noted that the distribution businesses (DNOs) had significantly underspent in the first few years of the previous (DPCR3) reset period. Ofgem's initial analysis found that the DNOs had achieved underspends of nearly 12% of allowances for the first three years of DPCR3 (see Figure 4).

Figure 4. Ofgem's analysis of historic underspend at DPCR3

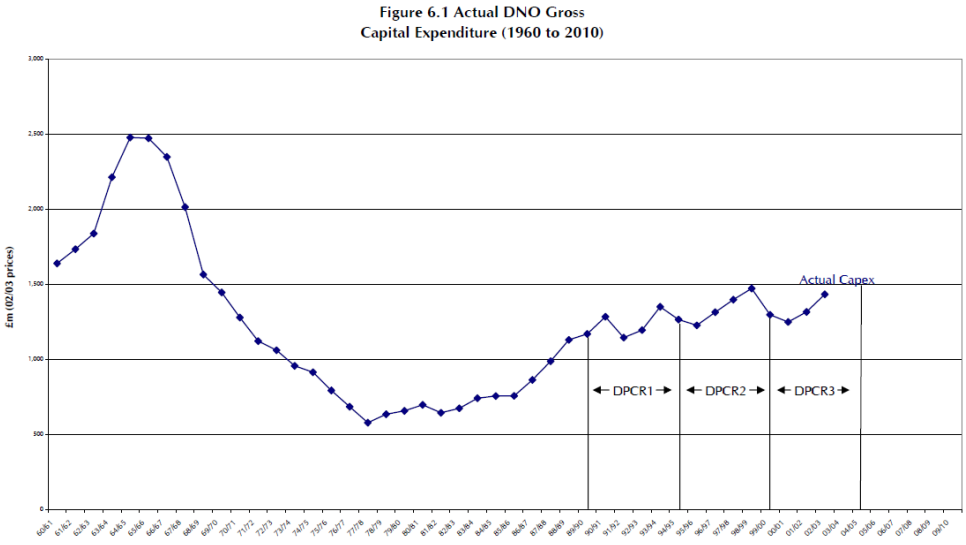


Source: Ofgem, DPCR4 Second Consultation, December 2003, Figure 6.1

11 Ofgem (Jun 2004). Electricity Distribution Price Control Review, Initial Proposals, pp.3-4

Ofgem considered this underspend was due to increasingly efficient asset management practices, operational efficiencies and some synergies resulting from mergers. In addition, some of this underspend may have been offset by overspend in the last two years of DPCR3, reflecting historical within-period profiles of expenditure (see Figure 5).

Figure 5. Historical profile of GB DNO capital investment



Source: Ofgem, DPCR4 Policy Document, March 2004

Nevertheless, the joint concern of higher forecasts and historic under-spending led Ofgem to introduce the sliding scale mechanism. The mechanism was designed to:

- retain an incentive for the DNOs to improve efficiency throughout DPCR4;
- reduce the emphasis on Ofgem's or its consultant's view of the appropriate level of capex;
- reduce the perceived risk that the price control would lead to under-investment;
- allow but not encourage overspend;
- reduce the possibility of 'high' capex companies making very high returns from underspend;
- reward the 'low' capex companies if they deliver what they proposed; and

- avoid strong incentives to underspend by cutting corners and not delivering outputs or by storing up problems for subsequent periods.[12]

The sliding scale mechanism employed at DPCR4 was slightly more complex than the simple mechanism described above. Ofgem published a sliding scale matrix that set out the way the mechanism would function (see **Figure 6**).

Figure 6. DPCR4 Sliding Scale matrix

Table 7.6 Sliding scale matrix

DNO:PB Power Ratio	100	105	110	115	120	125	130	135	140
Efficiency Incentive	40%	38%	35%	33%	30%	28%	25%	23%	20%
Additional income	2.5	2.1	1.6	1.1	0.6	-0.1	-0.8	-1.6	-2.4
as pre-tax rate of return	0.200%	0.168%	0.130%	0.090%	0.046%	-0.004%	-0.062%	-0.124%	-0.192%
Rewards & Penalties									
Allowed expenditure	105	106.25	107.5	108.75	110	111.25	112.5	113.75	115
Actual Exp									
70	16.5	15.7	14.8	13.7	12.6	11.3	9.9	8.3	6.6
80	12.5	11.9	11.3	10.5	9.6	8.5	7.4	6.0	4.6
90	8.5	8.2	7.8	7.2	6.6	5.8	4.9	3.8	2.6
100	4.5	4.4	4.3	4.0	3.6	3.0	2.4	1.5	0.6
105	2.5	2.6	2.5	2.3	2.1	1.7	1.1	0.4	-0.4
110	0.5	0.7	0.8	0.7	0.6	0.3	-0.1	-0.7	-1.4
115	-1.5	-1.2	-1.0	-0.9	-0.9	-1.1	-1.4	-1.8	-2.4
120	-3.5	-3.1	-2.7	-2.5	-2.4	-2.5	-2.6	-3.0	-3.4
125	-5.5	-4.9	-4.5	-4.2	-3.9	-3.8	-3.9	-4.1	-4.4
130	-7.5	-6.8	-6.2	-5.8	-5.4	-5.2	-5.1	-5.2	-5.4
135	-9.5	-8.7	-8.0	-7.4	-6.9	-6.6	-6.4	-6.3	-6.4
140	-11.5	-10.6	-9.7	-9.0	-8.4	-8.0	-7.6	-7.5	-7.4

Source: Ofgem, DPCR4 Final Proposals, November 2004

The sliding scale matrix rests on four core components.

