NZ EDB 2023 AMP REVIEW

Forecasting & Planning Assessment Report

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Innovative Assets Engineering

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NZ EDB 2023 AMP REVIEW FORECASTING & PLANNING ASSESSMENT REPORT

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EXECUTIVE SUMMARY

Background

IAEngg was engaged by the NZ Commerce Commission (ComCom) in July 2023 to undertake a review of the 2023 Asset Management Plans (AMPs) of the 29 Electricity Distribution Businesses (EDBs).

29 EDBs

ELECTRICITY DISTRIBUTION BUSINESSES

Specifically, the Commission asked IAEngg to identify and analyse key drivers of change, uncertainties and variables in financial and demand forecasts within the 2023 AMP and provide an opinion on the reasonableness of the variations.

The intended outcomes of the EDB 2023 AMPs review are to:

- gain an independent opinion on the level of assurance that can be had in the demand and expenditure forecasts contained in the AMPs, including the key drivers of change and areas of uncertainty;
- understand areas for improvement to information disclosure requirements aligned to good electricity industry practice asset management plans;
- identify good industry practice in planning and forecasting; and
- identify next steps to gain further assurance around forecast information to be used for DPP reset(s).

The review of 2023 AMPs holds particular significance for ComCom as the AMPs are likely to include expenditure forecasts that are linked to new investment drivers in response to decarbonisation through electrification and in adapting to climate change (e.g. extreme weather events and managed retreat), as well as reflecting other areas of increased risk (e.g. natural hazards, supply chain and cyber security).

Challenges

The purpose of the AMPs is broad but they do not provide full justification of forecast expenditure, so the AMPs are limited in the information they contain for this consultancy project. They do not include the models used by EDBs to forecast demand nor do they directly outline the relationship between inputs used in expenditure forecasts and the expenditure forecasts. Further, the AMPs do not present the inputs, in particular the new drivers, used to forecast demand or expenditure in a defined or consistent way. As a result, we were not able to assess the reasonableness of forecast expenditure though we have assessed the reasonableness of the approach used to develop the expenditure forecast.

Further, the review task was complex due to a number of factors:

- The AMPs are lengthy documents and it was not possible to review the 29 AMPs from front to back within the given timeline. It was therefore necessary to target areas of the AMP to extract the required information for analysis;

- While the information required to be published in the AMP is governed by ComCom's Electricity Distribution Information Disclosure Determination 2012, there are considerable variations in how the information is presented in the 29 EDB AMPs. This adds to the effort and time required to extract the required information;
- All AMPs report expenditure in standardised categories. However, these categories are not always used by EDBs for internal purpose. There are differences in approach and understanding in the mapping of internal categories to disclosure categories;
- There are generally no specific sections in the AMPs that summarise the key drivers of change and their assumptions;
- There are generally no specific sections in the AMPs that summarise the inputs used in forecasting demand from the key drivers of change, and how the resultant demand is converted into expenditure;
- The variance analysis provided in the 2023 AMP explains the variance from the 2022 AMP which covers the nine years from 2023 to 2032, in accordance with ComCom's disclosure requirement. The variance analysis does not focus on the variance caused by the new expenditure drivers for the 2026-30 period.

Review process

IAEngg undertook a process that involved the following high-level steps:

- All 29 AMPs were reviewed at a high level to understand the quantum of forecast change of expenditure;
- Financial thresholds were established for more in-depth analysis including: number of EDBs for detailed analysis, financial period over which the analysis is undertaken, key expenditure categories for analysis and key drivers of expenditure;
- Identifying and describing good electricity industry practice in forecasting demand and expenditure;
- Assessing the demand forecasting approach of each EDB;
- Assessing the EDB approach to convert demand into expenditure;

Note IAEngg considers demand in the broader context of quantity arising from a particular expenditure driver. For expenditure driver relating to the uptake of Electric Vehicles (EVs), for example, demand refers to the load increase caused by EV. For expenditure driver relating to a specific end-of-life equipment, demand refers to the quantity of assets to be replaced.

The primary source of information for the review came from the AMPs. Where further information was required, one-to-one clarification meetings were organised with selected EDBs. IAEngg is grateful for the cooperation from the EDBs to make themselves available and their preparation prior to those meetings.

HIGH LEVEL FINDINGS

Capex and opex summary

16 **Non-exempt EDBs**

Forecasting total **CAPEX** requirement

$1,550.5M pa

in the 2026-30 period

IAEngg finds that the 16 Non-exempt EDBs are forecasting a total gross capex (excluding capital contribution) requirement of $1,550.5M pa (in 2023 dollars) in the 2026-30 period. This represents an increase of $421.4M pa (37.3%) compared with their actual/forecast annual spends in 2021-23. Significant variability was observed between the EDBs, with the capex change varying from -22% to +171%. Taking all 16 Non-exempt EDBs as a whole, "**System growth**" is the capex category that exhibits the largest increase in the forecast period.

16 **Non-exempt EDBs**

Forecasting total **OPEX** requirement

$696.9M pa

in the 2026-30 period

For opex the 16 Non-exempt EDBs are forecasting a total opex requirement of $696.9M pa in the 2026-30 period. This represents an increase of $114.7M pa (19.7%) compared with their actual/forecast annual spends in 2021-23. Significant variability was observed between the EDBs, with the opex change varying from -5% to +73%. Taking all 16 Non-exempt EDBs as a whole, "**System Operations & Network Support**" and "**Business Support**" are the two opex categories that exhibit the largest increase in the forecast period.

13 **Exempt EDBs**

Forecasting total **CAPEX** requirement

$331.8M pa

in the 2024-28 period

The 13 Exempt EDBs are forecasting a total gross capex requirement of $331.8M pa in the 2024-28 period. This represents an increase of $24.8M pa (8.1%) compared with their actual/forecast annual spends in 2021-23. Significant variability was observed between the EDBs, with the capex change varying from -49% to +100%. Taking all 13 Exempt EDBs as a whole, "**System Growth**" is the capex category that exhibits the largest increase in the forecast period.

13 **Exempt EDBs**

Forecasting total **OPEX** requirement

$234.5M pa

in the 2024-28 period

The 13 Exempt EDBs are forecasting a total opex requirement of $234.5M pa in the 2024-28 period. This represents an increase of $30.4M pa (14.9%) compared with their actual/forecast annual spends in 2021-23. Significant variability was observed between the EDBs, with the opex change varying from +2% to +38%. Taking all 13 Exempt EDBs as a whole, "**System Operations & Network Support**" and "**Business Support**" are the two opex categories that exhibit the largest increase in the forecast period.

Growth drivers

IAEngg notes that new growth drivers (relative to 2022 AMP) associated with de-carbonisation are highly uncertain as they are influenced to a large extent by government policies and incentives. Growth associated with resilience is heavily influenced by EDBs' own experiences and the resilience standards they apply. IAEngg observes that these new drivers are consistently considered by all EDBs, but not all EDBs have proposed expenditure in 2026-30 (for Exempt EDBs IAEngg analysed 2024-2028) for these new developments.

The variability in EDB approach can be summarised simplistically as the EDB's own judgement with regard to the certainty and impact of the drivers on their network, the risk they are prepared to take, and contingent measures available if the impact of growth is more than their forecast. With regard to contingent measures, expenditure of Non-exempt EDBs is approved by ComCom for the 5-year period whereas expenditure of Exempt EDBs is normally approved by their shareholders on an annual cycle. This could be the reason behind the larger capex increase (as a whole) sought by Non-exempt EDBs compared with Exempt EDBs.

IAEngg has observed very different views and strategies about the future of load control capability by EDBs. For example, Orion has forecasted a significant decrease in load control capability with the resultant increase in load demand and increase in capital expenditure, whereas Vector has planned to expand its load control capability as one of the flexibility tools to curb demand growth.

INDIVIDUAL EDB ASSESSMENT

Ratings

For each EDB that satisfied the financial threshold for in-depth assessment, IAEngg identified the main expenditure categories that contributed to the observed significant total capex (or opex) increase. For these expenditure categories, the growth drivers were identified, their reasonableness considered and a rating of certainty to these drivers was assigned. IAEngg examined the model/approach used by the EDB to convert the drivers into demand and/or work volumes, and rated the accuracy and appropriateness of the model/approach. The approach used by the EDB to convert the model output into an expenditure forecast was examined, and the accuracy and appropriateness of the approach was rated. The framework and process adopted is designed to enable IAEngg to express our opinion about the certainty and reasonableness of EDB's asset forecasts.

For the majority of the EDBs, IAEngg has been able to find information about their demand forecasting approach and assigned qualitative ratings (excellent, good, average, needs improvement) based on good industry practice. EDB ratings were found to be either "good" or "average". Some EDBs could achieve the "excellent" rating if they explicitly align the demand growth assumptions with the industry accepted future energy scenario. Rating of "insufficient information for analysis" was given where there was not enough information.

Less information could be found about EDBs' expenditure forecasting approach. For those where information was available, IAEngg assigned a qualitative rating (excellent, good, average, needs improvement) based on good industry practice. EDB ratings were found to be either "good" or "average". An "excellent" rating would be given if the EDB has explicitly demonstrated how they have dealt with uncertainty in outturn demand by considering, for example, alternate options in lieu of building long-life assets, and clear consideration of deliverability if they propose an expanded program of work. For increases in capex and opex costs caused by cost inflation above CPI, an excellent rated EDB needs to demonstrate how they arrive at the forecasted cost inflations. Rating of "insufficient information for analysis" was given where there was not enough information.

For IAEngg to provide an opinion on the reasonableness of the demand and expenditure forecasts, it would have been necessary to make a quantitative assessment of the accuracy of the demand and expenditure forecasts. The AMPs do not contain the information necessary to perform this assessment. For example, where an EDB uses an S-curve of new customer technology uptake to forecast demand and expenditure, the shape and timing of the curve is required to assess the reasonableness of the expenditure forecast and this information is not included in the AMP.

CONCLUSIONS

In our review of the 2023 AMPs, we have identified a number of key drivers that have put upward pressure on forecast capital and operating expenditure:

- Demand growth drivers caused by forecasted uptake of decarbonisation initiatives such as process heat electrification, residential gas conversion and electrification of transport;
- Proactive investments to improve network resilience to respond to extreme climatic and seismic events;
- Increase in project and operating costs due to inflationary pressure and supply chain disruptions.

The provision, by EDBs, of detailed forecast data on the primary drivers would provide greater clarity on the planning scenario used by the EDB and the reasonableness of the underlying assumptions.

We also note that government policies and incentives have significant influence on the uptake of decarbonisation initiatives and hence there is a high degree of uncertainty whether the outturn demand growth scenario will align with the EDB's forecast. The inclusion of an EDB's approach to dealing with this uncertainty in their forecast and expenditure plan would enable a more comprehensive assessment of the forecast expenditure.

For resilience planning, in the absence of a mandated resilience standard, the inclusion of information that demonstrates the cost and benefit of the proposed investment would be beneficial.

IAEngg finds that the EDBs' AMPs are of generally high standard. The purpose of the AMP is broad and is not required to provide full and detailed justification for expenditure. The lack of data listed above should not be seen as a deficiency of the AMPs. Rather, supplementary information is required to justify expenditure arising from new drivers where there is no historic data.

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1 INTRODUCTION

1 INTRODUCTION

IAEngg was engaged by the NZ Commerce Commission (ComCom) in July 2023 to undertake a review of the 2023 Asset Management Plans (AMPs) of the 29 Electricity Distribution Businesses (EDBs).

The intended outcomes of the EDB 2023 AMPs review are to:

- Gain an independent opinion on the level of assurance that can be had in the demand and expenditure forecasts contained in the amps, including the key drivers of change and areas of uncertainty;
- Understand areas for improvement to information disclosure requirements aligned to good electricity industry practice asset management plans;
- Identify good industry practice in planning and forecasting; and
- Identify next steps to gain further assurance around forecast information to be used for DPP reset(s), and
- ComCom does not want an audit of EDB quantitative information, or a physical inspection of assets, or the state of the network or review of EDB projects.

The review work is to be delivered in three stages:

- Stage 1 - desktop review, summary analysis and presentation
- Stage 2 - detailed forecasting, planning assessments and report
- Stage 3 – review and report covering AMP disclosure requirements and resilience planning

This report is the deliverable for Stage 2, and covers IAEngg's expenditure forecast assessment, findings and opinions.

This report is structured in the following sections:

INTRODUCTION

this section

TERMS OF REFERENCE

shows the Terms of Reference for the report and identifies which sections of the report address each term

APPROACH AND FRAMEWORK

outlines our approach to the review and the framework adopted for assessment including a description of each framework stage

FINDINGS

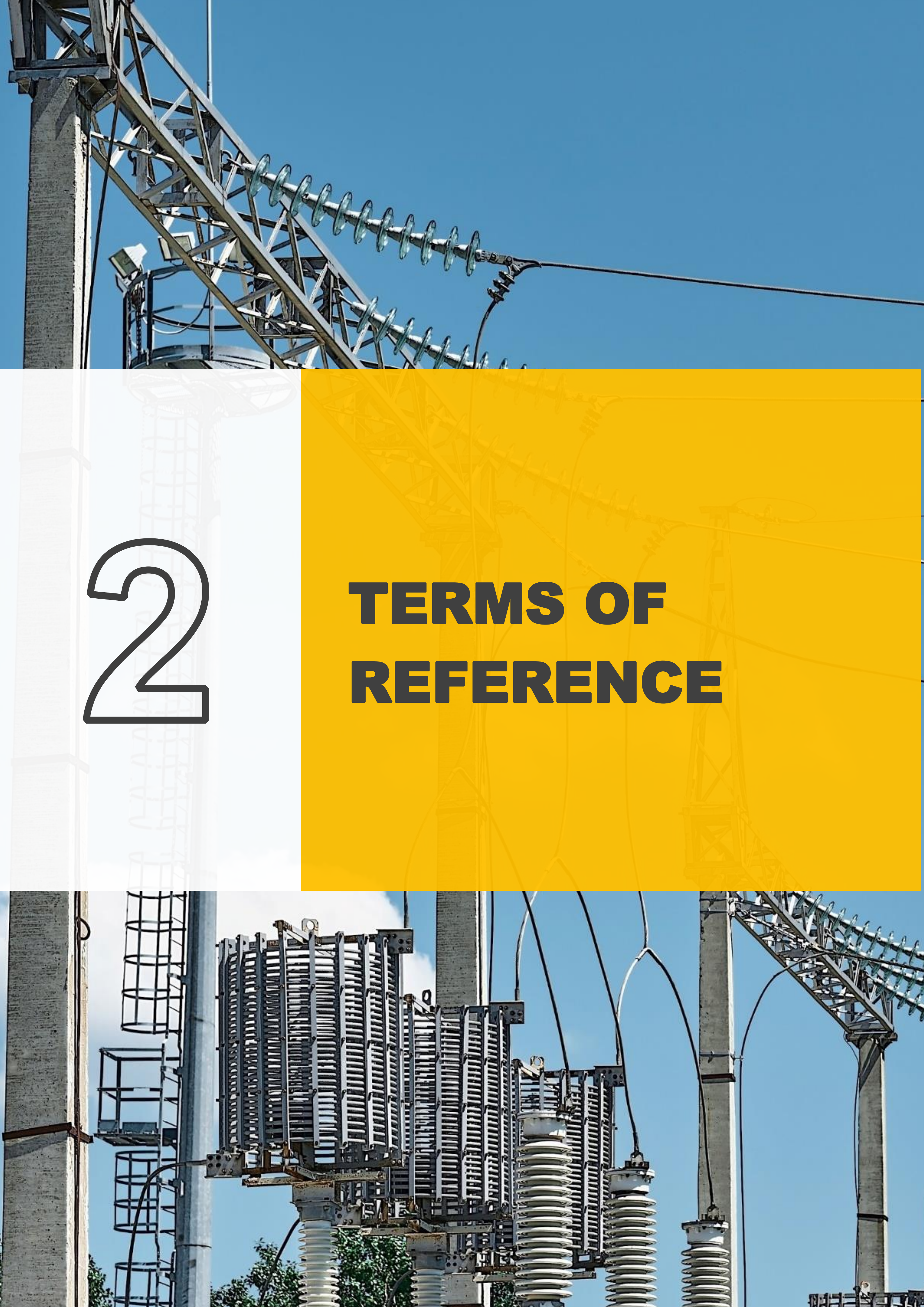
presents the findings of the review (for each stage in the framework)

RECOMMENDATIONS AND NEXT STEPS

describes our recommendations relating to further assessment of the EDBs

INDIVIDUAL EDB ASSESSMENTS

shows our assessment of each individual EDB's demand and expenditure forecasts



2

TERMS OF REFERENCE

2 TERMS OF REFERENCE

The terms of reference (ToR) for this report are shown in the table below along with a reference to the sections in this report which discuss each of the points in the ToR.

TERMS OF REFERENCE	REPORT SECTION(S)
Analysis of the forecasts of each of the 29 EDBs to understand the elements that are certain and areas that have less certainty, and variations across the industry on common elements. The forecasting assessment review is to include:	
I. Review of amps with a focus on 10-year forecasts,	**SECTION 4.2** **SECTION 7**
II. Identify and analyse key drivers of change, uncertainties, and variables in financial and demand forecasts. For each EDB, assessment of:	**SECTION 4.5 (TABLE 13)**
a. Reasonableness and accuracy of key inputs / drivers used in forecasting expenditure;	**SECTION 7**
b. Reasonableness of underlying drivers where edbs are forecasting a potential significant step change in expenditure requirements compared to previous levels;	**SECTION 4.3** **SECTION 7**
c. Identification of trigger points where increased certainty on level of spend required may be obtained;	**SECTION 7**
d. Key dependencies or risks which may impact forecast scenarios;	**SECTION 7**
e. Sensitivity of the expenditure plan to out-turn differences in requirements (such as incremental demand growth, resilience, decarbonisation, and connection growth);	**NOT ASSESSED DUE TO LACK OF QUANTITATIVE DATA**
f. Reasonableness of EDB forecasts accounting for availability of materials and skilled staff to deliver programmes of work if there are significant increases in expenditure forecasted;	**SECTION 4.5.12**
g. Identification of good electricity industry practice; and	**SECTION 3.2.8** **SECTION 4.5** **SECTION 7**
h. Comparison to scenarios and key drivers identified by Transpower or other published scenarios.	**SECTION 4.5.4** **SECTION 7**
III. Providing an opinion on the reasonableness of the variations, both the certainty and uncertainty, for example:	**SECTION 7**
a. For capex, specifically identifying projects or programmes of work where there is significant uncertainty about either the need for, or timing of, investment requirements for the 2025 - 2030 regulatory period, and what the particular drivers of uncertainty are; and b. For opex, identifying categories of cost where variances to historical levels are not well supported, or where there are significant assumptions applied in the forecasted values for the period 2025 - 2030.	**SECTION 7** **SECTION 4.5**
IV. Identify key forecast assumptions, uncertainties, and risks.	**SECTION 4.5** **SECTION 7**

3 APPROACH & FRAMEWORK

3 APPROACH AND FRAMEWORK

This section outlines the approach taken by IAEngg to undertake the review, discusses the limitations of the review and presents the framework used to assess the EDB AMPs.

3.1 Approach

The key source of information for the review was the AMPs published by the EDBs. This was supplemented, for a limited number of EDBs, by meetings to clarify information provided in the AMP. The number of EDBs with which a meeting was held was limited due to the time and resources available to undertake the project.

The purpose of the AMPs is broad but they do not provide full justification of forecast expenditure, so they are limited in the information they contain for this consultancy project. They do not include the models used by EDBs to forecast demand nor do they directly outline the relationship between inputs used in expenditure forecasts and the expenditure forecasts. Further, the AMPs do not present the inputs, in particular the new drivers, used to forecast demand or expenditure in a defined or consistent way. Due to these limitations, our review is limited in its conclusions. Further detail of the limitations is provided in Section 5.

IAENGG UNDERTOOK A PROCESS THAT INVOLVED THE FOLLOWING HIGH-LEVEL STEPS:

1

All 29 AMPs were reviewed at a high level to understand the quantum of forecast change of expenditure;

2

Financial thresholds were established for more in-depth analysis including: number of EDBs for detailed analysis, financial period over which the analysis is undertaken, key expenditure categories for analysis and key drivers of expenditure

3

Identifying and describing good electricity industry practice in forecasting demand and expenditure

4

Assessing the demand forecasting approach of each EDB

5

Assessing the EDBs approach to convert demand into expenditure

These steps are described in further detail in the Framework section below.

3.2 Framework

IAEngg's framework for assessing the EDBs is summarised in Figure 1 below:

STAGE	METHOD	OUTPUT
Data Collation	Collect data from AMPs & ensure that all data is in common constant 2023$	Excel spreadsheet for each EDB, covering expenditure from 2021 to 2033 in constant 2023$
Establish base year and Forecast Period	Compare change in expenditure using different forecast periods. Select appropriate period	Defined forecast periods for exempt and non-exempt EDBs. Establish capex and opex dashboards.
Select threshold to identify EDBs	Ascertained proportion of EDBs that exceed various thresholds – capex and opex. Selected threshold that provided a meaningful number of EDBs for further investigation.	EDBs exceeding thresholds identified. For these EDBs, capex and opex categories that materially contribute to the increase identified.
Identify material expenditure increase drivers	Review AMPs to identify key expenditure drivers and any stated assumptions.	Key expenditure drivers and assumptions
Additional Data Collation	Structured interviews with selected EDBs	Updated expenditure drivers and assumptions for the selected EDBs
Demand Forecasting Assessment	Identify demand drivers. Assess demand forecasting process for each expenditure sub-category	Rating of demand driver and the forecasting approach for selected expenditure categories of selected EDBs.
Expenditure Forecasting Assessment	Assess approach used by EDB to convert demand forecast into expenditure forecast using defined criteria	Rating of expenditure forecasting approach

Figure 1. Framework used by IAEngg for the 2023 AMP review

The following sub-sections describe details of the various stages in the framework:

3.2.1 Data collation

EDB expenditure forecasted and actuals are captured from FY21 to FY33. FY23 -FY33 data are obtained from the 2023 regulatory information disclosure Schedules 11a and 11b. Historic spends for FY21 and FY22 are obtained from disclosure Schedules 6a and 6b from ComCom's database FY23 is forecasted data from the 2023 AMPs'[1] All dollars are converted into constant 2023 using escalator indices provided by ComCom. The details of the methodology to convert to $2023 is shown in ATTACHMENT 8.

The conversion of historic expenditure into $2023 enables a comparison of expenditure to be undertaken on a common basis.

3.2.2 Establish base year and Forecast Period

To compare forecast expenditure with historical, analysis was undertaken involving the selection of a base year and a forecast period.

To overcome possible bias created by yearly variation, the methodology took the average of annual expenditure over three years (FY21 to FY23) as the base year expenditure. While we are aware that COVID could have an impact on the base year expenditure, going further back in time to select a base year has not been adopted as changes caused by COVID, such as remote working and supply chain logistics, are likely to continue to influence costs into the forecast period.

A number of forecast period options were available to compare with base year expenditure. Analysis was undertaken which showed the variations in expenditure of each EDB using three different forecast periods and from these a single period was selected as the forecast period for non-exempt EDBs and another forecast period for exempt EDBs.

[1] Audited FY23 actual spend was unavailable at the time of review of the AMPs'

3.2.3 Select Threshold to identify EDBs

The review was focused on key step changes, triggers for expenditure increases and uncertainty. Some EDBs are forecasting little change in expenditure from historical levels, others are forecasting material change. In order to target the review to key step changes, thresholds were determined based on the size of forecast capex and opex increases.

These thresholds were used to trigger more in-depth scrutiny to understand demand and expenditure drivers behind the large increases and to limit the analysis to material changes in forecast expenditure. Once the EDBs with material changes in forecast expenditure were identified, we also identified the expenditure categories that make significant contribution to the observed overall expenditure increase.

3.2.4 Identify Material Expenditure Increase Drivers

A desktop review of each of the AMPs was carried out to identify the key drivers of the expenditure categories identified above. This involved a review of relevant sections of the AMPs and identification of stated expenditure drivers, assumptions and approach used in developing the forecast. Each EDB AMP was reviewed to identify:

- Material expenditure increases
- Drivers of any material change in forecast expenditure
- Approaches used in forecasting the underlying demand and the resulting expenditure
- Trigger points where increased certainty of the magnitude of forecast expenditure might occur
- Any identified risks associated with the forecasts
- The approach used to develop expenditure forecasts

3.2.5 Additional Data Collation

From the desktop assessment of the 2023 AMPs, IAEngg identified the need for one-to-one clarifying meetings with the EDBs. The time constraints of the project did not allow for clarifying meetings with all EDBs so a process was undertaken to identify EDBs that have forecasted material expenditure increase or have proposed new expenditure drivers which will be assessed in the forthcoming DPP4 process. Clarifying questions were sent to the EDBs prior to the meetings. IAEngg is grateful for the cooperation from the EDBs to make themselves available and their preparation prior to the meetings.

3.2.6 Demand Forecasting Assessment

The development of an EDB capex expenditure forecast is a 2-step process: identification and quantification of the underlying demand drivers, and conversion of the quantified demand drivers into demand and expenditure forecast. IAEngg has applied a 2-step process for its assessment: the first step is to assess the demand forecasting approach, followed by assessment of the expenditure forecasting approach. This process is depicted below:

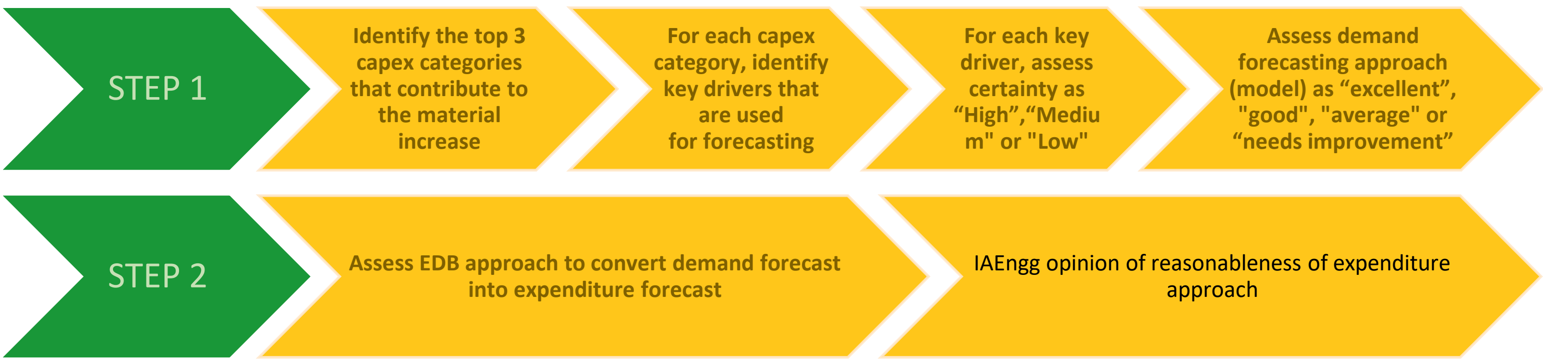


Figure 2. 2-step assessment process used by IAEngg

This section describes the assessment of the demand forecasting approach which involved an assessment of the key drivers/inputs and the demand forecasting approach/model. We applied qualitative rating to the key drivers/inputs based on their certainty. We have not confirmed the quantum nor timing of the key drivers as this information is generally based on assumptions that are not well documented in the AMPs. IAEngg then focused on the characteristics of the demand forecasting process & techniques used by the EDBs, and rated them according to good industry practice, noting in particular how the process dealt with uncertainty in the input parameters.

For each EDB that exceeded the overall capex or opex threshold, the top three expenditure categories that contribute to the increase were identified. For each expenditure category we identified the key underlying drivers and the approach (model) used to convert the underlying drivers into a demand forecast. The information was collected from the AMP review and the EDB clarifying meetings.

IAEngg has assessed the information in the AMP and rated the certainty in the expenditure drivers for individual EDB as “low”, “medium” and “high” based on the following definition:

CERTAINTY RATING	DEFINITION
LOW	The probability of the expenditure driver occurring in the 2026-30 period is deemed to be less than 50%. This can be due to lack of government detailed policy announcements, lack of bottom-up customer research and lack of customer commitment.
MEDIUM	The probability of the expenditure driver occurring in the 2026-30 period is deemed to be around 50%.
HIGH	The probability of the expenditure driver occurring in the 2026-30 period is deemed to be over 80%. This can be due to high customer commitment or government detailed policy announcements. We would also give a rating of “high” when the expenditure driver aligns with Transpower’s “accelerated electrification” scenario.

Table 1 - Definition of ratings used to assess certainty of expenditure drivers

Where the certainty is rated low or medium, we expect that an EDB would apply a forecasting approach (model) that deals with the uncertainty to arrive at a demand forecast that is realistic and optimal.

IAEngg notes that demand drivers, particularly those arising from de-carbonisation and climate resilience, are subject to both quantity and timing uncertainties. Where the information is available for each key underlying driver, we rated the **CERTAINTY OF TIMING** as …

"HIGH"
"MEDIUM" or
"LOW"

Where the certainty is rated low or medium, we expect the EDB applies a forecasting approach (model) that deals with the uncertainty to arrive at a demand forecast that is realistic and optimal. We also consider the reasonableness of the demand driver from a quantity perspective.

For the demand forecasting approach (model), **THE QUALITY OF THE APPROACH** has been rated as …

"EXCELLENT"
"GOOD"
"AVERAGE" or
"NEED IMPROVEMENT"

based on IAEngg's understanding of good industry practice. We also consider the accuracy of the inputs used in the demand forecasting approach (model) when those inputs are quantified.

IAEngg's assessment of the EDB's demand forecasting can be found in Section 4.5 and the assessment of individual EDBs is found in Section 7.

3.2.7 Expenditure Forecasting Assessment

This involved assessing how the EDB turned the demand forecast into an expenditure forecast (the expenditure forecasting process). This assessment considered the following criteria:

- Matrices to convert demand forecast into expenditure forecast e.g. $ per MVA
- Sensitivity of demand forecast to input assumptions and strategy adopted by the EDB to manage the uncertainty e.g. non-network/flexibility solutions or asset life extension in lieu of long-life asset investment
- Consideration of overlaps with other programs
- Deliverability of the program of works

For resilience planning, we assessed the EDB approach based on the following criteria:

- Has the EDB adopted a standard to assess resilience and target proposed expenditure?
- Has the EDB considered a wide range of resilience activities (opex & capex)?
- Has the EDB demonstrated that it has made changes to existing programs (replacement, new construction) to improve resilience?

The ratings we used are “Excellent”, “Good”, “Average” and “Need Improvement”. Table 2 to Table 5 provide the context of the ratings for the different capex and opex categories. Together with Table 1 (which rates the certainty of the key investment drivers), we arrive at the overall ratings for each EDB in Table 13 and Table 14.

3.2.8 Assessment Criteria

GOOD INDUSTRY PRACTICE

Our assessment of the demand and expenditure approach used by EDBs required us to identify good electricity industry practices. This section provides the definition of good electricity industry practice that we adopted in the review. The focus of our definition is demand forecasting however, we have also included some aspects of good electricity industry practice as it relates to expenditure forecasting. We have not defined the characteristics of all aspects of developing and operating an electricity distribution network. For example, we have not included good practices in maintenance or project delivery.

The following definition of good industry practice has been used in our assessment noting that there are no international standards or defined approaches to demand and expenditure forecasting used in the electricity supply industry:

The degree of skill diligence, prudence, foresight and economic management which would reasonably and ordinarily be expected from a skilled and experienced operator engaged in the same type of undertaking under the same or similar circumstances.

The definition does imply a degree of subjectivity which IAEngg applies based on its collective expertise in the electricity supply industry.

Good capex forecasting begins with understanding the underlying drivers that requires capital investment. For electricity distribution businesses operating in a stable environment, historic drivers and requirements are generally a good place to start.

With the significant changes in the operating environment faced by the NZ EDBs, emerging new drivers have no historic trends to begin with e.g. peak demand change caused by uptake of electric vehicles. A good capex forecasting technique needs to exhibit features that can deal with future uncertainties.

GOOD INDUSTRY PRACTICE FOR **CAPEX** FORECASTING

THE GENERAL CHARACTERISTICS OF A GOOD CAPEX FORECASTING APPROACH INCLUDE

- Expenditure should be prudent
  - Reflects the best course of action
  - Considers all credible available alternatives including Opex (Capex-Opex trade-offs)
  - Results in the lowest cost to consumers over the long term
- Forecasting techniques are objective
  - Actual data preferred over the use of judgement
- Departures from historic trends
  - Are explained with clearly defined inputs and assumptions
  - With supporting evidence
  - Particularly for repetitive expenditure types such as pole replacement
- Forecast takes account of the priority of various investments (as capital is nearly always limited)
- The forecast takes into account deliverability of capex program, particularly where there is a material change in the size of program

THE SPECIFIC CHARACTERISTICS OF GOOD CONSUMER CONNECTION AND SYSTEM GROWTH CAPEX FORECASTING APPROACH INCLUDE

- Realistic demand forecast
  - Where there are material uncertainties and variabilities in inputs and assumptions, scenario and sensitivity studies are carried out to assess the risk – cost balance and to demonstrate the prudency of the forecast
  - Demand forecast used to forecast expenditure should be based on a realistic scenario. Scenario is likely to be more realistic where the forecast is based on a variety of sources
- Combination of top-down and bottom-up modelling in validating, calibrating and testing to improve the accuracy and reliability of the demand forecast.
- Accuracy of the demand forecasting technique can be demonstrated by periodically checking using techniques such as backcasting.

THE SPECIFIC CHARACTERISTICS OF GOOD ASSET REPLACEMENT AND RENEWAL CAPEX FORECASTING APPROACH INCLUDE

- Demand forecast that underpins the asset replacement & renewal expenditure is based primarily on actual asset health, criticality and conditions as revealed via asset condition monitoring
- For low cost high volume assets, a form of asset replacement modelling taking into account of asset criticality, statistical information such as asset age profile, and recent failure rates is desirable
- Takes into account overlaps with other capex activities
- Demonstrate the economics of asset life extension versus asset replacement
- Accuracy of the asset replacement model output is periodically checked, using actual asset conditions versus forecast conditions
- When assets are replaced based on considerations other than asset conditions e.g resilience consideration or growth
  - There should be clear articulation of investment drivers, their uncertainties & variabilities
  - Supporting evidences of why certain asset classes are targeted
  - Clear articulation of how overlaps with other capex activities are managed

THE SPECIFIC CHARACTERISTICS OF GOOD RELIABILITY, SAFETY & ENVIRONMENT CAPEX FORECASTING APPROACH INCLUDE

- Clear drivers for the forecast expenditure, whether they are regulations, current performance, or demonstrated change in the external environment
- Where the expenditure is to do with deteriorating reliability or safety performance, cost-benefit and risk assessments have been conducted to support the proposed expenditure and the areas targeted for investment
- Adoption of a formal framework. For resilience planning the 4Rs framework by NZ National Emergency Management Agency or IEEE Resilience Framework, Methods, and Metrics for the Electricity Sector could be adopted
- Standards are adopted that align with industry/sector standards. For example, frequency of low probability events is aligned with other electricity industry participants and other planning authorities such as water suppliers
- Demonstrate balance between proactive expenditure and reacting / recovering after an event
- For specific network hardening initiatives, such as network hardening for floods & inundation, increase in wind speed and hot dry summers, supporting evidences that these are the areas where climate change will impact and hence priority areas to address

GOOD INDUSTRY PRACTICE FOR **OPEX** FORECASTING

Unlike capex which is expected to exhibit yearly variations due to the “lumpiness” of capex investment, opex tends to be more stable. The common industry approach to opex forecasting is the use of “base + step + trend”. Where an EDB uses the “base + step + trend” approach we consider that a good opex forecasting approach will:

- Start from historical trends
- Identify sources of step change
- Clearly articulate the drivers of step changes whether they are to do with legislative changes or new obligations
- Where the opex step change is caused by capex-opex tradeoff, justification that opex is a better option than capex
- Clear buildup of the costs of opex step change

We have not defined a good approach to opex forecasting where an EDB does not use the “base + step + trend” approach as none of the AMPs identified a method of forecasting opex in any other manner.

