EDB productivity

Submission on the CEPA Report

NZIER report to Major Electricity Users Group (MEUG)

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Key points

CEPA results raise challenging questions about EDB productivity

The ongoing decline in electricity distribution business (EDB) productivity is a challenging question for both EDBs and the Commerce Commission (the Commission) with respect to:

- DPP settings since 2012, as the Commission's expectations for EDB productivity over this period are far higher than those achieved by EDB based on the measures in the Cambridge Economic Policy Associates (CEPA) report[1]. The CEPA report does not provide any indication of how EDBs have adjusted to an apparent gap between the rate at which they were allowed to increase revenue and the expected rate at which their costs increased.
- The causes of lower than expected EDB productivity. The CEPA report has dismissed some of the suggested explanations while others are not likely to be material in explaining the sustained decline in EDB productivity.
- What has driven the reduction in the rate of decline in EDB productivity since 2014 (as estimated by the CEPA modelling).
- The outlook for productivity over DPP4 as EDBs scale up expenditure to prepare for the effects of electrification of light vehicle transport and process heat as well as increased household use of solar generation and batteries.

EDB opex productivity has been below Commission allowance for 2 DPP periods

CEPA estimate that total factor productivity has declined by an average of 1.2 percent per year over the period 2008 to 2023 but that the rate of decline has slowed since 2014 to about 0.5 percent per year. The partial productivity of operational expenditure has decreased by 1.3 percent per year over the period 2008 to 2023. In contrast to total factor productivity the rate of decline in operational expenditure accelerated from 0.8 percent per year before 2014 to 2 percent per year after 2014.

These estimates are well below the Commission's productivity allowances in its last three DPP decisions since 2012 as described below:

- For the 2012 reset[2] of the 2010 to 2015 default price quality path, the Commission assumed changes in total factor productivity and operational expenditure productivity of 0 percent per year.
- For the 2015 to 2020 default price quality[3] path, the Commerce Commission set a total factor productivity rate of change of 0 percent per year and an operational expenditure partial productivity rate of -0.25 percent per year.

1 CEPA, 'EDB Productivity Study, A report prepared for the Commerce Commission, 26 March 2024'

2 'Resetting the 2010-15 Default Price-Quality Paths for 16 Electricity Distributors, Date: 30 November 2012'. See page 7 Table X1 and note 8 for the setting of the total factor productivity allowance at 0 percent and page 81 para C31 for the opex partial productivity setting at 0 percent.

3 Default price-quality paths for electricity distributors from 1 April 2015 to 31 March 2020, Main policy paper, Date of publication: 28 November 2014. See section C pages 72 to 77 for discussion of the setting and see page X9 for the operating expenditure partial productivity setting. At note 150 on page 77, the Commission notes that *'Under the building blocks framework, there is no*

- For the 2020 to 2025 default price quality[4] path (DPP3), the Commerce Commission set both the total factor productivity and the operational expenditure partial productivity rates of change at 0 percent per year.

The Commission has noted in its DPP decisions in both 2015 and 2019 that overseas EDB productivity increases over time and rejected EDB submissions that the total factor productivity and the operational expenditure partial productivity factors should be set at negative values. Instead, the Commission has argued that improvements in productivity should be achievable.

The CEPA modelling does not provide any guidance on what the effect of the productivity difference is on the revenue received by EDBs and how they chose to reorganise the use of inputs to deliver outputs.

The reasons for EDB productivity decline are contested

The CEPA report acknowledges the difficulties in measuring EDB productivity but also links its approach to previous studies of EDB productivity in New Zealand and the approach used to EDB productivity studies in other countries. The CEPA modelling makes progress on considering possible explanations for the decline in EDB productivity. In particular:

- CEPA has analysed several of the potential reasons for the decline in productivity suggested by the EDBs in submissions on previous work but has argued that these are not material to its analysis.
- CEPA has identified several other factors that could be assessed for their contribution to the decline in productivity such as increase in insurance costs, changes in employee health and safety regulation and other changes in legislation that it has not been able to model. Some of these factors were rejected by the Commission as reasons for a step change in operating expenditure in the DPP3 decision[5]. In several cases (such as health and safety, tree regulations and climate change) the application for a step change was rejected because the step change was not regarded as significant or could not be robustly quantified and verified[6].

Different roles for operational expenditure and total factor productivity in DPP

Commission forecasts of operational expenditure productivity are included directly in the Commission's 'base, step, trend' model for setting operational expenditure allowances in its annual building block allowable revenue (BBAR) approach. There does not seem to be a

requirement for the same specification to be used to both base our decision on total factor productivity and operating expenditure partial productivity.