- **The DNO:PB Power Ratio**: This is the ratio of the relevant DNO's forecast capex to the efficient forecast for that firm established by Ofgem's consultants, PB Power, following scrutiny of the company's forecasts.
- **The Efficiency Incentive**: This is the share of any capex under-/over-spend that is retained/borne by the DNO, respectively (ie the sharing factor). It is decreasing in the DNO:PB Power ratio, meaning that companies who forecast high costs relative to the PB Power forecast face a lower-powered incentive regime (ie reducing the additional returns earned from underspending against the high forecast).
- **Additional Income**: This is an extra reward or penalty that the DNO receives depending on how closely its forecast matches Ofgem's forecast, but independent of its actual performance. Substantially higher DNO forecasts (ie above 125% of the PB Power forecast) incur a penalty for the high

12 Ofgem (Jun 2004). Electricity Distribution Price Control Review, Initial Proposals, para 6.92

forecast, while lower forecasts receive a reward. This value is used by Ofgem to adjust the payoffs to the DNOs to ensure that they face the correct incentives and receive what Ofgem considers to be the appropriate rewards under different scenarios.

- **Allowed expenditure**: This is the base capex allowance for the DNO in the period. It can be seen from Figure 6 that if the DNO forecast 100 and PB Power also forecast 100 (left hand column), the base capex allowance is set to 105 (ie above both forecasts). In contrast, higher DNO forecasts received an allowance in between the PB Power forecast and their own. Note that the base allowance does not define the amount the business ultimately receives or is able to retain.

The bottom half of the matrix shows the **payoff** the DNO would receive. This payoff reflects the ultimate position of the DNO relative to its actual level of expenditure over the period. Therefore, a positive payoff means that the business ultimately earns an amount in excess of its expenditure (ie it earns a profit) and a negative payoff means that the business ultimately earns an amount below what it has spent (ie it makes a loss).

The payoff depends on the DNO's actual level of expenditure in the period as well as its forecast expenditure relative to Ofgem's forecast and the additional income. The formula for a DNO's payoff is given by the following formula:

Payoff = (Allowed expenditure – Actual expenditure) × Incentive strength + Additional income

For example, **Figure 6** shows that if the DNO:PB forecast ratio is 100, and the DNO's actual expenditure is 90, the DNO's payoff would be 8.5 (being (105-90)× 0.4+2.5). In other words, the DNO would have spent 90 and been able to earn or retain 98.5, leaving it ultimately 8.5 better off relative to its actual expenditure. This shows that the amount ultimately received by the business may be less than the original allowed expenditure, whilst still rewarding the business for reducing its actual expenditure below the forecast.

The sliding scale matrix has some important characteristics.

- **For any given level of <u>actual</u> expenditure, the DNO will always maximise its payoff by accurately forecasting its costs:** For example, if a DNO expects its actual expenditure to be 100, it will maximise its expected payoff (and its total amount received) by also forecasting expenditure of 100. The payoff from accurately forecasting 100 is 4.5 (meaning that the business spends 100 but receives 104.5 in total), which is higher than any other payoff in the row representing actual expenditure of 100. For example, if the DNO expects to spend 100 but forecasts 110, it will receive a payoff of 4.3, meaning that it spends 100 but receives only 104.3 in total. Similarly if the DNO thinks it will genuinely need to spend 125 in the period, its highest (least negative) payoff is achieved by forecasting 125. In this instance, the

DNO will suffer a penalty of 3.8 if it actually does spend 125, meaning that it spends 125 and receives 121.2. However, this penalty is smaller than the penalty it would face if it forecast any amount above or below 125. For example, if the DNO expected it would need to spend 125 but forecast 100, it would face a penalty of 5.5, meaning that it would spend 125 but receive only 119.5. The highlighted cell in each row of **Figure 6** is the highest number in each row, demonstrating that this property holds for any level of expected expenditure.

- **Irrespective of the DNO's forecast, it will have an incentive to minimise its expenditures:** For example, if a DNO makes a forecast of 100, it obtains a higher payoff by reducing its actual expenditure is below 100 – the payoff is 4.5 if actual expenditure is 100, 8.5 if actual expenditure is 90 and 16.5 if actual expenditure is 70. This is because the firm's payoffs always increase higher up in a given column. Under no circumstances would a firm be better off spending the amount it had forecast if it has the ability to beat the forecast.

Jointly, these two properties have the effect of encouraging DNOs to forecast the level of expenditure they expect to spend *having regard to the incentives they expect to face to minimise expenditures*, and to subsequently strive to achieve efficiencies within the period to achieve or beat forecasts. In other words, the matrix gives a DNO an incentive to set stretching targets for itself, and perform thorough business planning to seek out ways in which it can deliver its operations and investment in the most efficient way.

The sliding scale matrix achieves this in two ways:

- First, if a DNO maximises its return by accurately forecasting its costs, the DNO will have an incentive to gain a detailed understanding of its business.
- Second, the DNO achieves higher payoffs towards the top left of the matrix, with negative payoffs towards the bottom right. This means that the DNO has an incentive to try and forecast expenditure close to or lower than the regulator's expectation of efficient costs. If the DNO strongly considers it will need to spend 140, it will still be better off forecasting at 140 than at any lower level (assuming it does actually spend 140). However, the matrix gives the network the incentive to try and find ways to achieve the same outputs at lower cost and to reveal these efficiencies in its forecast. This incentive is strongest when the DNO does not know with certainty what the regulator's forecast for its expenditure will be. This is because if the DNO does not seek ways to build efficiency into its plans, there is a risk that its forecast could be much higher than the regulator's, resulting in a negative payoff.

The different parameters of the matrix can be tweaked to give different payoffs. However for the matrix to be well-designed, it must retain the two properties above. This is described as being 'incentive compatible'.

At DPCR4, the sliding scale mechanism was introduced after the companies had submitted their business plan capex forecast for the period. The mechanism was first spelled out fully in Ofgem's Initial Proposals, although Ofgem did allow the companies an opportunity to revise their forecasts in light of the mechanism. In its Final Proposals, Ofgem noted that it was *"encouraging that* [the sliding scale mechanism] *has led some of the companies with the biggest gap between their forecast and PB Power's view to rethink their own forecast."*[13] However, at that stage Ofgem did not recognise explicitly its sliding scale matrix as a truth-telling incentive mechanism. Instead, it was focussed on ensuring the DNOs would be able to overspend their capex allowances if needed, while reducing the scope for excess returns.