ASSESSMENT CRITERIA- **CAPEX**

Consumer connection & system growth capex forecast High level summary of assessment area	Detailed list of what was considered to form a view on this element	What constitutes 'excellent'	What constitutes 'good'	What constitutes 'average'	What constitutes 'need improvement'
Realistic demand forecast • Where there are material uncertainties and variabilities in inputs and assumptions, scenario and sensitivity studies are carried out to assess the risk – cost balance and to demonstrate the prudency of the forecast	• Inputs and drivers used in demand forecasting, their certainties and variabilities • Demand forecasting model/methodology	• Clear articulation of investment drivers, their uncertainties & variabilities • Sound approach to manage the uncertainties and variabilities by the use of scenario and sensitivity studies where appropriate	• Clear articulation of investment drivers, their uncertainties & variabilities • Scenario assessment has been used to manage the uncertainties and variabilities	• New investment drivers have been adequately identified • Has not applied approach to manage the uncertainties and variabilities of the new drivers	• Investment drivers have not been adequately identified
Demand forecast used to forecast expenditure • Based on a realistic scenario • Scenario is likely to be more realistic where the forecast is based on a variety of sources	• Scenario analysis (if this has been used)	• Scenario is clearly articulated • Scenario is linked to industry recognised scenario	• Scenario is clearly articulated • Scenario is not linked to industry recognised scenario	• Scenario is not clearly articulated	Not defined

Consumer connection & system growth capex forecast High level summary of assessment area	Detailed list of what was considered to form a view on this element	What constitutes 'excellent'	What constitutes 'good'	What constitutes 'average'	What constitutes 'need improvement'
Combination of top-down and bottom-up modelling in validating, calibrating and testing to improve the accuracy and reliability of the demand forecast	• Demand forecasting model/methodology	• Systematic approach using both top-down & bottom-up models • The models are reconciled at the top-down level	• Both top-down and bottom-up models are used • Models are not reconciled	• Only top-down or bottom-up model is used	No model is used
Accuracy of the demand forecasting technique can be demonstrated by periodically checking using techniques such as backcasting	• Demand forecasting output	• Accuracy of demand forecast from BAU drivers is regularly checked • Process in place to monitor the outturn demand from new drivers • Process in place to re-tune model when required	• Accuracy of demand forecast from BAU drivers is regularly checked & model re-tuned	• No process in place to check accuracy of demand forecast against outturn demand	Not defined

Table 2 – Definition of assessment ratings for System Growth & Consumer Connection Capex

Asset replacement and renewal capex forecast High level summary of assessment area	Detailed list of what was considered to form a view on this element	What constitutes 'excellent'	What constitutes 'good'	What constitutes 'average'	What constitutes 'need Improvement'
Demand forecast that underpins the asset replacement & renewal expenditure is based primarily on actual asset health, criticality and conditions as revealed via asset condition monitoring	• Inputs and drivers used in asset replacement & renewal forecast	• Clear articulation of how asset health, criticality and actual conditions are taken into account in replacement & renewal forecast • With supporting evidences • Sound approach to manage uncertainties where exist	• Clear articulation of how asset health, criticality and actual conditions are taken into account in replacement & renewal forecast	• Asset replacement & renewal forecast is based on historic trend and subjective judgement	Not defined
When assets are replaced based on considerations other than asset conditions e.g resilience consideration or growth	• Inputs and drivers used in asset replacement & renewal forecast	• Clear articulation of investment drivers, their uncertainties & variabilities • Supporting evidences of why certain asset classes are targeted • Clear articulation of how overlaps with other capex activities are managed	• Clear articulation of investment drivers, their uncertainties & variabilities • Clear articulation of how overlaps with other capex activities are managed	• New investment drivers have been adequately identified, but not the uncertainties and variabilities • Overlaps with other capex activities are managed	• Overlaps with other capex activities have not been explicitly considered

Asset replacement and renewal capex forecast High level summary of assessment area	Detailed list of what was considered to form a view on this element	What constitutes 'excellent'	What constitutes 'good'	What constitutes 'average'	What constitutes 'need Improvement'
For low cost, high volume assets, a form of asset replacement modelling taking into account asset criticality, statistical information such as asset age profile, and recent failure rates is desirable	• Asset replacement model/methodology	• An industry recognised asset replacement model has been used • The model is applied to majority of the asset classes	• An industry recognised asset replacement model has been used • The model is yet to be deployed to majority of the asset classes	• There is an asset replacement model but not an industry recognised one	• There is no systematic asset replacement model
Demonstrate the economics of asset life extension versus asset replacement	• Asset replacement approach	• Clearly articulate approach used to determine the economics of life extension versus asset replacement • Process in place to continually look for and trial new asset life extension techniques	• There are trials of new asset life extension techniques but not clear how these are taken into account in asset replacement decision making	• No explicit consideration of life extension versus asset replacement	Not defined
Accuracy of the asset replacement model output is periodically checked, using actual asset conditions versus forecast conditions	• Asset replacement model output	• Accuracy of replacement forecast from BAU drivers is regularly checked • Process in place to monitor the outturn demand from new drivers • Process in place to re-tune model when required	• Accuracy of replacement forecast from BAU drivers is regularly checked & model re-tuned	• No process in place to check accuracy of replacement forecast against outturn conditions	Not defined

Table 3 – Definition of assessment ratings for Asset Replacement & Renewal Capex

Reliability, safety & environment capex forecast (incorporating rse-quality of supply, rse-legislative & regulatory and rse-others) High level summary of assessment area	Detailed list of what was considered to form a view on this element	What constitutes 'excellent'	What constitutes 'good'	What constitutes 'average'	What constitutes 'need improvement'
Clear drivers for the forecast expenditure, whether they are regulations, current performance, or demonstrated change in the external environment	• Inputs and drivers used in expenditure forecasting, their certainties and variabilities	• Clear articulation of investment drivers, their uncertainties & variabilities • Sound approach to manage the uncertainties and variabilities by the use of scenario and sensitivity studies where appropriate	• Clear articulation of investment drivers, their uncertainties & variabilities • Scenario assessment has been used to manage the uncertainties and variabilities	• New investment drivers have been adequately identified • Has not applied approach to manage the uncertainties and variabilities of the new drivers	• Investment drivers have not been adequately identified
Where the expenditure is to do with deteriorating reliability or safety performance	• Inputs and drivers used in expenditure forecasting	• Cost-benefit and risk assessments have been conducted to support the proposed expenditure • Detailed studies conducted to support the areas targeted for investment	• Cost-benefit and risk assessments have been conducted to support the proposed expenditure • Areas targeted for investment are based on recent experiences	• No cost-benefit and risk assessments have been conducted to support the proposed expenditure • Areas targeted for investment are based on recent experiences	Not defined

Reliability, safety & environment capex forecast (incorporating rse-quality of supply, rse-legislative & regulatory and rse-others) High level summary of assessment area	Detailed list of what was considered to form a view on this element	What constitutes 'excellent'	What constitutes 'good'	What constitutes 'average'	What constitutes 'need improvement'
Adoption of a formal framework. For resilience planning, 4Rs framework by NZ National Emergency Management Agency or IEEE Resilience Framework, Methods, and Metrics for the Electricity Sector	• Expenditure forecast methodology	• Framework is clearly articulated • Framework is linked to industry recognised framework	• Framework is clearly articulated • Framework is not linked to industry recognised scenario	• Framework is not clearly articulated	Not defined
Standards are adopted that align with industry/sector standards. For example, frequency of low probability events is aligned with other electricity industry participants and other planning authorities such as water suppliers	• Expenditure forecast methodology	• Standards are clearly articulated • Standards are aligned with relevant industry standards	• Standards are clearly articulated • Standards are not aligned with relevant industry standards	• Standards are not clearly articulated	Not defined
Demonstrate balance between proactive expenditure and reacting / recovering after an emergency event	• Expenditure forecast methodology	• Cost-benefit and risk assessments have been conducted to support the proposed proactive expenditure • Detailed studies conducted to support the areas targeted for investment	• Cost-benefit and risk assessments have been conducted to support the proposed proactive expenditure • Areas targeted for investment are based on recent experiences	• No cost-benefit and risk assessments have been conducted to support the proposed proactive expenditure • Areas targeted for investment are based on recent experiences	Not defined

Table 4 – Definition of assessment ratings for Reliability, Safety & Environment Capex

ASSESSMENT CRITERIA – **OPEX**

High level summary of assessment area	OPEX category	What constitutes 'excellent'	What constitutes 'good'	What constitutes 'average'	What constitutes 'need improvement'
The forecast is based on historic trend	Service Interruptions & emergencies, Vegetation Management, Routine & Corrective Maintenance & Inspection, Asset Replacement & Renewal, System Operations & Network Support, Business Support	Thorough analysis performed on historic trend to confirm if historic trend is likely to continue into the future	Some analysis performed on historic trend	Historic trend is used without analysis	Forecast not based on historic trend and not supported by analysis
Step change from historic trend is forecasted	Service Interruptions & emergencies, Vegetation Management, Routine & Corrective Maintenance & Inspection, Asset Replacement & Renewal, System Operations & Network Support, Business Support	Reasons for step change clearly articulated, with supporting evidence that the step change $ is efficient	Reasons for step change clearly articulated, with supporting evidence of how the step change $ is determined	Reasons for step change articulated, without supporting evidence for the $	Reasons for step change are not provided

Table 5 – Definition of assessment ratings for Opex

IAEngg's assessment of the EDB's expenditure forecasting can be found in Section 4.5.

4 FINDINGS

4 FINDINGS

This section presents the findings of the review including summaries of the results of the analysis and observations. The findings are presented for each stage of the framework.

4.1 Data Collation

Excel spreadsheets covering expenditure from 2021 to 2033, in constant 2023$, were prepared for each EDB at the completion of the data collation stage.

An example of the spreadsheet for Electricity Invercargill is show below:

Name of EDB																							
Electricity Invercargill*	1.140	1.067																					
	NZ CC (Constant Prices)																						
$year	2021	2022	2023	2023	2023	2023	2023	Mix	2023	2023	2023	2023	2023	FY23	2023	2023	2023	2023	2023	2023	2023	2023	2023
Opex Category	FY21	FY22	FY21	FY22	FY23	FY24	FY25	FY21-25	FY26	FY27	FY28	FY29	FY30	FY26-30	FY31	FY32	FY33	Average 21-23	Average 24-26	Average 24-28	Average 24-30	Average 24-33	Average 26-30
Service interruptions and emergencies	473	532	539	567	514	550	550	2,720	550	550	550	550	550	2,749	550	550	550	540	550	550	550	550	550
Vegatation management	2	2	2	2	7	2	2	16	2	2	2	2	2	11	2	2	2	4	2	2	2	2	2
Routine & corrective maintenance & inspection	1,087	1,087	1,240	1,159	1,271	1,518	1,455	6,642	1,502	1,480	1,480	1,480	1,480	7,422	1,480	1,480	1,480	1,223	1,491	1,487	1,485	1,483	1,484
Asset replacement & renewal	149	149	170	159	213	228	228	998	166	166	166	166	166	832	166	166	166	181	208	191	184	179	166
System operations & network support	1,162	1,280	1,325	1,365	1,280	1,255	1,255	6,480	1,255	1,255	1,255	1,255	1,255	6,273	1,255	1,255	1,255	1,323	1,255	1,255	1,255	1,255	1,255
Business support	2,031	2,056	2,316	2,193	2,056	2,181	2,149	10,896	2,187	2,187	2,187	2,187	2,187	10,937	2,187	2,187	2,187	2,188	2,173	2,178	2,181	2,183	2,187
Opex Total	**4,904**	**5,106**	**5,593**	**5,446**	**5,341**	**5,734**	**5,639**	**27,752**	**5,663**	**5,640**	**5,640**	**5,640**	**5,640**	**28,224**	**5,640**	**5,640**	**5,640**	**5,460**	**5,678**	**5,663**	**5,657**	**5,652**	**5,645**
Autual/Forecast	A	A	A	A	A	F	F	A & F	F	F	F	F	F	F	F	F	F	A	F	F	F	F	F

Figure 3 – Data collation spreadsheet example

4.2 Establish Base Year and Forecast Period

4.2.1 Base Year Establishment

FY21-23 was selected as the base year to compare against the future forecasts contained in the AMPs. To overcome possible bias created by yearly variation, the methodology took the average of annual expenditure in FY21 to FY23 as the base year expenditure. Note while FY21 and FY22 expenditures are actuals, FY23 are forecasts but are expected to be fairly close to actual expenditure incurred in FY23.

4.2.2 Forecast Period Establishment

Several forecast period options were available; one option was to look at the forecast for the whole 10-year period from FY24 to FY33; another, the forecast from FY26 to FY30, to align with the DPP4 period, or other combinations.

For each forecast period chosen, IAEngg has taken the average of the period to arrive at the annual expenditure forecast and used it to compare with the base year expenditure. The percentage change is the ratio of the annual forecast expenditure to the annual base year expenditure.

The following tables show the effect of choosing different forecast periods for Exempt and non-Exempt EDBs. The shaded cells show increases of greater than 25% in annual capital expenditure or 10% in annual operating expenditure between the base period and forecast period.

000	Avg	Avg	Avg	Avg	% Change	% Change	% Change
EDB	(21-23)	(24-33)	(24-30)	(26-30)	(24-33)	(24-30)	(26-30)
Alpine Energy	25,178	30,336	31,994	31,632	20%	27%	26%
Aurora Energy	90,932	83,387	83,306	81,597	-8%	-8%	-10%
EA Networks	17,280	13,120	14,325	13,558	-24%	-17%	-22%
FirstLight	12,107	15,075	15,508	15,554	25%	28%	28%
Electricity Invercargill	6,384	7,260	7,296	7,984	14%	14%	25%
Horizon Energy	8,637	12,294	12,087	12,947	42%	40%	50%
Nelson Electricity	1,590	1,976	2,027	2,055	24%	27%	29%
Network Tasman	12,831	18,763	18,008	15,887	46%	40%	24%
Orion NZ	104,021	298,360	244,085	281,954	187%	135%	171%
OtagoNet	22,305	21,798	21,104	22,525	-2%	-5%	1%
Powerco	285,861	353,698	333,808	346,583	24%	17%	21%
The Lines Company	21,955	21,874	24,235	23,732	0%	10%	8%
Top Energy	16,336	18,527	19,083	18,203	13%	17%	11%
Unison Networks	71,184	96,670	94,301	95,133	36%	32%	34%
Vector Lines	375,415	427,964	441,447	429,259	14%	18%	14%
Wellington Electricity	57,076	118,451	126,283	151,915	108%	121%	166%

Table 6 - Capex comparison for Non-Exempt EDBs using different forecast periods

000 EDB	Avg (21-23)	Avg (24-26)	Avg (24-28)	Avg (24-33)	Avg (26-30)	% Change (24-26)	% Change (24-28)	% Change (24-33)	% Change (26-30)
Buller Electricity	3,083	3,670	3,049	2,594	2,200	19%	-1%	-16%	-29%
Centralines	14,288	8,580	7,250	7,186	7,201	-40%	-49%	-50%	-50%
Counties Energy	67,252	56,694	53,862	44,814	45,063	-16%	-20%	-33%	-33%
Electra	16,381	26,121	25,520	24,497	24,399	59%	56%	50%	49%
MainPower NZ	30,662	26,651	25,494	25,082	24,447	-13%	-17%	-18%	-20%
Marlborough Lines	11,952	26,487	23,884	21,006	20,391	122%	100%	76%	71%
Network Waitaki	10,102	18,125	15,302	14,953	12,143	79%	51%	48%	20%
Northpower	33,771	45,694	43,203	43,634	39,976	35%	28%	29%	18%
Scanpower	4,360	4,255	4,141	3,931	4,419	-2%	-5%	-10%	1%
The Power Company	30,727	35,961	33,423	31,328	29,609	17%	9%	2%	-4%
Waipa Networks	17,147	25,655	20,676	16,730	15,102	50%	21%	-2%	-12%
WEL Networks	62,872	73,144	72,077	76,304	71,599	16%	15%	21%	14%
Westpower	4,407	5,084	3,946	2,810	2,432	15%	-10%	-36%	-45%

Table 7 - Capex comparison for Exempt EDBs using different forecast periods

000	Avg	Avg	Avg	Avg	% Change	% Change	% Change
EDB	(21-23)	(24-33)	(24-30)	(26-30)	(24-33)	(24-30)	(26-30)
Alpine Energy	24,481	29,717	29,705	29,961	21%	21%	22%
Aurora Energy	49,130	46,963	47,606	46,636	-4%	-3%	-5%
EA Networks	14,811	20,163	20,233	20,033	36%	37%	35%
FirstLight	12,421	15,213	15,243	15,337	22%	23%	23%
Electricity Invercargill	5,323	5,652	5,657	5,645	6%	6%	6%
Horizon Energy	11,218	12,576	12,533	12,528	12%	12%	12%
Nelson Electricity	2,286	2,240	2,240	2,240	-2%	-2%	-2%
Network Tasman	12,749	14,822	14,642	14,740	16%	15%	16%
Orion NZ	69,495	123,784	108,889	120,251	78%	57%	73%
OtagoNet	9,556	10,079	10,054	10,119	5%	5%	6%
Powerco	107,069	128,514	125,295	128,545	20%	17%	20%
The Lines Company	15,629	15,869	15,838	15,847	2%	1%	1%
Top Energy	20,751	23,057	22,937	22,963	11%	11%	11%
Unison Networks	47,499	49,527	49,253	49,426	4%	4%	4%
Vector Lines	142,810	159,676	158,598	159,245	12%	11%	12%
Wellington Electricity	36,954	42,070	41,346	43,411	14%	12%	17%

Table 8 - Opex comparison for Non-Exempt EDBs using different forecast periods

000 EDB	Avg (21-23)	Avg (24-26)	Avg (24-28)	Avg (24-33)	Avg (26-30)	% Change (24-26)	% Change (24-28)	% Change (24-33)	% Change (26-30)
Buller Electricity	3,789	4,081	4,060	4,051	4,039	8%	7%	7%	7%
Centralines	5,684	5,964	5,866	5,793	5,719	5%	3%	2%	1%
Counties Energy	21,030	25,233	25,380	25,475	25,345	20%	21%	21%	21%
Electra	16,040	20,565	21,380	22,057	22,273	28%	33%	38%	39%
MainPower NZ	21,022	22,529	22,294	22,187	22,077	7%	6%	6%	5%
Marlborough Lines	18,785	19,200	19,140	18,955	19,000	2%	2%	1%	1%
Network Waitaki	9,250	12,014	11,966	11,912	11,872	30%	29%	29%	28%
Northpower	30,141	34,271	34,097	33,937	33,917	14%	13%	13%	13%
Scanpower	4,161	4,771	4,771	4,771	4,771	15%	15%	15%	15%
The Power Company	17,673	19,098	19,149	19,173	19,222	8%	8%	8%	9%
Waipa Networks	12,103	16,750	16,669	16,619	16,561	38%	38%	37%	37%
WEL Networks	33,650	37,222	37,340	37,629	37,586	11%	11%	12%	12%
Westpower	10,791	12,503	12,437	12,392	12,335	16%	15%	15%	14%

Table 9 -. Opex comparison for Exempt EDBs using different forecast periods

FY26-30 is a logical choice as it aligns with DPP4 and the ComCom has indicated[2] that an intended outcome of the 2023 AMP review is that IAEngg provides an independent opinion on the reasonableness of the expenditure forecasts contained in the AMPs which will be considered and inform DPP4.

However, there is an issue of applying this period to Exempt EDBs. Significant variations can be observed for Exempt EDBs depending on the forecast period chosen. For Exempt EDBs, our review of AMP indicated that most EDBs focus on the next 3 to 5 years (FY24-28) so including forecasts for all future years may not provide the best comparison as we would be including expenditure forecasts that are simply an extrapolation of previous years. The inclusion of expenditure forecasts that are simply an extrapolation does not assist in revealing key drivers of change, uncertainties, and variables. Table 7 indicates that for EDBs that have forecasted a material increase in capex, the increases are more significant in (FY24-28) compared with (FY26-30).

Based on the above assessment, IAEngg has chosen FY26-30 for non-Exempt EDBs and FY24-28 for Exempt EDBs as the forecast period to compare with base year expenditure.

Capex and Opex dashboards were prepared for each EDB after the base year and forecast period were chosen. The EDB dashboards are included in the individual EDB assessments in Section 7.

The dashboards provide a visual display of each EDBs capex and opex expenditure by expenditure category and clearly identify the categories where material increases (or decreases) in expenditure are forecasted.

An example of the dashboard for Powerco is shown here. The dashboard shows the:

- Relative size of annual expenditure (capex and opex) by category of expenditure over the base period and the forecast period
- Total percentage annual increase in expenditure (capex and opex) between the base and forecast periods
- Contribution made to the annual increase in expenditure (capex and opex) by each category of expenditure

[2] Commerce Commission letter, External reviews of electricity distribution businesses' 2023 asset management plans and of efficiency and productivity, 31 August 2023

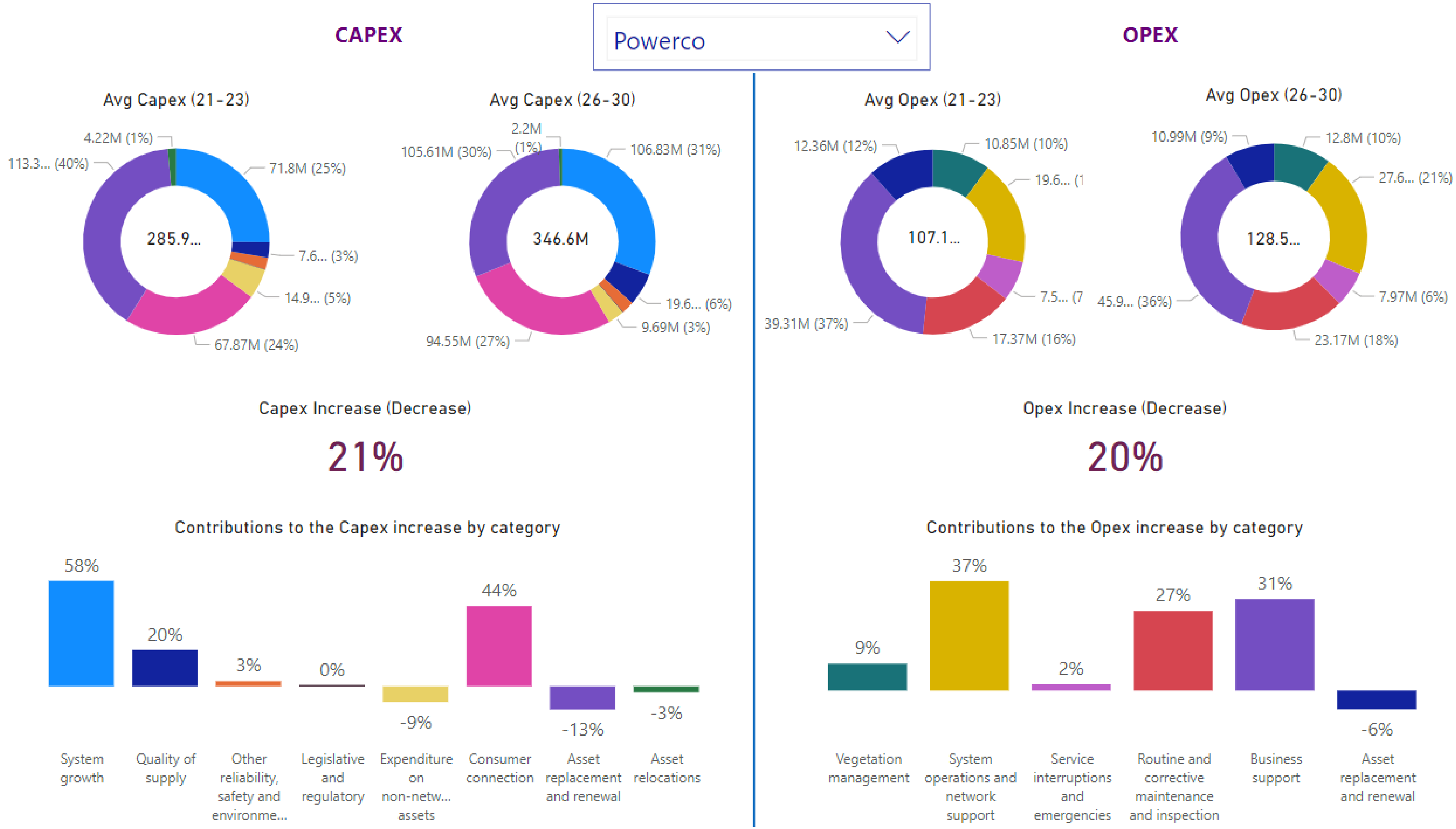


Figure 4 – EDB Dashboard example

4.3 Selection of Thresholds to identify EDBs

29 EDBs

ELECTRICITY DISTRIBUTION BUSINESSES

This stage included the selection of EDBs for detailed assessment and the identification of material expenditure increases.

16 Non-exempt EDBs

Forecasting total CAPEX requirement

$1,550.5M pa

in the 2026-30 period

Significant variability in both capex and opex forecast expenditure is evident across the EDBs. The 16 Non-exempt EDBs are forecasting a total capex requirement of $1,550.5M pa (in 2023 dollars) in the 2026-30 period. This represents an increase of $421.4M pa (37.3%) compared with their actual annual spends in 2021-23. Among the 16 Non-exempt EDBs, the capex change is found to be within a range from -22% to +171%.

13 Exempt EDBs

Forecasting total CAPEX requirement

$331.8M pa

in the 2024-28 period

The 13 Exempt EDBs are forecasting a total capex requirement of $331.8M pa in the 2024-28 period. This represents an increase of $24.8M pa (8.1%) compared with their actual annual spends in 2021-23. Among the 13 Exempt EDBs, the capex change is found to be within a range from -49% to +100%.

16 Non-exempt EDBs

Forecasting total OPEX requirement

$696.9M pa

in the 2026-30 period

For opex the 16 Non-exempt EDBs are forecasting a total opex requirement of $696.9M pa in the 2026-30 period. This represents an increase of $114.7M pa (19.7%) compared with their actual annual spends in 2021-23. Among the 16 Non-exempt EDBs, the opex change is found to be within a range from -5% to +73%.

13 Exempt EDBs

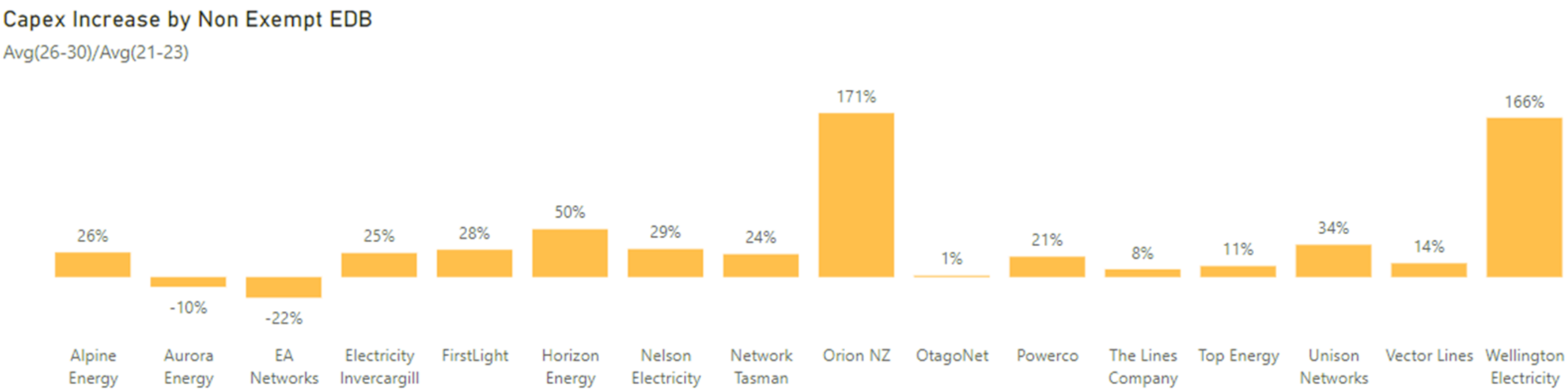
Forecasting total OPEX requirement

$234.5M pa

in the 2024-28 period

The 13 Exempt EDBs are forecasting a total opex requirement of $234.5M pa in the 2024-28 period. This represents an increase of $30.4M pa (14.9%) compared with their actual annual spends in 2021-23. Among the 13 Exempt EDBs, the opex change is found to be within a range from +2% to +38%.

and below summarise the total increase or decrease in forecast capex and opex for each of the EDBs based on the chosen base year expenditure (average annual expenditure in FY21-23) and the forecast period expenditure (average annual forecast expenditure in FY26-30 for Non-exempt and FY24-28 for Exempt EDBs)



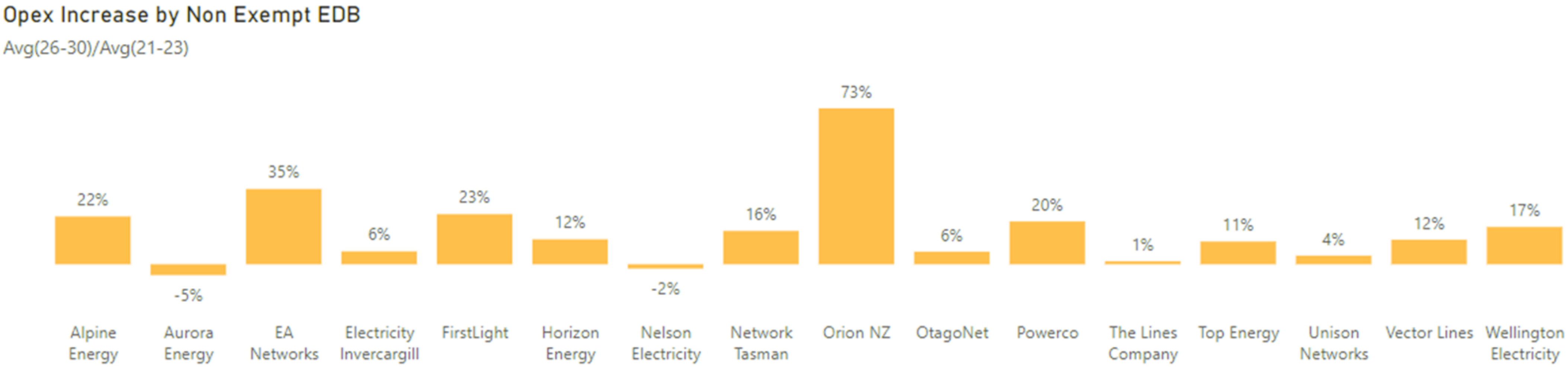
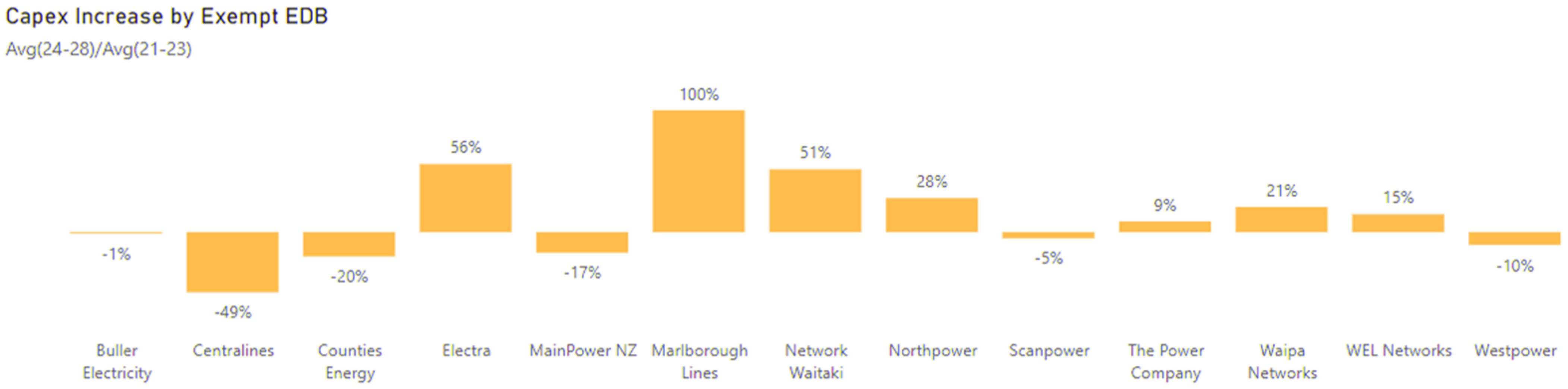


Figure 5 - Expenditure changes for Non-exempt EDBs (positive % denotes expenditure increase whereas negative % denotes expenditure decrease)



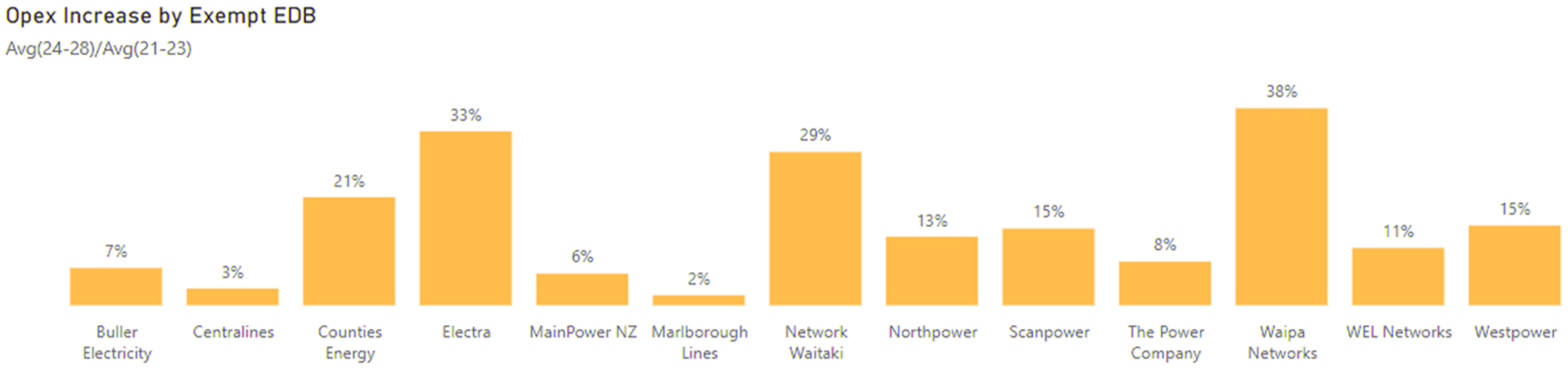
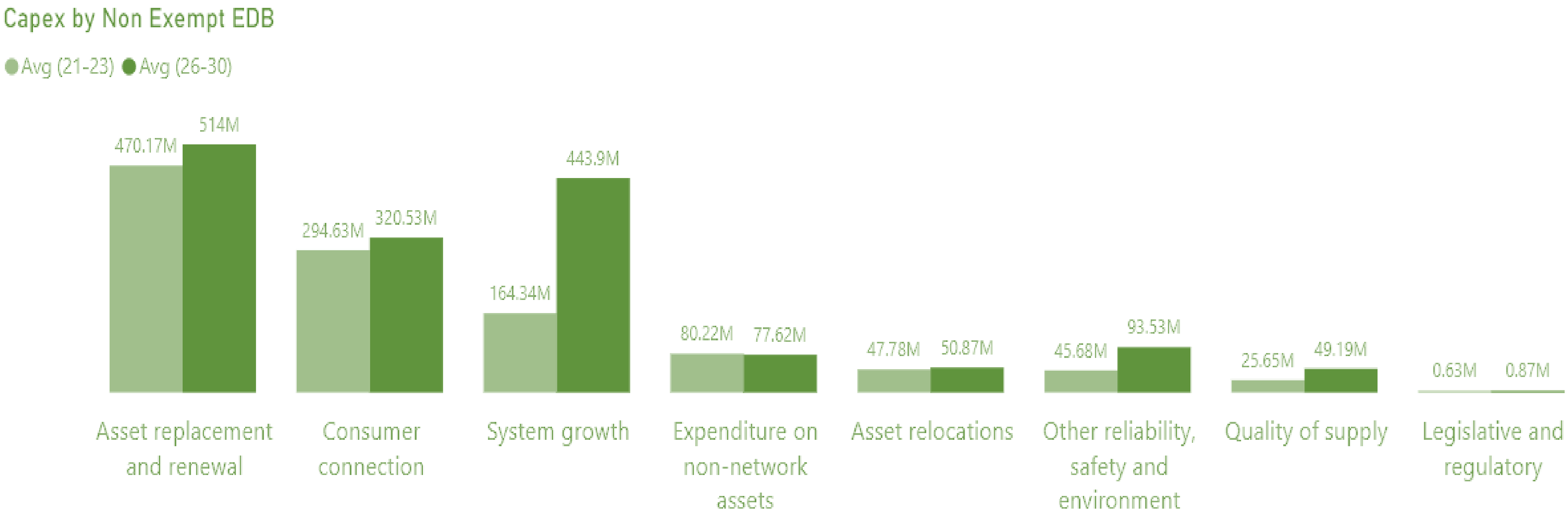


Figure 6 - Expenditure changes for Exempt EDBs (positive % denotes expenditure increase whereas negative % denotes expenditure decrease)

4.3.1 Expenditure category comparison

The following two charts show the comparison of capex and opex categories between the expenditure in the base year and forecast period for all non-exempt EDBs. “**System growth**” is the capex category that has increased significantly in the forecast period. For opex, “**system operations & network support**” and “**business support**” are the two opex categories that have increased considerably in the forecast period.