4 'Default price-quality paths for electricity distribution businesses from 1 April 2020 – Final decision, Reasons paper, Date of publication: 27 November 2019'. see page 6 for the levels. On page 21 X49 the Commission stated We have retained a partial productivity factor of 0%. This is because on balance, between the evidence of historical productivity in the electricity sector in New Zealand, comparable overseas jurisdictions, and other industries in New Zealand, we consider a neutral setting is appropriate for DPP3. We remain unconvinced that declining productivity in the past is predictive of future declines.

5 'Default price-quality paths for electricity distribution businesses from 1 April 2020 – Final decision, Reasons paper, Date of publication: 27 November 2019'. see pages 164 to 166 which listed twenty items where the Commission rejected requests for a step change. The list included: *health and safety (for example, reducing live lines work)', vegetation management regulation (tree regulations), labour skills shortages potentially exacerbated by the increased demand from Powerco's CPP capex programme, cyber security costs, insurance costs and climate change e.g. meeting Interim Climate Change Committee's electrification outcomes and responding to the climate change response amendment bill.*

6 'Default price-quality paths for electricity distribution businesses from 1 April 2020 – Final decision, Reasons paper, Date of publication: 27 November 2019'. see pages 171 to 173, Table A4 Analysis of step changes.

similar role for a capital productivity measure in the Commission's DPP decision making. The Commission's total factor productivity assumption (the 'X' in the formula 'CPI – X' only seems to be used to smooth BBAR across the DPP periods.

DPP4 capital expansion plans are likely to lower productivity further

The CEPA modelling is another stage in a series of reports about EDBs productivity that contrasts with Commission expectations for EDB productivity in DPP decisions. The CEPA modelling shows there is a wide gap between actual and expected EDB productivity but does not provide insights into what has caused the gap, how EDBs have responded, or how the gap might change in the future. These are important questions for the Commission in its DPP4 decision, particularly as EDBs have indicated they will need a 'step' increase in capital spending (primarily to renew assets and accommodate system growth) during DPP4 and have complained that operational expenditure allowances are too low.

Part of the planned increase in EDB capital expenditure over DPP4, is in preparation for increased customer demand and changes in services provided due to the anticipated replacement of fossil fuel energy with electricity. This pattern of spending is likely to further lower the productivity indexes measured in the CEPA report. In addition, some of the factors that EDBs have suggested as reasons for declining productivity such as insurance cost, health and safety and prevention of cyber attack, are also likely to require more expenditure to deliver the same output over the DPP4 period.

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1 Scope

1.1 Objective of the CEPA report

The purpose of this report is to provide brief comments on the key themes of the CEPA report and the implications that this report has for the Commission's decisions on DPP4. We note that the CEPA report is the first stage in a three-stage process by the Commission to assess the performance and efficiency of EDBs separately. The purpose of the Commission's assessment process is to meet a statutory objective (see section 1.2) but the findings of the CEPA report cover trends in operating expenditure productivity which are relevant to the DPP4 decision (see section 1.3). It is clear from the timeline for this process that the assessment of individual EDB efficiency will not inform the DPP4 decision:

> *For context, phase 2 of the study aims to develop a proof of concept for an EDB comparative efficiency study, while phase 3 aims to apply analytical technique(s) and methodology(ies) to produce EDB comparative efficiency analysis and performance assessment. We do not expect to initiate phase 2 of the study until the second half of the 2024 calendar year at the earliest, with most of the engagement more likely to occur after the November 2024 DPP4 reset decision.*[7]

(We note that even if the assessment of individual EDB efficiency were completed in time, the DPP process would probably only consider outlier results as it is not configured for a tailored approach to individual EDBs.)

1.2 Meet the statutory obligation and then what?

The Commission states that the purpose of the efficiency assessment is to meet a statutory obligation under s53B(2)(b)) of the Commerce Act to publish analysis of the change in EDB performance and relative performance over time[8].

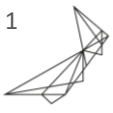
This explanation raises at least two questions on which it would be helpful to hear the Commission's views:

- As the primary tool used in the CEPA report is comparison of input and output indexes based on adding up individual EDB measures could the '*phase 2 of the study*' start with a 'phase 2a' that compares input and output indexes for operating expenditure based on the EDB data CEPA already has[9] and could this analysis be started now?