By the time of the next price control review (DPCR5, for the period 2010-15) Ofgem had re-named the sliding scale mechanism as the Information Quality Incentive (IQI). This was more explicit recognition that the properties of the payoff matrix incentivised improved accuracy and efficiency in the businesses' cost forecasts.

The IQI was largely a continuation of the sliding scale mechanism, with two modifications:

- While in DPCR4 the sliding scale mechanism applied to capex only, in DPCR5 the IQI included a broader range of costs, including both opex and capex (with some cost categories excluded).
- The parameters of the IQI matrix were tweaked. The DPCR5 IQI matrix is shown in **Figure 7** below.

Figure 7. DPCR5 IQI matrix

Figure 21.1 - DPCR5 IQI matrix

Ratio of forecast to baseline	95	100	105	110	115	120	125	130	135	140
Incentive rate	0.53	0.50	0.48	0.45	0.43	0.40	0.38	0.35	0.33	0.30
Allowed expenditure	98.75	100.00	101.25	102.50	103.75	105.00	106.25	107.50	108.75	110.00
Additional income	3.09	2.50	1.84	1.13	0.34	-0.50	-1.41	-2.38	-3.41	-4.50
Actual expenditure										
90	7.69	7.50	7.19	6.75	6.19	5.50	4.69	3.75	2.69	1.50
95	5.06	5.00	4.81	4.50	4.06	3.50	2.81	2.00	1.06	0.00
100	2.44	2.50	2.44	2.25	1.94	1.50	0.94	0.25	-0.56	-1.50
105	-0.19	0.00	0.06	0.00	-0.19	-0.50	-0.94	-1.50	-2.19	-3.00
110	-2.81	-2.50	-2.31	-2.25	-2.31	-2.50	-2.81	-3.25	-3.81	-4.50
115	-5.44	-5.00	-4.69	-4.50	-4.44	-4.50	-4.69	-5.00	-5.44	-6.00
120	-8.06	-7.50	-7.06	-6.75	-6.56	-6.50	-6.56	-6.75	-7.06	-7.50
125	-10.69	-10.00	-9.44	-9.00	-8.69	-8.50	-8.44	-8.50	-8.69	-9.00
130	-13.31	-12.50	-11.81	-11.25	-10.81	-10.50	-10.31	-10.25	-10.31	-10.50
135	-15.94	-15.00	-14.19	-13.50	-12.94	-12.50	-12.19	-12.00	-11.94	-12.00
140	-18.56	-17.50	-16.56	-15.75	-15.06	-14.50	-14.06	-13.75	-13.56	-13.50
145	-21.19	-20.00	-18.94	-18.00	-17.19	-16.50	-15.94	-15.50	-15.19	-15.00

Source: Ofgem, DPCR5 Final Proposals – Incentives and Obligations, December 2009, p.111.

13 Ofgem, *Electricity Distribution Price Control Review, Final Proposals*, November 2004, Para 7.82, p.88.

Figure 7 shows that the DPCR5 IQI matrix contained several key differences relative to the DPCR4 matrix. First, the incentive rates in the DPCR5 matrix (the shares of a DNO's over-/under-spending borne/retained by the DNO) were higher than in the DPCR4 matrix.[14] Second, the DPCR4 matrix was more generous, in that the allowed expenditure for a given forecast ratio was always 5 units higher than in the DPCR5 matrix. The additional income term was also higher in the DPCR4 matrix.[15]

The net effect of the differences in the incentive strength, the allowed expenditure and the additional income was that the DPCR4 sliding scale mechanism was unambiguously more generous than the DPCR5 IQI (over the range of the costs considered in the matrix[16]). For example:

- A DNO that forecast expenditure of 100 and achieved actual expenditure of 100 would receive a payoff of 4.5 under the DPCR4 matrix and a payoff of 2.5 under the DPCR5 matrix.
- A DNO that forecast expenditure of 120 and achieved actual expenditure of 110 would face a payoff of 0.6 under the DPCR4 matrix and a payoff of -2.5 under the DPCR5 matrix.
- A DNO that forecast expenditure of 100 and achieved actual expenditure of 110 would face a payoff of 0.5 under the DPCR4 matrix and a payoff of -2.5 under the DPCR5 matrix.

Apart from being less generous that the DPCR4 matrix, the DPCR5 matrix sharpened DNOs' incentive to forecast accurately – for example:

- As noted above, a DNO that forecast expenditure of 100 and achieved actual expenditure of 100 would receive a payoff of 4.5 under the DPCR4 matrix and a payoff of 2.5 under the DPCR5 matrix.
- A DNO that forecast expenditure of 110 and achieved actual expenditure of 100 would receive a payoff of 4.3 under the DPCR4 matrix and a payoff of 2.25 under the DPCR5 matrix.
- Therefore, the implicit 'penalty' to the DNO for forecasting inaccurately under DPCR4 was 0.2 as compared to 0.25 under DPCR5.

This illustrates that the attractiveness of the IQI, from a DNO's perspective, hinges on how the matrix is calibrated.

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14 The main reason Ofgem changed the incentive strength was because it also included opex within the IQI for DPCR5.

15 Except for a forecast ratio of 100 where the additional income terms are the same.

16 If a DNO had costs drastically lower than its forecast costs, then it may be better off under the DPCR5 IQI matrix because that matrix offered a higher incentive rate.

In addition to electricity distribution networks, Ofgem has also applied the IQI mechanism to gas distribution networks and transmission networks.

The same concept has also been applied in the water sector by Ofwat. Ofwat's final calibration of the IQI matrix for the 2010-15 period is shown in Table 1 below.