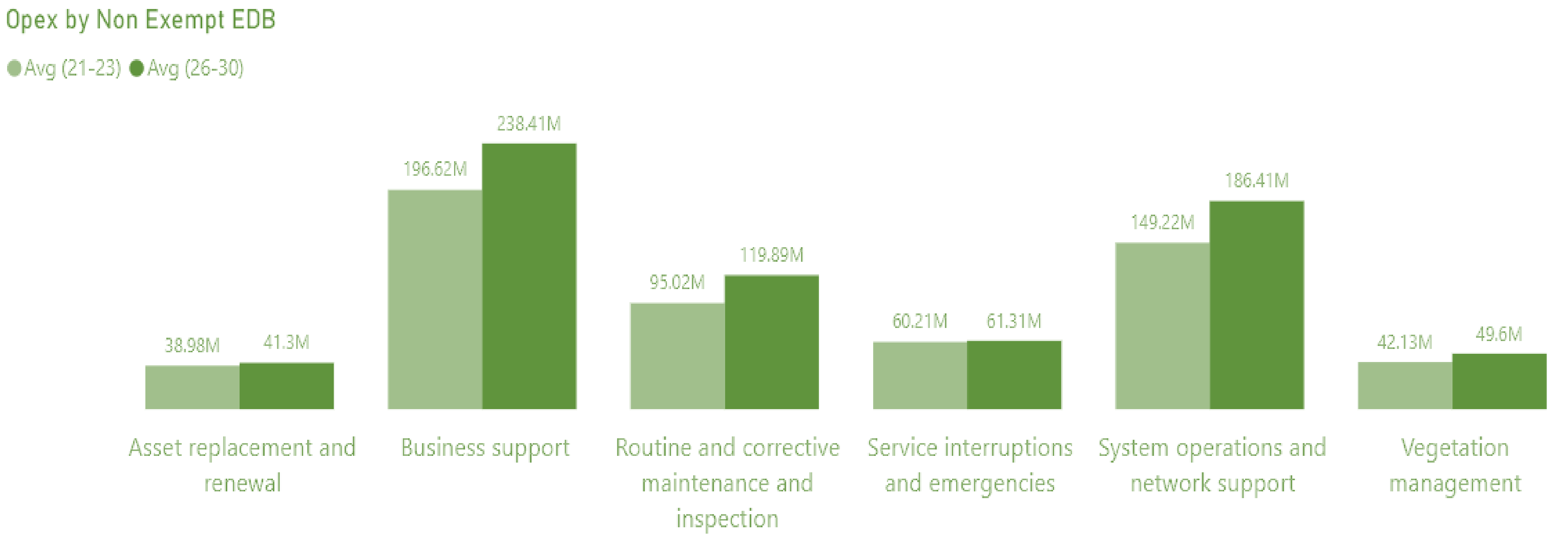


Figure 7 - Expenditure changes for Non-exempt EDBs shown in expenditure categories

For exempt EDBs, a picture similar to Non-exempt EDBs has emerged - "**system growth**" is the capex category that has increased significantly in the forecast period. For opex, "**system operations & network support**" and "**business support**" are the two opex categories that have increased considerably in the forecast period.

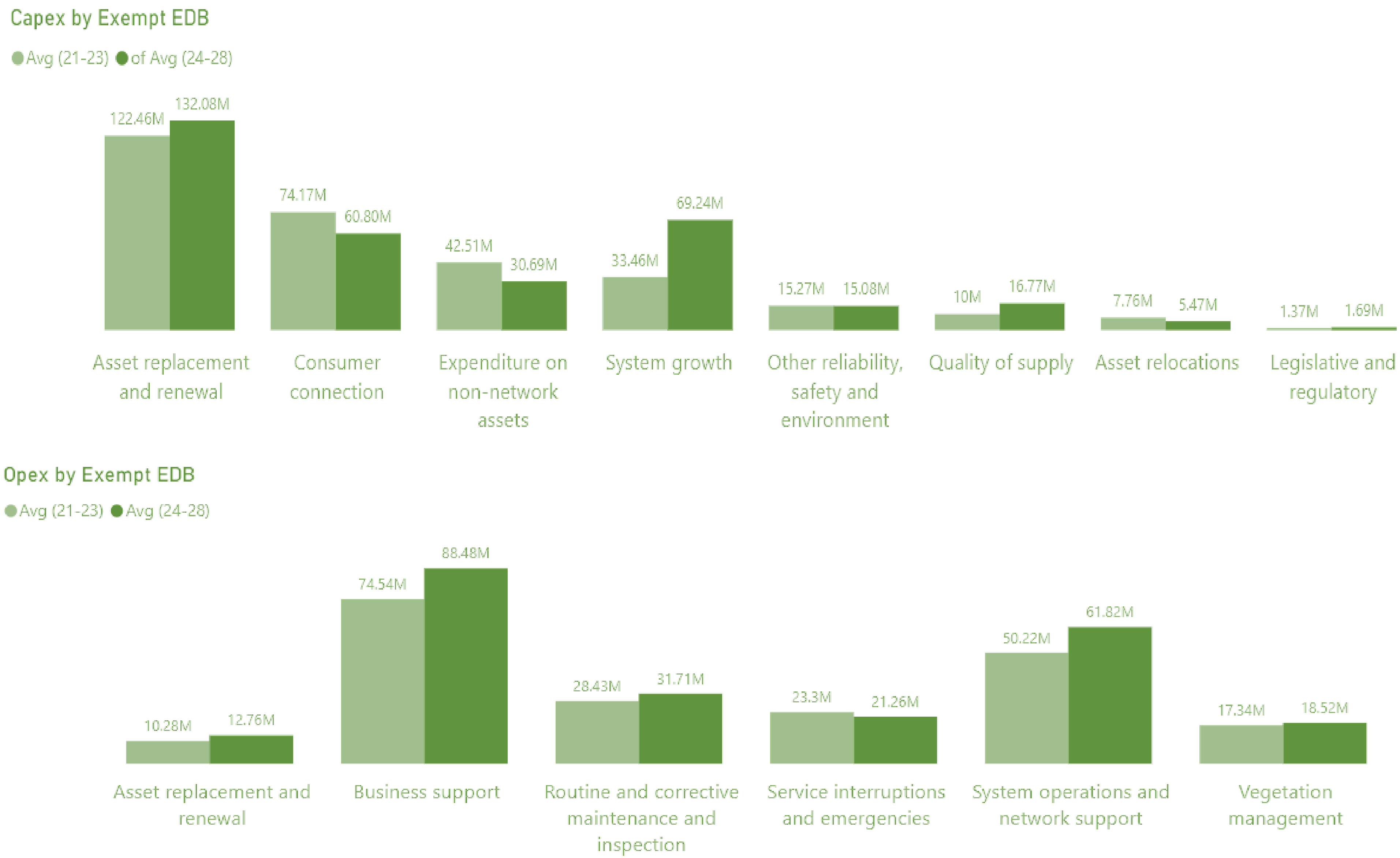


Figure 8 - Expenditure changes for Exempt EDBs shown in expenditure categories

25%
CAPEX thresholds

10%
OPEX thresholds

IAEngg has chosen 25% as the capex threshold and 10% as the opex thresholds to trigger more in-depth scrutiny to understand demand and expenditure drivers behind the large increases. These threshold values are relatively arbitrary and were chosen to limit the analysis to material changes. Focussing the review on material changes should ensure that the key drivers of expenditure change are properly identified and that attributes of the drivers are considered.

Other outputs from the AMP review were used as inputs to the Demand and Expenditure forecasting Assessments shown below in Section 4.5, and as inputs to the individual EDB detailed reviews shown in Section 7.

4.4 Additional Data collation

From the desktop assessment of the 2023 AMPs, IAEngg identified the need for one-to-one clarifying meetings with the EDBs as the AMPs are limited in the information they contain. For example, they generally contain limited information on the way that an EDB has converted expenditure drivers into forecast expenditure.

The time constraints of the project did not allow for clarifying meetings with all EDBs so, 13 Non-Exempt and 4 Exempt EDBs were selected for clarifying meetings. The selection of EDBs for meetings was based primarily on the change in forecast expenditure and secondarily on ensuring a wide range of EDBs (size and operating environment) were considered. Clarifying questions were sent to the EDBs prior to the meetings. IAEngg is grateful for the cooperation from the EDBs to make themselves available and their preparation prior to the meetings.

The yellow highlights in the table below are the EDBs invited to clarifying meetings and their capex forecast characteristics:

Capex '000	Avg	Avg	% Change
Non Exempt EDB	(21-23)	(26-30)	(26-30)
Alpine Energy	25,178	31,632	26%
Aurora Energy	90,932	81,597	-10%
EA Networks	17,280	13,558	-22%
FirstLight	12,107	15,554	28%
Electricity Invercargill	6,384	7,984	25%
Horizon Energy	8,637	12,947	50%
Nelson Electricity	1,590	2,055	29%
Network Tasman	12,831	15,887	24%
Orion NZ	104,021	281,954	171%
OtagoNet	22,305	22,525	1%
Powerco	285,861	346,583	21%
The Lines Company	21,955	23,732	8%
Top Energy	16,336	18,203	11%
Unison Networks	71,184	95,133	34%
Vector Lines	375,415	429,259	14%
Wellington Electricity	57,076	151,915	166%

Capex '000	Avg	Avg	% Change
Exempt EDB	(21-23)	(24-28)	(24-28)
Buller Electricity	3,083	3,049	-1%
Centralines	14,288	7,250	-49%
Counties Energy	67,252	53,862	-20%
Electra	16,381	25,520	56%
MainPower NZ	30,662	25,494	-17%
Marlborough Lines	11,952	23,884	100%
Network Waitaki	10,102	15,302	51%
Northpower	33,771	43,203	28%
Scanpower	4,360	4,141	-5%
The Power Company	30,727	33,423	9%
Waipa Networks	17,147	20,676	21%
WEL Networks	62,872	72,077	15%
Westpower	4,407	3,946	-10%

Table 10 – EDB clarifying meetings and their capex forecast

The information collected in the clarifying meetings was used to supplement the information gathered from the desktop review of the 2023 AMP, and aided in the identification and analysis of potential uncertainties and variables in EDBs financial and demand forecast for each of the key driver of change. This information has been incorporated into the findings of the individual EDB assessments shown in Section 7.

4.5 EDB Demand Forecasting and expenditure Assessment

The development of an EDB capex expenditure forecast is a 2-step process shown in Figure 2. This section of the report firstly discusses our review of the first step of the process and then presents the our assessment of the forecasting and expenditure approaches.

Fit-for-Purpose Demand Forecasting

IAEngg believes that the demand forecasting approach should be “fit-for-purpose”, and not a “one-size-fit-all” across the 29 EDBs, for the following reasons:

- There are significant variations in Regulatory Asset Base (RAB), service territory, maximum demand, network un-utilised capacity, customer type and number
- There are significant variations in the availability of engineering resource for forecasting work
- The current state of the EDB networks is quite different as they are results from different historic developments
- Exempt versus non-exempt from price-quality regulations drive different behaviours with regard to allowance for uncertainties
- There are likely to be more uncertainties associated with forecasting customer behaviours when there are more customer types and number (i.e. Smaller edbs have an advantage here)
- Forecasting asset conditions using statistical analysis is generally only applicable when there are relatively large asset volumes

A summary of the commonly found expenditure categories that have contributed to the forecast material expenditure increase, and their key underlying drivers are shown in Table 11 below.

Expenditure category	Underlying key demand drivers
Capex – consumer connection	Increase in economic activities
	De-carbonisation initiatives such as process heat conversion, small gas conversion, electric vehicle charging
Capex – system growth	Increase in economic activities
	Expansion plans of large electricity users
	EV – light transport
	Process heat conversion
	Small gas conversion
	DER/DSR
	Open access network/DSO
Capex – asset replacement & renewal	Ageing assets
	Resilience
Capex – Reliability, Safety & Environment – all categories	Reliability
	LV visibility
	Resilience
	MV and LV switching control
Opex - System Operations & Network Support	Salary and wage growth
	Increased contracting costs
	Migration to cloud service
	Increase in use of flexibility service
	Increase in network scale
Opex – Business Support	Salary and wage growth
	Increased contracting costs
	Migration to cloud service
	Corporate support cost e.g. insurance premiums
Opex - Routine & Corrective Maintenance & Inspection	Increase in network scale

Table 11 -Expenditure categories and key demand drivers

4.5.1 Context

This section provides some context to the drivers of demand forecasts.

All the 29 EDBs are facing significant changes in their operating environment due to a number of factors:

NZ government commitment to achieve net zero by 2050.

Structural changes in the industry including the new role of Distribution System Operator (DSO)

Recent experiences of extreme weather and seismic events. Beginning on Friday, 27 January 2023, regions across the upper North Island of New Zealand experienced widespread catastrophic floods caused by heavy rainfall, with Auckland being the most significantly affected. Cyclone Gabrielle caused significant devastation in northern and eastern regions of North Island in Feb 2023 and was described as NZ's costliest non-earthquake natural disaster.

The EDB AMPs refer to the following policy documents which support the call to action on decarbonisation and consider the impact on their electricity distribution networks:

NZ Government's Climate Change Response (Zero Carbon) Amendment Actl (2019)[3]. The key actions for Energy and Industry (chapter 11) under New Zealand's First Emissions Reduction Plan include investigating the need for electricity market measures to support the transition to a highly renewable electricity system, investigating options for electricity storage in dry years, supporting industry to improve energy efficiency, reduce costs and switch from fossil fuels to low-emissions alternatives through the Government Investment in Decarbonising Industry fund. Government will also ensure there is corresponding growth in utility scale renewable generation to replace fossil fuel to achieve emission reduction targets. The key actions for transport (chapter 10) include rapid adoption of low-emissions vehicles by incentivising uptake of low- and zero-emissions vehicles (Clean Vehicle Discount scheme and trialling an equity-oriented vehicle scrap-and-replace scheme and improving EV-charging infrastructure), decarbonise heavy transport and freight include providing funding to support the freight sector to purchase zero- and low-emissions trucks and requiring only zero-emissions public transport buses to be purchased by 2025;

[3] https://www.legislation.govt.nz/act/public/2019/0061/latest/whole.html#LMS183736

The Clean Car Discount[4], and the tax on utes and SUVs, are likely to encourage the uptake of EV. The Energy Efficiency & Conservation Authority 2022 report on improving the efficiency of electric vehicle chargers[5] has forecasted significant uptake of EVs.

The Energy Efficiency & Conservation Authority (EECA) is running a flagship program called Energy Transition Accelerator (ETA)[6]. The program is targeted at large energy-using businesses and public sector organisations that are committed to reducing carbon emissions. Building on the ETA project is the EECA's Regional Energy Transition Accelerator (RETA)[7]. The RETA program aims to provide a regional view of opportunities and barriers to reducing emissions. A number of reports have been generated covering different regions of NZ. For example, the North Canterbury RETA report[8] investigates the de-carbonisation pathways for 80 sites – spanning the dairy, meat, industrial and commercial sector – in the North Canterbury region for process heat fuel switching to biomass and electricity. De-carbonisation of process heat in this region will impact on the electricity infrastructure of Transpower, Mainpower and Orion. A similar report for the mid-South Canterbury region[9] examines the effect of process heat fuel switching on the electricity infrastructure of Transpower, EA Networks, Alpine Energy and Network Waitaki. Co-funding support was available through the GIDI fund but has now been stopped.

[4] https://www.nzta.govt.nz/vehicles/clean-car-programme/clean-car-discount
[5] https://www.eeca.govt.nz/assets/EECA-Resources/Consultation-Papers/EV-charging-Green-Paper-8-August-2022.pdf
[6] https://www.eeca.govt.nz/co-funding-and-support/products/energy-transition-accelerator/
[7] https://www.eeca.govt.nz/co-funding-and-support/products/about-reta/#:~:text=The%20RETA%20programme%20involves%20working,agencies%2C%20Iwi%20and%20industry%20groups.
[8] https://www.eeca.govt.nz/co-funding-and-support/products/north-canterbury-regional-energy-transition-accelerator/
[9] https://www.eeca.govt.nz/co-funding-and-support/products/mid-south-canterbury-regional-energy-transition-accelerator/

The $650M Government Investment to Decarbonise Industry (GIDI) fund[10], administered by the Energy Efficiency & Conservation Authority, provides co-funding support to help residential, businesses and industries accelerate energy efficiency and fuel switching projects.

The banning of new low and medium temperature coal-fired burners[11].

For resilience to extreme climatic and seismic events, there is a general consensus that the frequency of extreme climatic events (such as storms and floodings) is increasing and this is caused by climate change. As Energy infrastructure is classified as "lifeline" utility, EDB asset owners have existing duties as lifeline utilities under the Civil Defence Emergency Management Act 2002[12] to "function to the fullest possible extent, even though this may be at a reduced level, during and after an emergency" (s. 60 (a)). These duties are not new but there is heightened awareness of the impact of extreme weather events from the recent experiences in 2023. Many EDBs have forecasted increased expenditure to undertake proactive asset replacement and renewal expenditure as a means to harden the network against extreme weather events.

4.5.2 Key investment drivers and underlying causes

Table 12 encapsulates the key investment drivers (and their underlying cause) put forward by EDBs in their AMPs in support of their financial and demand forecast. The last column highlights the potential elements of uncertainty and variability in the forecast.

[10] https://www.eeca.govt.nz/strategic-focus-areas/productive-and-low-emissions-business/about-the-government-investment-in-decarbonising-industry-fund/
[11] https://www.beehive.govt.nz/release/government-ban-new-coal-boilers-place#:~:text=The%20national%20direction%20will%20phase,from%2027%20July%20this%20year.
[12] https://www.legislation.govt.nz/act/public/2002/0033/51.0/DLM149789.html

Primary driver of change	Customer / Network response	Investment areas	ComCom expenditure category	Potential elements of uncertainty and variability in the forecast
Adapting to climate change	Consumers responding to climate change by increasing uptake of small-scale distributed energy resource (DER) – roof top solar	Enhance low voltage management / visibility to manage adverse impact on power quality.	Quality of Supply	Customer uptake of DER depends on evolution in New Zealand electricity market rules and regulations to support the transition to a highly renewable electricity system in line with Government commitment[13] to reduce greenhouse gases to net zero by 2050
		Investment in network analytics to improve network management effectiveness and maximise DER benefits to customers.	Non-network System growth Other RSE	
	Increasing use of air conditioning due to higher summer & lower winter ambient temperature plus more frequent extreme temperature days.	Network augmentation to meet demand growth for water and space heating & cooling.	System growth	Depends on the frequency of the extreme temperature days which is not easy to forecast as climate change models are generally long-range models.

[13] As part of Government's Climate Change Response (Zero Carbon) Amendment Bill (2019). The key actions for Energy and Industry (chapter 11) under New Zealand's First Emissions Reduction Plan include investigating the need for electricity market measures to support the transition to a highly renewable electricity system and investigating options for electricity storage in dry years.

	Increase network resilience to increase storm, bushfires & flooding severity and frequency (from more extreme weather events).	Increase inspection and maintenance to ensure network is in optimal conditions.	Routine and corrective maintenance and Inspections	In the absence of any industry recognised or government mandated standards, justification of resilience expenditure would have to be based on cost-benefit analysis. The frequency of extreme weather events, required in a cost-benefit analysis, is not easy to forecast as climate change models are generally long-range models.
		Increased vegetation management to increase network resilience to weather events	Vegetation management	
		Pre-emptive replacement / retirement of assets assessed as vulnerable to extreme weather events.	Asset Replacement and Renewal (capex or opex?)	
	Household gas substitution with heat pump conversion – cooking and water heating.	Network augmentation to meet demand growth from gas substitution.	System growth	Conversion rate is sensitive to Government policy & incentives (e.g. Warmer Kiwi Homes programme), equipment costs and gas prices.

Decarbonisation of New Zealand economy	Small industrial & commercial (e.g. hospitals & schools) heat processes conversion to electricity	Network augmentation to meet demand growth.	System growth	Conversion rate is sensitive to Government policy & incentives, equipment costs, gas prices and other substitution fuels.
	Industrial process heat conversion to electricity	Network (HV) augmentation to meet demand growth.	Consumer Connection (network extensions)	Industrial process heat conversion rate is highly influenced by economics and Government policies[14] and incentives, e.g. emission reduction plan. Given the relative low number of industrial customers, the uncertainties and variability should be confined to un-confirmed projects. Not all industrial process heat conversion that would be connected to distribution network (large ones potentially would be connected directly to Transpower GXP).
	Utility scale renewable generation (solar/wind farms) to meet increasing demand for renewable electricity and phase out of coal generation	Network (HV) augmentation to connect generation	Consumer Connection (network extensions)	Depends on the future price of carbon and additional incentive from government

[14] The key actions for Energy and Industry (chapter 11) under New Zealand's First Emissions Reduction Plan include supporting industry to improve energy efficiency, reduce costs and switch from fossil fuels to low-emissions alternatives through the Government Investment in Decarbonising Industry fund. Government will also ensure there is corresponding growth in utility scale renewable generation to replace fossil fuel to achieve emission reduction targets.

	Transport electrification – Electric vehicles (light vehicles)	Network augmentation to meet demand growth from (household) EV charging.	System growth	EV (light vehicles) uptake rate is very uncertain as it's localised and influenced by cost, charging infrastructure development and Government policies[15], e.g. emission reduction plan, EV car incentive & additional charge on ICE vehicles.
	Transport electrification – Electric vehicles (heavy transport)	Increase consumer requested works.	Consumer connection	Industry response is uncertain as it's influenced by cost, charging infrastructure development and Government policies[16]. Given the relative low number of heavy transport customers, the uncertainties and variability should be confine to un-confirmed projects.
		Network (HV)augmentation to meet demand growth from EV charging.	System growth	

[15] The key actions for transport (chapter 10) under New Zealand's First Emissions Reduction Plan include rapid adoption of low-emissions vehicles by incentivising uptake of low- and zero-emissions vehicles (Clean Vehicle Discount scheme and trialling an equity-oriented vehicle scrap-and-replace scheme and improving EV-charging infrastructure). Another relevant document could be the Energy Efficiency & Conservation Authority 2022 report on improving the efficiency of electric vehicle chargers which contained forecast number of EVs (quoted by Powerco).

[16] The key actions for transport (chapter 10) under New Zealand's First Emissions Reduction Plan to decarbonise heavy transport and freight include providing funding to support the freight sector to purchase zero- and low-emissions trucks and requiring only zero-emissions public transport buses to be purchased by 2025.

Electricity market evolution	Loss of hot water control as demand management tool	Network augmentation to maintain supply security.	System growth	This is highly uncertain as it will involve Regulatory change.
	LV visibility	Install LV monitoring (ADMS)	System growth RSE – quality of supply RSE - others	DER & DSO is a relatively new driver of network investment and in the absence of regulatory drivers, the development of a cost-benefit analysis will be required to justify the investment.
	Develop strategy and plan to transform network into a smart grid that support open access and enable flexibility service to maximise DER benefits for customers	Develop specification for a smart grid that enable a DSO to fulfil its functions and responsibilities	Non-network	In the absence of defined functions of a DSO, the development of a cost-benefit analysis will be required to justify the investment.

Maintain service levels & network performance	Condition and/or economic life and/or work efficiency based asset (including non-network asset) replacement Reliability		Asset Replacement and Renewal (capex or opex?)	Stay in business investment. Any step change in expenditure forecast should be supported by quantitative data analysis.
	Security of supply standard	Security of supply standard (SoSS) requiring network augmentation, primarily at zone substations and GXP	System Growth & RSE	Unless SoSS is mandated, the SoSS adopted by each EDB can change[17]
Meet current regulations	Consumers replacing non-compliant* solid fuel burners for home heating with electric heating. (*National Environmental Standard)	Network (LV) augmentation to meet demand growth from solid fuel home heating substitution.	System growth	Conversion rate is related to the geographical locations where these restrictions apply. Conversion rate depends on costs and substitute fuel options.

[17] For example, Vector quotes "compliance with the Security of supply Standards (SoSS) (ESP010)" in page 85 of their 2023 AMP.

Population growth and intensification of residential development, including infill in urban areas	Increase consumer connection works	Network (LV) extension and augmentation	Consumer connection	Future economic activities and migration policy will affect the growth in population and dwellings
Provision of network connection service	New commercial / industrial loads, including data & hydrogen centres driving an increase in customer driven work	Network extension and augmentation to meet consumer request.	Consumer connection	Uncertainty about future trend of new commercial/industrial loads and where they are located

Table 12 - Key investment drivers (and their underlying cause) put forward by EDBs in their 2023 AMP

Most of the drivers shown in Table 12 contain significant assumptions which materially impact forecast demand and hence expenditure e.g. EV uptake is very sensitive to government rebates, residential conversion rate from gas to electrical appliances is very sensitive to government policy & incentives, equipment costs and gas prices; process heat conversion may not result in all customers switching to electricity as there are other possible substitution energy sources such as wood pellets and biofuels.

A recent announcement (December 2023) by the 2023 elected NZ government on scrapping the rebate for low emission vehicles and the charge for high polluting vehicles is likely to slow the EV uptake trend.

There is a general recognition that energy system has a number of possible future development pathways. Transpower published "Te Mauri Hiko – Energy Futures paper[18]" in 2018 which set out how New Zealand's energy systems could lead the decarbonisation of New Zealand's economy. In 2020 Transpower published "Whakamana i te Mauri Hiko – Empowering Our Energy Future[19]" in which the "accelerated electrification" scenario was regarded as the base scenario that would play out. Since then, Transpower has been publishing a six-monthly monitoring report "The Whakamana i Te Mauri Hiko Monitoring Report" which aims to identify, within the key drivers of Whakamana i Te Mauri Hiko, those factors that are consistent—or vary—from the expected course of our scenarios. In the absence of other credible and independent assessments, IAEngg has taken the view that the Transpower scenario should be adopted by the EDBs in their demand forecasting.

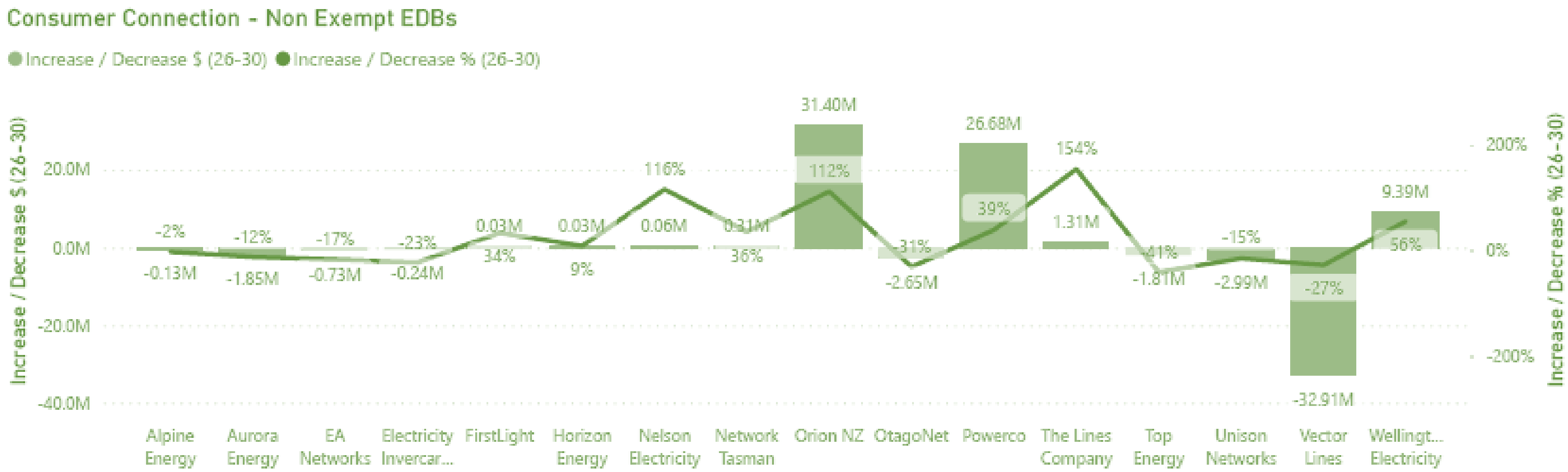
4.5.3 Consumer Connection

EDB Trends

Figure 9 provides a comparison of forecast increase/decrease of consumer connection capex for the Non-exempt and Exempt EDBs. The values of the capex increase/decrease are shown in the bar chart whereas the line graph shows the % increase/decrease. For example, Orion has forecasted an annual increase of $31.4M and it represents an increase of 112% of what was spent in the base year.

18 https://static.transpower.co.nz/public/publications/resources/TP%20Energy%20Futures%20-%20Te%20Mauri%20Hiko%2011%20June'18.pdf?VersionId=MDV0p3zqO_I5CKry.QZsY2_cugsqKhGn

19 https://static.transpower.co.nz/public/publications/resources/TP%20Whakamana%20i%20Te%20Mauri%20Hiko.pdf?VersionId=FljQmfxCk6MZ9mIvpNws63xFEBXwhX7f



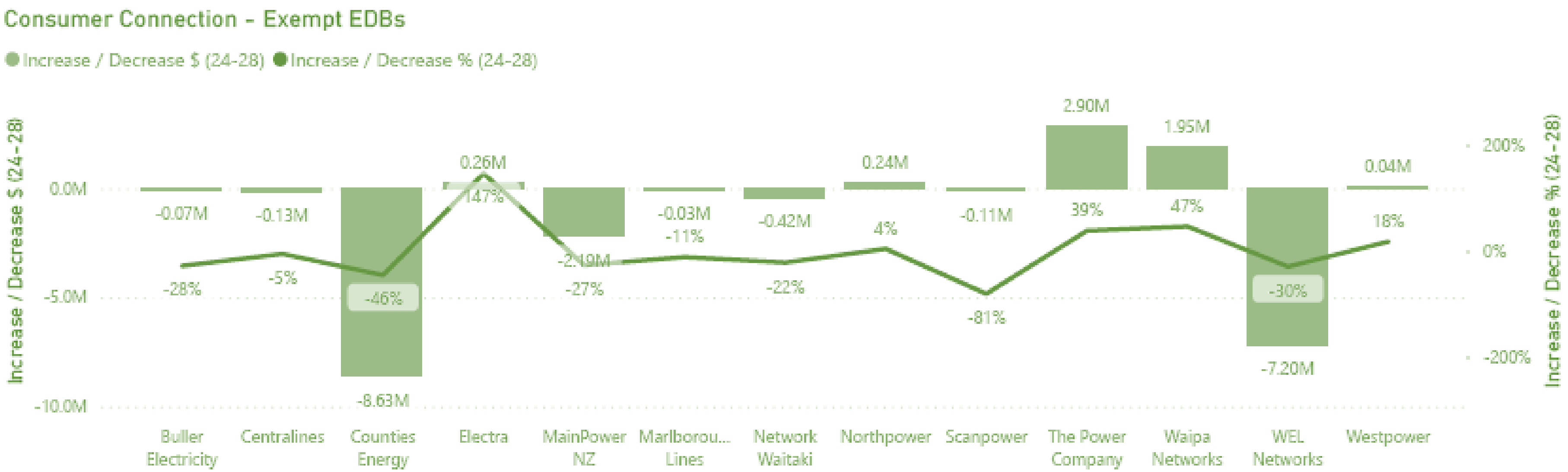


Figure 9 – Consumer Connection expenditure trends

Historically, growth in consumer connection volume and expenditure is related to dwelling and business growth which in turn relies on economic activities and developments in the EDB's supply region. EDBs use a combination of information from the local planning authorities and EDBs' historic trends to forecast the types and volumes of different consumer connections in 2026-30.

Residential dwelling growth generally exhibit a relatively stable trend over the medium term but could see short-term fluctuations caused by medium or high density residential developments particularly for the smaller EDBs. Business connection growth exhibits a higher degree of volatility as it is very sensitive to economic growth both within and outside NZ.

A trend that has been reported by Vector relates to increasing number of data centre developments. This is not surprising as work-from-home and IT outsourcing/co-location trends start to take root in the worldwide economy, and increasing awareness of data centre management to build their energy-intensive data centres in parts of the world where electricity generation is seen to be "cleaner"[20].

Business connection generally incurs capital contribution from the customers, with the cost calculated based on the upfront connection (shallow connection cost) and average costs for the use of upstream network capacity (deep connection cost), offset by revenue derived by the network over the life of the connection agreement.

Uncertainty of New Demand Growth Drivers – Consumer Connection

The new driver caused by the decarbonisation of New Zealand economy is likely to push the consumer connection volumes (including customer requests to increase their supply capacity) above the historic trends but the timing and volume are subject to a high degree of uncertainty as this is affected, to a major extent, by government policies to incentivise decarbonisation initiatives such as process heat conversion and residential gas electrification.

Example of government providing certainty

In Australia, the state government of Victoria recently announced a ban on new gas connections on residential customers and encourages the development of all-electric new homes from 1 Jan 2024 onwards[1]. The Victorian EDBs can reasonably assume, with a high degree of certainty, that all new residential connections will have a higher electricity demand and factor this into their demand and expenditure forecasting. A defined government approach, like that applying in Victoria, will reduce the uncertainties in consumer connection capex forecast caused by de-carbonisation of the economy.

4.5.4 System Growth

EDB Trends

Figure 10 provides a comparison of forecast increase/decrease of system growth capex for the Non-exempt and Exempt EDBs. The values of the capex increase/decrease are shown in the bar chart whereas the line graph shows the % increase/decrease.