[7] Commerce Commission webpage, 'Productivity and efficiency study of electricity distributors' available at https://comcom.govt.nz/regulated-industries/electricity-lines/electricity-distributor-performance-and-data/productivity-and-efficiency-study-of-electricity-distributors

[8] Paraphrased from Commerce Commission webpage, 'Productivity and efficiency study of electricity distributors' available at https://comcom.govt.nz/regulated-industries/electricity-lines/electricity-distributor-performance-and-data/productivity-and-efficiency-study-of-electricity-distributors

[9] The CEPA report seems to have started on this track with the analysis with the inclusion of *'fixed effects'* in the modelling that capture '*the estimated cost impact of each EDB, assuming that the effects of unchanging, unobserved variables can be captured by an EDB-specific dummy variable. In this report we have not set out to consider or benchmark the relative productivity of EDBs, however, the introduction of FE changes the interpretation and value of the other variables. Without FE, the estimates look "across" the data, whilst with the inclusion of EDB FE the estimates instead look "within" the EDBs.'* See See CEPA, 'EDB Productivity Study, A report prepared for the Commerce Commission, 26 March 2024' pages 28 – 29.



- How does the Commission intend to use the results of the analysis of EDB relative performance in its price path decision-making.

1.3 Application to DPP4 decision

It is not clear what role the Commission intends the CEPA modelling to have in the DPP4 decision process for the following reasons:

- The CEPA study has a broader scope than the DPP4 decision as it considers EDBs not subject to DPP regulation ('exempt') as well as those that are ('non-exempt'). The modelling results for exempt EDBs show a faster decline in productivity than for non-exempt EDBs after 2014, particularly with respect to operating expenditure productivity.
- The CEPA study applies considerable effort to estimating total factor productivity, but this is only used to inform the smoothing of revenue over the DPP period.

The CEPA model results that the productivity of non-exempt EDB operational expenditure has deteriorated since 2014 to -1.5 percent per year is the result that is most relevant to the Commission's DPP4 decision.

The questions for the Commission in making its DPP4 decision that are not answered by the CEPA modelling are:

- What are the root causes of the decline in productivity?
- How does the productivity trend affect the reliability of EDB estimates for the output that would be delivered from their proposed expenditure?
- What can the Commission do to encourage EDBs to improve productivity?

2 CEPA model outputs

2.1 Productivity is difficult to measure accurately

Productivity is a measure of how efficiently an economy converts inputs into outputs and the change in productivity is measured by comparing changes in the ratio of inputs to outputs over time. If output increases faster than inputs, productivity has increased. Measuring productivity is complicated because of the difficulties in defining useful measures of output and inputs and in understanding the key drivers of changes in the mix of inputs required to produce a bundle of outputs and how the outputs are valued by consumers. The CEPA report notes that it is particularly difficult to estimate the annual capital input from regulated asset base data because the assets are long-lived and expanded in larger lumps than the increase in outputs.

However, these difficulties can be addressed or at least accepted by regulators in setting performance expectations for EDBs. Productivity improvement expectations are used by the regulator in the United Kingdom to set EDB returns and in Australia to reduce the operating expenditure allowances to efficient levels (in extreme cases).

2.2 CEPA model results

CEPA has analysed the change in EDB productivity for the period 2008 to 2023 for the Commission as the first stage in a three-stage process to develop measures that compare EDB efficiency and performance. The first stage completed by CEPA is focussed on measuring the productivity of EDBs as a group. However, the 28 EDBs vary widely in size and density of connections. The variation in EDB asset size is shown in section A.4, Table 4 at the end of this report.

CEPA has measured productivity for all EDBs as a group and for two subgroups of EDBs:

- 'Non-exempt' EDBs that are subject to Commission price-quality path regulation.
- 'Exempt' EDBs that are not subject to Commission price-quality path regulation.

In addition, the econometric approach, which models the time trend in costs not explained by other data, CEPA has also included a version of the model that estimates the cost impact of individual EDB on cost functions for EDBs as a group.

2.3 CEPA estimate that EDB productivity has declined

CEPA (using its index approach) estimate that total factor productivity has declined by an average of 1.2 percent per year over the period 2008 to 2023 but that the rate of decline has slowed since 2014 to about 0.5 percent per year. The analysis (see Table 1) considers two input indexes: capital services and operational expenditure, but only reports the partial productivity of operational expenditure separately.