Table 1. Ofwat IQI matrix (subset)

CIS ratio (company: baseline)	90	95	100	105	110	115	120
Incentive strength	**37.50%**	**33.75%**	**30.00%**	**27.50%**	**25.00%**	**22.50%**	**20.00%**
Allowed expenditure	**97.5**	**98.75**	**100**	**101.25**	**102.5**	**103.75**	**105**
Additional income	**0.69**	**0.39**	**0.00**	**-0.41**	**-0.88**	**-1.41**	**-2.00**
Actual expenditure							
90	**3.50**	3.34	3.00	2.69	2.25	1.69	1.00
95	1.63	**1.66**	1.50	1.31	1.00	0.56	0.00
100	-0.25	-0.03	**0.00**	-0.06	-0.25	-0.56	-1.00
105	-2.13	-1.72	-1.50	**-1.44**	-1.50	-1.69	-2.00
110	-4.00	-3.41	-3.00	-2.81	**-2.75**	-2.81	-3.00
115	-5.88	-5.09	-4.50	-4.19	-4.00	**-3.94**	-4.00
120	-7.75	-6.78	-6.00	-5.56	-5.25	-5.06	**-5.00**

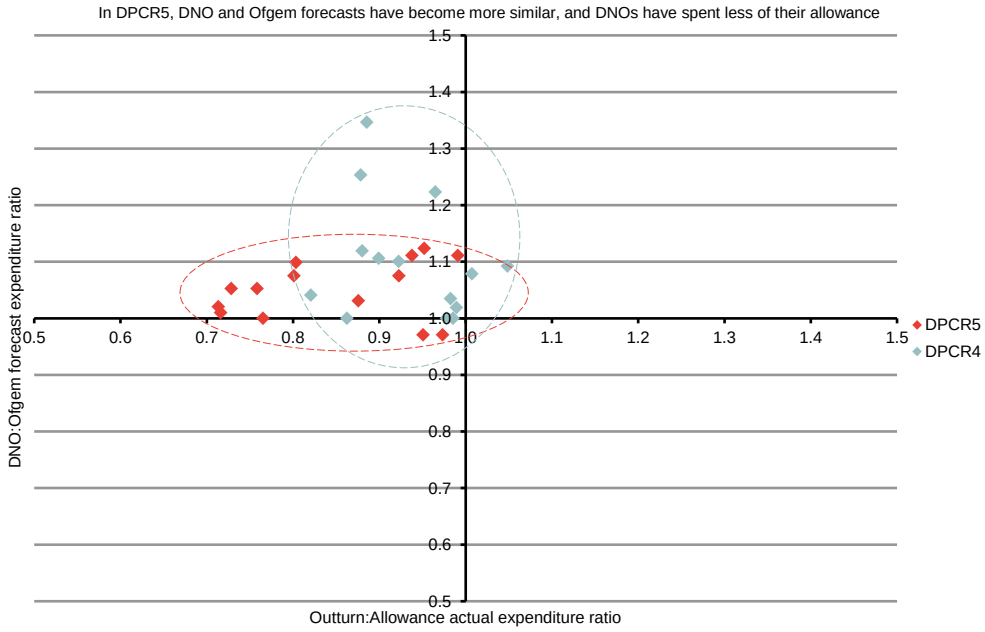
Source: Ofwat – Future water and sewage charges 2010-15: Final determinations

4.2.2 Outcomes

Considering the Ofgem:DNO ratio and the outturn expenditure profiles of the DNOs provides an indication of how well the IQI has performed in terms of encouraging truth-telling and delivering strong efficiency incentives. Figure 8 plots the Ofgem:DNO ratio on the y-axis and the ratio of outturn expenditure to allowed expenditure on the x-axis for both DPCR4 and DPCR5. The outturn data cover the full DPCR4 period, although at present Ofgem has only published one year of outturn expenditure data for DPCR5.[17]

[17] For DPCR4, the IQI was only applied to capex. Our calculations for DPCR4 therefore use the DNO:PB Power ratio from Ofgem's final proposals, and outturn capex:allowed capex on the x-axis. For DPCR5, the IQI covered Ofgem's cost categories of network investment, network opex and closely associated indirects – which broadly covers all of capex and a large portion of opex. In the charts, we use outturn expenditure:allowed expenditure for total costs on the x-axis (since almost all costs are now included in the IQI), and the outturn data only covers the year 2011 (since this is the only available year).

Figure 8. Change in forecasting and expenditure between DPCR4 and DPCR5



Source: Frontier Economics

Figure 8 suggests a number of conclusions can be drawn on the effectiveness of the IQI:

- In general, the DNOs submitted cost forecasts at DPCR5 that were much closer to Ofgem's forecast than at DPCR4. This is indicated by the fact that the red markers denoting DPCR5 outcomes generally lie much closer to the x-axis than do the blue markers denoting DPCR4 outcomes. At DPCR4, the DNOs forecasts were up to 35% higher than Ofgem's, while the furthest away at DPCR5 was around 12%. In addition, two DNOs forecast lower expenditure than Ofgem at DPCR5 (compared to none at DPCR4).
- However, in both periods there appears to still be substantial underspend relative to the baseline allowances.[18] This is indicated by the fact that most of the markers (i.e. denoting DPCR4 and DPCR5) tend to lie to the left of the y-axis. In DPCR4, the maximum underspend was 18%, while several companies seem to be underspending greater than this in DPCR5.