[20] Fiona Brocklehurst, Ballarat Consulting, "International Review of Energy Efficiency in Data Centres", September 2021

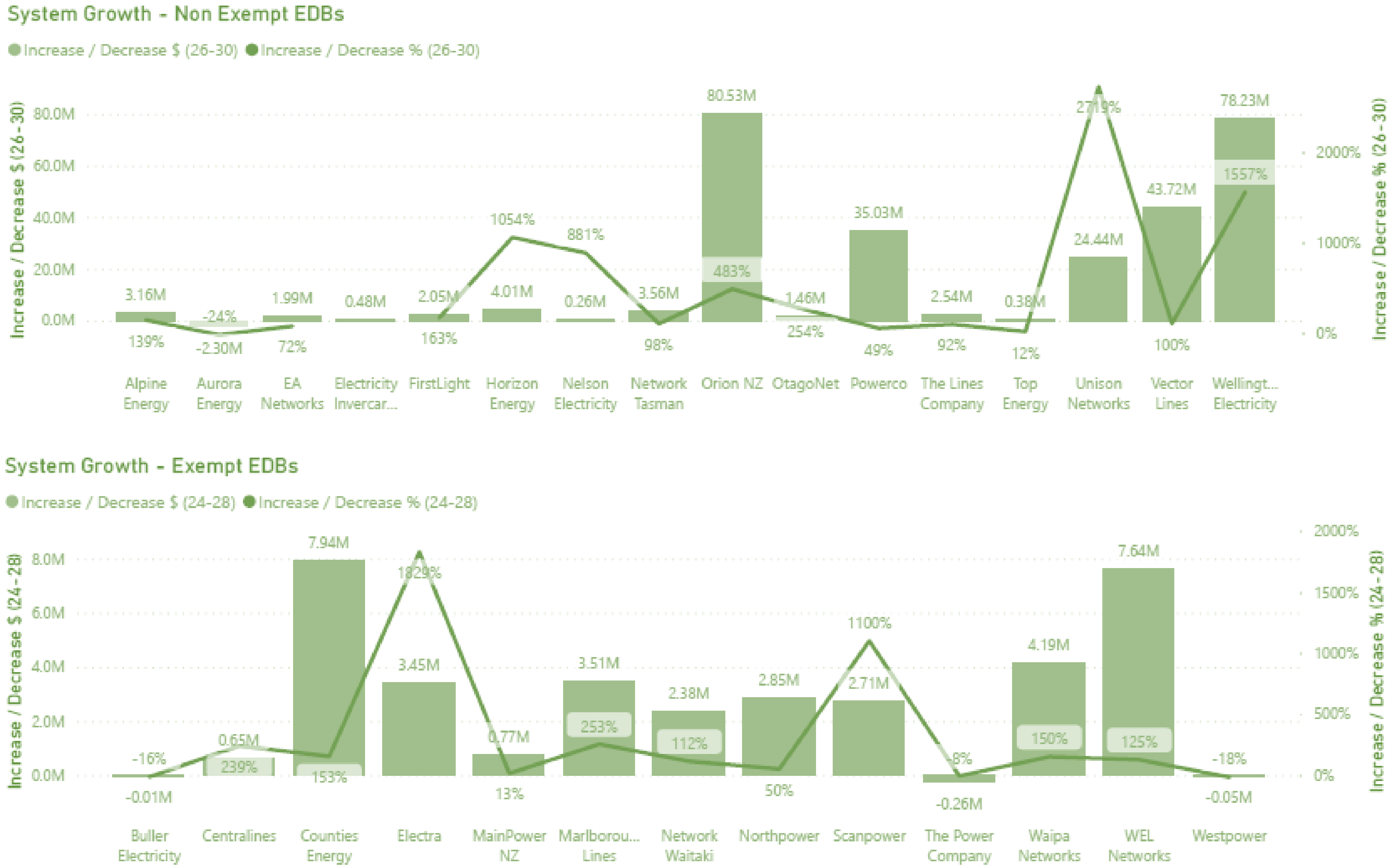


Figure 10 – System Growth expenditure trends

Uncertainty of New Demand Growth Drivers – System Growth

System growth is a common factor that drives up the overall capital expenditure of EDBs. Apart from business-as-usual underlying demand growth, the new growth driver arising from decarbonisation, such as process heat conversion, transport electrification and domestic gas conversion are contributing to significant demand growth forecast. The growth projections, however, are subject to a high degree of uncertainty particularly in this initial period where government and industry as a whole are still coming to terms with the concrete policies and plans to achieve net zero by 2050. New Zealand is not alone in this as other countries are also grappling with similar questions and uncertainties.

Demand Forecasting Taking Uncertainty into Account

A good industry practice in dealing with future uncertainty is to adopt scenario assessment and planning. IAEngg noted that scenario assessment is being adopted by Transpower. In the absence of other credible and independent assessments, IAEngg believes the Transpower scenario – accelerated electrification - should be adopted by the EDBs in their demand and expenditure planning.

Example of an approach to dealing with uncertainty caused by decarbonisation

As a mid-sized EDB, Unison has the benefits of foresight by investing early into network visibility and control capability (smart networks, LV visibility & flexibility). This gives Unison the confidence that there is enough capacity in its network to handle the impact of electrification, and also the visibility/early warning if their forecasts are inadequate. As a result, Unison has adopted a measured approach to de-carbonisation and made only modest increase in demand forecast to cater for early adopters. Unison has stated that it will rely on the re-opener mechanism if there is unexpected significant increase in demand.

IAEngg notes that a number of EDBs have adopted scenario assessment to quantify the impact of various decarbonisation initiatives on maximum demand forecasting. From a forecasting perspective the approach accords with good industry practice. What is not clear to IAEngg is how the inputs of the EDB scenarios align with Transpower's scenarios – particularly the "accelerated electrification" scenario which is currently considered to be most realistic.

Adopting scenario assessment is not the only viable approach to address uncertainty caused by de-carbonisation. Some EDBs, notably those with a smaller customer base, face less uncertainty with regard to some de-carbonisation initiatives e.g. EV uptake is likely to lack behind the national adoption rate because of customer demographics, or there are no heavy industries that will undertake process heat conversion to electricity. Under such circumstances, a "wait-and-see" strategy could be the right approach especially if the EDBs have plans in place to continually monitor the uptake rate and/or have enough surplus capacity to cater for uptake in the short to medium term.

Under scenario assessment, EDBs need to make assumptions about the uptake of new consumer technologies and the impact the uptake has on the network demand. This information is not readily available in EDBs' AMPs. Due to this limitation, IAEngg has not been able to compare the assumptions used by different EDBs and form an opinion of the reasonableness of the inputs and assumptions. Data for the two examples quoted below are obtained from EDB meetings and not readily available from the AMPs.

From New Demand Growth to Expenditure Forecast

The maximum demand growth, as output from the scenario assessment, is generally converted into a program of augmentation works at the sub-transmission and zone substation level. It is, however, not clear, from the information available in the AMPs, how the maximum demand growth caused by these de-carbonisation initiatives are converted into expenditure forecast at the Medium and Low Voltage networks in the absence of a defined programs of work.

Once the demand forecast is established, the general approach is to look for network solutions to satisfy the future demand and this is then turned into a program of works and an expenditure forecast. Network solutions generally require significant lead time for implementation, and once implemented, the network assets are expected to have a 40-50 year life. If the forecast demand increase does not eventuate, EDBs could be left with under-utilised assets.

IAEngg notes that Vector has highlighted the use of flexibility tools to reduce future demand which in turn reduce future system growth expenditure. Apart from de-carbonisation, future industry structural change is also seen to impact the system growth capex. One specific example is to do with hot water control. Orion estimates that it will need to increase network capacity by some 31MW by 2035 due to the loss of control of hot water to retailers (through smart meters) from approximately FY27. On the other hand, we have seen Vector's plan to increase capacity of load control as a flexibility tool to reduce future demand increase under their "Symphony" scenario. IAEngg is not advocating one approach over the other but highlights the position that each EDB takes for a future scenario/uncertainty will influence the action it takes, and this will in turn affect its expenditure forecast.

Example of different EDB approaches to demand and expenditure forecasting

Powerco applies scenario assessments (base, high, low) to model the uncertainties in forecasting peak demand impact of new consumer technologies arising from the decarbonisation driver. Standard S-curve constructs are used to forecast uptake of these new consumer technologies (such as electric vehicles and small gas conversions) to arrive at the peak demand impact. The increase in peak demand and the historical cost assumptions are used to generate a consumer connections forecast, using $1.6M/MW across 11kV and LV developments.

Horizon Energy made a high-level capex allowance of $0.5M, from 2026 onwards, to cater for impact of de-carbonisation initiatives that is unknown. Confirmed de-carbonisation initiatives (the AMP refers to two solar farm developments) have been factored into the forward expenditure forecast.

Other Observations on Growth Capex

Some EDBs have also included security of supply initiatives under growth capex. While load growth is a trigger for security of supply investment in accordance with EDBs' security of supply standards, IAEngg notes that resilience has also been mentioned as a driver for security of supply initiatives. While we will discuss resilience planning under "Asset replacement & renewal" section below, we want to note that the different EDB approaches have made it harder to compare and assess the reasonableness of EDB's growth expenditure.

4.5.5 Asset Replacement & Renewal

EDB Trends

provides a comparison of forecast increase/decrease of asset replacement & renewal capex for the Non-exempt and Exempt EDBs. The values of the capex increase/decrease are shown in the bar chart whereas the line graph shows the % increase/decrease.

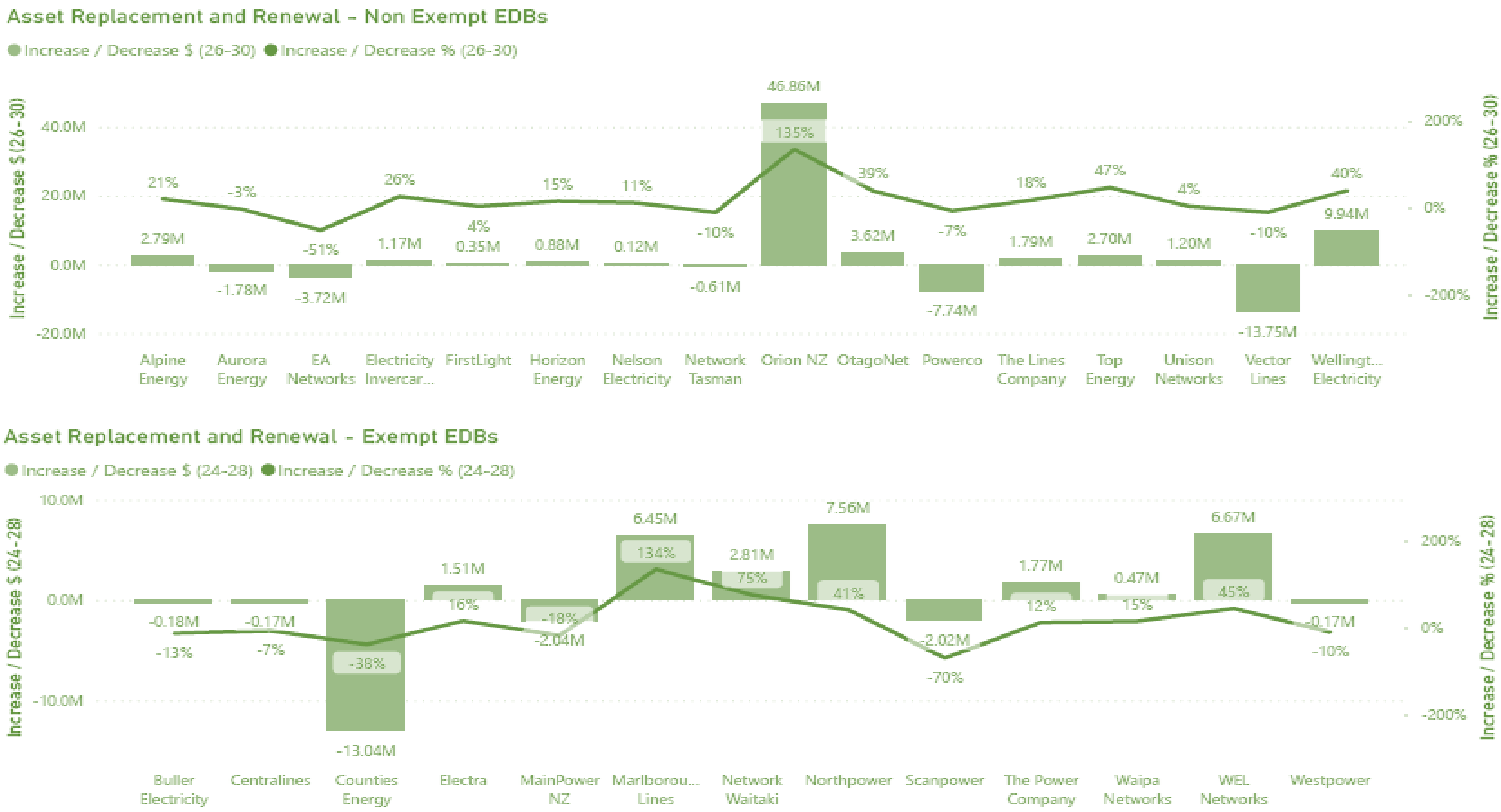


Figure 11 – Asset Replacement and Renewal trends

Business-As-Usual

Demand forecasts that underpin the asset replacement & renewal expenditure are based primarily on actual asset health, criticality and conditions as revealed via asset condition monitoring.

For high cost, low volume assets, such as zone substation transformers, EDBs generally have good asset data available to confirm their health, including data from on-going condition monitoring. The approaches taken by EDBs to forecast the replacement need for these types of assets are proven in the past. Note, however, our assessment was limited as we have not checked the asset condition data.

For low cost, high volume assets, such as conductors and poles, forecast of replacement need down to the individual asset level is generally not practical. For EDBs that are forecasting replacement based on a historic trend i.e. no significant increase, IAEngg consider that this is a reasonable approach without any elaborate replacement model. For EDBs that are forecasting a significant uplift in replacement volumes, forecast at an aggregate level (such as supply regions) based on historic trend, statistical information such as asset age profile, and recent failure rates is desirable. The CBRM model used by UK DNOs, REPEX model used by Australian DNSPs and EEA NZ Asset Health Indicator Guide (EEA AHI Guide) are examples of such forecast models, which some EDBs have adopted. IAEngg is aware that these model outputs can vary and is important to "tune" the models so they reasonably reflect the actual replacement experiences. While IAEngg can provide an opinion on the reasonableness of the forecasting approach based on assessing the quality of the forecasting model, we cannot provide an assurance of the forecasting output (volume of assets to be replaced) without examining the model inputs. In the same way, IAEngg cannot provide an opinion on the reasonableness of the expenditure forecast without access to the unit rates used to convert volumes of work into expenditure.

Addressing Many Assets Coming to End-of-Life

A number of EDBs have mentioned that there is a "bow wave" coming for asset replacement and renewal need due to a large number of assets near the end of their nominal life (being installed in the 1960s). This is a similar experience for EDBs in other countries and should not come as a surprise. Good industry practices for assets deemed to be near their end-of-life include:

Based on cost-benefit assessment, implement more intensive or new condition assessment programs to ascertain their conditions;	Based on cost-benefit assessment, implement asset life extension programs to defer replacement to later periods;	Aligning asset replacement & renewal program with other programs such as system growth and reliability, safety & environment.

The first two initiatives will result in capex-opex trade-offs while the third initiative will eliminate duplication between programs. An example is Wellington Electricity which has taken the third initiative in their 2023 AMP.

Uncertainty of Asset Replacement and Renewal Drivers

IAEngg notes that the resilience driver has also impacted asset replacement & renewal expenditure in that some assets are going to be replaced or renewed based on resilience consideration and not end-of-life. For example, Orion is proposing to replace more of its higher altitude poles that have been identified as high risk of wind damage. Specific initiatives of replacing assets before end-of-life need to be separately itemised from the general asset replacement if they are to be assessed appropriately. Specifically for Orion's forecast, it is not clear how these poles are identified and the cost-benefit when compared to the 'do nothing option'.

Some EDBs are proposing to relocate assets due to resilience consideration e.g. moving assets to higher ground to avoid flooding. While this is a reasonable approach, the question arises as to what standard should be used for resilience planning. We expect to see in AMPs the standard that EDBs have used in assessing the resilience of their networks, such as 1 in 100 or greater and, where a change in standard is proposed, justification for the change.

From Asset Replacement and Renewal Quantity to Expenditure Forecast

For high cost low volume assets (such as zone substation transformers), the cost to renew or replace these assets are generally established through customised project scopes and cost estimation. For low cost high volume assets (such as poles), the average unit costs are generally used to convert the quantity forecast from the asset replacement model into expenditure of the replacement programs. IAEngg notes that the AMPs do not provide enough granular details to allow assessment of the reasonableness of the expenditure forecast.

4.5.6 Asset Relocations

EDB Trends

Figure 12 provides a comparison of forecast increase/decrease of Asset Relocation capex for the Non-exempt and Exempt EDBs. The values of the capex increase/decrease are shown in the bar chart whereas the line graph shows the % increase/decrease.

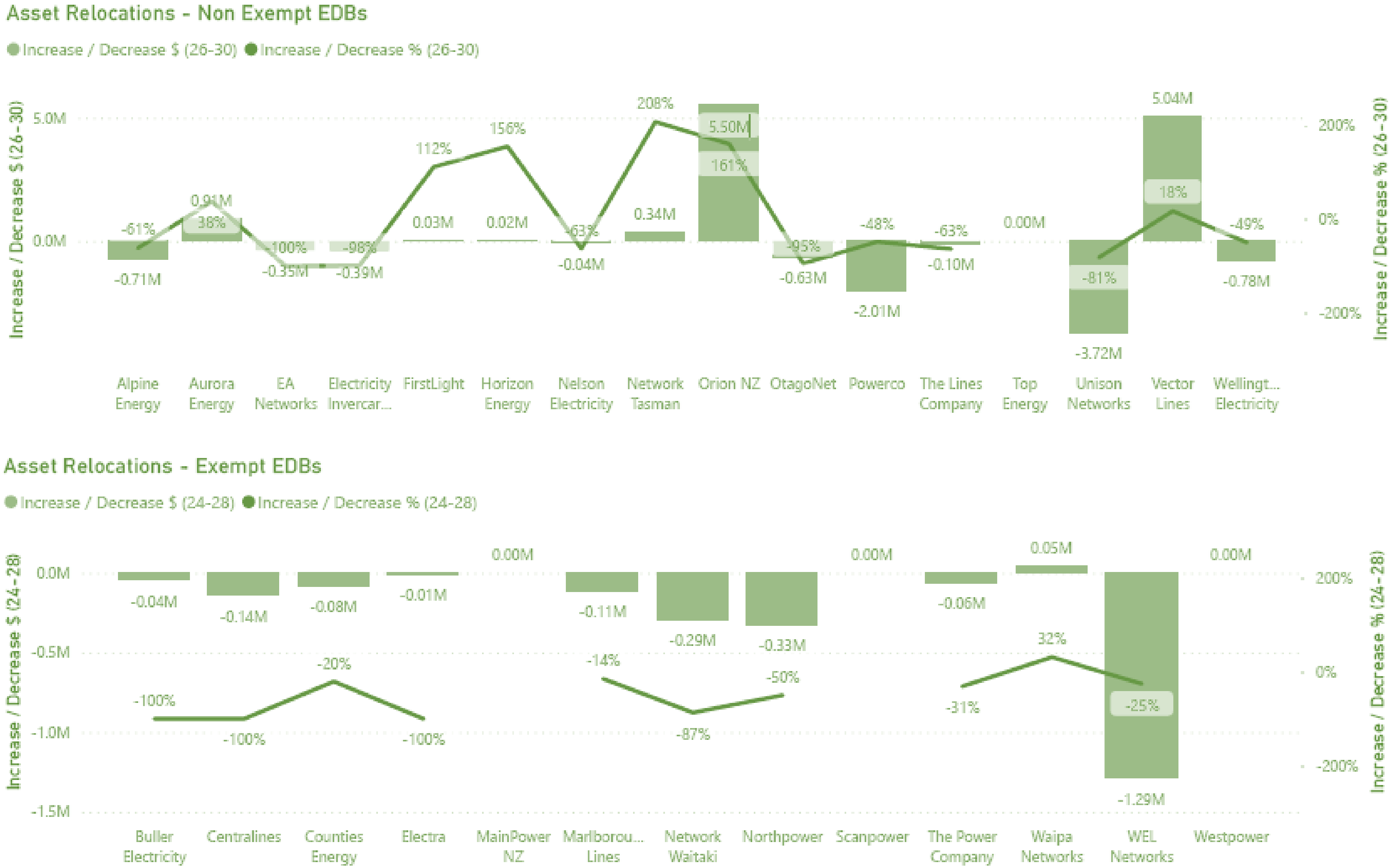


Figure 12 – Asset Relocations trends

EDB assessment of asset relocation volumes and expenditure in 2026-30 is generally based on historic trends. None of the AMPs have identified key infrastructure projects with clear requirements of scope and timings of asset relocation. There are clearly uncertainties in the demand and expenditure forecast for this capex item. However, as asset relocations are generally fully funded by the requesting authorities, the impact of out-turn difference on EDB's net capex position is relatively small.

IAEngg considers the approach taken by EDBs for asset relocation demand and expenditure forecast align with good industry practices.

4.5.7 Reliability, Safety & Environment

EDB Trends

Figure 13 provides a comparison of forecast increase/decrease of reliability, safety & environment capex for the Non-exempt and Exempt EDBs. The values of the capex increase/decrease are shown in the bar chart whereas the line graph shows the % increase/decrease.

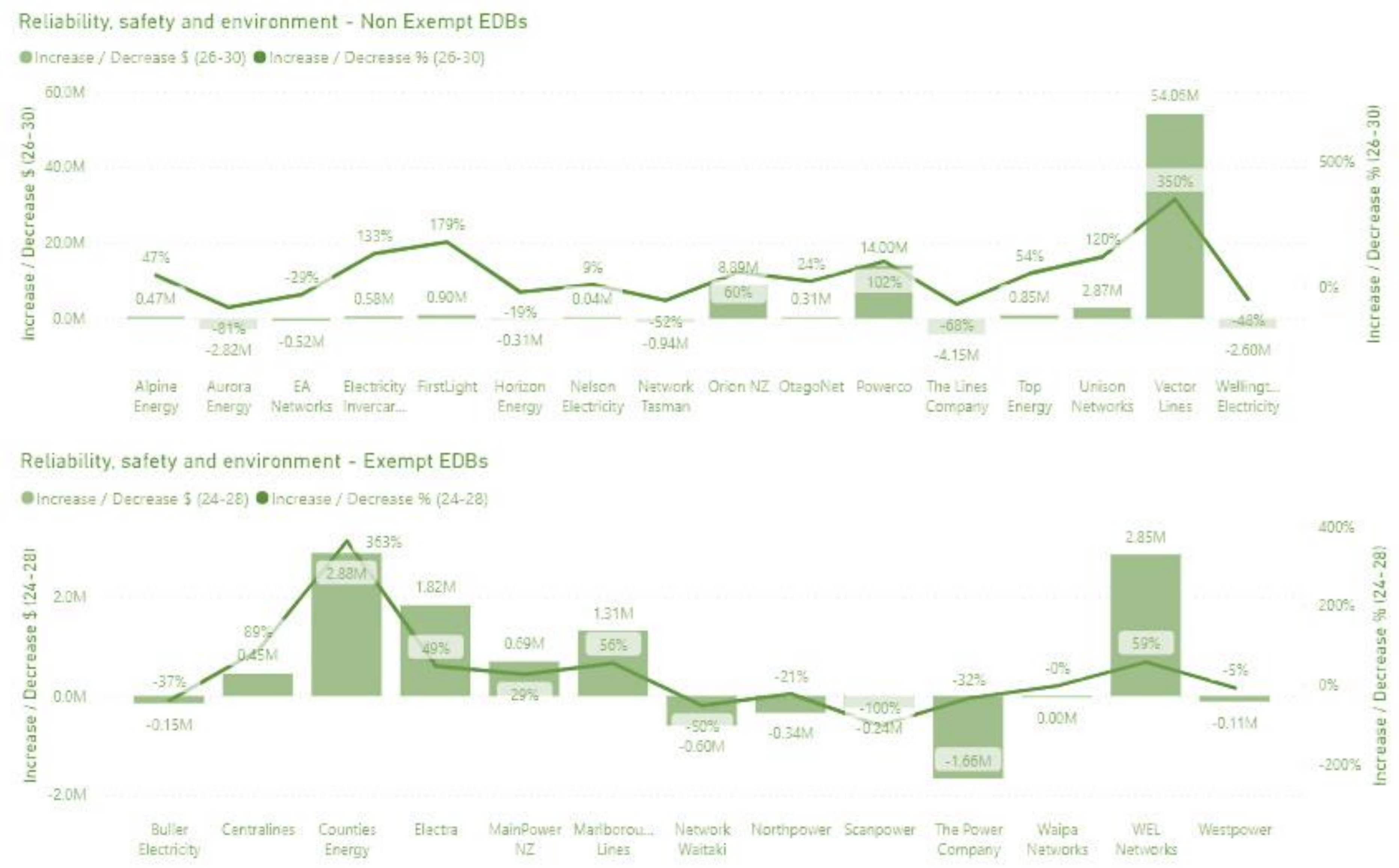


Figure 13 – Reliability, safety and environment trends

Business-As-Usual

There are three categories: RSE – Quality of Supply, RSE – Legislative & Regulatory and RSE – Others.

QUALITY OF SUPPLY	LEGISLATIVE & REGULATORY	OTHERS

Growth in "**Reliability, Safety & Environment – Quality of Supply**" capex is primarily driven by mandatory power quality standards which in turn is influenced by load growth (e.g. EV charging) and DER connections, particularly in low voltage circuits. Increase in spend in this category has been modest across the EDBs, and is not a major contributor to any material increase in overall capex.

Growth in "**Reliability, Safety & Environment – Legislative & Regulatory**" capex is primarily driven by asset failures leading to deteriorating reliability performance or safety outcomes, or by any changes in legislation /regulations that are introduced. Increase in spend in this category has been modest across the EDBs, and is not a major contributor to any material increase in overall capex.

Uncertainty of Reliability, Safety & Environment Drivers

Growth in "**Reliability, Safety & Environment – Others**" capex is a bit of a catch-all and can include smart grid initiatives (if budgeted) to prepare the network of the future (open access network, LV visibility, DSO). Some EDBs also include reliability improvement initiatives under this category.

With regard to expenditure to prepare the network of the future, in the absence of mandatory legislation and a clear industry position, IAEngg believes the appropriate course of action is to carry out cost-benefit analysis to justify any proposed expenditure that is considered "no-regrets" or "foundational". We have seen proposals for "no-regrets" and foundational expenditure but have not seen business cases that justify the expenditure as this level of detail is not included in AMPs.

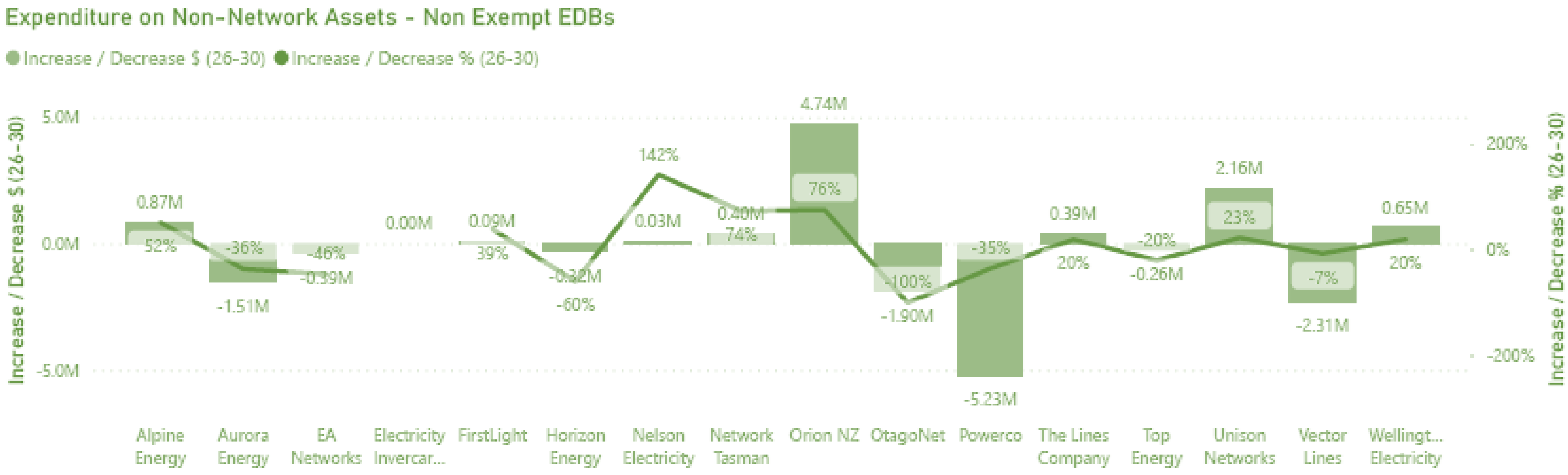
From RSE Quantity to Expenditure Forecast

Average unit costs or costs of similar RSE programs are generally used to estimate the RSE expenditure. IAEngg notes that the AMPs do not provide enough granular details to allow assessment of the reasonableness of the expenditure forecast.

4.5.8 Non-network Assets

EDB Trends

Figure 14 provides a comparison of forecast increase/decrease of non-network capex for the Non-exempt and Exempt EDBs. The values of the capex increase/decrease are shown in the bar chart whereas the line graph shows the % increase/decrease.



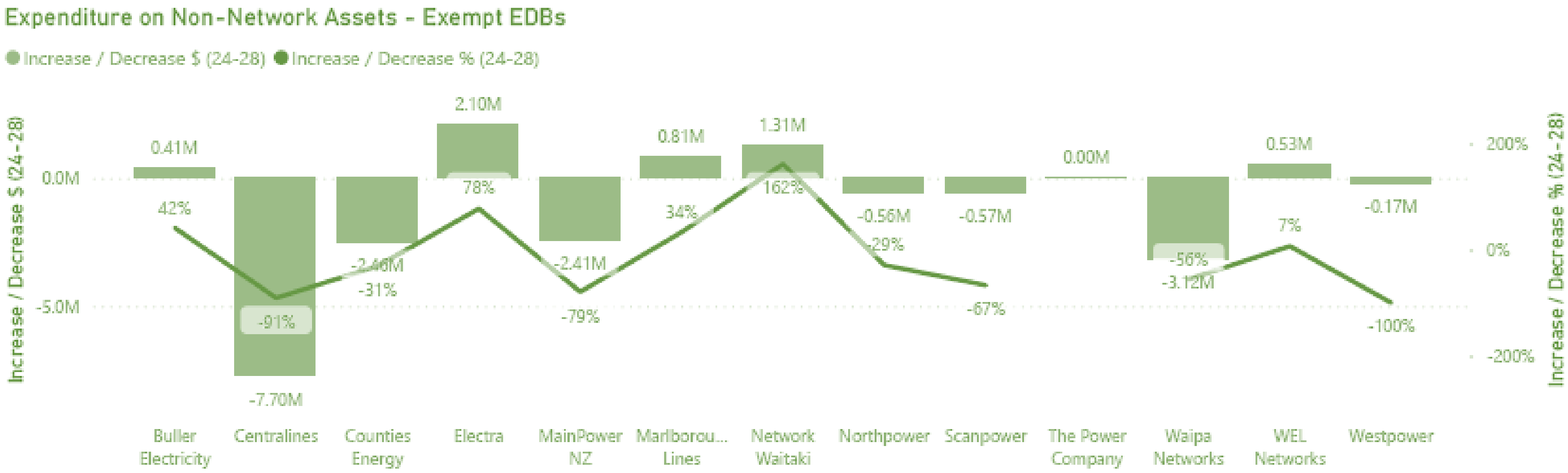


Figure 14 – Non-Network Assets trends

Business-As-Usual

"Non-network assets" capex has two key components: land/building/trucks/tools of trade and IT assets.

TRADE ASSETS	IT ASSETS

Land and building capex, in particular for new or refurbished buildings, is lumpy and exhibiting significant variations from year to year. These projects are generally included in the forward program of works as detailed line items, the driver and expenditure can be assessed if required.

Uncertainty of Non-Network Assets Drivers

It is noteworthy that the resilience driver has also found its way into "non-network assets". For example, Marlborough Lines is relocating its control room because the existing building is found to be below earthquake code and has a number of structural issues including water-tightness and Wellington Electricity head office is currently located in a Tsunami evacuation zone and they have commenced planning to relocate the headquarters away from the coast in order to mitigate the risk.

IT asset capex is likely to include smart grid initiatives (if budgeted) to prepare the network of the future (open access network, LV visibility, DSO). A recent trend which is reducing IT capex in favour of an increase in IT opex is the adoption of cloud-based services.

"Non-network" capex has not been found to be a major contributor where material capex increase is observed.

4.5.9 Other Comments on Capex Increase

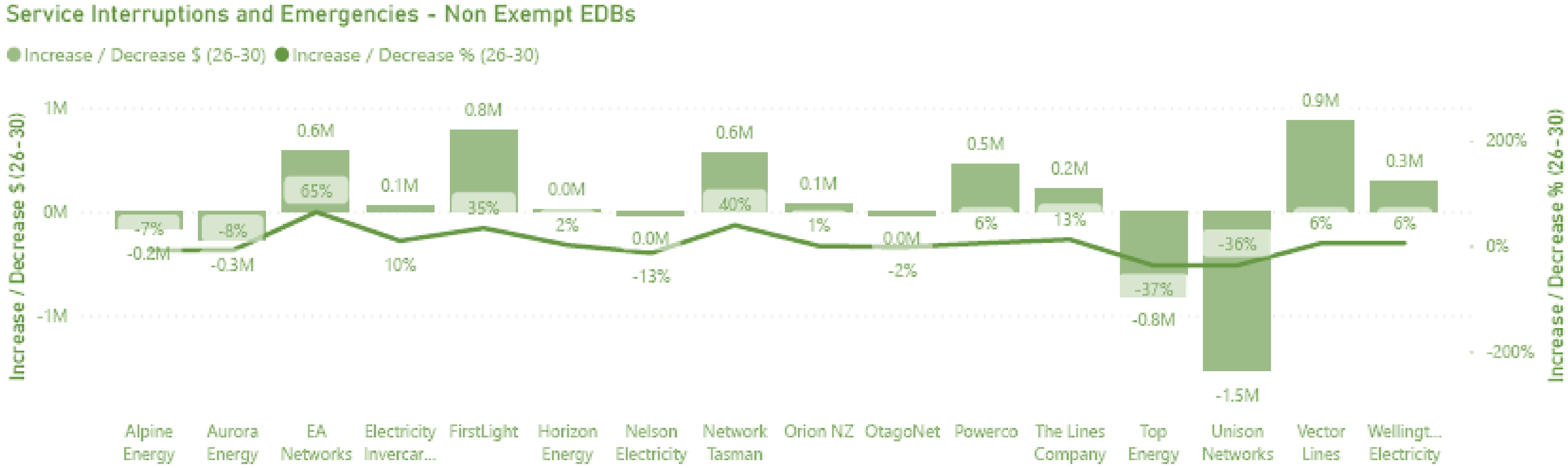
IAEngg has observed that an uplift in capex could be due to an increase (above CPI) of material & labour (internal and external) costs specific to the electricity supply industry. A number of EDBs have suggested that they have seen significant increases in material and labour costs due to supply chain disruptions caused by COVID. IAEngg is aware supply chain disruption has been experienced by EDBs in other countries. What remains to be demonstrated is whether the increase seen in the COVID recovery phase will continue into 2026-30. EDBs have made representations that increases have occurred however the AMPs have shown no evidence. However this is expected as AMPs wouldn't necessarily include this kind of detail.