Table 1 EDB Productivity measures

Index based method

EDB type	Total factor productivity			Opex partial productivity		
	2008 to 2023	Pre 2014	Post 2014	2008 to 2023	Pre 2014	Post 2014
Non-exempt	-1.20%	-2.60%	-0.40%	-1.10%	-1.00%	-1.50%
Exempt	-1.30%	-2.60%	-0.70%	-1.90%	-0.30%	-3.30%
Overall	-1.20%	-2.50%	-0.50%	-1.30%	-0.80%	-2.00%

Source: CEPA (2024), page 6, Table 3

The partial productivity of operational expenditure has decreased by 1.3 percent per year over the period 2008 to 2023 but in contrast to total factor productivity the rate of decline in operational expenditure accelerated from 0.8 percent per year before 2014 to 2 percent per year after 2014. This means that the slowdown in the decline in total factor productivity after 2014 is due to a much greater reduction in the rate of decline of capital services productivity. This part of the CEPA calculation is based on simple uniform assumptions about the RAB and the rate of use of capital assets. As this is a key component of the reduction in the decline in productivity after 2014, it is important to have a clear understanding of the sensitivity of this estimate to both the change in assumptions and the outlook for this measure as EDBs embark on higher levels of capital spending over DPP4.

The CEPA model results exclude consideration of the change in reliability of service as an output (which is included in the Australia and United Kingdom measures). When reliability is included, the productivity decline is larger.

The total factor productivity estimates are similar for 'Non-exempt' and 'Exempt' EDBs, but the operational expenditure performances are quite different. The operational expenditure productivity for 'Non-exempt' EDBs is relatively stable before and after 2014. However, the decline in operational expenditure productivity for 'Non-exempt' EDBs accelerated from 0.3 percent per year before 2014 to 3.3 percent per year after 2014.

The CEPA models measure changes in EDB productivity using two methods:

- Comparison of indexes of outputs and inputs (a conventional method). CEP separates the measurement of productivity pre and post 2014.
- Modelling of the production function for EDB services and comparison of the time trend in production costs to the change in production values. This approach is a cross check on the index approach. CEPA also used this analysis to:
  - Consider the change in EDB productivity year by year to get insight into how much EDB productivity changed in the years around 2014.
  - Roughly estimate the impact of individual EDB on the trend in production cost.

3 Productivity change analysis

3.1 Comparing input and output indexes

The CEPA modelling compares growth in operating expenditure and 'flow of capital services' with changes with subsets of EDB output measures listed in Table 2 below. It is clear from Table 2 that the real operating expenditure has grown more quickly than nearly all the output measures both before and after 2014. Table 5 and Table 6 in section A.4 provide data on the change in indexes for non-exempt and exempt EDBs separately.

Table 2 All EDB input and output measure

Index based method

EDB type	Chang in index over the period		
	2008 to 2023	Pre 2014	Post 2014
Inputs			
Real Opex	45%	12%	29%
Real flow of capital services	39%	35%	3%
Output			
Transformers (MVA)	33%	11%	20%
Overhead line capacity (MVA-km)	11%	4%	7%
Underground line capacity (MVA-km)	40%	13%	24%
Connections (Count)	16%	4%	11%
Circuit length (km)	8%	2%	6%
Energy delivered (GWh)	16%	8%	7%
Maximum demand (GW)	11%	5%	6%
Ratcheted maximum demand (GW)	23%	15%	7%
Planned outage (minutes)	4.31	1.35	3.18
Unplanned outage (minutes)	2.50	1.09	2.28

Source: NZIER analysis of CEPA file 'FullDatasetEDB.csv'

The CEPA index estimate of the change in productivity is based on the average of 9 models. A model is defined as a comparison of the two input indexes compared with a weighted average of three or four of the nine output measures. (The two reliability measures - planned and unplanned outages are combined into a single measure.) The combinations of output indicators are listed in Table 3 below.

The CEPA report implies that the average of the models is a simple average, so considering the number of times each output appears in each model gives an indication of the key output measures. The output measure 'number of connections' is the most common output measure and is used in seven of the nine models, followed by 'circuit length' which is used in five of the nine models and together with 'number of connections' in four of the nine models.

In other words, the number of connection and to a lesser extent the density of customers are the main measures of EDB output. The least frequently used measures are 'energy delivered' and 'transformer capacity'.

Table 3 Output indicators used in productivity models

Output subsets used in each model. The model numbers are listed in the top row

Output indicator	1	2	3	4	5	6	7	8	9
Transformer capacity		Yes				Yes			
Overhead line capacity (MVA-kms)							Yes	Yes	Yes
Underground cable capacity							Yes	Yes	Yes
Connections	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Circuit length	Yes		Yes	Yes	Yes	Yes			
Energy delivered		Yes	Yes						
Ratcheted maximum demand[1]			Yes	Yes		Yes			Yes
Reliability – Total minutes lost					Yes				
Transformer capacity		Yes				Yes			

Note:

1 Ratcheted maximum demand for the current year Y is the highest demand over the period 2008 to the year Y in which the maximum demand is measured.