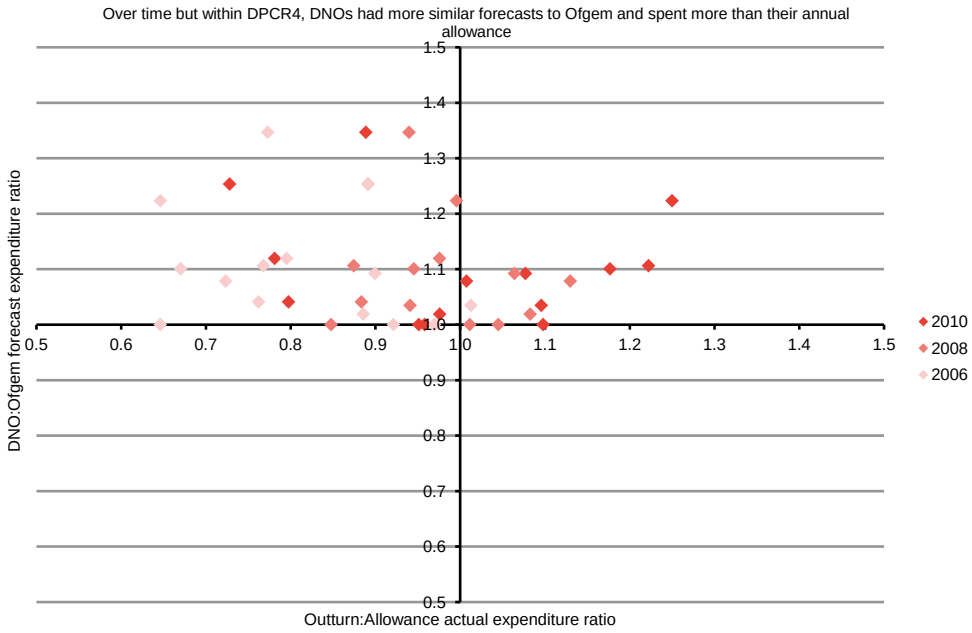
It is unclear whether underspend should be considered a success or failure of the IQI mechanism. If the underspend reflects genuine efficiencies, then the IQI has been successful in its design to encourage productive efficiency. The higher

18 This conclusion needs to be treated with some caution since the data available for DPCR5 cover only a single year

underspend in DPCR5 could be interpreted as the effect of the stronger incentive rate. However, given that the IQI is also designed to encourage networks to identify stretching targets and to reveal their true costs, it might be expected that substantial underspend due to efficiency gains would be difficult to generate. In principle, we would expect to see a broader spread of data points across the top left and top right quadrants of Figure 8.

There is also evidence of changes in DNO outturn costs within the DPCR4 period, as shown in Figure 9.

Figure 9. Changes in expenditure within DPCR4



Source: Frontier Economics

Figure 9 shows that the DNOs at DPCR4 tended to underspend allowances in the early years of the period but overspend in the latter years. One interpretation of this behaviour is that the DNOs generated savings in the early years, which they 'banked', and then over-spent in the later years of the price control in order to 'catch up' on expenditure that had been deferred.

Overall, the IQI has been viewed in Great Britain by businesses and Ofgem as a qualified success. Anecdotally, it is clear that following the introduction of the sliding scale mechanism at DPCR4, the DNOs invested more effort in developing efficient and accurate forecasts at DPCR5. This has continued to improve further in the current RIIO-ED1 review for the period 2015-23, supplemented by the introduction of Ofgem's 'fast-tracking' mechanism.

There has also been learning over time around the processes needed to make IQI work effectively:

- **The timing of information revelation**: At the DPCR4 review the sliding scale mechanism was introduced too late in the process to materially influence the forecasts; the DNOs did not have sufficient time to understand the financial implications of the incentives offered by the sliding scale, and to respond to these incentives by investing effort in improving their forecasts. By DPCR5, the mechanism was understood better by the DNOs. In addition, in the reviews that followed DPCR4, Ofgem has shared its view of the IQI matrix parameters with the networks earlier, although Ofgem has still not tended to finalise the matrix until later in the review. This seems to reflect a conflicting requirement of the IQI. On the one hand, it is important to provide clear incentives to the DNOs to provide accurate forecasts, which would be assisted by finalising the matrix early in the process. On the other hand, delaying the calibration of the matrix until after the DNO forecasts have been submitted allows Ofgem to tweak its baseline forecast to ensure that the mechanism delivers what Ofgem consider to be an appropriate level of returns. Arguably, the DNOs will recognise that the existence of the IQI matrix is in itself sufficient reason to improve forecasting. However, as discussed in the next section, the incentives still need to be strong enough if they are to result in the desired behaviours.
- **The timing of submitting and revising forecasts**: At DPCR4, some of the networks were able to revise their forecasts once it became apparent that the sliding scale mechanism was going to be used. At DPCR5 Ofgem allowed less scope for this, with the DNOs having limited interaction with Ofgem and its consultants after submitting their original forecasts.[19] In general, the regulator needs to strike an appropriate balance between allowing some flexibility for companies to update their forecasts in light of new information, without allowing too much room for gaming the mechanism. We discuss this further in the next section.

4.2.3 Assessment of the IQI mechanism

While the IQI appears to have been reasonably successful, there are a number of challenges associated with implementing this type of mechanism. If a similar mechanism is to be implemented in New Zealand, it would be important to recognise these challenges and consider how they may be overcome. We discuss these in turn below:

- potential for gaming by the regulated businesses;

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19 Specifically, the DNOs were only allowed to submit error corrections and genuinely new information in their updated forecasts.

- the problem of risk aversion;
- calibrating the matrix and the strength of the incentives; and
- potential for gaming by the regulator.

Potential for gaming by the regulated businesses

As noted earlier, regulated businesses have an incentive to overstate cost forecasts in order to try and influence the regulator to allow higher baseline costs. Although the IQI provides incentives to reduce this problem, it does not eliminate the problem entirely.

In particular, if the businesses think that they can influence the regulator's baseline cost forecasts by submitting high forecasts, they will continue to have an incentive to inflate forecasts. If there are a number of iterative forecasting rounds then there is greater opportunity for the businesses to influence the regulator, and so the businesses will have an even greater incentive to inflate their costs.

- In the initial round, a business can focus on influencing the regulator's baseline by inflating its forecasts, without having to worry about its position in the IQI matrix. The regulator will always try to reduce the costs the business submits in its initial forecast, so the business will not have an incentive to reveal its expected costs in the initial round.
- In the final round, once the business has influenced the regulator's baseline by inflating its initial forecast, the business can then position itself optimally in the IQI matrix in accordance with its true view of its achievable costs, the level of expenditure uncertainty the business faces and its degree of risk aversion (see below).