4.5.10 Opex – Forecasting Assessment & Opinions

This section summarises our assessment of forecast opex in each of the regulatory categories using the criteria as discussed in Section 3.

Service Interruptions and Emergencies

Figure 15 provides a comparison of forecast increase/decrease of Service Interruptions & Emergencies Opex for the Non-exempt and Exempt EDBs. The values of the opex increase/decrease are shown in the bar chart whereas the line graph shows the % increase/decrease.



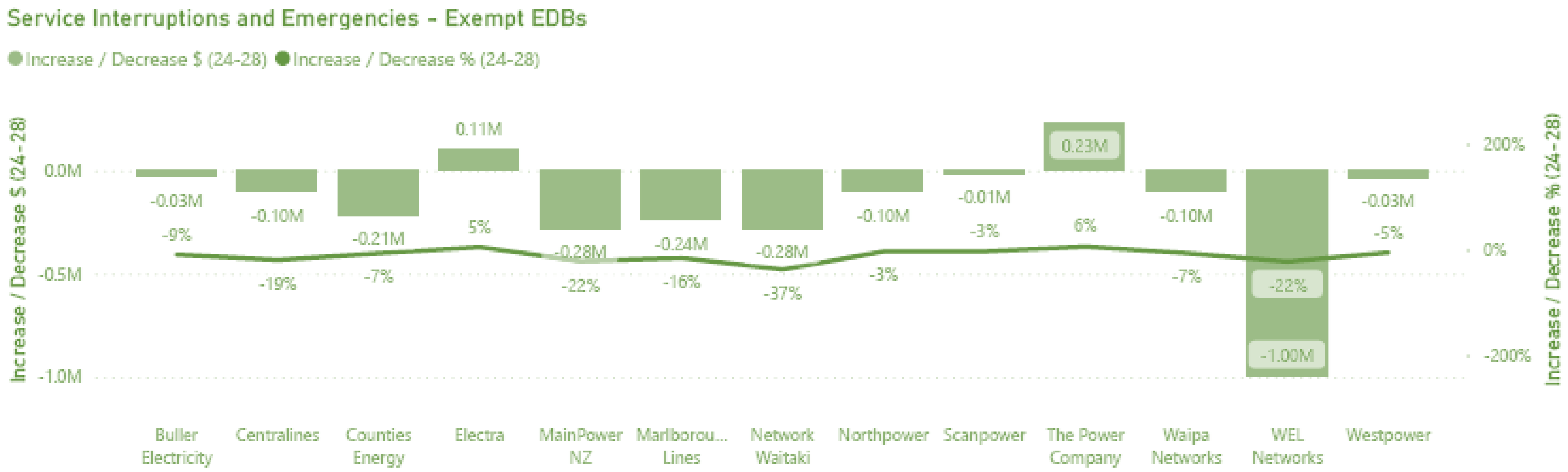


Figure 15 – Service Interruptions and Emergencies trends

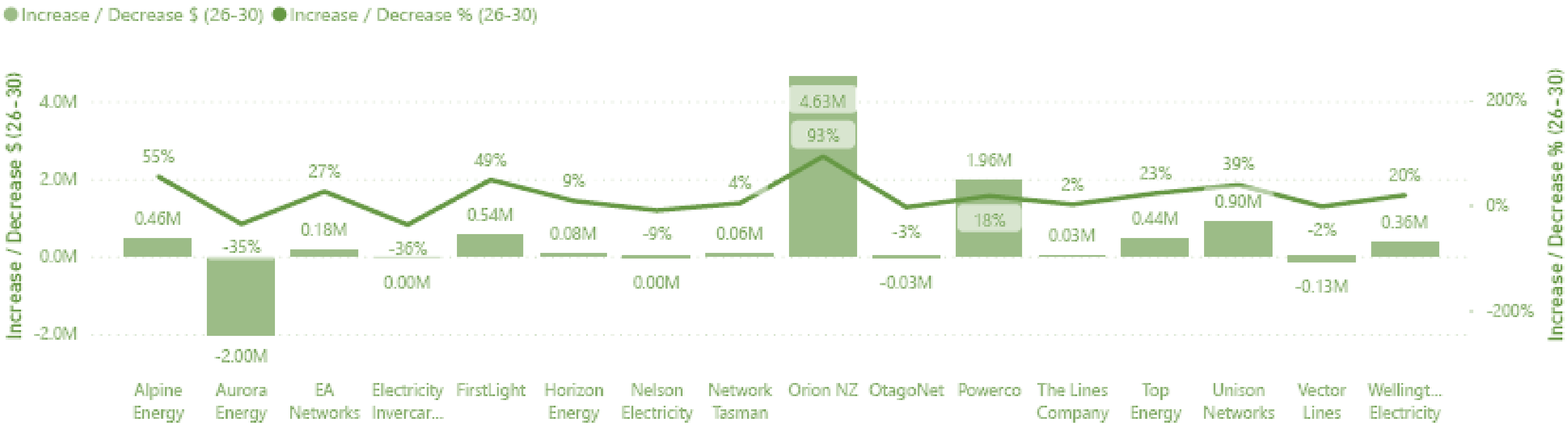
As the name implies, this is the opex cost incurred due to service interruptions and emergencies. IAEngg notes that many EDBs have incurred increased expenditure in the baseline Period (FY21-23) due to recent weather events. As such we have not observed many EDBs forecasting significant further increase in this opex item for 2026-30. That said, we understand the expenditure in the base year used for DPP4 will be normalised (by removal of one-off events)[21] which means that EDBs may need to consider whether a step change in base level expenditure is justified to account for any expected increase in the frequency of events that lead to above average service interruption and emergency costs.

Vegetation Management

Figure 16 provides a comparison of forecast increase/decrease of Vegetation Management Opex for the Non-exempt and Exempt EDBs. The values of the opex increase/decrease are shown in the bar chart whereas the line graph shows the % increase/decrease.

[21] Default price-quality paths for electricity distribution businesses from 1 April 2025 Issues Paper, Commerce Commission, 2 November 2023

Vegetation Management - Non Exempt EDBs



Vegetation Management - Exempt EDBs

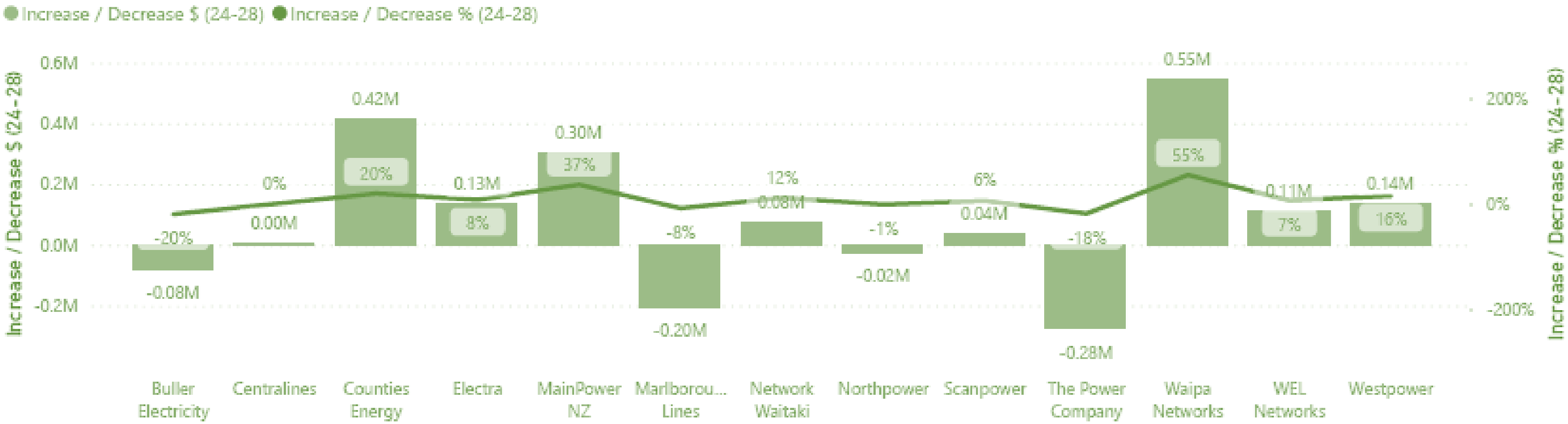


Figure 16 – Vegetation Management trends

IAEngg notes that some EDBs are proposing more vegetation cutting as a result of storm experiences (where the majority of the vegetation related faults were caused by trees outside the clearance zone) and this has an impact on the vegetation management expenditure. This cost item could face a more significant increase if the tree vegetation regulation is amended, which some EDBs are advocating.

Routine & Corrective Maintenance & Inspection

Figure 17 provides a comparison of forecast increase/decrease of Routine & Corrective Maintenance & Inspection Opex for the Non-exempt and Exempt EDBs. The values of the opex increase/decrease are shown in the bar chart whereas the line graph shows the % increase/decrease.

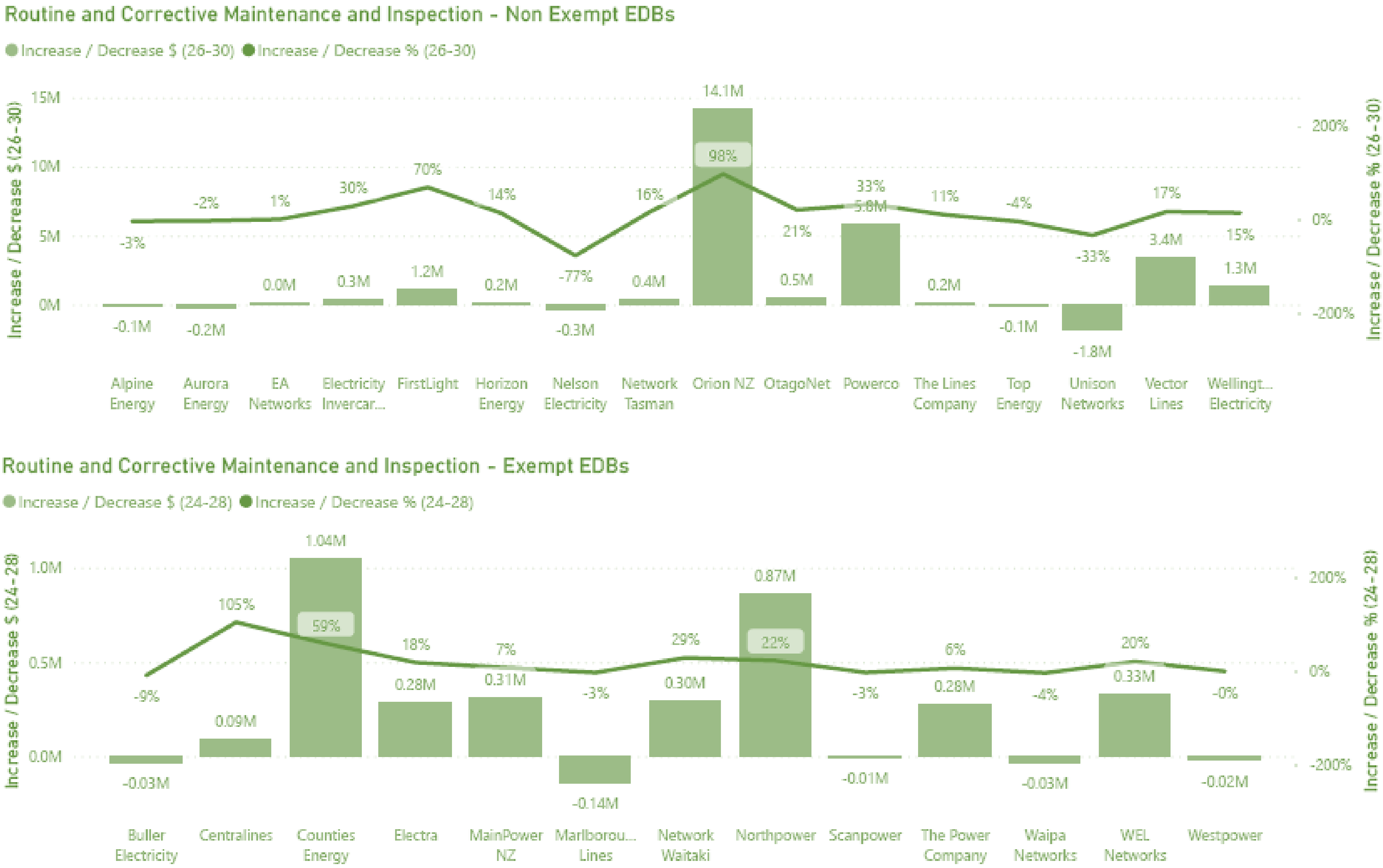


Figure 17 – Routine and Corrective Maintenance and Inspection trends

The majority of the EDBs are forecasting relatively stable expenditure for this opex category. Where an EDB is forecasting a significant uplift in this category, the increase is generally based on growth in the scale of the network caused by significant uplift in system growth capex e.g. Orion.

Asset Replacement & Renewal

Figure 18 provides a comparison of forecast increase/decrease of Asset Replacement Opex for the Non-exempt and Exempt EDBs. The values of the opex increase/decrease are shown in the bar chart whereas the line graph shows the % increase/decrease.

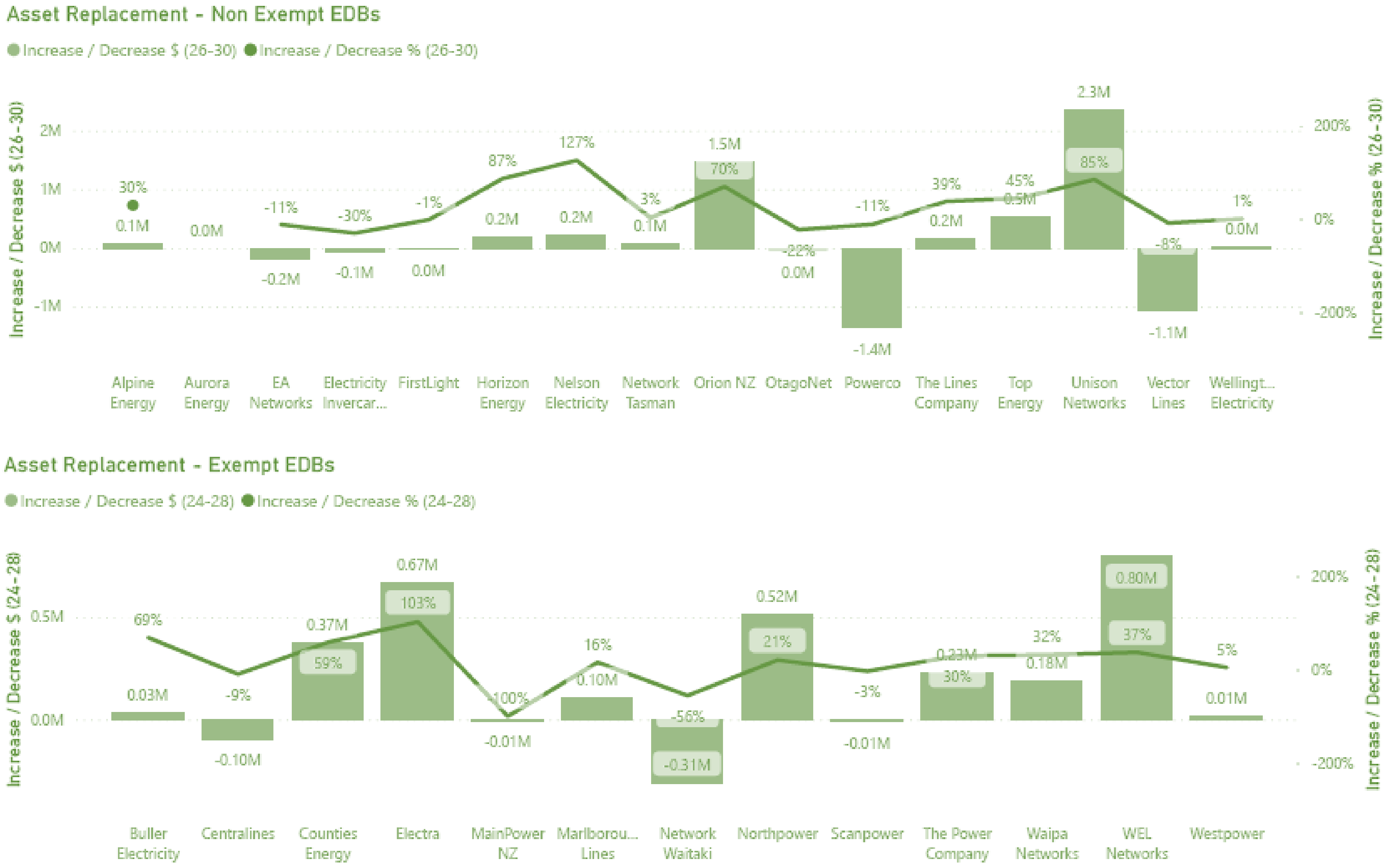


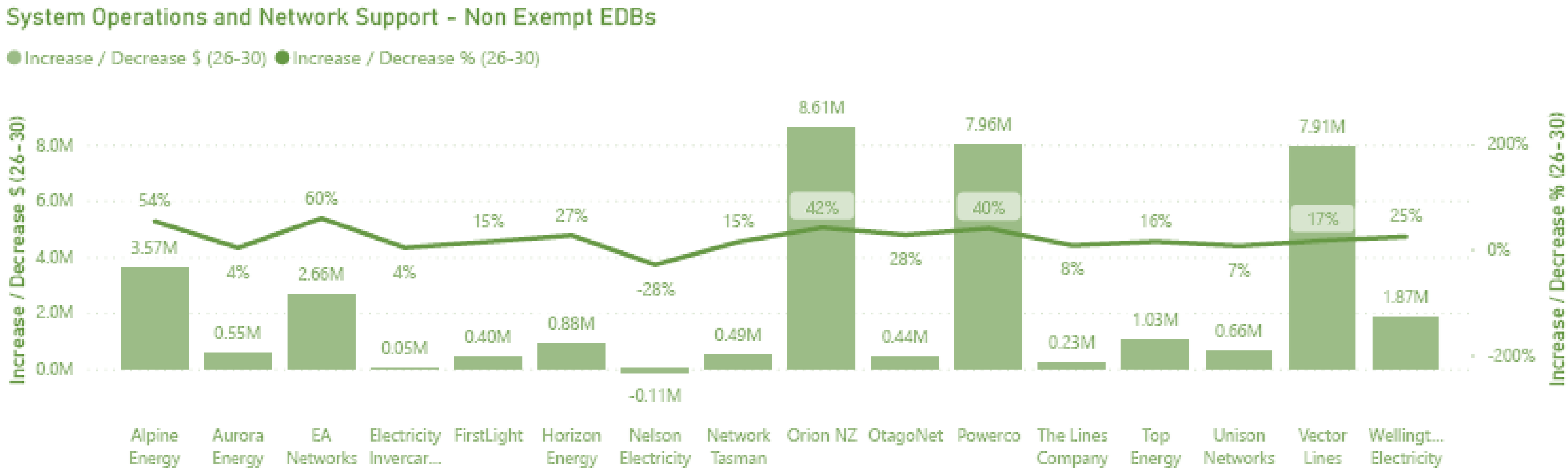
Figure 18 – Asset Replacement trends

IAEngg has not observed any significant increase in absolute dollar terms for this opex item. Where high percentage increases are observed, they represent a small proportion of the total expenditure in the forecast period by the particular EDBs.

System Operations & Network Support

Figure 19 provides a comparison of forecast increase/decrease of System Operations & Network Support Opex for the Non-exempt and Exempt EDBs. The values of the opex increase/decrease are shown in the bar chart whereas the line graph shows the % increase/decrease.

System operations & network support, together with business support, are the most common opex items that contribute to any material increase in overall opex. These two items are mainly to do with labour cost although there is also an increasing component of IT support cost (cloud-based service) transferred from IT capex, and flexibility service in lieu of network build. The reasons offered for increase are relatively standard: additional headcounts to manage the network due to increasing complexity, labour cost increase (above CPI), and for networks with significant increase in capex, increase in network assets to manage.



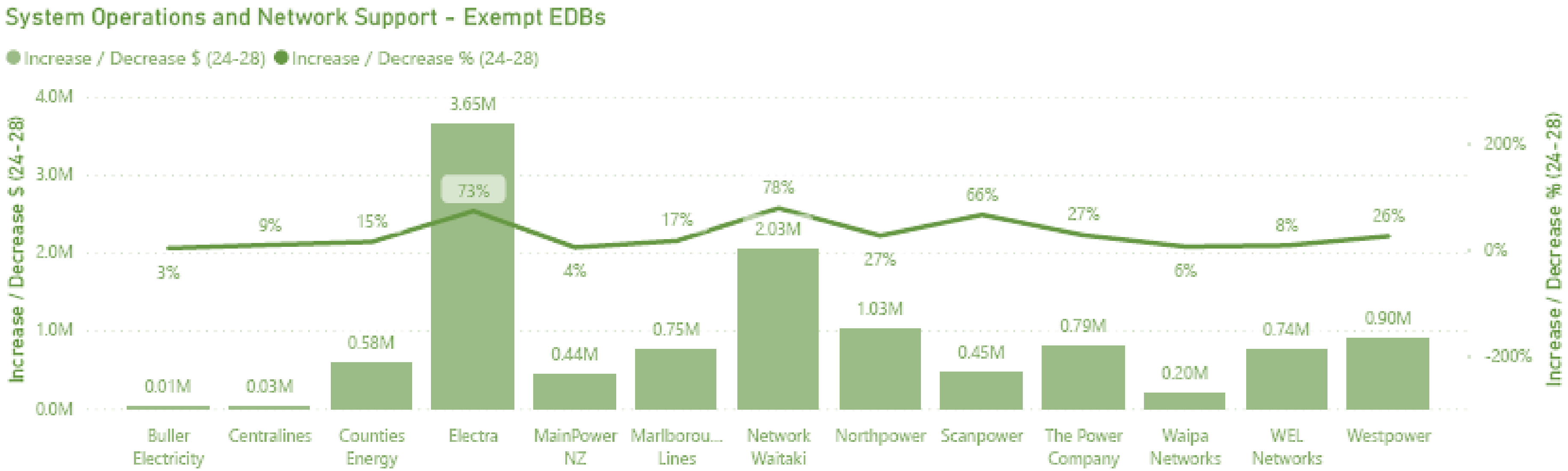


Figure 19 – System Operations and Network Support trends

Business Support

Figure 20 provides a comparison of forecast increase/decrease of Business Support Opex for the Non-exempt and Exempt EDBs. The values of the opex increase/decrease are shown in the bar chart whereas the line graph shows the % increase/decrease.

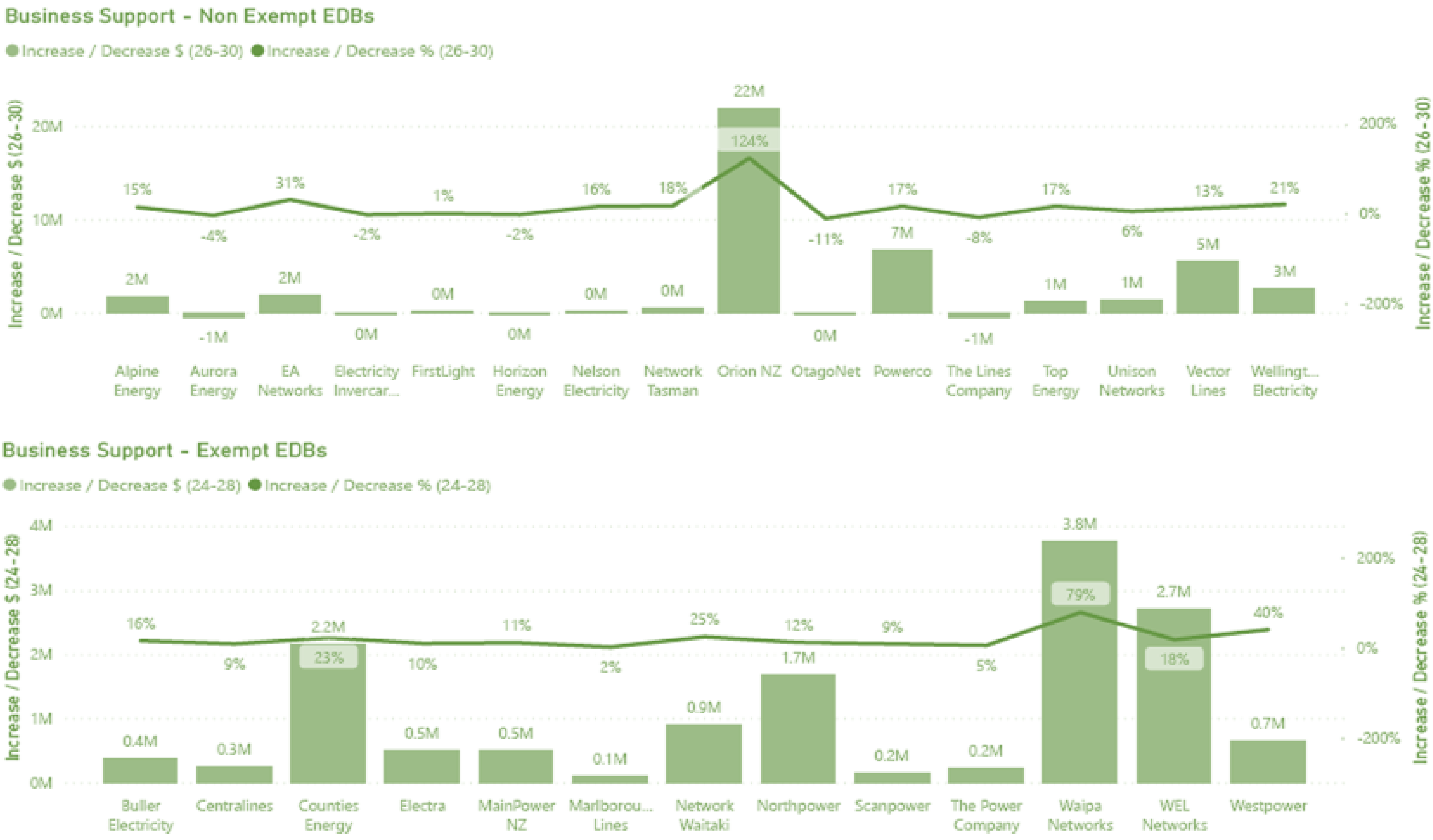


Figure 20 – Business Support trends

Business support opex increase is mainly to do with labour cost increase (above CPI) although there is also an increasing component of corporate IT support cost (cloud-based service) transferred from IT capex. Increase in insurance premiums has also been quoted by a number of EDBs

4.5.11 Other Comments on Opex

IAENgg found that EDBs have only offered qualitative reasons for forecast opex increases in their AMPs. This approach does not provide sufficient granularity for assessment of the (economic) justification, validity of the cost drivers and departures from historical trends. It is also not clear whether the forecast has considered the potential offset from productivity improvement and scale efficiency improvements.

A common reason that has been offered by EDBs to account for forecast opex increases is to do with increased labour costs above CPI, for both contract (external) and internal labour costs, and to a smaller degree, increased cost of materials. IAEngg is aware that increases in labour costs have been experienced by Australian DNSPs and in other countries due to a high demand for skilled workers and large work programs.

4.5.12 Deliverability of Expenditure Programs & Projects

The 29 EDBs are forecasting a total capex requirement of $1,849.3M pa in the 2026-30 period. This represents an increase of $413.4M pa (28.8%), compared with their actual annual spends in 2021-23. If we consider only the Non-exempt EDBs, the increase is higher at $421.4M or 37.3% pa. There is insufficient information in the AMPs for us to determine the proportion of the increased forecast expenditure that is driven by cost and the proportion driven by increased volumes of work. However, given the size of the total increase in forecast expenditure, it is likely that material increases in the volume of activities is forecasted. This view is supported by some information contained in the AMPs where EDBs have identified an increase in the volumes of activities and the need to recruit more resources (which in turn drives up network and business support opex). For example, Northpower is forecasting a 28% increase in capex and has taken steps to recruit more cadets to deliver the expanded program of work.

In IAEngg's opinion, an enlarged capital program of this size is likely to provide a significant deliverability challenge for EDBs given the current labour market in NZ. Only a small number of EDBs (e.g. Orion) have clearly considered the deliverability challenge that will arise from an enlarged capital program. However, the initiatives outlined by Orion are high level and there is no assurance that those initiatives will adequately address the deliverability challenge.

Some EDBs have suggested recruiting labour from overseas which would increase the available workforce. However, taking into account the time taken to recruit and train workers from overseas, it might not be possible for EDBs to ramp up expenditure until the latter period of the DPP4. It should also be noted that many other countries, including Australia, are anticipating increased expenditure on electricity networks to facilitate the transition to a renewable future. This increase in expenditure on energy networks internationally is likely to result in increased competition for both labour and materials.

4.5.13 EDB Assessment Summary

This section shows a summary of our assessment of each of the EDBs. Further details of the individual EDB assessments can be found in Section7.

The tables show an assessment of each of the following categories of Capital expenditure:

- Consumer connection
- System growth
- Asset replacement and renewal
- Reliability, Safety & Environment

And for each of the following categories of Opex expenditure:

- System Operations & Network Support
- Business Support
- Asset Replacement & Renewal
- Routine & Corrective Maintenance & Inspection

And, for each category of expenditure, we have made an assessment of the:

- Certainty of Drivers of the expenditure
- Demand forecasting approach
- Expenditure forecasting approach

Note IAEngg considers demand in the broader context of quantity arising from a particular expenditure driver. For expenditure driver relating to the uptake of Electric Vehicles (EVs), for example, demand refers to the load increase caused by EV. For expenditure driver relating to a specific end-of-life equipment, demand refers to the quantity of assets to be replaced.

Capex Forecasting

Non-Exempt EDBs													
EDB	Consumer connection			System growth			Asset replacement & renewal			Reliability, Safety & Environment			Overall
	Certainty of Drivers	Demand Forecast	Expenditure Forecast	Certainty of Drivers	Demand Forecast	Expenditure Forecast	Certainty of Drivers	Demand Forecast	Expenditure Forecast	Certainty of Drivers	Demand Forecast	Expenditure Forecast	
Alpine Energy	Not assessed*			HIGH	GOOD	GOOD	HIGH	GOOD	GOOD	Not assessed*			GOOD
Aurora Energy	Not assessed*			Not assessed*			Not assessed*			Not assessed*			Not assessed*
EA Networks	Not assessed*			Not assessed*			Not assessed*			Not assessed*			Not assessed*
Electricity Invercargill	Not assessed*			Organic growth HIGH Electric heating MEDIUM EV LOW	GOOD	AVERAGE	HIGH	AVERAGE	AVERAGE	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	AVERAGE

FirstLight	Not assessed*			Organic growth HIGH PV & Batteries MEDIUM EV & industrial growth LOW	GOOD	GOOD	HIGH	GOOD	Insufficient Information for Analysis	HIGH	GOOD	GOOD	GOOD
Horizon Energy	Not assessed*			Organic growth MEDIUM De-carbonisation MEDIUM Cost increase HIGH	GOOD	GOOD	HIGH	GOOD	GOOD	Not assessed*			GOOD
Nelson Electricity	HIGH	AVERAGE	AVERAGE	MEDIUM	AVERAGE	Insufficient Information for Analysis	HIGH	GOOD	Insufficient Information for Analysis	Not assessed*			AVERAGE
Network Tasman	Residential growth HIGH Industry growth MEDIUM	GOOD	Insufficient Information for Analysis	Organic growth HIGH Industry growth, DG MEDIUM Process heat LOW	GOOD	GOOD	Not assessed*			Not assessed*			GOOD

Innovative Assets Engineering

Orion	Population growth & subdivision **HIGH** Process heat **MEDIUM** EV **LOW**	**GOOD**	**GOOD**	Organic growth **MEDIUM** Expansion of large users **HIGH** Domestic heat pump **HIGH** EV & process heat **LOW** Loss of hot water control **LOW**	**AVERAGE**	**GOOD**	**MEDIUM**	**HIGH**	Insufficient Information for Analysis	Not assessed*			**GOOD**
OtagoNet	Not assessed*			Organic growth **HIGH** Electric heating **MEDIUM** EV **LOW**	**AVERAGE**	Insufficient Information for Analysis	**HIGH**	**GOOD**	Insufficient Information for Analysis	**HIGH**	Insufficient Information for Analysis	Insufficient Information for Analysis	**AVERAGE**
Powerco	Economic activities **HIGH** Decarbonisation **LOW**	**GOOD**	**GOOD**	Decarbonisation **LOW** DER/DSR/Energy Efficiency **MEDIUM** Large-scale customer developments **HIGH**	**GOOD**	**GOOD**	Not assessed*			Network automation	**MEDIUM**	Insufficient Information for Analysis	**GOOD**
The Lines Company	Industry growth **HIGH** De-carbonisation **LOW**	**AVERAGE**	**AVERAGE**	**LOW**	**GOOD**	**GOOD**	**HIGH**	**GOOD**	Insufficient Information for Analysis	Not assessed*			**GOOD**

Top Energy	Not assessed*			Not assessed*			Not assessed*			Not assessed*			Not assessed*
Unison Networks	Not assessed*			HIGH	GOOD	GOOD	Not assessed*			Not assessed*			GOOD
Vector	Not assessed*			Decarbonisation LOW DER/DSR/Energy Efficiency MEDIUM Large-scale customer developments HIGH	EXCELLENT	GOOD	Not assessed*			Reliability improvement HIGH Climate resilience LOW	MEDIUM	Insufficient Information for Analysis	GOOD
Wellington Electricity	Housing intensification HIGH Electrification MEDIUM	GOOD	GOOD	Population growth/transport electrification MEDIUM Gas electrification/DSR LOW	EXCELLENT	GOOD	Asset health - HIGH	GOOD	GOOD	Not assessed*			GOOD
Exempt EDBs													
Buller Electricity Ltd	Not assessed*			Not assessed*			Not assessed*			Not assessed*			Not assessed*
Centralines	Not assessed*			Not assessed*			Not assessed*			Not assessed*			Not assessed*

Counties Energy	Not assessed*	Not assessed*			Not assessed*					Not assessed*			Not assessed*
Electra	Insufficient Information for Analysis	MEDIUM	GOOD	Insufficient Information for Analysis	Insufficient Information for Analysis					MEDIUM	Insufficient Information for Analysis	Insufficient Information for Analysis	GOOD
Mainpower	Not assessed*	Not assessed*			Not assessed*					Not assessed*			Not assessed*
Marlborough Lines	Not assessed*	HIGH	Not assessed*	Not assessed*	HIGH	Not assessed*	Not assessed*	Not assessed* (likely to be High)	Not assessed*	Not assessed*			Not assessed*
Network Waitaki	Not assessed*	MEDIUM	GOOD	Insufficient Information for Analysis	HIGH	GOOD	Insufficient Information for Analysis			Not assessed*			GOOD
Northpower	Not assessed*	Not assessed*	Not assessed*	MEDIUM	MEDIUM – HIGH	Not assessed*	Not assessed*			Not assessed*			Not assessed*
Scanpower	Not assessed*	Not assessed*			Not assessed*					Not assessed*			Not assessed*
The Power Company Ltd	Not assessed*	Not assessed*			Not assessed*					Not assessed*			Not assessed*

Waipa Networks	MEDIUM	Not assessed*	Not assessed*	MEDIUM	Not assessed*	Not assessed*	MEDIUM	Not assessed *	Not assessed*	Not assessed*	Not assessed*
WEL Networks	Not assessed*			MEDIUM	GOOD	# Not assessed due to lack of quantitative data	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	Not Assessed*	GOOD
Westpower	Not assessed*			Not assessed*			Not assessed*			Not assessed*	Not assessed*

Table 13 – Summary of EDB assessment for Capex Forecasting[22]

* **Not assessed** as the capex category is not a major contributor to overall capex increase

Insufficient Information for Analysis - Insufficient available information to perform analysis and assessment for the purpose of undertaking the review on forecasting inputs, modelling or approach to forecasting

[22] Capex categories of Asset Relocation and Non-Network are not assessed as they are not found to contribute to material capex increase

Opex Forecasting

Non-Exempt EDBs													
EDB	System Operations & Network Support			Business support			Asset replacement & renewal			Routine & Corrective Maintenance & Inspection			Overall
	Certainty of Drivers	Demand Forecast	Expenditure Forecast	Certainty of Drivers	Demand Forecast	Expenditure Forecast	Certainty of Drivers	Demand Forecast	Expenditure Forecast	Certainty of Drivers	Demand Forecast	Expenditure Forecast	
Alpine Energy	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	Not assessed*			Not assessed*			Insufficient Information for Analysis
Aurora Energy	Not assessed*			Not assessed*			Not assessed*			Not assessed*			Not assessed*
EA Networks	MEDIUM	Insufficient Information for Analysis	Insufficient Information for Analysis	MEDIUM	Insufficient Information for Analysis	Insufficient Information for Analysis	Not assessed*			Not assessed*			Not assessed*
Electricity Invercargill	Not assessed*			Not assessed*			Not assessed*			Not assessed*			Not assessed*
FirstLight	Not assessed*			Not assessed*			Not assessed*			HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	Not assessed*

Horizon Energy	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	Not assessed*			Not assessed*	Asset condition HIGH Cost increase HIGH Climate resilience Medium	Insufficient Information for Analysis	Insufficient Information for Analysis	Insufficient Information for Analysis
Nelson Electricity	Not assessed*			Not assessed*			Not assessed*	Not assessed*			Not assessed*
Network Tasman	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	Not assessed*	Not assessed*			Insufficient Information for Analysis
Orion	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	Not assessed*	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	Insufficient Information for Analysis
OtagoNet	Not assessed*			Not assessed*			Not assessed*	Not assessed*			Not assessed*
Powerco	Flexibility/ R&D MEDIUM Others HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	Not assessed*	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	Insufficient Information for Analysis
The Lines Company	Not assessed*			Not assessed*			Not assessed*	Not assessed*			Not assessed*

Top Energy	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	Not assessed*			Insufficient Information for Analysis
Unison Networks	Not assessed*			Not assessed*			Not assessed*			Not assessed*			Not assessed*
Vector Lines	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	Not assessed*			HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	Insufficient Information for Analysis
Wellington Electricity	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	Not assessed*			HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	Insufficient Information for Analysis
Exempt EDBs													
Buller Electricity Ltd	Not assessed*			Not assessed*			Not assessed*			Not assessed*			Not assessed*
Centralines	Not assessed*			Not assessed*			Not assessed*			Not assessed*			Not assessed*
Counties Energy	Insufficient Information for Analysis			Insufficient Information for Analysis			Not assessed*			HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	Insufficient Information for Analysis
Electra	Not assessed*			HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	MEDIUM	Insufficient Information for Analysis	Insufficient Information for Analysis	Not assessed*			Insufficient Information for Analysis

Mainpower	Not assessed*			Not assessed*			Not assessed*			Not assessed*			Not assessed*
Marlborough Lines	Not assessed*			Not assessed*			Not assessed*			Not assessed*			Not assessed*
Network Waitaki	Insufficient Information for Analysis			Insufficient Information for Analysis			Not assessed*			HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	Insufficient Information for Analysis
Northpower	HIGH	Not assessed*	Not assessed*	HIGH	Not assessed*	Not assessed*	Not assessed*			HIGH	HIGH	Not assessed*	Not assessed*
Scanpower	Insufficient Information for Analysis			Insufficient Information for Analysis			Not assessed*			Not assessed*			Insufficient Information for Analysis
The Power Company Ltd	Not assessed*			Not assessed*			Not assessed*			Not assessed*			Not assessed*
Waipa Networks	Not assessed*			MEDIUM	Not assessed*	Not assessed*	Not assessed*			Not assessed*			Not assessed*
WEL Networks	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	HIGH	Insufficient Information for Analysis	Insufficient Information for Analysis	MEDIUM	Insufficient Information for Analysis	Insufficient Information for Analysis	Not assessed*			Insufficient Information for Analysis
Westpower	Not assessed*	MEDIUM	Not assessed*	Not assessed*			Insufficient Information for Analysis			Insufficient Information for Analysis			Insufficient Information for Analysis

Table 14 – Summary of EDB assessment for Opex Forecasting[23]

*** Not assessed** as the opex category is not a major contributor to overall opex increase

Insufficient Information for Analysis - Insufficient available information to perform analysis and assessment for the purpose of undertaking the review on forecasting inputs, modelling or approach to forecasting

[23] Opex categories of Vegetation Management and System Emergencies & Interruptions are not assessed as they are not found to contribute to material opex increase

5 RECOMMENDATIONS & NEXT STEPS

5 RECOMMENDATIONS & NEXT STEPS

IAEngg has identified expenditures that are certain and those that are uncertain. We understand the uncertainties are created by a number of new (relative to 2022 AMP) expenditure drivers which are considered by all EDBs, although not all of them have proposed expenditure in 2026-30 for those new developments.