Source: CEPA (2024), page 6, Table 3

CEPA considered additional combinations of outputs but limited its reporting to the nine models shown in Table 3 above. The operating expenditure[10] productivity indexes for non-exempt EDBs in 2023 are on average 82 percent to 86 percent of the productivity index in 2008. There is a wide variation in the results from the models with the:

- Lowest productivity index from model 5 with:
  - Output measures of connection numbers, circuit length and reliability.
  - 2023 productivity index at 61 to 81 percent of the 2008 productivity index.
- Highest productivity index from model 9 with:
  - Output measures of ratcheted maximum demand, overhead line capacity and underground line capacity.
  - 2023 productivity index at 86 to 89 percent of the 2008 productivity index.

4 Testing materiality of potential explanations

4.1 Factors affecting the productivity analysis

The CEPA modelling does not provide an explanation for the cause of the decline in EDB productivity. However, the CEPA report does acknowledge the potential effect of choice of methodology and changes in the service provided by EDBs on the measurement of productivity.

[10] See CEPA, 'EDB Productivity Study, A report prepared for the Commerce Commission, 26 March 2024' pages 42- 43, Table 4.6

4.2 Methodology issues

The CEPA report lists several methodology issues that may explain the decline in productivity indexes. These include:

- Change in EDB outputs have not been captured in the output measures used in the CEPA modelling such as:
  - Changed business practices to reduce workplace injuries, improve resilience to cyder attack or provide better services to customers.
  - Provision of new services as part of the electrification of the energy sector in response to climate change.
- EDB replacement of capital expenditure with operating expenditure has not been recognised.
- Reliability is not being valued correctly.
- Prices used to value inputs or outputs may not be granular enough to reflect the values that are relevant to EDBs.

The CEPA report does not express a view on the materiality of these issues but suggests that they could be the subject of further consultation about the development of new output measures.

4.3 Operating expenditure issues

The CEPA report specifically considered EDBs arguments that operating expenditure has increased because EDB operating environments have become more complex. The causes of increased complexity claimed by EDBs include:

- Changes to legislation such as the Health and Safety at Work Act 2015 and Heritage New Zealand Pouhere Taonga Act 2014.
- Increasing frequency of severe weather events.
- Rising insurance costs.
- Investment in cyber security.
- Use by customers of energy efficient technologies, generators and batteries.
- Impact of Covid 19.

CEPA looked for changes in the composition of operating expenditure over the period 2013 to 2023 that might reflect specific responses to the factors listed above but could not find any clear evidence that *'a particular category of operating costs that has increased more than other categories.'*[11] CEPA concluded that this could suggest that EDB productivity had declined or that measurement of productivity did not recognise either:

- A more complex operating environment has increased EDB costs across the board.
- Output measures do not include the drivers of the cost increase.

[11] CEPA, 'EDB Productivity Study, A report prepared for the Commerce Commission, 26 March 2024' page 64.

4.4 Observation

The CEPA report accepts that there are potential issues that could change how operational expenditure increases are measured against increases in outputs but does not suggest what the impact of the changes might be on the estimated change in productivity.

At the end of the CEPA analysis we are left with:

- Clear evidence of a decline in productivity indexes based a set of output measures that are consistent with previous New Zealand studies.
- No clear indication of how much of the decline in productivity can be addressed by changing measurement methods.

5 Comparison to overseas EDB productivity

5.1 Overseas EDB productivity

In setting operating expenditure productivity allowances, the Commission has referred to the difference between New Zealand EDB productivity measurements and those for overseas EDBs. In particular:

- 2015 to 2020 DPP decision[12]: *We have also considered that Economic Insights found only two instances where estimates of historic improvements in total factor productivity overseas were estimated to be negative, with the remaining estimates ranging from 0% to 1.5%.*
- 2020 to 2025 DPP3 decision[13]: *5.67.1 evidence of positive productivity in electricity distribution sectors across the world, including productivity studies which take quality of outputs into account.*

5.2 Recent overseas examples

The Commission DPP decisions refer to EDB productivity studies completed before 2020 and arguably do not include recent impacts such as the effect of COVID 19 or the take-up of electrification initiatives. However, recent examples from Australia and the UK show that operational expenditure productivity has improved recently and the UK regulator expects this improvement to continue.