These incentives to game the system can be reduced if the regulator:

- commits to generating its baseline forecast independently of the business's forecast and
- limits the opportunity for the businesses to re-submit modified cost forecasts after the regulator's baseline forecast has been revealed.

For example, in Great Britain Ofgem develops independent baseline forecasts using a range of different techniques in addition to looking at the DNOs' forecasts,[20] while Ofwat has imposed restrictions on the extent to which water companies may change their initial forecasts when submitting final forecasts.

However, price controls in Great Britain are typically interactive, iterative, and long-running processes. Regulators there have found that information asymmetry

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20 *Inter alia*, Ofgem uses asset replacement modelling with unit costs, load-related expenditure forecasts based on peak demand forecasts, benchmarking analysis and other comparisons across companies, outturn historical performance and specialist engineering scrutiny.

makes it difficult to establish robust, independent forecasts without at least some reference to the companies' forecasts. There is also likely to be further information revealed during a price control review which will require forecasts to be revised and updated. As explained below, it is not necessarily appropriate to assume that the regulator's baseline forecast is the most accurate or efficient. In principle, the businesses should ideally be given the opportunity to convince the regulator of why their forecasts are justified and efficient (and potentially superior to the regulator's).

In general, therefore, there is a balance to be struck between limiting the freedom for businesses to re-submit forecasts (so as to strengthen the incentive for accurate forecasting and information revelation at the first step under the IQI) while making full use of new information. If the processes are designed well and established clearly *ex ante*, the IQI can offer the regulator more confidence that it can use the businesses' cost forecasts to set allowances. Indeed, this is the one of the key benefits of having truth-telling incentives in the first place. Establishing a mechanism to improve businesses' forecasting accuracy and then restricting the use of those forecasts in determining allowances would not make the best use of the information revealed through the operation of the mechanism. A well-defined process of engagement can be combined with the IQI so that the companies have the opportunity to convince the regulator that their forecasts are correct.

The problem of risk aversion

Ofgem's calibration of the DPCR4 and DPCR5 menus did not reflect the fact that DNOs may be risk averse. The incentive properties of the matrices presented above rest on the assumption that the businesses have a fairly strong idea of what their costs will be in future. However, in reality, regulated businesses may face just as much uncertainty about what their future costs will be as the regulator.

If this is the case, the businesses may be willing to sacrifice some expected payoff from the matrix in exchange for less exposure to cost risk. Even if the businesses' forecasts do not influence the regulator's forecasts, the businesses would know that inflating forecasts would increase their allowed expenditure and reduce incentive strength. In the calibration of the DPCR4 and DPCR5 IQIs, DNOs' expected payoffs did not decrease by much if they overstated their costs by a relatively small amount.

For example, consider a business who believed its expenditure would be 100 or 120 each with fifty percent probability. Under DPCR5, the DNO would face the following potential payoffs from choosing between a forecast of 110 (the risk neutral choice) and 120 (the risk averse choice):

- Forecast 110 (Allowed expenditure 102.50 Incentive rate 0.45, Additional income 1.13):

- If actual expenditure is 100: Payoff is 2.25
- If actual expenditure is 120: Payoff is -6.75
- Expected payoff is -2.25

- Forecast 120 (Allowed expenditure 105.00 Incentive rate 0.40, Additional income -0.50):
  - If actual expenditure is 100: Payoff is 1.50
  - If actual expenditure is 120: Payoff is -6.50
  - Expected payoff is -2.50

Therefore, a risk averse DNO may forecast 120 instead of 110 to avoid the risk of an additional 0.25 penalty if actual expenditure were to be 120, in exchange for a slightly lower (more negative) expected payoff. In effect, DNOs were able to gain a level of 'insurance' against cost risk by inflating forecasts, at fairly low cost in terms of potentially foregone rewards.

To deal with risk aversion, the matrix could be calibrated so that the payoffs for a given level of actual expenditure fall more dramatically as the businesses increase their forecasts. This would mean that businesses would have to sacrifice a greater expected payoff in exchange for less risk. The businesses would therefore have a greater incentive to take on cost risk and manage it appropriately. However, as we note below, tweaking the calibration of the IQI matrix while retaining incentive compatibility is not necessarily easy. An alternative way of tackling risk aversion would be to index the baseline, such that the baseline varies with changes in input prices.

Calibrating the matrix, and getting strong enough incentives

In calibrating the IQI matrix, the regulator needs to trade-off two primary concerns, namely:

- giving the IQI matrix enough 'bite' so that it becomes worth the extra effort from the businesses to improve their ability to forecast minimum achievable costs; while
- balancing the exposure of the businesses to the risk of forecasting error, and limiting the possibility for excess returns or losses.

Arguably, the rewards parameters set out in **Figure 6** and **Figure 7** would not provide businesses with a strong enough incentive to perform thorough business planning. **Figure 6** shows that the difference between each of the columns in the sliding scale matrix in terms of additional return was of the order of 4-5 bps of pre-tax return (assuming the company spends to its plan). The incentives for truth-telling were strengthened at DPCR5. However, strengthening or tweaking the matrix calibration is not simple. Small changes to the rewards parameters can quickly affect the incentive compatibility properties of the matrix. In addition,

increasing the distance between rewards in each column towards the middle of the matrix is likely to introduce too much risk at the extreme ends of the matrix, given the need to retain incentive compatibility. This is potentially undesirable, particularly when there is likely to be a degree of forecasting error (by the businesses and by the regulator).

Finally, as explained above, the regulator must decide at what stage of the price control review it will reveal the parameters of the matrix to the networks. The incentives will be more effective if businesses know the final IQI matrix before they submit their forecasts, since they can tailor their investment in effort to improve forecasting in the knowledge of the payoffs they can expect. This typically has not occurred in Great Britain. Instead, Ofgem has relied on the DNOs knowing that a matrix will be applied without knowing the parameters of the matrix *ex ante*.

Can the IQI be gamed by the regulator?