IAEngg attempted to identify the demand and associated expenditure arising from these new expenditure drivers for 2026-2030 but was unable to do so due to:

- EDBs are required to report/forecast expenditure in categories specified by the Commerce Commission in Schedule 11a and 11b.

- The standardised expenditure categorisation assists in performing comparison between EDBs but may not be aligned to the categorisation used internally within the EDB businesses.

- EDBs use mapping table to map internal categorisation to regulatory categorisation but there appears to be a degree of subjectivity and inconsistency in the mapping approach.

- A minority of EDBs are apportioning capex project costs into the different regulatory capex categories based on their purpose e.g. a new zone substation cost may be split between system growth capex and asset replacement & renewal. The majority of EDBs allocate the whole project cost to the capex category that reflects the main purpose of the project.

- There are inconsistencies of how costs associated with LV visibility, future DSO functions and open access networks are categorised.

- The variance analysis provided in the 2023 AMP explains the variance from the 2022 AMP which covers the nine years from 2023 to 2032, in accordance with ComCom’s disclosure requirements. The variance analysis is not very useful, however, for pinpointing the variance caused by the new expenditure drivers for the 2026-30 period. As a result, the majority of AMPs do not provide information granular enough to allow identification of expenditure for business-as-usual versus new expenditure drivers.

In addition to the constraints resulting from the information provided on new expenditure drivers, the AMPs do not provide all the information necessary to convert demand forecasts into expenditure forecasts. For example, where an EDB uses an S-curve for forecast expenditure, the shape and timing of the curve is required to assess the reasonableness of the expenditure forecast.

These constraints limited our assessment of the expenditure forecasts including our ability to:

- Assess the reasonableness and accuracy of key inputs / drivers used in forecasting expenditure

- Specifically identify projects or programmes of work where there is significant uncertainty about the need for, or timing of, forecast expenditure

- Assess the sensitivity of the expenditure plans to out-turn differences in requirements

The information provided in the existing AMP format is not adequate to determine the demand and expenditure arising from new expenditure drivers. To undertake a review of the demand and expenditure arising from new expenditure drivers, IAEngg recommends that the AMP information be supplemented by breakdown of expenditure against the new investment drivers. In this way it will be possible to identify:

- Business-as-usual (also known as stay-in-business) expenditure that is almost certain

- Expenditure for each new investment driver that is subject to uncertainty. For example, quantum of demand growth and associated system growth expenditure that is caused by uptake of residential electric vehicles (EV).

The granular data will allow analysis of the expenditure that is subject to uncertainty across the EDBs. For the uptake of residential EV, for example, analysis could be undertaken to:

- Compare the demand growth caused by EV across the EDBs to determine the reasons for any differences in demand growth

- Compare the expenditure caused by EV across the EDBs to assist in understanding the EDBs network augmentation responses

- Establish the mean/average, max and min

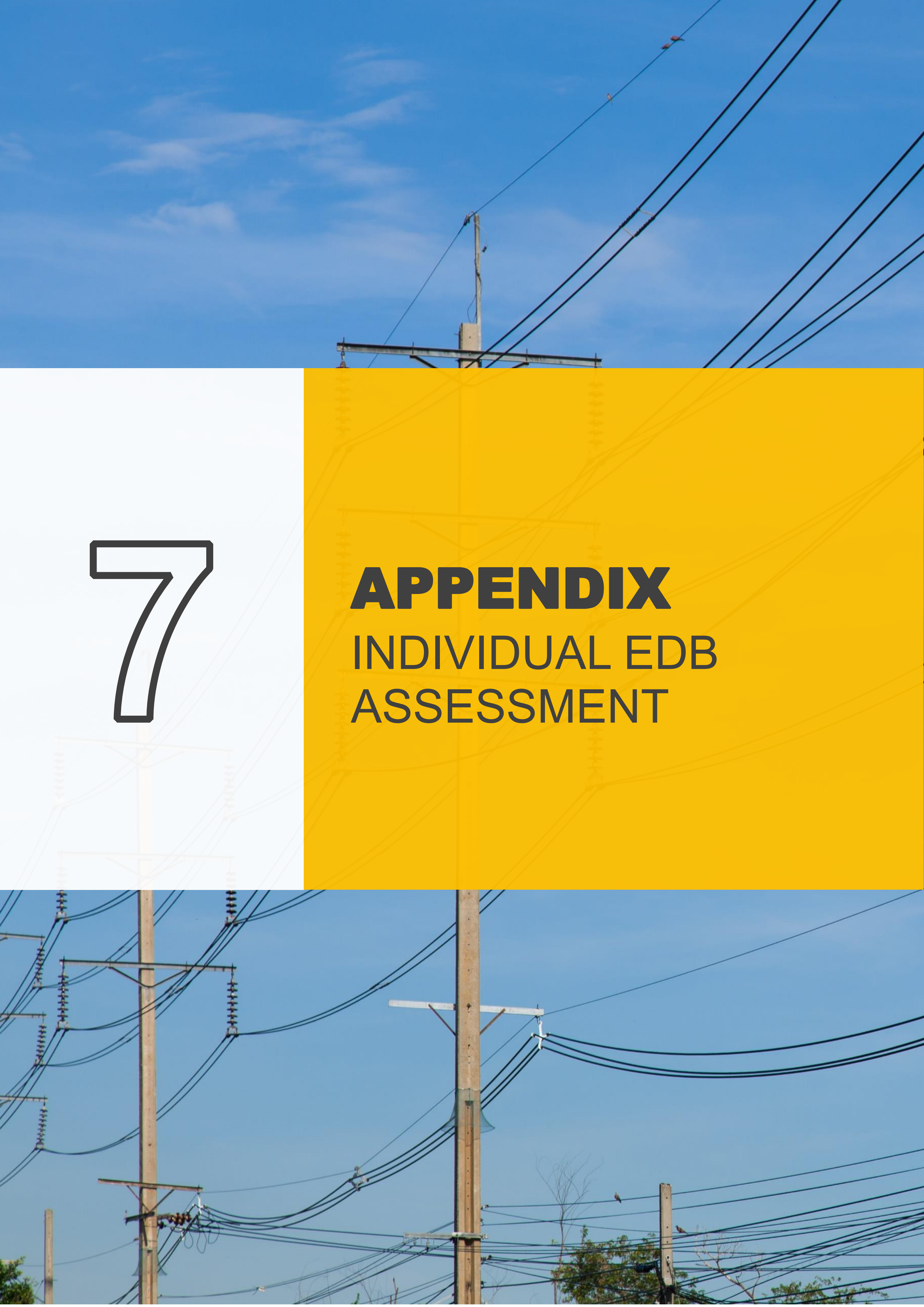
- Make comparisons with other jurisdictions

6 Glossary

6 Glossary

ADMD	After Diversity Maximum Demand
ADMS	Advanced Distribution Management Systems
AMP	Asset Management Plan
CAGR	Compound Annual Growth Rate
CAPEX	Capital Expenditure
CBRM	Condition Based Risk Management
ComCom	Commerce Commission
COVID	Coronavirus Disease
CPI	Consumer Price Index
DER	Distributed Energy Resources
DG	Distributed Generation
DNO	Distribution Network Operator
DNSP	Distribution Network System Provider
DPP	Default Price-quality Path
DSO	Distribution System Operator
DSR	Demand Side Response
EDB	Electricity Distribution Business
EEA	Electricity Engineers Association
EECA	Energy Efficiency and Conservation Authority
ERP	Enterprise Resource Planning
ETA	Energy Transition Accelerator
EV	Electric Vehicle

FMECA	Failure mode effects and criticality analysis
FPI	Fault Passage Indicator
GIDI	Government Investment to Decarbonise Industry
GIS	Geographic Information System
GXP	Grid Exit Point
HILP	High Impact Low Probability
HV	High Voltage
IT	Information Technology
LV	Low Voltage
MV	Medium Voltage
NPV	Net Present Value
ODV	Optimised Deprival Valuation
OPEX	Operational Expenditure
PGF	Provincial Growth Fund
PV	Photovoltaics
REPEX	Replacement Expenditure
RETA	Regional Energy Transition Accelerator
RSE	Reliability, Safety & Environment
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SONS	System Operations & Network Support
SoSS	Security of Supply Standard
ZSS	Zone Substations



7

APPENDIX

INDIVIDUAL EDB ASSESSMENT

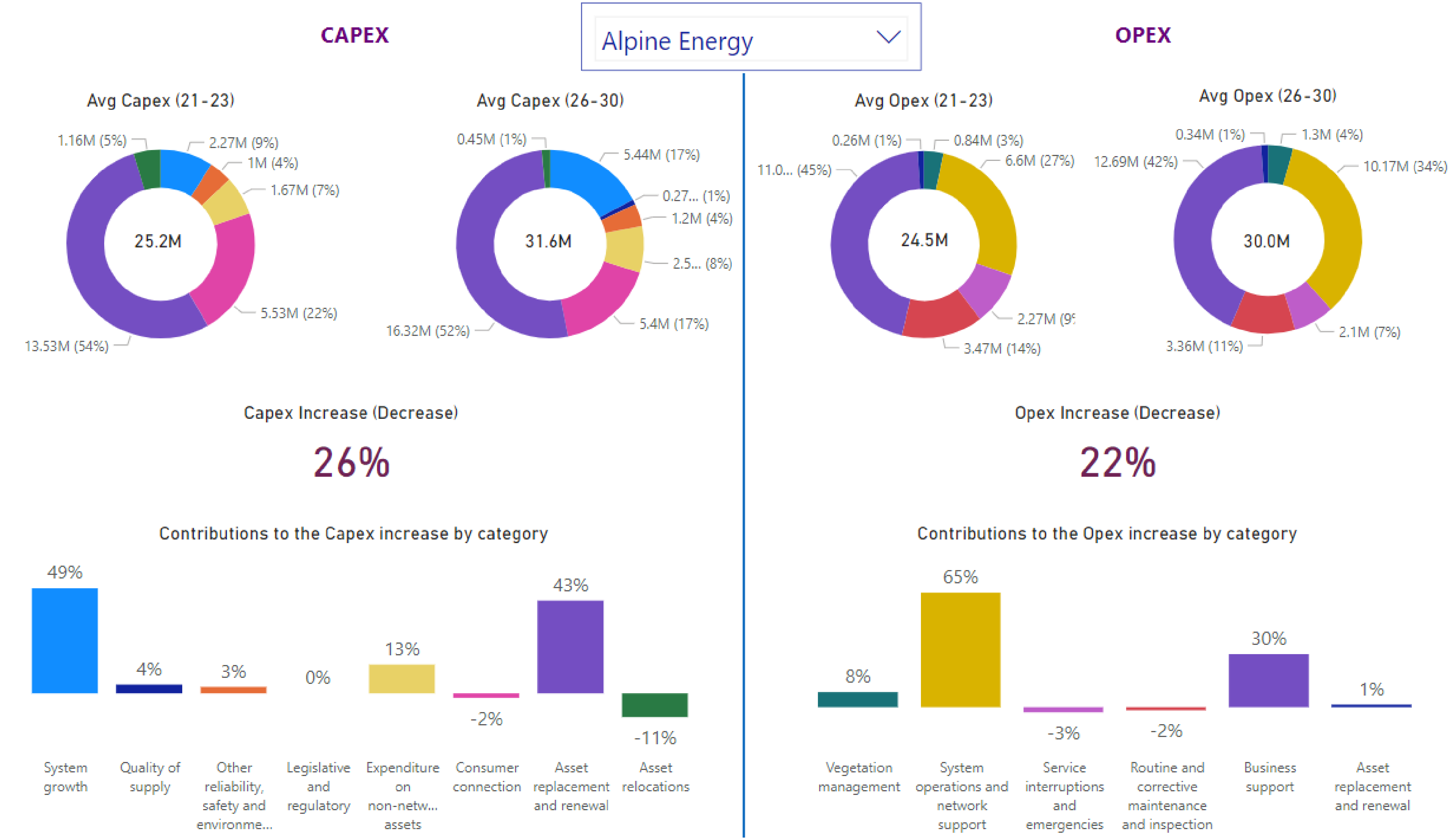
7 APPENDIX - INDIVIDUAL EDB ASSESSMENT

This section shows an assessment of each individual EDB's demand and expenditure forecast processes and our opinion of their reasonableness, subject to the limitations as stated earlier in this report. In alphabetical order, Appendix 7.1 to 7.16 cover the Non-Exempt EDBs and Appendix 7.17 to 7.29 cover the Exempt EDBs

Alpine ENERGY

7.1 Alpine Energy

7.1.1 Expenditure Dashboard



7.1.2 Business overview (2022 data)

	Parameter	Value
	Customers	33,269
	Peak demand	135MW
	Electricity volume	772GWh
	Line length	4,326km
	Distribution and LV Underground	808km
	Distribution and LV Overhead	3,264km
	Current Reliability performance	
	» Total SAIDI	297
	» Total SAIFI	1.11

7.1.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☒	No ☐
Future DSO role/open access network	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.1.4 Summary of Capex and Opex Categories assessed

Capex Categories	Assessed Further
Consumer connection	☒
System growth	☒
Asset replacement and renewal	☒
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☒

Opex Categories	Assessed Further
Service interruptions and emergencies	☒
Vegetation management	☐
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☐
System operations and network support	☒
Business support	☒

7.1.5 CAPEX category assessment – Top Contributors

SYSTEM GROWTH				
Annual Capex	$2,273,958 (21-23) $5,438,000 (26-30)			
% contribution to overall capex increase	49%			
Growth drivers	Driver	IAEngg Comments	Certainty	Reasonableness
	Organic growth	Forecast increase in connection and organic demand growth align with the growth projections of local councils.	High	Reasonable
	De-carbonisation	Significant energy-consuming process heat sites exist in Alpine's supply area but only those more than 80% likely to happen is included in the demand forecast for prudent scenario. Alpine believes residential gas electrification will not cause a major load shift to electricity within the next thirty years.	High	Reasonable
	Security of supply standard	Implement N-1 security supply standard on sub-transmission system as per EEA guideline	High	Reasonable
	Project cost inflation above CPI	Costs of major growth projects have been updated based on latest quotes	High	Reasonable

Demand forecasting Inputs & modelling	Accuracy	Reasonable	Assessment rating	Good

The assessment rating is based on the following considerations:

- Alpine has developed an Energy Roadmap based on a stocktake of energy-consuming process heat sites in the South Canterbury area (in conjunction with other South Island EDBs, Transpower and EECA). The Energy Roadmap also incorporates insights from active interaction with customers on their energy transition plans, plans for sustainable fleets, DG, and business growth. The Roadmap stipulates a future 2040 state which is then used to model the demand growths in various parts of the network.
- For demand forecasting, Alpine uses scenario analysis to deal with uncertainties of step loads that are used in the demand forecasting inputs. A probability is assigned to each load based on factors such as the likelihood of it materialising and its potential impact on our network.
- There are three scenarios: Speculative, Possible and Prudent. The prudent scenario takes into account of work that is more than 80% likely to happen within two years of when the customer said it would happen.
- The demand forecast coming from the prudent scenario is used for expenditure forecasting.
- What is unclear from the AMP, other than step load increases caused by process heat electrification, is how the impact of other de-carbonisation initiatives (such as adoption of EV, DER, DSR) has been factored into the demand forecast.

Expenditure forecasting approach	**Accuracy**	**Reasonable**	**Assessment rating**	**Good**
	The assessment rating is based on the following considerations: » Demand forecast is used to identify substations and HV lines that required reinforcement based on ratings and security of supply standards. This produces a program of works for expenditure forecasting. » It is not clear how expenditure for MV and LV upgrades are determined as there is no program of works. » It is not clear if non-network solutions (such as load flexibility) have been considered to defer the need for network upgrades. » Proposed investments to increase LV visibility (such as use of smart meter data) to monitor the impact of EV on the network. » The AMP has raised “supply chain challenges, inflationary pressures, and a compressed labour market” as the challenges to deliver the expanded program of works but Alpine’s strategy to deal with the challenges is not clear.			
Trigger point	Process heat conversion to electricity is forecasted to have a major impact on the network demand. Process heat conversion is very sensitive to government policies and incentives so change in policies could be a major trigger point.			
Dependencies & Risks	The risks are overbuilding infrastructure that may not be required, or underbuilding leading to capacity constraints and impact on supply reliability.			
Sensitivities	If de-carbonisation activities pick up pace, Alpine could be faced with not having enough network capacity to supply the additional load leading to delay in new customer connections and supply reliability. Conversely if de-carbonisation is delayed, Alpine could have built infrastructure that is not required.			
Assumptions	The step loads included in the prudent scenario are more than 80% likely to happen			

ASSET REPLACEMENT & RENEWAL

Annual Capex	$13,533,446 (21-23)	$16,324,000 (26-30)		
% contribution to overall capex increase	**43%**			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	End-of-life transformers and equipment in zone substations	Alpine uses Asset Health Indices (based on EEA's Asset Health Indicator Guide) to track the conditions of these equipment and their end-of-life	High	Reasonable
	Poor asset conditions revealed via condition assessment	Applies to a number of distribution asset categories such as overhead lines, distribution transformers, switchgear and cables	High	Reasonable
Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Good**

The assessment rating is based on the following considerations:

- Alpine uses Condition-based Asset Risk Management models (CBARM) and Failure Modes, Effects and Criticality Analysis (FMECA) to predict the optimal replacement or renewal time of the assets. The model and analysis are considered industry standards.
- Assets installed in the 1950s and 1960s are near the end of their nominal useful lives

IAEngg has no access to asset condition data to confirm if the assets targeted for end-of-life or condition-based replacement are appropriate.

Expenditure forecasting approach	Accuracy	Insufficient Information for Analysis	Assessment rating	Good
	The assessment rating is based on the following considerations: » IAEngg has not been provided with the volumes and unit rates to confirm the reasonableness and accuracy of the expenditure increase » It is not clear if Alpine has considered the overlap between system growth and asset replacement programs of works.			
Trigger point	Not applicable			
Dependencies & Risks	There will be significant impact on supply reliability and safety if end-of-life assets are left in service.			
Sensitivities	The proposed replacement programs are sensitive to availability of resources to undertake the work.			
Assumptions	No particular assumption has been made.			

7.1.6 Opex category assessment – Top Contributors

SYSTEM OPERATIONS & NETWORK SUPPORT				
Annual opex	$6,603,612 (21-23) $10,169,000 (26-30)			
% contribution to overall opex increase	65%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Salary and wage growth	Wage inflation	High	Unable to determine
	Future network	New positions required to manage future network	High	Unable to determine
	Succession planning	Additional resource for succession planning	High	Unable to determine
	Digital and data transformation	Increase resource and expenditure on digital & data platforms and strategies to prepare for future-state network	High	Unable to determine
	Expanded capex program	» The administrative support required to deliver the expanded network programme is likely to increase » Alpine has stated “Increase investment in risk management practices due to increased work on the network”.	High	Unable to determine

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine the reasonableness of the inputs nor the approach.			
Trigger point	There is no trigger point for this expenditure			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Not clear if productivity improvement has been considered in the opex increase			
Assumptions	Cost increase is above CPI			

BUSINESS SUPPORT

Annual **opex**	$11,041,202 (21-23) $12,690,000 (26-30)			
% contribution to overall opex increase	**30%**			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Salary and wage growth	Wage inflation	High	Unable to determine
	Future network	New positions required to manage future network	High	Unable to determine
	Succession planning	Additional resource for succession planning	High	Unable to determine
	Digital and data transformation	Increase resource and expenditure on digital & data platforms and strategies to prepare for future-state network	High	Unable to determine

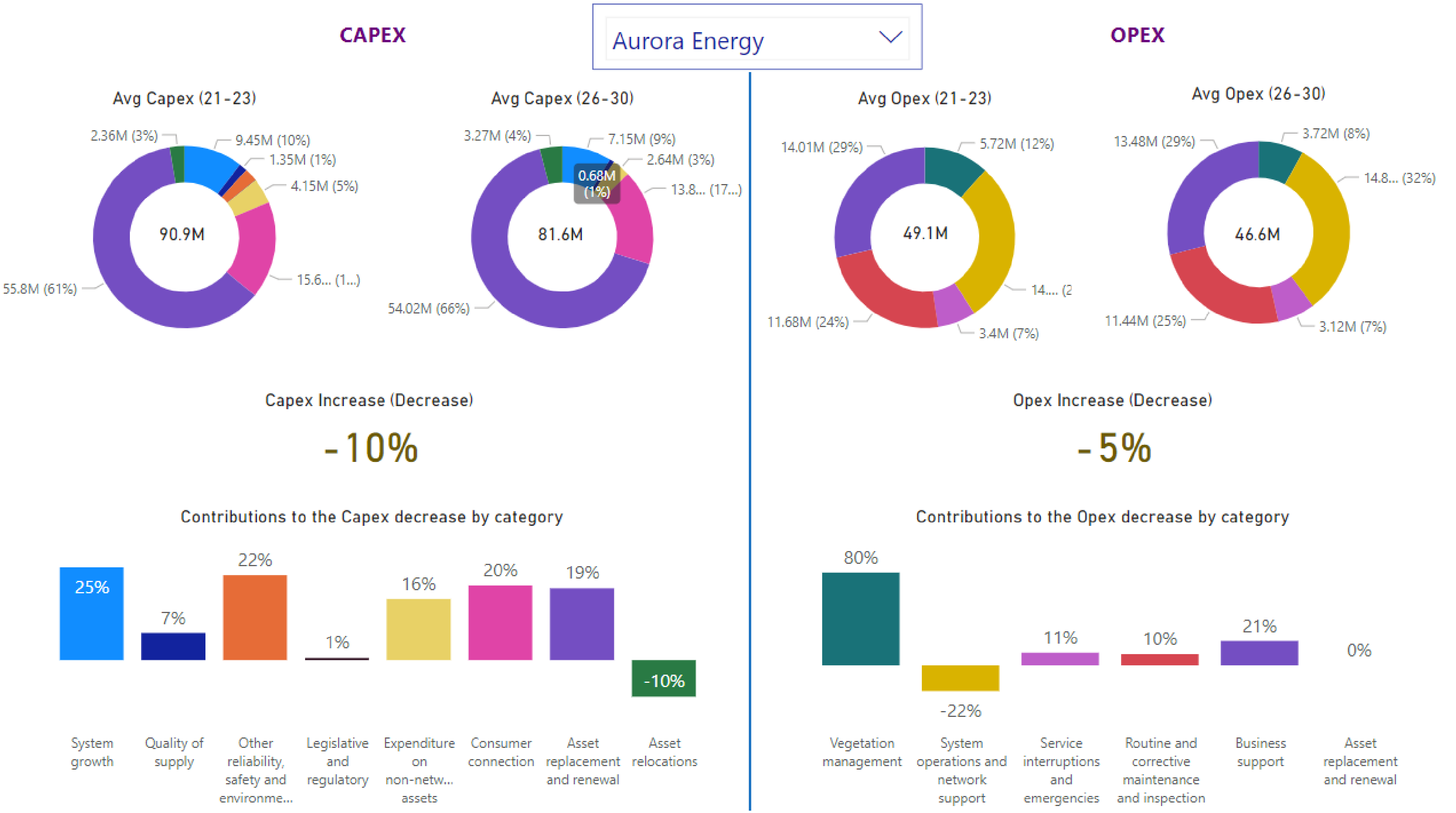
	Expanded capex program	- The administrative support required to deliver the expanded network programme is likely to increase - Alpine has stated "Increase investment in risk management practices due to increased work on the network".		High	Unable to determine
Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**		**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine the reasonableness of the inputs nor the approach.				
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**		**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.				
Trigger point	There is no trigger point				
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of vegetation management) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.				
Sensitivities	Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.				
Assumptions	Cost increase is above CPI				

Aurora

ENERGY

7.2 Aurora Energy

7.2.1 Expenditure Dashboard



7.2.2 Business overview (2022 data)

Parameter	Value
Customers	93,287
Peak demand	309 MW
Electricity volume	1307 GWh
Line length	6,214 km
Distribution and LV Underground	3,843 km
Distribution and LV Overhead	2,371 km
Current Reliability performance	
» Total SAIDI	321.0
» Total SAIFI	2.672

7.2.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☒	No ☐
Future DSO role/open access network	Yes ☒	No ☐	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex trade-off	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.2.4 Summary of Capex and Opex Categories assessed

IAEngg did not undertake further assessment of Aurora Energy's CAPEX & OPEX forecast as it was below the assessment threshold.

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☐
Asset replacement and renewal	☐
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☐
System operations and network support	☐
Business support	☐

7.2.5 CAPEX category assessment

GENERAL COMMENTS ON CAPEX	
Annual **CAPEX**	$90,932,273 (21-23) $81,596,774 (26-30)
% overall capex increase / decrease	**-10%**

Aurora's AMP indicated that Aurora used a bottom up methodology to develop its peak demand forecast. There was no mention of the use of top down forecast to validate and/or calibrate the bottom up forecast to improve its accuracy. Aurora have also not adjusted the forecast starting point for weather effects which could have a materially effects on forecast accuracy. Taking these two factors into account, IAEngg view is that for capex underpinned by peak demand forecasts, there is risk that the timing might not be optimal.

7.2.6 OPEX category assessment

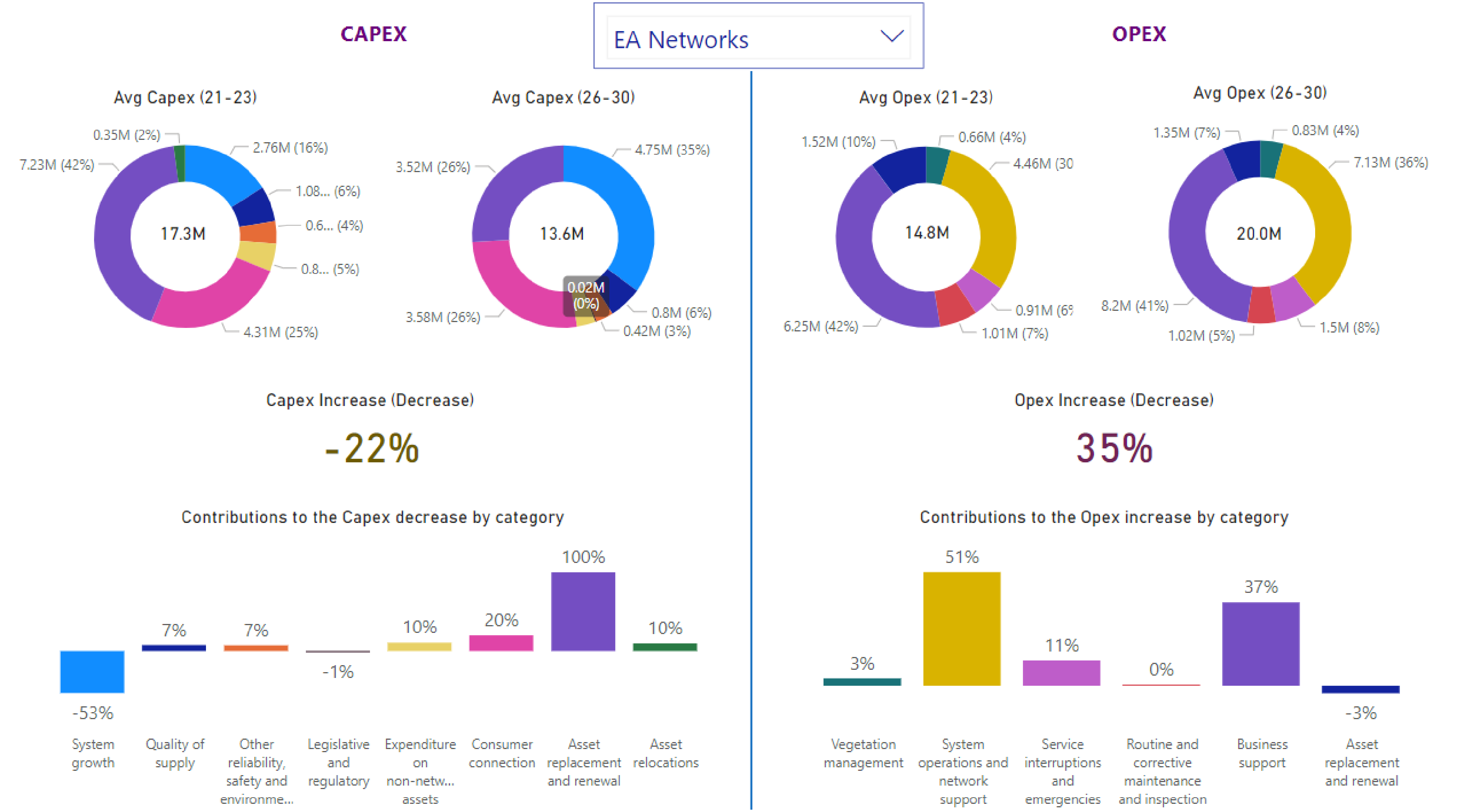
GENERAL COMMENTS ON OPEX	
Annual OPEX	$49,129,802 (21-23) $46,636,188 (26-30)
% overall opex increase / decrease	-5%

Despite pressure on opex cost from changes in traffic management regulations and the application tree regulations, Aurora's planned opex when compared to actual spent remains somewhat constant (with slight downward trend) over the AMP planning period. This could be the result of Aurora planned overspending its CPP determination and hence Aurora is forecasting a relatively stable level going forward.

EA networks

7.3 EA Networks

7.3.1 Expenditure Dashboard



7.3.2 Business overview (2022 data)

	Parameter	Value
	Customers	**20,247**
	Peak demand	**160MW**
	Electricity volume	**554GWh**
	Line length	**3,105km**
	Distribution and LV Underground	**720km**
	Distribution and LV Overhead	**1,999km**
	Current Reliability performance	
	» Total SAIDI	**236**
	» Total SAIFI	**2.01**

7.3.3 Capex and Opex Growth Drivers

Drivers for capex growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☐	No ☒
DER connection growth	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – commercial EV charging	Yes ☐	No ☒	Yes ☐	No ☒
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☐	No ☒	Yes ☐	No ☒
LV visibility	Yes ☐	No ☒	Yes ☐	No ☒
Future DSO role/open access network	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☐	No ☒	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☐	No ☒	Yes ☐	No ☒
Labour costs above CPI	Yes ☐	No ☒	Yes ☐	No ☒
Material costs above CPI	Yes ☐	No ☒	Yes ☐	No ☒
Network scale escalator	Yes ☐	No ☒	Yes ☐	No ☒
Capex/Opex tradeoff	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.3.4 Summary of Capex and Opex Categories assessed

IAEngg did not undertake further assessment of EA Networks CAPEX forecast as it was below the assessment threshold.