5.2.1 Australia

The 2023 annual benchmarking report[14] for EDBs in Australia noted the following:

- Total factor productivity (TFP) decreased by 0.2 percent over 2022 (after increasing by 1.8 percent over 2021and 1.3 percent in 2020).

12 'Default price-quality paths for electricity distributors from 1 April 2015 to 31 March 2020, Main policy paper, Date of publication: 28 November 2014'. See page X9. Page 72

13 'Default price-quality paths for electricity distribution businesses from 1 April 2020 – Final decision, Reasons paper, Date of publication: 27 November 2019' page 107

14 Australian Energy Regulator (AER) 'Annual Benchmarking Report, Electricity distribution network service providers, November 2023', pages 21 for the first four bullet points and page 48 for the last bullet point.

- The decrease in 2022 was mainly due to a decrease in reliability which reduced TFP by 2.1 percentage points.
- Opex reductions contributed one percentage point to TFP growth over 2022.
- TFP has decreased over the period 2006 to 2022 by 0.3 percent per year mainly due to the much faster decline in capital productivity of 0.9 percent per year.
- Since 2012 opex partial factor productivity has increased on average by 2.9% each year.

5.2.2 Ofgem

The Ofgem electricity distribution price control decision RIIO-ED2[15] for the period from 1 April 2023 to 31 March 2028 included an efficiency challenge of 1 percent per year. The efficiency challenge is based on the *75th percentile of the efficiency scores in the first year of RIIO-ED2 followed by a glide path to the 85th percentile, which will be the benchmark in the last two years of RIIO-ED2.*

Ofgem modelling[16] for the efficiency challenge is based on up to 11 years of historical data (6 years from RIIO-ED1 and 5 years from DPCR5).

5.2.3 Observation

In addition to the productivity measurement results, the AER and Ofgem use a wider range of productivity measures than the CEPA modelling and for Ofgem a different approach to the inclusion of productivity objectives in EDB price path setting.

Both the AER and Ofgem routinely include service reliability measures in their productivity assessment, report partial productivity indexes for more inputs than just operating expenditure and include stochastic frontier analysis as a tool for measuring and comparing EDB efficiency.

In addition, Ofgem seems to include a 'progressive' productivity improvement objective as a key component of its price quality path and seems to be comfortable to set the challenge based on a relatively short data history.

6 Next steps

The CEPA report is an informative and timely analysis of the trends in productivity indexes of EDBs (as a group). However, it is not clear what the intended uses of the report will be. We suggest that the Commission consider the following next steps:

- Clarify the relevance of the CEPA productivity modelling to the Commission's DPP4 decision making.
- Consider rapid extension of the CEPA analysis to individual EDBs, phase 2a as suggested in section 1.2

[15] Ofgem 'RIIO ED2 Final Determinations Core Methodology, Document Publication date: 30 November 2022', page 220. RIIO stands for 'Revenue = Incentives + Innovation + Outputs ', also described as 'setting revenues using Incentives to deliver innovation and outputs'

[16] Op cit, page 349

Appendix A DPP decisions on operating expenditure productivity

A.1 Productivity definitions used in DPP decisions

The role of the partial operating expenditure productivity factor and the total productivity factor in the DPP revenue cap setting are different. Total factor productivity analysis is used to set 'X' in the formula 'CPI – X' which is used to smooth annual building blocks allowable revenue (BBAR) over the DPP period.

> *C2 As explained in Chapter 3, in each year of the regulatory period, we apply a cap to the allowable rate of change in the price of electricity distribution services, net of pass-through costs and recoverable costs. The rate of change is expressed in the form CPI–X%, where 'CPI' reflects general inflation, and X is a percentage differential known as the 'X-factor'.* [17]

The partial productivity operating expenditure productivity factor is used by the Commission in the DPP to forecast operating expenditure which is a component of the BBAR. The formula used is:

> Opex(t) = opex(t-1) × (1 + Δ due to network scale effects) × (1 + Δ input prices) × (1 – Δ partial productivity for opex) ± step changes[18].