A final concern for the application of the IQI is that the matrix presumes that the regulator's forecast of 100 is itself unbiased. This may not be true because the mechanism potentially provides the regulator with an incentive to be more aggressive with its baseline view. The IQI provides:

- Greater rewards to businesses *for a given level of actual expenditure* the closer they are to the regulator's benchmark (for example); and
- Greater rewards to businesses *for making a given expenditure saving* the lower their expenditure is relative to the regulator's benchmark. For example, a businesses is rewarded:
  - 2.5 for a saving of 5 from 100 to 95 if it forecast 100; and
  - 2 for a saving of 5 from 120 to 115 if it forecast 120.

  This follows from the way the incentive rate falls as the businesses' forecast expenditure climbs.

Set against this prospect in Great Britain is the regulator's statutory duty to ensure that the companies remain financeable under their price control proposals. In jurisdictions where similar obligations on the regulator do not exist, such as in New Zealand, an IQI mechanism might (all else being equal) be more susceptible to opportunistic conduct by the regulator.

British regulators also typically interpret the customer interest as not just about achieving the lowest possible cost, but achieving the best possible value for money, including allowing higher costs where they are merited to, for instance, improve network performance. As noted above, Ofgem's main concern about introducing the sliding scale mechanism at DPCR4 appears to have been to allow the companies opportunities to over-spend uncertain capex allowances, given an environment where there was a need for increasing investment.

The more mechanistic the regulator's approach to establishing its baseline forecast (e.g. through statistical forecasting models that are easily replicable), the more limited would be the regulator's ability to game its cost forecasts.

Related to the question of whether the regulator can game the IQI is the perhaps more fundamental question of whether the premise of the IQI – that the regulator's baseline forecast of 100 is the 'right' forecast – is correct. It is not necessarily the case that a regulator has developed more robust forecasting techniques than the businesses themselves. Yet the returns achieved through the IQI matrix depend heavily on the regulator's own forecast.

Hence, there is clear potential for forecast error not only by the businesses but also by the regulator. In this context, a company that happens to have the same (potentially poor) forecast as the regulator would receive a reward under the IQI, while a company that has a (potentially good) forecast which is further away from the regulator's may be penalised.

This outcome represents a potentially unfair distribution of returns, and would weaken the credibility of the system as a tool for improving forecasting. The regulator therefore needs to commit to ensuring that its own forecasts are determined transparently and open to scrutiny, as well as committing to invest effort in determining as robust a forecast as it possibly can.

4.2.4 Lessons

In summary, the experience from Great Britain with the sliding scale and IQI mechanism suggests the following lessons can be learned for regulators seeking to design an IQI scheme from scratch:

- Menu regulation is a useful tool for improving forecasting accuracy, but it is unlikely to entirely remove the problems of gaming in the regulatory process. Careful attention needs to be paid to the design and calibration of the menu and to the rules and processes surrounding the price control review and the employment of IQI, so as to minimise the possibility of gaming.
- Regulators should be clear about their reasons for introducing menu regulation and their long-term intentions for its development. In particular, improved forecasting by the networks is unlikely to be achieved overnight. Networks therefore need to be given sufficient scope and time to investigate and understand their businesses better and improve their forecasting. This will likely require increased resources to be devoted to business planning processes. Advanced knowledge and understanding of how the IQI will work will aid this process.
- Since the IQI is an incentive mechanism, in order to be as effective as possible, the businesses would need to invest effort in understanding: how the scheme would work, and the economic consequence, in terms of the payoffs and penalties embodied within the IQI matrix, of adopting different

strategies. To this end, a considered rollout of the scheme would be more desirable than an abrupt introduction.

- Menu regulation is likely to entail greater regulator and business input and burden than a regulatory framework without menus (all else being equal). This is both because the design of the regulation itself is unlikely to be uncontroversial, and because the implication of encouraging greater forecasting accuracy is that the regulator will need to assess and respond to cost forecasts and justifications put to it by the networks. Nevertheless, a menu regulation framework would still be lower cost to administer than the approach taken in Australia, for instance, where businesses' forecasts are subjected to detailed regulatory scrutiny.

4.3 Potential application in New Zealand

4.3.1 In-principle application

At the 2012 DPP reset, the Commission expressed an interest in considering, at some point in the future, whether menu regulation could be used to improve the quality of the forecasts in the EDBs' AMPs going forward.

We consider that the IQI is compatible with the DPP framework applied in New Zealand, in that it could be applied in a manner that is relatively low-cost. In its simplest form, the IQI could be applied by:

- Using top-down models to produce its baseline forecast against which the EDBs' forecasts could be compared; and
- Adopting the DPCR5 IQI matrix to specify the initial expenditure allowance, incentive rate and payoffs for different levels of EDB-Commission forecast ratios and actual expenditure outturns.

In this way, the EDBs' AMP forecasts would influence their initial expenditure allowances as well as their ultimate financial positions. In our view, this would represent a clear improvement over the use of a top-down-style model, in isolation, to set EDBs' expenditure allowances. However, such a simplistic version of the IQI mechanism would not maximise its benefits. This is because:

- Two of the advantages of the IQI approach are that it avoids the presumption that the regulator's baseline is the 'right' forecast and it encourages businesses to invest in producing accurate forecasts of efficient costs. If EDBs' forecasts cannot affect the Commission's baseline (because it is set mechanically using a top-down model), then the benefits to the business from investing in planning are reduced and many of the potential benefits to customers of more accurate forecasts are foregone.
- If that the Commission's methodology for establishing its baseline forecast is known to the EDBs ahead of future resets, it could potentially be applied by

the EDBs to predict the Commission's baseline forecast. While this approach satisfies the requirement that the Commission's baseline forecast is developed independently of the EDBs' forecasts, the risk is that it:

- encourages the EDBs to forecast (and spend) to a level orientated to delivering a quality of service that matches the Commission's forecast expenditures, even if that level of expenditure is suboptimal or inefficient. This highlights the need to have strong quality maintenance and improvement incentives in place; and
- reveals to the EDBs the precise cost of the 'insurance' obtained by forecasting higher to receive a higher initial allowance and a lower incentive rate. This may encourage risk averse EDBs to deliberately forecast inaccurately (i.e. too high).