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☐
Asset replacement and renewal	☐
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☐
System operations and network support	☒
Business support	☒

7.3.5 Capex category assessment – Top Contributors

GENERAL COMMENTS ON CAPEX	
Annual **CAPEX**	$17,280,163 (21-23) $13,557,916 (26-30)
% contribution to overall capex increase	-22%
	» Significant network investment (voltage conversion) - a large capital works programme during the late 1990s and the early part of this century now has the almost all sub-transmission lines operating at 66 kV and a significant portion of the distribution network operating at 22 kV. » The network is relatively new overall and in good condition, as a result of investment in sub-transmission and 22kV conversion to supply the increased irrigation demand over the last 20 years. » Over 25% of the network is underground, especially around the Ashburton township. » The overall capex for FY24-33 is showing a decrease from FY21-23. » At the capex sub-category level, system growth shows a step increase but is more than offset by the step decrease in asset replacement & renewal » System growth is driven by known process heat conversion projects. » Does not forecast that EV and replacement of gas reticulation will have significant impact on the network » Plan for network resilience is based on the use of emergency response plans and mutual support agreements which is probably appropriate for a relatively new network with significant underground assets.

7.3.6 Opex category assessment – Top Contributors

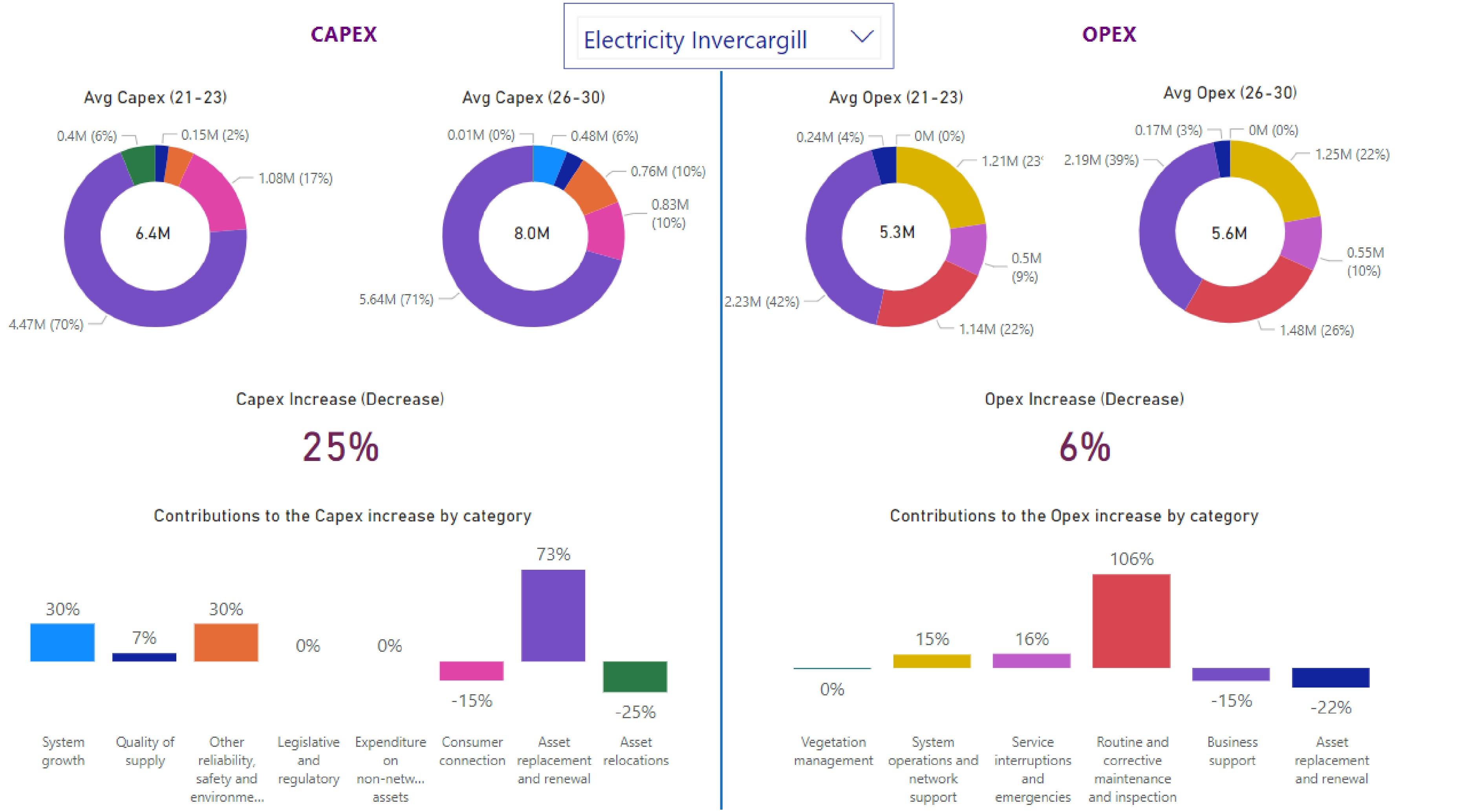
SYSTEM OPERATIONS AND NETWORK SUPPORT				
Annual OPEX	$4,464,957 (21-23) $7,126,000 (26-30)			
% contribution to overall opex increase	51%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Data driven analysis and decision making	The support costs of EA Networks are predicted to initially rise to cover a large GIS project (FY24 & 25) and then reduce to a stable level (FY26 onwards) as capital expenditure reduces and asset management support becomes more data driven/intensive transferring existing resources for analysis and development	Medium	Unable to determine
	Additional work	Increase staffing to cater for demands of the more rigorous regulated business environment EA Networks operate in.	Medium	Unable to determine

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point for this expenditure			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Not clear if productivity improvement has been considered in the opex increase			
Assumptions	No specific assumptions have been made			

<table>
<tr><th colspan="5">BUSINESS SUPPORT</th></tr>
<tr><td>Annual OPEX</td><td colspan="4">$6,247,481 (21-23) $8,202,000 (26-30)</td></tr>
<tr><td>% contribution to overall opex increase</td><td colspan="4">37%</td></tr>
<tr><td rowspan="2">Growth drivers</td><td>Driver</td><td>IAEngg Comments</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td>Additional work</td><td>Increase staffing to cater for demands of the more rigorous regulated business environment EA Networks operate in</td><td>Medium</td><td>Unable to determine</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td rowspan="2">Expenditure forecasting approach</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td>Trigger point</td><td colspan="4">There is no trigger point</td></tr>
<tr><td>Dependencies & Risks</td><td colspan="4">Possible impact to other opex items (e.g. deferral of vegetation management) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.</td></tr>
<tr><td>Sensitivities</td><td colspan="4">Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.</td></tr>
<tr><td>Assumptions</td><td colspan="4">No specific assumptions have been made</td></tr>
</table>

7.4 Electricity Invercargill

7.4.1 Expenditure Dashboard



7.4.2 Business overview (2022 date)

	Parameter	Value
	Customers	**17,491**
	Peak demand	**62MW**
	Electricity volume	**252GWh**
	Line length	**663 km**
	Distribution and LV Underground	**610 km**
	Distribution and LV Overhead	**53 km**
	Current Reliability performance	
	» Total SAIDI	**105.2**
	» Total SAIFI	**1.152**

7.4.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☐	No ☒
Future DSO role/open access network	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☐	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☒
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.4.4 Summary of Capex and Opex Categories assessed

IAEngg did not undertake further assessment of EIL's OPEX forecast as it was below the assessment threshold.

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☒
Asset replacement and renewal	☒
Asset relocations	☐
Reliability, Safety & Environment (combined)	☒
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☐
System operations and network support	☐
Business support	☐

7.4.5 CAPEX category assessment – Top Contributors

SYSTEM GROWTH				
Annual **CAPEX**	$0.00 (21-23) $480,226 (26-30)			
% contribution to overall capex increase	30%			
Growth drivers	**Driver**	**Comment**	**Certainty**	**Reasonableness**
	Population Growth, Housing density & utilisation	Population increasing in future years by ~ 3.6% by 2033. Long term growth is expected to be relatively flat, a medium growth rate of 0.3% per annum is forecasted	High	Reasonable
	Electric Heating	Electricity Invercargill (EIL) is forecasting the effect of heat pump conversion to be small, estimated to be about 0.5% growth in demand over the next 10 years.	Medium	Unable to determine
	Electric Vehicles	EIL is forecasting some demand growth towards the end of the ten year planning period	Low	Unable to determine

<table>
<tr><td rowspan="2">Demand forecasting Inputs & modelling</td><td>Accuracy | Reasonable | Assessment Rating | Good</td></tr>
<tr><td>The assessment rating is based on the following considerations:
» EIL carries out Demand forecasting based on historical trends and takes into account other demand drivers which may lead to change in future demand
» EIL considers growth per substation as the most appropriate level for identifying constraints on the network. Projected substation demands indicates expected growth forecast and EIL uses these projections as basis for Network development planning.
» EIL also carries out internal prudent growth forecast with appropriate contingency planning.
» The overall impact of the future demand drivers is a 1.2% per annum maximum demand growth rate.
» EIL utilises both bottom-up & top-down techniques for Demand forecasting</td></tr>
<tr><td rowspan="2">Expenditure forecasting approach</td><td>Accuracy | Insufficient Information for Analysis | Assessment Rating | Average</td></tr>
<tr><td>The assessment rating is based on the following considerations:
» Prior to any investment in any infrastructure EIL evaluates non-network solutions like load control, demand-side management solutions, install generation or energy storage, use of high – technology devices & network re-configuration
» Depending on the network constraints EIL identifies possible development options to meet demand and uses cost-based decision tools (NPV calculations & risk analysis) to evaluate options.</td></tr>
</table>

Trigger point	» Customer Behavioural Changes » Ongoing electricity demand growth (residential, commercial, and industrial) » Electrification of transport » Demands for de-carbonisation » Greater reliance on renewable energy
Dependencies & Risks	There is a risk that if there is material change in things like economic growth, Government policies affecting population growth etc. it might result in significant budget variances
Sensitivities	It is not evident in the AMP if EIL has completed a sensitivity study and addressed the sensitivity analysis results in its expenditure forecast.

Assumptions	
Assumptions	» The assumption is that unforeseen changes in growth rates or step changes due to connection or loss of large customers will not occur. » Tiwai Smelter will be operational for the foreseeable future and that no investment will be required by EDB to counteract any negative effects on the networks that may be caused by the loss of load » General demand growth for existing customers tracks close to projected rates. New housing developments and decarbonisation initiatives is additional to the general growth. » Single large customer driven growth (such as supplies to data centres and electrode boilers) is likely. This may not occur on the EIL network but will affect the bulk supply to EIL. » Small scale (household) distributed generation is expected to have little coincidence with network peak demand, and therefore will have little impact on network configuration within the ten-year planning horizon » Electric vehicle adoption rate iswithin the national forecast range. Consumers respond well to price signals so that vehicle charging occurs mainly off-peak » Step changes in underlying growth are considered unlikely based on historical trending over a long period. Population growth for sizing of equipment is based on the high projection. » No significant changes to local and/or national government development policies

ASSET REPLACEMENT AND RENEWAL

Annual CAPEX	$4,468,270 (21-23)	$5,639,671 (26-30)		
% contribution to overall capex increase	**73%**			
Growth drivers	**Driver**	**Comment**	**Certainty**	**Reasonableness**
	Asset Condition	Inspection and testing programmes identifying assets reaching end-of-life or asset condition	High	Reasonable
Forecasting Inputs & modelling	**Accuracy**	**Reasonable**	**Assessment Rating**	**Average**
	The assessment rating is based on the following considerations: » EIL are currently using an internal decision-making approach for replacement or renewal of assets based on the network asset category. » EIL uses Commerce Commission's Optimised Deprival Valuation (ODV) asset life to initiate asset replacement work with the actual replacement done based on condition, remaining economic life and work efficiency.			

	Accuracy	Insufficient Information for Analysis	Assessment Rating	Average
Expenditure forecasting approach	The assessment rating is based on the following considerations: » Annual inspection & testing programme results leads to development of Annual replacement program of works based on the network asset category. » IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	» Whole-of-life cost analysis » Operational/public safety » Risk management » Declining service levels » Accessibility for maintenance » Obsolescence » New technology			
Dependencies & Risks	» No material deviation from historical failure rates » Resourcing is sufficient for projected works programme			
Sensitivities	IAEngg has not been provided with details of cost-benefit analysis of the proposed program of work and hence not in a position to assess the sensitivities of the expenditure.			
Assumptions	Service life of assets tend towards industry accepted expected life for each specific asset type and operating environment			

RELIABILITY, SAFETY & ENVIRONMENT				
Annual CAPEX	$438,685 (21-23) $1,022,187 (26-30)			
% contribution to overall capex increase	37%			
Growth drivers	Driver	Comment	Certainty	Reasonableness
	Safety	Programmes to address multiple safety concerns on the network have been initiated	High	Reasonable
	Quality of Supply	Programmes to address low voltage issues on the low voltage network have been initiated	High	Reasonable
	Network Automation	Automation programs to increase network reliability by installing additional remote switching devices on the network	High	Reasonable

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
	» Programmes have been put in place to mitigate the safety & quality issues on the network, IAEngg could not find details of a cost-benefit analysis against this CAPEX category in the AMP			
Expenditure Forecasting Approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
	» IAEngg does not find the information in the AMP that allows it to assess how the expenditure of this CAPEX category is determined			
Trigger point	Network Reliability & Safety			
Dependencies & Risks	The risk is network not in compliance with Electricity (Safety) Regulations			
Sensitivities	IAEngg has not been provided with details of cost-benefit analysis of the proposed program of work and hence not in a position to assess the sensitivities of the expenditure.			
Assumptions	» No material deviation from historical failure rates » Little change in safety & work practice regulations			

7.4.6 Opex category assessment – High Level Insights from IAEngg

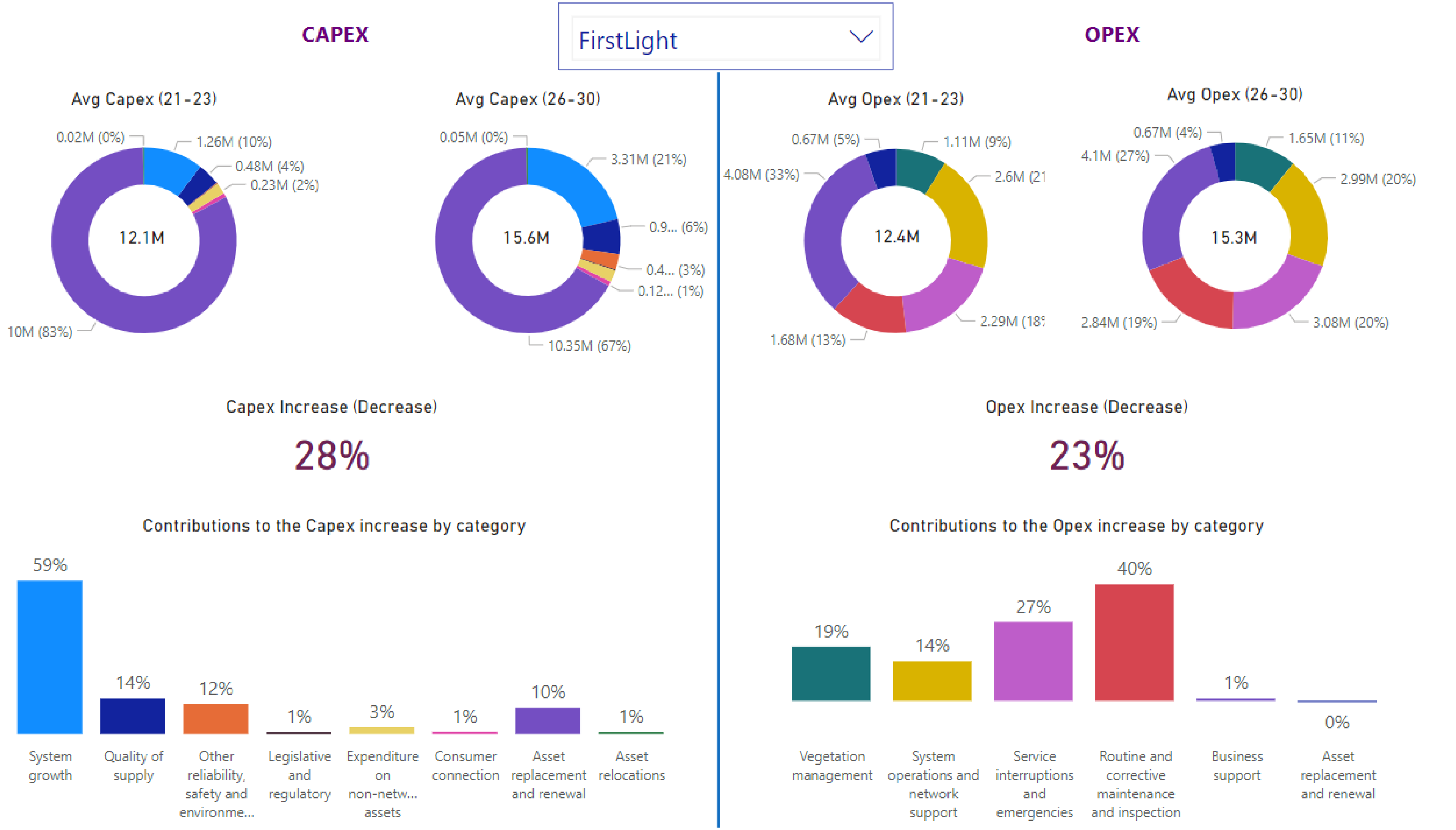
GENERAL COMMENTS ON OPEX	
Annual OPEX	$5,323,458 (21-23) $5,644,786 (26-30)
% overall opex increase / decrease	6%

- EIL opex expenditure forecast doesn't have a significant step change
- An increase is OPEX budget is forecasted from 2025-26 onwards, This is in anticipation of increased maintenance activity, since 2020 – 2025 period is deemed as constrained renewal period by EIL
- EIL's network is predominantly underground, vegetation issues are very minimal so the costs are relatively low, routine inspections are also restricted to assets that can be checked visually
- The main uncertainty in the OPEX spend will be in the expenditure of Service interruptions and emergencies as this category is highly reactive
- The OPEX forecast vs Actuals for 2021/22 published in the AMP show the actuals to be 1% under budget.

Firstlight network™

7.5 FirstLight

7.5.1 Expenditure Dashboard



7.5.2 Business overview (2022 data)

Parameter	Value
Customers	25,775
Peak demand	66 MW
Electricity volume	288 GWh
System length	3,943 km
Distribution and LV Underground	417 km
Distribution and LV Overhead	3,526 km
Current Reliability performance	
» Total SAIDI	436.8
» Total SAIFI	4.328

7.5.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential gas to electricity conversion	Yes ☐	No ☒	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☐	No ☒	Yes ☐	No ☒
Future DSO role/open access network	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.5.4 Summary of Capex and Opex Categories assessed

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☒
Asset replacement and renewal	☒
Asset relocations	☐
Reliability, Safety & Environment (combined)	☒
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☒
Vegetation management	☒
Routine and corrective maintenance and inspection	☒
Asset replacement and renewal	☐
System operations and network support	☐
Business support	☐

7.5.5 CAPEX category assessment – Top Contributors

SYSTEM GROWTH				
Annual **CAPEX**	$1,259,033 (21-23) $3,305,000 (26-30)			
% contribution to overall capex increase	59%			
Growth drivers	**Driver**	**Comment**	**Certainty**	**Reasonableness**
	Consumer Connection Growth	Based on Residential growth which is a continuation of the recent trends in the sector & based on commercial growth which reflects recent growth in the sector	High	Reasonable
	Baseline maximum demand growth	Historical trends indicates consumer demand increase, FirstLight forecasts ADMD CAGR to be 1.23% p.a for Gisborne region & 1.49 % p.a for Wairoa	High	Reasonable
	Industrial Growth	Given the uncertainty in industrial growth FirstLight has included a planning margin of 5MW in demand forecast to cater for potential growth	Low	Unable to determine
	Electric Vehicles Uptake	FirstLight has adapted Transpower's accelerated electrification scenario as a reference forecast and adjusted it GDP per capita of the region	Low	Unable to determine
	Solar PV & Batteries Installation	FirstLight has adjusted Transpower's accelerated electrification scenario forecasts for DERs for factors relevant to FirstLight's regions	Medium	Unable to determine

Demand forecasting Inputs & modelling	**Accuracy**	**Reasonable**	**Assessment Rating**	**Good**
	The assessment rating is based on the following considerations: » FirstLight has taken into account a wide range inputs for developing the demand forecast » The inputs are based on recent trends for Consumer connections growth, assumptions for energy efficiency improvements, historical trends for change in baseline peak demand growth, prudent planning margin for industrial growth, Transpower's accelerated electrification scenario adjusted by FirstLight for Electric Vehicles & DERs » The baseline growth forecasts have been developed with a top-down approach » IAEngg assumes FirstLight has not adapted a bottom-up approach to reconcile top-down model because of its customer connection policy			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Good**
	» FirstLight's expenditure forecasting approach for consumer connections & minor network upgrades are based on historical averages adjusted to higher growth » Prior to investment in any infrastructure FirstLight evaluates non-network solutions such as demand-side management solutions & distribution generation » To meet demand & security requirements a network project list is developed and several options are assessed prior to finalising a proposing solution and the recommended solution is included in the expenditure forecasts. » IAEngg cannot comment on the appropriateness of the various long run average costs used above without examining the underlying data or how they compare to other EDBs			

Trigger point	Forecasting input with low certainty like Electric Vehicles is very sensitive to government policies.
Dependencies & Risks	The risks are building additional capacity early results in an overinvestment, whereas building additional capacity too late may have much greater consequences such as equipment damage or inability to customer the load required.
Sensitivities	It is not evident in the AMP if FirstLight has completed a sensitivity study and addressed the sensitivity analysis results in its expenditure forecast.
Assumptions	» High inflation environment would persist for sometime. Inflation of nominal expenditure forecasts was assumed a 5.5% from FY2024 to FY2025, 5.3% from FY2025 to FY2026, and around 4.0% for each subsequent year. » New Zealand's Climate Change Response (ZeroCarbon) Amendment Act and associated emissions budget and strategy will increase the demand or electricity » Climate change will increase the intensity and frequency of adverse weather events. » Materials and equipment will not constrain the ability to complete planned work. The timing of some projects to account for the longer lead-times for major plant items have been brought forward. » Resources will not constrain the ability to complete planned work. » The economics of PVs and batteries will improve and their penetration on the network will increase. » The economics of EVs will improve and their penetration on the network will increase. » Hot water load control will continue to be available

<table>
<tr><th colspan="5">ASSET REPLACEMENT AND RENEWAL</th></tr>
<tr><td>Annual
CAPEX</td><td colspan="4">$9,997,746 (21-23) $10,351,400 (26-30)</td></tr>
<tr><td>% contribution to overall capex increase</td><td colspan="4">10%</td></tr>
<tr><td rowspan="2">Growth drivers</td><td>Driver</td><td>Comment</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td>Asset Health Condition</td><td>Asset age and health are the key drivers for asset replacement & renewal, FirstLight is transitioning from age-based renewal forecasting to an asset health-based approach.</td><td>High</td><td>Reasonable</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td>Reasonable</td><td>Assessment Rating</td><td>Good</td></tr>
<tr><td colspan="4">The assessment rating is based on the following considerations:

FirstLight adapted DNO common network asset indices methodology (“DNO Methodology”) in combination with EEA Asset Health indicator guide 2016 to assess the health & criticality of the network assets. This is a sound approach to identifying the assets that require replacement. The outputs would be based on the risk and inclusion of asset criticality might enhance the renewal forecasts.</td></tr>
</table>

Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
	» IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	Asset Health Condition, immediate safety concern & deteriorating reliability performance			
Dependencies & Risks	Rapid increase in the rate of failure of a certain asset fleet (pre-2000) poles due to external weather events			
Sensitivities	IAEngg has not been provided with details of cost-benefit analysis of the proposed program of work and hence not in a position to assess the sensitivities of the expenditure.			
Assumptions	» Inflation of nominal expenditure forecasts was assumed a 5.5% from FY2024 to FY2025, 5.3% from FY2025 to FY2026, and around 4.0% for each subsequent year. » Materials and equipment will not constrain the ability to complete planned work. The timing of some projects has been adjusted to account for the longer lead-times for major items of plant. » Climate change will increase the intensity and frequency of adverse weather events. » Resources will not constrain the ability to complete planned work.			

RELIABILITY, SAFETY & ENVIRONMENT				
Annual CAPEX	$503,682 (21-23) $1,403,600 (26-30)			
% contribution to overall capex increase	27%			
Growth drivers	**Driver**	**Comment**	**Certainty**	**Reasonableness**
	Reliability	Extreme weather events have become a major contributor for unreliability on the network so focus is on improving unplanned SAIDI & SAIFI	High	Reasonable
	Resilience	Improve resilience of Network feeders that accounts for adverse weather & adverse environment SAIDI	High	Reasonable
	Network Automation	To Support Resilience & improve network security by minimising the impact of outages to consumers on the network	High	Reasonable
Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Good**
	» Based on the Network reliability figures and the network constraints identified, projects are proposed as resilience initiatives to reduce risk and improve reliability & safety of the network			

Expenditure forecasting approach	Accuracy	Insufficient Information for Analysis	Assessment Rating	Good
	‣ It is evident from the AMP that alternatives are considered for each of the projects to identify if it is an economically viable option ‣ The areas targeted for investment are based on recent experiences of Cyclone Gabrielle. IAEngg cannot comment on the appropriateness of the forecasted expenditure without examining the underlying data or how they compare to other EDBs			
Trigger point	Network Reliability Performance			
Dependencies & Risks	The risk is FirstLight exceeding its cap on the regulated reliability which may prevent it from delivering the works planned under this CAPEX category			
Sensitivities	Network performance is sensitive to weather events.			
Assumptions	‣ Inflation of nominal expenditure forecasts was assumed a 5.5% from FY2024 to FY2025, 5.3% from FY2025 to FY2026, and around 4.0% for each subsequent year. ‣ Materials and equipment will not constrain an ability to complete planned work. The timing of some projects has been adjusted to account for the longer lead-times for major items of plant. ‣ Climate change will increase the intensity and frequency of adverse weather events.			

7.5.6 Opex category assessment – Top Contributors

<table>
<tr><th colspan="5">ROUTINE & CORRECTIVE MAINTENANCE AND INSPECTION</th></tr>
<tr><td>Annual OPEX</td><td colspan="4">$1,676,030 (21-23) $2,844,200 (26-30)</td></tr>
<tr><td>% contribution to overall opex increase</td><td colspan="4">40%</td></tr>
<tr><td rowspan="4">Growth drivers</td><td>Driver</td><td>Comment</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td>FirstLight's Fleet Management Strategy</td><td>Transitioning to DNO methodology has accelerated asset inspections resulting in forecast step-change</td><td>High</td><td>Unable to determine</td></tr>
<tr><td>Diesel Generator Fleet</td><td>Inclusion of diesel generators fleet maintenance cost has contributed to step change</td><td>High</td><td>Unable to determine</td></tr>
<tr><td>Time writing Allocation</td><td>Reallocation of costs from SONS category to other OPEX categories</td><td>High</td><td>Reasonable</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment Rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
</table>

Expenditure forecasting approach	Accuracy	Insufficient Information for Analysis	Assessment Rating	Insufficient Information for Analysis
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	Asset Failure & Asset defects			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.			
Assumptions	» Inflation of nominal expenditure forecasts was assumed a 5.5% from FY2024 to FY2025, 5.3% from FY2025 to FY2026, and around 4.0% for each subsequent year.			

<table>
<tr><th colspan="5">SERVICE INTERRUPTIONS & EMERGENCIES</th></tr>
<tr><td>Annual OPEX</td><td colspan="4">$2,286,971 (21-23) $3,078,000 (26-30)</td></tr>
<tr><td>% contribution to overall opex increase</td><td colspan="4">27%</td></tr>
<tr><td rowspan="2">Growth drivers</td><td>Driver</td><td>Comment</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td>Increase in network faults</td><td>All fault related activities including operating costs of gensets & emergency maintenance</td><td>High</td><td>Unable to determine</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment Rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td rowspan="2">Expenditure forecasting approach</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment Rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">» Forecast is based on recent trends and includes operating costs of generators.
» FirstLight has stated once full capital costs of the network resilience program is included in the forecasts the Service Interruptions & Emergencies OPEX costs will drop
» IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
</table>

Trigger point	Weather, Asset failure, Vegetation & several other factors
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.
Sensitivities	Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.
Assumptions	» Climate change will increase the intensity and frequency of adverse weather events » Inflation of nominal expenditure forecasts was assumed a 5.5% from FY2024 to FY2025, 5.3% from FY2025 to FY2026, and around 4.0% for each subsequent year.

<table>
<tr><th colspan="7">VEGETATION MANAGEMENT</th></tr>
<tr><td>Annual OPEX</td><td colspan="6">$1,109,342 (21-23) $1,653,000 (26-30)</td></tr>
<tr><td>% contribution to overall opex increase</td><td colspan="6">19%</td></tr>
<tr><td rowspan="3">Growth drivers</td><td colspan="2">Driver</td><td colspan="2">Comment</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td colspan="2">Network Reliability & performance</td><td colspan="2">Focus of the program is to improve the vegetation SAIDI by increasing vegetation management on worst performing feeders</td><td>High</td><td>Unable to determine</td></tr>
<tr><td colspan="2">Time writing Allocation</td><td colspan="2">Reallocation of costs from SONS category to other OPEX categories</td><td>High</td><td>Reasonable</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td colspan="2">Insufficient Information for Analysis</td><td>Assessment Rating</td><td colspan="2">Insufficient Information for Analysis</td></tr>
<tr><td colspan="6">
- FirstLight have targeted 5% improvement in vegetation outages each year (from RY2021 to RY2026)
- FirstLight are forecasting to use drone inspections to increase the overall inspection coverage
- FirstLight are forecasting to implement vegetation management software to improve efficiency and to manage vegetation data
- IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.
</td></tr>
</table>

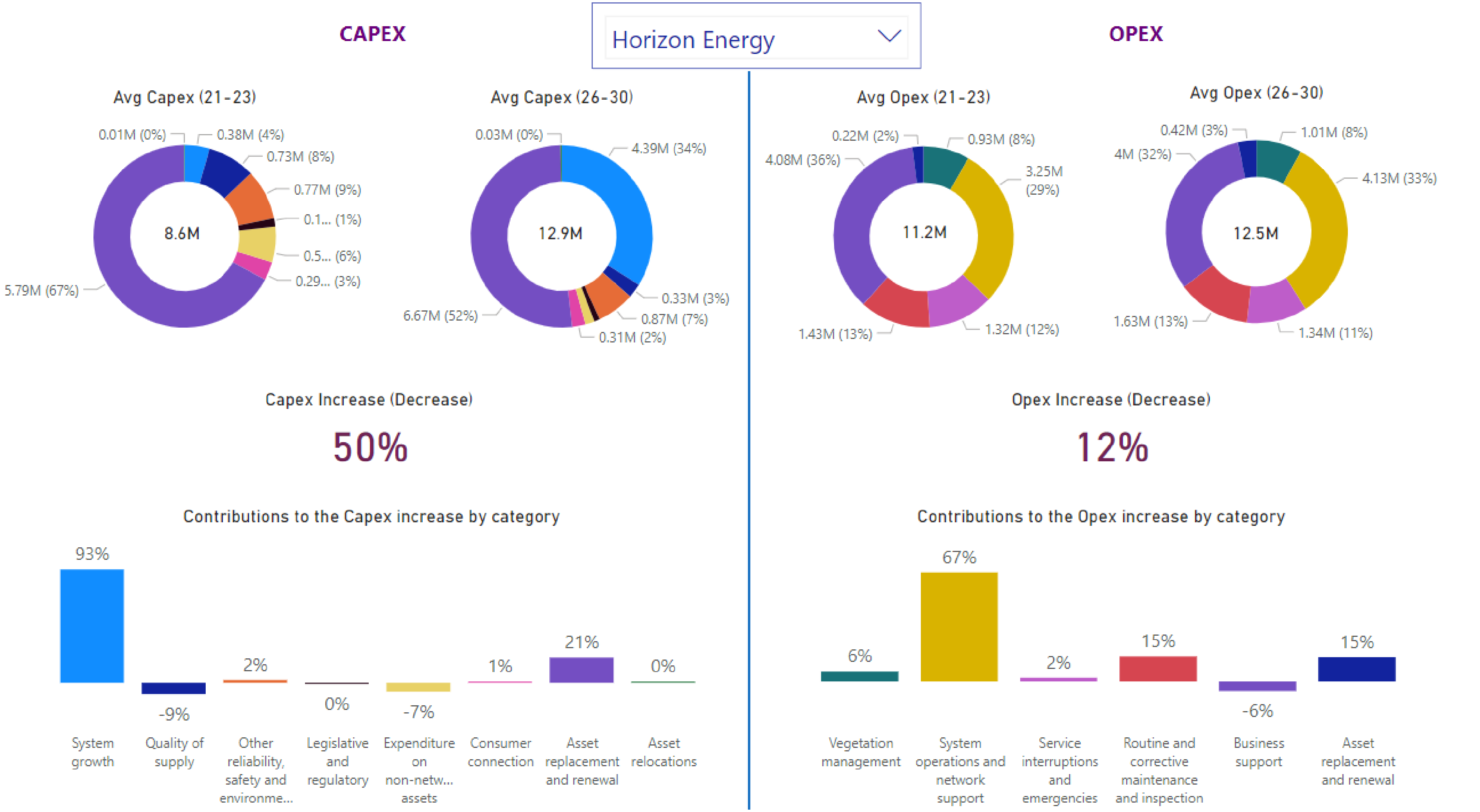
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
	» IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	Extreme weather events			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of vegetation management) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.			
Assumptions	» Climate change will increase the intensity and frequency of adverse weather events » Inflation of nominal expenditure forecasts was assumed a 5.5% from FY2024 to FY2025, 5.3% from FY2025 to FY2026, and around 4.0% for each subsequent year.			

HEG®

Horizon Energy Group

7.6 Horizon Energy

7.6.1 Expenditure Dashboard



7.6.2 Business overview (2022 data)

Parameter	Value
Customers	25,081
Peak demand	97MW
Electricity volume	556GWh
Line length	2,612km
Distribution and LV Underground	609km
Distribution and LV Overhead	1,757km
Current Reliability performance	
» Total SAIDI	387
» Total SAIFI	2.72

7.6.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☐	No ☒
LV visibility	Yes ☒	No ☐	Yes ☒	No ☐
Future DSO role/open access network	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☐	No ☒	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☐	No ☒	Yes ☐	No ☒
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.6.4 Summary of Capex and Opex Categories assessed

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☒
Asset replacement and renewal	☒
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☒
Asset replacement and renewal	☐
System operations and network support	☒
Business support	☐

7.6.5 CAPEX category assessment – Top Contributors

SYSTEM GROWTH				
Annual CAPEX	$380,795 (21-23) $4,394,630 (26-30)			
% contribution to overall capex increase	93%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Increase in economic activities & population growth (organic growth)	Generally based on strong economic growth experienced in recent years due to investment from Provincial Growth Fund (PGF) & increased migration due to inflated house prices in cities like Auckland and Tauranga.	Medium	Reasonable
	De-carbonisation	Horizon is aware that de-carbonisation activities in the region could affect its demand growth. While impact modelling is still in progress, an allowance of $0.5M per year has been made from 2026 onwards	Medium	Reasonable
	Project cost inflation above CPI	Costs of major growth projects have been updated based on latest quotes	High	Reasonable

<table>
<tr><td rowspan="2">Demand forecasting Inputs & modelling</td><td>Accuracy</td><td>Reasonable</td><td>Assessment rating</td><td>Good</td></tr>
<tr><td colspan="4">The assessment rating is based on the following considerations:
» Sunshine capital of NZ and attractive to solar farm developments. These developments are not included in the growth capex due to significant contribution from the developers and likelihood of connection to Transpower’s GXP.
» Other de-carbonisation drivers have not been explicitly considered in demand forecasting
» Current demand forecasting approach is based on historic trends plus confirmed step loads so have a high degree of certainty.
» The annual organic growth rate in the Opotiki region has been revised from 1.9% to 2.8% which appears high. However, this is supported by historic trend. The high growth rate is forecasted to continue based on the multi million dollar investments by PGF and land subdivision activities around the township.</td></tr>
<tr><td rowspan="2">Expenditure forecasting approach</td><td>Accuracy</td><td>Reasonable</td><td>Assessment rating</td><td>Good</td></tr>
<tr><td colspan="4">The assessment rating is based on the following considerations:
» The growth capex is determined based on a program of works. The costs for major growth projects (New CBD Substation, Opotiki 11kV to 33kV Conversion, and Manawahe Substation) have been updated based on latest quotes which indicate substantial material (43%) and labour cost (16%) increase.
» An annual allowance of $0.5M has been made to cater for de-carbonisation. While this allowance has not been justified (as scenario modelling is still in progress), it appears to be reasonable (about 11% of the forecasted growth capex).</td></tr>
</table>

Trigger point	There is no trigger point
Dependencies & Risks	The risks are overbuilding infrastructure that may not be required, or underbuilding leading to capacity constraints and impact on supply reliability.
Sensitivities	As de-carbonisation has not been explicitly built into the demand forecast, the current capex is not sensitive to the uncertainties associated with de-carbonisation activities. If de-carbonisation activities pick up pace, Horizon could be faced with not having enough network capacity to supply the additional load leading to delay in new customer connections and supply reliability. Conversely if de-carbonisation has little impact, then Horizon will not need to spend the $0.5M provision in their growth capex.
Assumptions	An annual provision of $0.5M is sufficient to address impact on the network caused by de-carbonisation activities.