A.2 Productivity decisions 2015 to 2020

A.2.1 2015 to 2020 operating expenditure productivity

> *Linkage to estimates of partial productivity*
>
> *C26 Improvements in productivity associated with either operating expenditure or capital expenditure will reduce the amount of expenditure a distributor needs to provide the service. As set out in our Low Cost Forecasting Paper:*
>
> *C26.1 We have taken expected changes in operating expenditure partial productivity into account when forecasting operating expenditure; and*
>
> *C26.2 Our partial productivity assumption for operating expenditure is informed by evidence on past trends in productivity in New Zealand and overseas, as well as consideration of whether those trends are likely to continue in future.*
>
> *C27 As part of our draft decision, we invited views on the productivity study undertaken by Economic Insights, which also included evidence relating to partial productivity for operating expenditure. Consistent with the assumption for overall productivity, we have assumed that partial productivity for operating expenditure will change by -0.25% per annum over the upcoming regulatory period.*[19]

[17] 'Default price-quality paths for electricity distributors from 1 April 2015 to 31 March 2020, Main policy paper, Date of publication: 28 November 2014' page 71

[18] 'Default price-quality paths for electricity distribution businesses from 1 April 2020 – Final decision, Reasons paper, Date of publication: 27 November 2019', page 151

[19] 'Default price-quality paths for electricity distributors from 1 April 2015 to 31 March 2020, Main policy paper, Date of publication: 28 November 2014'page 77.

A.2.2 2015 to 2020 total factor productivity

Productivity-based rate of change[20]

C5 Our final decision is to apply a productivity-based rate of change of 0% for the upcoming regulatory period. This decision is in part based on a study into the long-run average productivity improvement rate of electricity distributors in New Zealand, conducted by Economic Insights Pty Limited (Economic Insights).

C6 Our decision for the productivity-based rate of change differed to the recommendation of -1% by Economic Insights and Pacific Economics Group's recommendation of between -1.66% and -2.12%. 140 We decided to base our decision on specifications which better captured a wider range of outputs than the specification on which Economic Insights based its recommendation. 141

C7 We have also considered that Economic Insights found only two instances where estimates of historic improvements in total factor productivity overseas were estimated to be negative, with the remaining estimates ranging from 0% to 1.5%.142

C8 Submissions generally suggested a greater reliance on the historic-based productivity assessment provided by Economic Insights and the Pacific Economics Group. However, we are mindful that these productivity estimates reflect past economic conditions which may not necessarily reflect future economic conditions.143Therefore while we have based or productivity decisions on historic information we have also taken a forward looking view.
Productivity in 201 – 2025 price quality path

A.3 Productivity in 2020 – 2025 price quality path (DPP3)

A.3.1 Operational expenditure productivity improvement expectations[21]

5.66 We have retained a partial productivity factor of 0% for the DPP3 period.

5.67 NERA provides strong evidence to show that historic partial productivity is negative.149 However, we remain unconvinced that declining productivity in the past is predictive of future declines. We consider improvements in productivity are achievable due to:

5.67.1 evidence of positive productivity in electricity distribution sectors across the world, including productivity studies which take quality of outputs into account;150

5.67.2 evidence of positive productivity in comparable sectors within New Zealand; and

5.67.3 a changing policy environment with a greater focus on innovation and technology.

[20] 'Default price-quality paths for electricity distributors from 1 April 2015 to 31 March 2020, Main policy paper, Date of publication: 28 November 2014'. See page X9. Page 72

[21] 'Default price-quality paths for electricity distribution businesses from 1 April 2020 – Final decision, Reasons paper, Date of publication: 27 November 2019' page 107

5.68 The reason we do not set the partial productivity factor based on historic performance is because continually decreasing productivity is generally not associated with workably competitive markets. Adopting a negative growth rate may entrench declines in partial productivity and weaken incentives to improve efficiency.

5.69 Similarly, however, we do not consider it appropriate to use a high productivity factor to 'incentivise' distributors to find gains. This would have the effect of passing gains onto consumers in anticipation of their discovery, which is not the purpose of the productivity factor.

No step changes in relation to issues suggested by EDB

X48 We have not accepted any step changes proposed by stakeholders. In general, this is because we have not been able to verify the quantities involved, or because other DPP tools (such as reopeners or recoverable costs) are better at managing any potential increases or decreases in expenditure. [22]

A58 We have not made any step changes in response to submissions. Submissions were largely qualitative, so we lacked information to show if step changes proposed by submitters met the significance or robustly verifiable criteria. We appreciated receiving cost evidence from Wellington Electricity and Vector as this helps build our evidence base. However, we were unable to tell whether these costs were efficient for the duration of DPP3.[23]

A.3.2 2020 to 2025 total factor productivity[24]

6.3 The rate of change is expressed in the form CPI-X, where 'CPI' reflects general inflation, and X is a percentage differential known as the 'X-factor'.