For these reasons, it would be ideal if the Commission could credibly commit to the possibility that it will change its baseline forecast established on the basis of well-justified forecasts provided by the EDBs. We envisage an arrangement whereby the Commission's methodology for establishing its baseline would provide a useful starting point from which the Commission could begin its discussions with the EDBs on setting cost allowances. The burden of proof could then be placed on the EDBs to demonstrate why their allowances should differ from the Commission's baseline, such as by putting forward independent audit assessments of their AMP forecasts. This interaction could occur through the Commission's DPP reset consultation process. On the basis of information submitted by the EDBs, the Commission would then be able to decide whether to retain its original forecast or to change its baseline view *in the direction of the EDB's forecast*. Changes to the Commission's baseline forecast towards the forecast of an EDB would simultaneously reward the EDB for investing in robust planning as well as undermine any self-conscious attempts by risk averse EDBs to 'self-insure' against high outturn expenditures. Limiting potential Commission forecast changes to those in the direction of the EDB's forecast (i.e. through a firm upfront commitment to never lower cost allowances below the original baseline) would overcome any perceptions of Commission gaming.

The question raised by such a process is whether it would be consistent with the required low-cost character of a DPP reset. At this point, we do not have a clear indication from the Commission on its view of the precise scope of engagement with the EDBs deemed acceptable under a DPP reset. However, we do not consider that the process outlined above would require anything like the time or resources involved in British or Australian energy regulatory resets. There ought to be a level of engagement that is both consistent with DPP requirements and that falls between the completely mechanical 'minimalist' approach described above and the much more resource-intensive British/Australian style of regulation.

If some degree of interaction along the lines above were considered acceptable, an implication is that the IQI would necessarily require the Commission to introduce 'stages' to its determination of DPP cost allowances. The Commission would need to take account of this when developing its timetable for the DPP reset process. Finally, while the Commission would have the option of altering its baseline forecast towards the EDBs' forecasts, the EDBs should not have the ability to subsequently amend their forecasts based on the Commission's revised forecast. Preventing such EDB revisions would minimise concerns about gaming by the businesses.

Although the IQI would dampen the possibility of unfairly creating winners and losers in such a context (relative to a pure statistical approach), it would not eliminate this possibility entirely. Ultimately, the IQI mechanism would still depend heavily on the baseline forecast developed by the Commission. For this reason, it is crucial that the process used to determine the baseline be as robust and transparent as possible.

In our view, the likelihood of benefits from the use of an IQI-type mechanism would be further enhanced if there was:

- regulatory commitment that the IQI will continue to be used over multiple price controls, with the incentives potentially being tightened up at each review;
- some institutional memory on the part of the regulator to retain or adapt features of the regime based on how it has worked in the past;
- appropriate processes for scrutinising any substantial cost outperformance *ex post*, as well as the requisite data collection templates/processes and regulatory resource required to implement these rules for assessing costs *ex post*;
- ongoing engagement between the Commission and the EDBs to ensure that all parties understand the mechanism.

4.3.2 Practical application – 2015 reset or a 'shadow trial'?

One option for implementing an IQI-type approach in New Zealand would be to proceed with a 'minimalist' approach in the forthcoming 2015 reset. The Commission's baseline forecast might be established using top-down forecasting models or other suitable approaches, and the EDBs' 2013 or 2014 AMPs expenditure forecasts could serve as their forecasts.

As noted in section 4.2.1, Ofgem introduced the original 'sliding scale' at DPCR4 after the DNOs had submitted their forecasts, although Ofgem did allow the companies an opportunity to revise their forecasts in light of the mechanism. Only some companies were able to take advantage of this opportunity. In our view, such an approach would not be desirable for the 2015 reset. The

methodology to be used by the Commission to set its 'baseline' forecasts is still uncertain and an abrupt shift to a new unfamiliar regulatory process would create substantial uncertainty for businesses. The EDBs would have to be given an opportunity to:

- understand the mechanics of the scheme and work through the implications for their business;
- undertake additional analysis and planning to improve the accuracy and ambitiousness of their forecasts; and
- reformulate and resubmit their forecasts

All of these steps would likely extend significantly the timeframe for the reset.

During discussions with the ENA Working Group, the prospect of implementing a 'shadow trial' of the application of the IQI in New Zealand was raised. We consider the idea of a shadow test to be both reasonable and sensible. Such a test would allow the parties to understand more about how applying the IQI would affect cost allowances and value. Under such a trial, the EDBs networks would be able to:

- observe the cost allowances, sharing factor, and additional reward they would have ended up with had IQI been applied, thereby gaining an idea of what would be at stake financially under an IQI approach;
- re-examine their forecasting approaches closely and identify the areas in which the most significant improvements in forecasting could be made; and
- see what would have happened had they forecast differently and, therefore, the potential gains from investing additional effort to improve forecasting at the next review.

This learning may also be achieved with sufficient engagement and discussion between the parties ahead of a full deployment of the IQI. However a trial run of IQI would have the advantage of demonstrating clearly and practically, for each EDB, how the scheme would work and the implications for them. A shadow trial would also help the Commission understand the practicalities of implementing IQI fully.

A fairly low-cost way to introduce a shadow run would be to use directly one of the IQI matrices developed by Ofgem or Ofwat and using forecasts generated from top-down forecasting models as the Commission's baseline forecast.

In summary, we consider that:

- Menu regulation design would provide incentives for EDBs to produce accurate forecasts in their AMPs.

- Menu regulation (along with complementary mechanisms) has been effective in Great Britain, although within a more 'hands on' approach than could be applied under the DPP framework in New Zealand.
- Menu regulation is compatible with the DPP framework, but the implementation requires careful thinking about key areas outlined and the time and resources for the EDBs to develop more sophisticated forecasting capabilities.

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