6.4 In determining the X-factor, we are required to determine a default rate of change in price that is based on the long-run average productivity improvement rate of distributors. We may consider the long-run average productivity improvement rate achieved by distributors in New Zealand and/or comparable countries.153 …

6.6 A default X-factor of 0% will apply to all distributors for the DPP3 regulatory period.

6.7 Based on our analysis of partial factor productivity in Attachment A we consider 0% appropriate.

22 'Default price-quality paths for electricity distribution businesses from 1 April 2020 – Final decision, Reasons paper, Date of publication: 27 November 2019' page 21.

23 'Default price-quality paths for electricity distribution businesses from 1 April 2020 – Final decision, Reasons paper, Date of publication: 27 November 2019' page 164.

24 'Default price-quality paths for electricity distribution businesses from 1 April 2020 – Final decision, Reasons paper, Date of publication: 27 November 2019' page 107.

A.4 Additional data

The total RAB in 2022 for: all EDBs was $14,492.6m, non-exempt EDBs $11,412.6m and exempt EDBs $3,079.9m.

Table 4 EDB Regulated asset base (RAB)

Total closing value in $m for 2002

Non- exempt EDB	Value	Share of non-exempt EDB	Share of all EDB	Exempt EDB	Value	Share of exempt EDB	Share of all EDB
Vector Lines	3,642.0	31.9%	25.1%	WEL Networks	644.3	20.9%	4.4%
Powerco	2,285.8	20.0%	15.8%	The Power Company	457.4	14.9%	3.2%
Orion NZ	1,308.0	11.5%	9.0%	Counties Energy	374.5	12.2%	2.6%
Wellington Electricity	743.6	6.5%	5.1%	Northpower	328.4	10.7%	2.3%
Unison Networks	740.1	6.5%	5.1%	MainPower NZ	282.3	9.2%	1.9%
Aurora Energy	645.3	5.7%	4.5%	Marlborough Lines	248.7	8.1%	1.7%
EA Networks	321.9	2.8%	2.2%	Electra	226.8	7.4%	1.6%
Top Energy	320.0	2.8%	2.2%	Waipa Networks	145.4	4.7%	1.0%
The Lines Company	250.9	2.2%	1.7%	Network Waitaki	110.9	3.6%	0.8%
OtagoNet	240.5	2.1%	1.7%	Westpower	110.8	3.6%	0.8%
Alpine Energy	238.1	2.1%	1.6%	Centralines	67.2	1.5%	0.5%
Network Tasman	191.5	1.7%	1.3%	Scanpower	50.0	1.6%	0.3%
Eastland Network	188.0	1.6%	1.3%	Buller Electricity	33.1	1.1%	0.2%
Horizon Energy	150.7	1.3%	1.0%				
Electricity Invercargill	99.9	0.9%	0.7%				
Nelson Electricity	46.3	0.4%	0.3%				

Source: NZIER

Table 5 Non-exempt EDB input and output measure

Index based method

EDB type	Total factor productivity		
	2008 to 2023	Pre 2014	Post 2014
Inputs			
Real Opex	38%	13%	22%
Real flow of capital services	40%	34%	5%
Output			
Transformers (MVA)	31%	9%	20%
Overhead line capacity (MVA-km)	12%	4%	8%
Underground line capacity (MVA-km)	34%	9%	23%
Connections (Count)	15%	4%	10%
Circuit length (km)	8%	2%	6%
Energy delivered (GWh)	17%	9%	7%
Maximum demand (GW)	9%	4%	5%
Ratcheted maximum demand (GW)	22%	15%	6%
Planned outage (minutes)	3.39	0.30	2.38
Unplanned outage (minutes)	1.61	0.15	1.26

Source: NZIER analysis of CEPA file 'FullDatasetEDB.csv'

Table 6 Exempt EDB input and output measure

Index based method

EDB type	Total factor productivity		
	2008 to 2023	Pre 2014	Post 2014
Inputs			
Real Opex	65%	10%	50%
Real flow of capital services	37%	38%	-1%
Output			
Transformers (MVA)	41%	18%	19%
Overhead line capacity (MVA-km)	11%	4%	6%
Underground line capacity (MVA-km)	78%	35%	32%
Connections (Count)	20%	6%	14%
Circuit length (km)	8%	3%	4%
Energy delivered (GWh)	12%	5%	7%
Maximum demand (GW)	21%	12%	8%
Ratcheted maximum demand (GW)	30%	15%	13%
Planned outage (minutes)	3.07	0.52	1.68
Unplanned outage (minutes)	1.05	-0.15	1.40

Source: NZIER analysis of CEPA file 'FullDatasetEDB.csv'