ASSET REPLACEMENT & RENEWAL

Annual CAPEX	$5,786,271 (21-23)	$6,671,244 (26-30)		
% contribution to overall capex increase	**21%**			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	End-of-life protection equipment	Aged-based replacement of protection relays based on 15-year life	High	Reasonable
	End-of-life communication equipment	Analogue 2-way radio system replaced by digital equivalent (DMR)	High	Reasonable
Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Good**

The assessment rating is based on the following considerations:

- Many utilities replace their protection equipment on time-based consideration due to the important role the equipment perform on the power system.
- Many utilities have to replace their analogue radio system by their digital equivalent due to technological obsolescence.

	Accuracy	Insufficient Information for Analysis	Assessment rating	Good
Expenditure forecasting approach	The assessment rating is based on the following considerations: » IAEngg has not been provided with the volumes and unit rates to confirm the reasonableness and accuracy of the expenditure increase			
Trigger point	For time-based protection relay replacement program, the trigger point is the year of installation.			
Dependencies & Risks	Failures of protection relays have significant implication on supply reliability and safety. Breakdown causing communication system outages will impact on operation of the network.			
Sensitivities	The proposed replacement programs are sensitive to availability of resources to undertake the work.			
Assumptions	No particular assumption has been made.			

7.6.6 Opex category assessment – Top Contributors

SYSTEM OPERATIONS & NETWORK SUPPORT				
Annual OPEX	$3,246,820 (21-23) $4,130,090 (26-30)			
% contribution to overall opex increase	67%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Salary and wage growth	Wage inflation	High	Unable to determine
	Succession planning	Additional resource for succession planning	High	Unable to determine
	Migration to cloud service	ICT related maintenance costs	High	Unable to determine
	Additional work	» Support decarbonisation initiatives and network resilience » Support to retain ISO55001 certification	High	Reasonable

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point for this expenditure			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Not clear if productivity improvement has been considered in the opex increase			
Assumptions	Cost increase is above CPI			

ROUTINE & CORRECTIVE MAINTENANCE & INSPECTION

Annual **OPEX**	$1,426,143 (21-23) $1,626,935 (26-30)			
% contribution to overall opex increase	**27%**			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Asset condition monitoring	» Increase in maintenance activities such as asset health and Low Voltage (LV) inspections » An additional asset inspector role has been introduced for LV data collections for FY24 onwards to improve power quality in the LV network	High	Unable to determine
	Increased contracting costs	Increased contracting cost above CPI	High	Unable to determine
	Climate resilience	Allowance for additional maintenance requirements ($100k pa) to adapt to the new climate pattern	Medium	Unable to determine

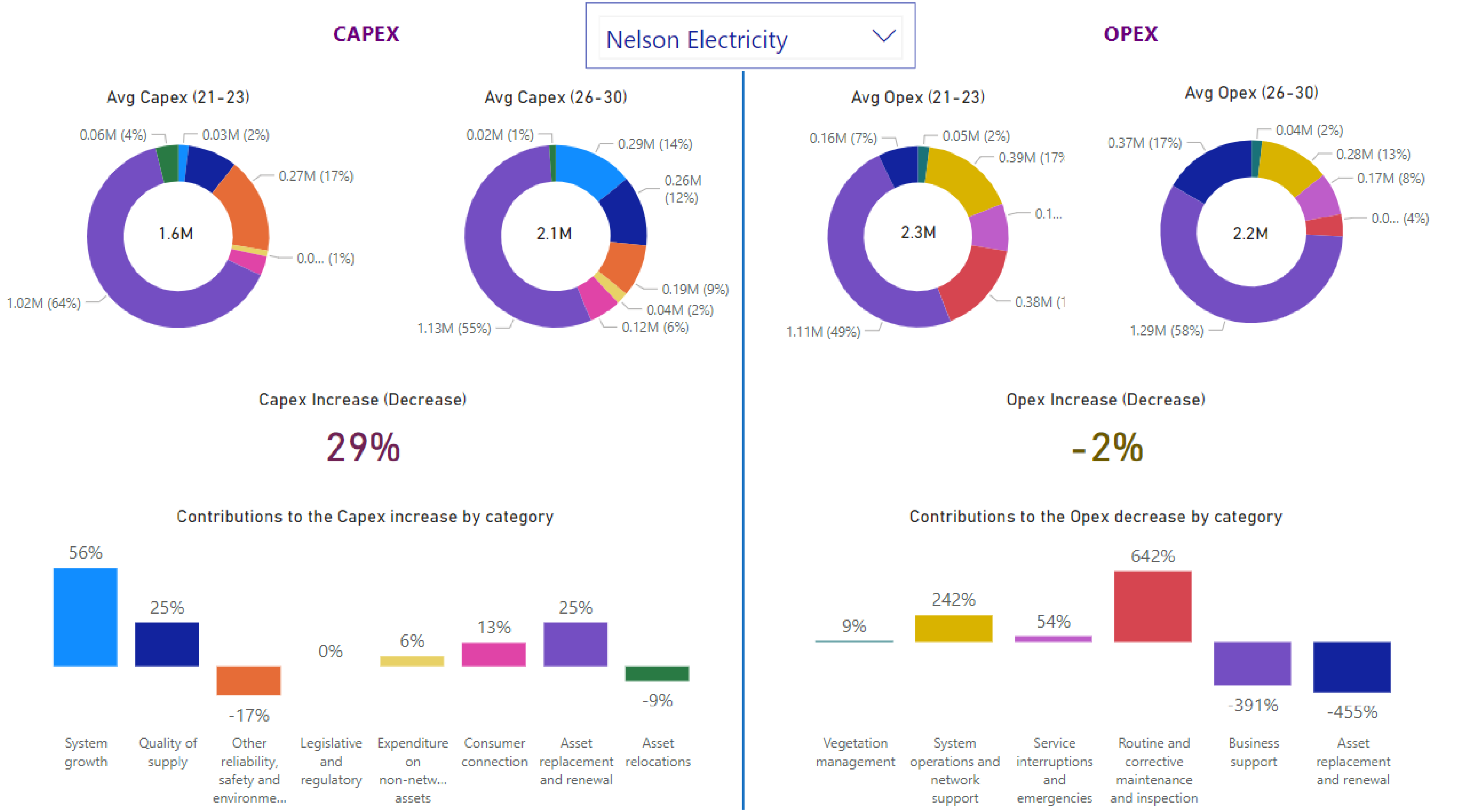
Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of vegetation management) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.			
Assumptions	Cost increase is above CPI			

NEL

NELSON ELECTRICITY LTD

7.7 Nelson Electricity

7.7.1 Expenditure Dashboard



7.7.2 Business overview (2022 data)

Parameter	Value
Customers	9,285
Peak demand	33 MW
Electricity volume	138 GWh
Line length	296 km
Distribution and LV Underground	269 km
Distribution and LV Overhead	27 km
Current Reliability performance	
» Total SAIDI	19.4
» Total SAIFI	0.273

7.7.3 Capex and Opex Growth Drivers

Drivers for capex growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential gas to electricity conversion	Yes ☐	No ☒	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☐	No ☒	Yes ☐	No ☒
Future DSO role/open access network	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.7.4 Summary of Capex and Opex Categories assessed

IAEngg did not undertake further assessment of Nelson Electricity's OPEX forecast as it was below the assessment threshold.

Capex Categories	Assessed Further
Consumer connection	☒
System growth	☒
Asset replacement and renewal	☒
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☐
System operations and network support	☐
Business support	☐

7.7.5 CAPEX category assessment – Top Contributors

SYSTEM GROWTH				
Annual CAPEX	$29,657 (21-23) $291,000 (26-30)			
% contribution to overall capex increase	**56%**			
Growth drivers	**Driver**	**Comment**	**Certainty**	**Reasonableness**
	Loading changes on the Network	Nelson Electricity (NEL) has a distribution transformer replacement programme and the requirement for replacing them is influenced by changes in loading on the network or transformer maintenance criteria	Medium	Reasonable
		NEL has a LV cable review & replacement programme for upgrading existing assets	Medium	Reasonable

Demand forecasting Inputs & modelling	**Accuracy**	**Reasonable**	**Assessment Rating**	**Average**
	The assessment rating is based on the following considerations: » NEL's demand and consumption figures have been flat or in decline in recent years, NEL is assuming the growth would remain flat for 1-5 years of the planning period and increase by 1% for the remaining planning period. » Although NEL is forecasting growth to remain flat, NEL has a step change in forecasted expenditure to manage the loading changes on the distribution network by replacing/ upgrading distribution transformers and Low voltage cables » It is evident NEL has not made an allowance for the decarbonisation drivers in their demand forecasting although NEL acknowledges it will have an impact on peak demand in the future.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
	» IAEngg cannot comment on the expenditure forecasting approach under this CAPEX category without examining the underlying data which is not available in the AMP			
Trigger point	Loading changes on the Network			
Dependencies & Risks	The risks are building additional capacity too late may have much greater consequences such as equipment damage or inability to supply the load to the customer.			
Sensitivities	NEL has not completed any sensitivity studies.			

Assumptions	- The setting of the forecast is difficult given the demand and consumption figures have been flat or in decline and there is enough uncertainty as to the effects of all the variables. - Flat demand will continue for the short to medium term, and longer term begin to increase again predominantly due to increases in electric vehicle charging and decarbonisation of energy use - Forecast consumption remain flat for the first 5 years of the planning period, then increasing by 1.0% per year for the remainder of the planning period - Peak demand growth rate remaining flat at 33.3MW for the planning period - Consumer's utilisation of load control will continue for the entire planning period - Increasing levels of embedded generation will be commissioned during the planning period - Introduction of more PV embedded generation will not have any significant impact on the network peak demand - Impacts of climate change will only be realised outside of the planning period of this Asset Management Plan, but all asset management planning will consider the future impacts - Inflation is forecast to be 5% for the next two years and dropping to 2% for each year thereafter. - Interest rates to be around 6.0% over the next few years. - Existing external regulatory and legislative requirements to remain unchanged throughout the planning period.

ASSET REPLACEMENT AND RENEWAL

Annual CAPEX	$1,017,450 (21-23) $1,134,000 (26-30)			
% contribution to overall capex increase	**25%**			
Growth drivers	**Driver**	**Comment**	**Certainty**	**Reasonableness**
	Asset Health Condition	NEL has taken a condition driven maintenance approach on its network. It is based on results of risk modelling against Asset performance standards	High	Reasonable
Forecasting Inputs & modelling	**Accuracy**	**Reasonable**	**Assessment Rating**	**Good**
	The assessment rating is based on the following considerations: » Since major section of NEL's network is underground NEL has taken a condition driven maintenance against asset performance standards » NEL has a lifecycle audits process in place and is continually auditing its assets » NEL has developed an Asset replacement guide and a risk model which uses a probabilistic approach to measure asset performance against a standard formulated for each asset type. The model is used to determine an assets current or future suitability of the network.			

	Accuracy	Insufficient Information for Analysis	Assessment Rating	Insufficient Information for Analysis
Expenditure forecasting approach	» The capital expenditure for 2024-2028 is dominated by replacement and renewal of under rated and aged high voltage cables. » IAEngg cannot comment on the forecast expenditure under this CAPEX category without examining the underlying data which is not available in the AMP			
Trigger point	Asset Health Condition			
Dependencies & Risks	Use of an in-house Risk model compared to a Nationally or Internationally recognised Asset Health & Criticality guide or methodology			
Sensitivities	IAEngg has not been provided with details of cost-benefit analysis of the proposed program of work and hence not in a position to assess the sensitivities of the expenditure.			
Assumptions	» Inflation is forecast to be 5% for the next two years and dropping to 2% for each year thereafter. » Interest rates to be around 6.0% over the next few years. » Existing external regulatory and legislative requirements to remain unchanged throughout the planning period.			

CONSUMER CONNECTIONS

Annual **CAPEX**	$53,665 (21-23)	$116,000 (26-30)		
% contribution to overall capex increase	13%			
Growth drivers	**Driver**	**Comment**	**Certainty**	**Reasonableness**
	High Density Housing	Generally based on growth experienced in recent years.	High	Reasonable
	Housing Intensification Commercial & Industrial	Generally based on growth experienced in recent years	High	Reasonable
Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Average**
	The assessment rating is based on the following considerations: » NEL has used data from Nelson City Council on planned subdivision and infill housing. » NEL has factored in the list of confirmed & prospective projects based on the information received from customers » Consumer connection capex is assumed to follow the same trend line as System growth			

	Accuracy	Insufficient Information for Analysis	Assessment Rating	Average
Expenditure forecasting approach	The assessment rating is based on the following considerations: » Based on the projects listed on the AMP under consumer projects IAEngg believes NEL used a bottom-up approach for forecasting expenditure but cannot sight evidence of it in the AMP			
Trigger point	1. Economic factors 2. New central governments policy on Net Zero Emissions by 2050 3. Population Growth 4. Transport Electrification 5. Transition from gas to electricity			
Dependencies & Risks	Consumer connection capex is driven by customer requests. The risk of over or underbuilding infrastructure is low. Budget risk is partially offset with capital contribution from customers.			
Sensitivities	Demand increase is very sensitive to population growth and economic factors. However, as consumer connection capex is only spent when customer requests to connect, the risk of over or underbuilding infrastructure is low.			

Assumptions	» Flat demand will continue for the short to medium term, and longer term begin to increase again predominantly due to increases in electric vehicle charging and decarbonisation of energy use » Forecast consumption remain flat for the first 5 years of the planning period, then increasing by 1.0% per year for the remainder of the planning period » Peak demand growth rate remaining flat at 33.3MW for the planning period » Consumer's utilisation of load control will continue for the entire planning period » Increasing levels of embedded generation will be commissioned during the planning period » Introduction of more PV embedded generation will not have any significant impact on the network peak demand » Impacts of climate change will only be realised outside of the planning period of this Asset Management Plan, but all asset management planning will consider the future impacts » Inflation is forecast to be 5% for the next two years and dropping to 2% for each year thereafter. » Interest rates to be around 6.0% over the next few years. » Existing external regulatory and legislative requirements to remain unchanged throughout the planning period.

7.7.6 Opex category assessment – High Level Insights from IAEngg

GENERAL COMMENTS ON OPEX	
Annual **OPEX**	\$2,285,534 (21-23) \$2,239,986 (26-30)
% overall opex increase /decrease	**-2%**

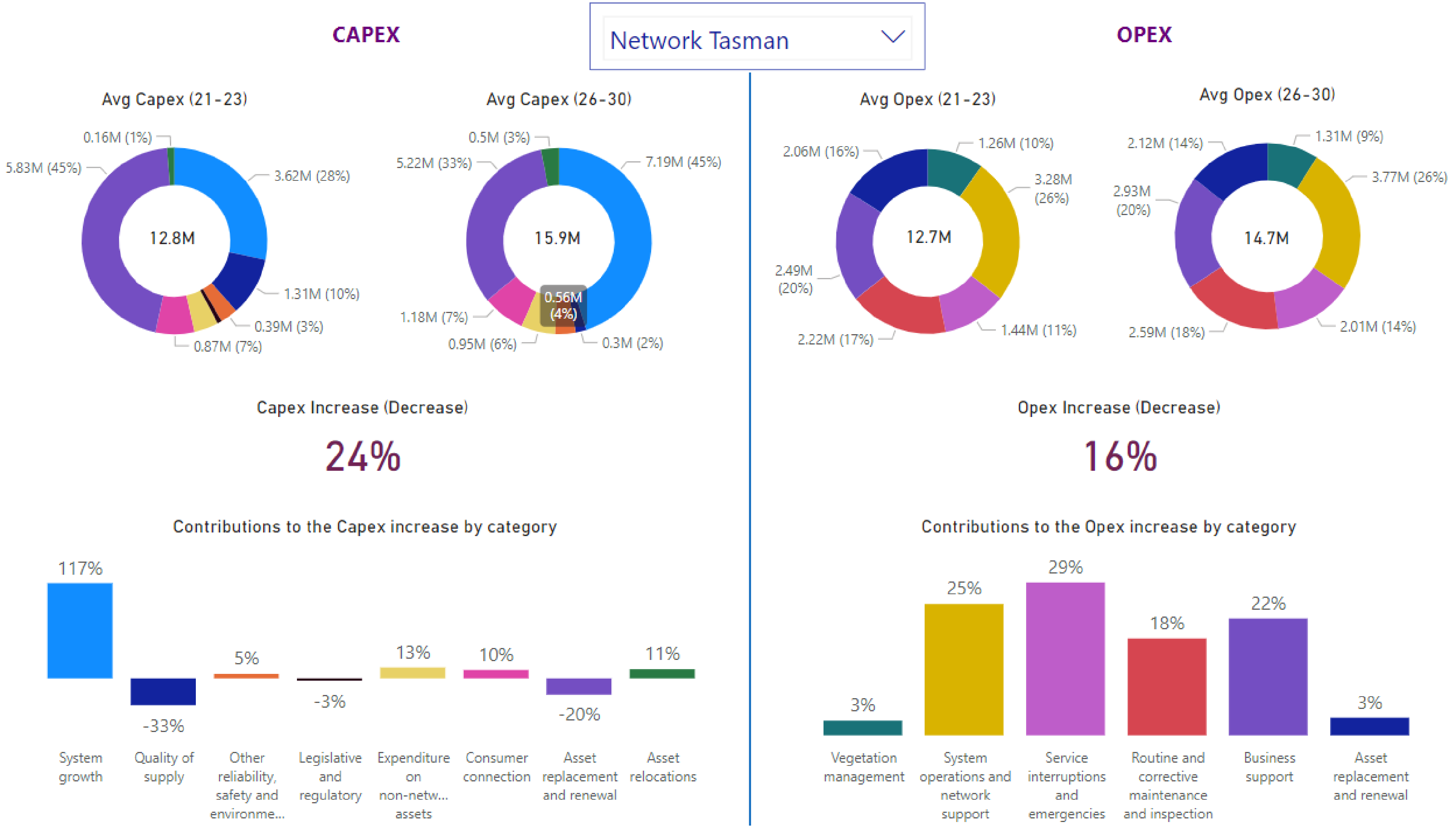
- Nelson Electricity opex expenditure forecast doesn't have a significant step change.
- The main uncertainties in the OPEX spend will be in the expenditure of Service interruptions and emergencies as this category is highly reactive.
- 90% of the network is underground and vegetation only plays a minor role in SAIDI & SAIFI still expenditure is forecasted to address public safety concerns
- A cyclic programme has been implemented for asset condition auditing which is part of routine and corrective maintenance and inspection Category. This involves each asset being audited and specific information gathered relating to each asset. The forecast is flat for entire planning period.
- Forecast for Asset replacement and renewal is also flat for the entire planning period but no further information relating to this OPEX category is available in the AMP.

networktasman

Your consumer-owned electricity distributor

7.8 Network Tasman

7.8.1 Expenditure Dashboard



7.8.2 Business overview (2022 data)

	Parameter	Value
	Customers	**41,622**
	Peak demand	**149 MW**
	Electricity volume	**652 GWh**
	Line length	**3,688 km**
	Distribution and LV Underground	**1,030 km**
	Distribution and LV Overhead	**2,658 km**
	Current Reliability performance	
	» Total SAIDI	**176.2**
	» Total SAIFI	**1.311**

7.8.3 Capex and Opex Growth Drivers

Drivers for capex growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential gas to electricity conversion	Yes ☐	No ☒	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☒	No ☐
Future DSO role/open access network	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.8.4 Summary of Capex and Opex Categories assessed

Capex Categories	Assessed Further
Consumer connection	☒
System growth	☒
Asset replacement and renewal	☐
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☒

Opex Categories	Assessed Further
Service interruptions and emergencies	☒
Vegetation management	☐
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☐
System operations and network support	☒
Business support	☒

7.8.5 CAPEX category assessment – Top Contributors

System Growth				
Annual CAPEX	$3,622,835 (21-23) $7,186,000 (26-30)			
% contribution to overall capex increase	**117%**			
Growth drivers	**Driver**	**Comment**	**Certainty**	**Reasonableness**
	Population/Housing Growth	Housing development growth is occurring concurrently in several regions of the network	High	Reasonable
	Industrial Growth	Industrial growth is expected to continue in the form of light manufacturing, seafood processing, aquaculture, timber processing & cold storage	Medium	Reasonable
	Process Heat	Process heat conversion is forecasted to create some spot loads both in urban and rural areas	Low	Unable to determine
	Distributed Generation	Small scale solar PV generation uptake progressing at a steady rate and to have a negative impact on consumption	Medium	Reasonable

Demand forecasting Inputs & modelling	Accuracy	Reasonable	Assessment Rating	Good

Demand forecasting Inputs & modelling

The assessment rating is based on the following considerations:

- Population forecasts published by local councils in their long-term plan documents has been used as a base for forward projections in demand
- Historic feeder loadings are combined with known specific growth initiatives to refine population forecast for each area
- Population growth in each area is translated to high voltage feeder growth, a network forecast is developed by combining high voltage feeders forecast into Zone substation forecasts and combining Zone substations forecasts to 33kV feeder load forecasts and is then adjusted with known spot load information and DG developments. GXP forecasts are developed from consolidated 33kV feeder load forecasts and diversity factor is included to arrive at the regional demand forecasts
- Network Tasman Limited (NTL) uses network modelling tools for assessing future network scenarios, the growth projections include process heat conversion effects of distributed generation and load management.
- NTL has used a combination of bottom-up & top-down approach with their network demand forecasting

	Accuracy	Insufficient Information for Analysis	Assessment Rating	Good
Expenditure forecasting approach	The assessment rating is based on the following considerations: » NTL completes network analysis studies as part of demand forecasting to identify network constraints. » NTL generates a series of development projects options to address the constraints on the network, the development projects are prioritised based on criteria like public safety, uncontrolled loss of supply, supply capacity for new customers, to improve reliability & to improve supply security. » Based on the above the method demand forecast is converted to expenditure by bottom-up build of system growth projects. » IAEngg has not examined the program of work and hence cannot comment on its appropriateness.			
Trigger point	Changes to government policies and initiatives with regards to Emission reductions plan may significantly affect load forecasts and development plans			
Dependencies & Risks	The risks are building additional capacity early results in an over investment, whereas building additional capacity too late may have much greater consequences such as equipment damage or inability to supply load required by customer			

Sensitivities	It is not evident if NTL has completed a sensitivity study and addressed it results in its expenditure forecast.
Assumptions	» No change to the company's obligation to maintain supply to existing consumers, nor any major changes to the existing legislative and regulatory required conditions of supply to consumers during the period of the plan » Economic activity in the region will continue to be based on primary production, including fishing and forestry, hops and wine » Land use development will happen at a steady gradual rate, and that this rate will not significantly deviate from past trends. Land subdivided for residential development will occur in line with recent trends in terms of density etc » Distributed generation will continue to develop in the region, with no significant changes to the rates of uptake experienced to date » Existing supply capacity continues to be available at all Transpower GXPs and that future projected demands are available to the Nelson area via the national grid.

<table>
<tr><th colspan="5">EXPENDITURE ON NON-NETWORK ASSETS</th></tr>
<tr><td>Annual
CAPEX</td><td colspan="4">$545,458 (21-23) $946,400 (26-30)</td></tr>
<tr><td>% contribution to overall capex increase</td><td colspan="4">13%</td></tr>
<tr><td rowspan="3">Growth drivers</td><td>Driver</td><td>Comment</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td>Information Technology Expenditure</td><td>Purchase of computer hardware and software</td><td>High</td><td>Unable to determine</td></tr>
<tr><td>Property</td><td>Purchase of Vehicles, plant and equipment</td><td>High</td><td>Unable to determine</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment Rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">» IAEngg has no access to granular data to determine accuracy or to assess.</td></tr>
<tr><td rowspan="2">Expenditure forecasting approach</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment Rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">» Replace assets at the end of their economic life or if they are considered to be obsolete due to a change initiative
» IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td>Trigger point</td><td colspan="4">Asset Condition/Asset Age/obsolescence</td></tr>
<tr><td>Dependencies & Risks</td><td colspan="4">Possible impact to other Capex items if this category is under-forecasted. Conversely, expenditure may not be prudent or efficient if the Capex item is over-forecasted.</td></tr>
<tr><td>Sensitivities</td><td colspan="4">N/A</td></tr>
<tr><td>Assumptions</td><td colspan="4">N/A</td></tr>
</table>

CONSUMER CONNECTIONS				
Annual **CAPEX**	$865,352 (21-23) $1,175,000 (26-30)			
% contribution to overall capex increase	10%			
Growth drivers	**Driver**	**Comment**	**Certainty**	**Reasonableness**
	Housing Growth	Housing development growth is occurring concurrently in several regions of the network	High	Reasonable
	Industrial Growth	Industrial growth is expected to continue in the form of light manufacturing, seafood processing, aquaculture, timber processing & cold storage	Medium	Reasonable

<table>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy | Insufficient Information for Analysis | Assessment Rating | Good</td></tr>
<tr><td>The assessment rating is based on the following considerations:

NTL has used multiple sources of information (listed below) as inputs to arrive at the ICP connection numbers forecast for this CAPEX category.

» Number of Land subdivisions consented by Local Territorial Authorities
» Population forecasts published by local councils in their long-term plan documents has been used as a base for forward projections in Demand
» Historical trends on the network
» Capacity upgrades for businesses – Confirmed connection requests</td></tr>
<tr><td rowspan="2">Expenditure forecasting approach</td><td>Accuracy | Insufficient Information for Analysis | Assessment Rating | Insufficient Information for Analysis</td></tr>
<tr><td>» NTL has used the ADMD, Number of forecasted ICPs’ and historical average costs per rural and urban connections to forecast the expenditure for this CAPEX category

» IAEngg cannot comment on the appropriateness of the various long run average costs used above without examining the underlying data or how they compare to other EDBs</td></tr>
<tr><td>Trigger point</td><td>Forecast capital expenditures of this CAPEX category could be expected to increase by approx. $1.2m per annum or 15% If growth projects are not partially funded from developer contributions as under the Capital Contributions Policy</td></tr>
</table>

Dependencies & Risks	Consumer connection capex is driven by customer requests. The risk of over or underbuilding infrastructure is low. Budget risk is partially offset with capital contribution from customers.
Sensitivities	Demand increase is very sensitive to population growth and economic factors. However, as consumer connection capex is only spent when customer requests to connect, the risk of over or underbuilding infrastructure is low.
Assumptions	» Growth based projects will continue to be funded from the combination of contributions from developers and additional income from increased consumer demand, in line with the company’s Capital Contributions Policy » No change to the company’s obligation to maintain supply to existing consumers, nor any major changes to the existing legislative and regulatory required conditions of supply to consumers during the period of the plan. » Economic activity in the region will continue to be based on primary production, including fishing and forestry, hops and wine. » Land use development will happen at a steady gradual rate, and that this rate will not significantly deviate from past trends. Land subdivided for residential development will occur in line with recent trends in terms of density etc. » Distributed generation will continue to develop in the region, with no significant changes to the rates of uptake experienced to date.

7.8.6 Opex category assessment – Top Contributors

SYSTEM OPERATIONS & NETWORK SUPPORT				
Annual **OPEX**	$3,277,430 (21-23) $3,770,600 (26-30)			
% contribution to overall opex increase	25%			
Growth drivers	**Driver**	**Comment**	**Certainty**	**Reasonableness**
	Management Fee	No further details provided in Asset Management Plan	High	Unable to determine
	Training	No further details provided in Asset Management Plan	High	Unable to determine
	Contractor H&S Auditing	No further details provided in Asset Management Plan	High	Unable to determine
	Emergency Stock Management	No further details provided in Asset Management Plan	High	Unable to determine

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point for this expenditure			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	N/A			
Assumptions	Cost increase is above CPI			

BUSINESS SUPPORT						
Annual **OPEX**	$2,492,331 (21-23) $2,931,000 (26-30)					
% contribution to overall opex increase	**22%**					
Growth drivers	**Driver**	**Comment**			**Certainty**	**Reasonableness**
	Corporate Services	No further details provided in Asset Management Plan			High	Unable to determine
Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**		
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.					
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**		
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.					
Trigger point	There is no trigger point for this expenditure					
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.					
Sensitivities	N/A					
Assumptions	Cost increase is above CPI					

SERVICE INTERRUPTIONS & EMERGENCIES						
Annual **OPEX**	$1,439,747 (21-23) $2,013,400 (26-30)					
% contribution to overall opex increase	**29%**					
Growth drivers	**Driver**	**Comment**			**Certainty**	**Reasonableness**
	Increase in network faults	All fault related activities including recoveries, portable generator costs, service level payments & emergency maintenance			Medium	Unable to determine
Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**		
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.					
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**		
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.					
Trigger point	Weather, Asset failure, Vegetation & several other factors					
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of vegetation management) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.					
Sensitivities	Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.					
Assumptions	Cost increase is above CPI					

Orion

7.9 Orion

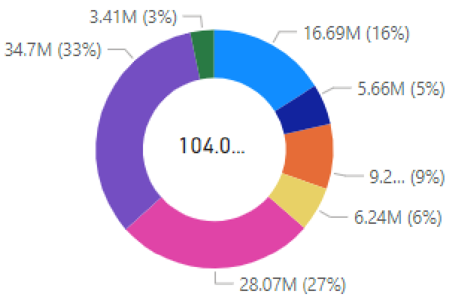
7.9.1 Expenditure Dashboard

CAPEX

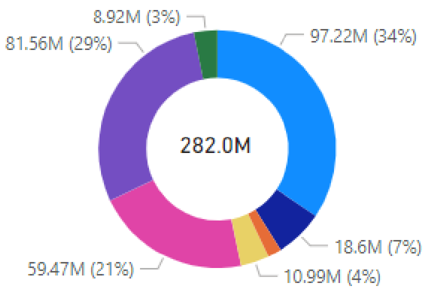
Orion NZ

OPEX

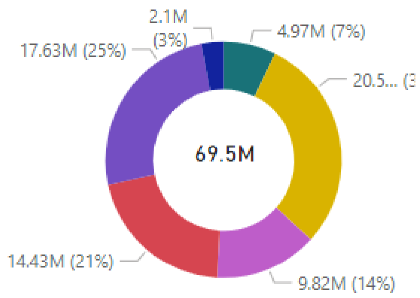
Avg Capex (21-23)



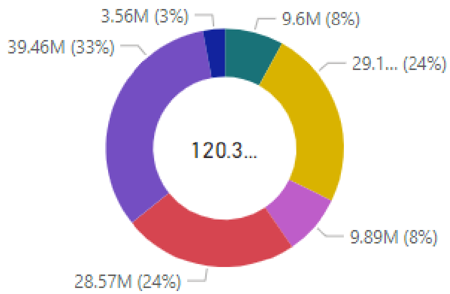
Avg Capex (26-30)



Avg Opex (21-23)



Avg Opex (26-30)



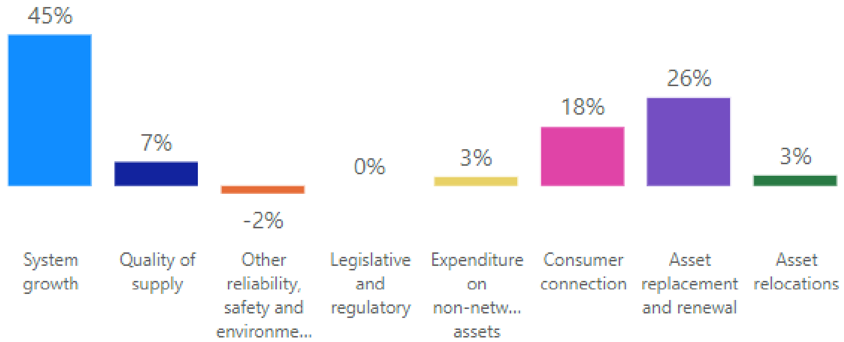
Capex Increase (Decrease)

171%

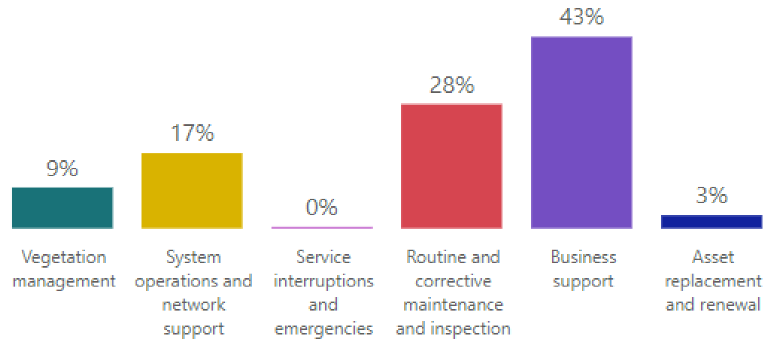
Opex Increase (Decrease)

73%

Contributions to the Capex increase by category



Contributions to the Opex increase by category



7.9.2 Business overview (2022 data)

	Parameter	Value
	Customers	**213,669**
	Peak demand	**713MW**
	Electricity volume	**3,281GWh**
	Line length	**11,740km**
	Distribution and LV Underground	**6,239km**
	Distribution and LV Overhead	**4,893km**
	Current Reliability performance	
	» Total SAIDI	**78**
	» Total SAIFI	**0.68**

7.9.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – commercial EV charging	Yes ☐	No ☒	Yes ☐	No ☒
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☒	No ☐
Future DSO role/open access network	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☒	No ☐	Yes ☒	No ☐

Drivers for opex growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☐	No ☒	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☐	No ☒	Yes ☐	No ☒
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.9.4 Summary of Capex and Opex Categories assessed

Capex Categories	Assessed Further
Consumer connection	☒
System growth	☒
Asset replacement and renewal	☒
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☒
Asset replacement and renewal	☐
System operations and network support	☒
Business support	☒

7.9.5 CAPEX category assessment – Top Contributors

SYSTEM GROWTH				
Annual CAPEX	$16,685,807 (21-23) $97,216,868 (26-30)			
% contribution to overall capex increase	45%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Increase in economic activities (organic growth)	Generally based on strong economic growth experienced in recent years.	Medium	Reasonable
	Expansion plans of large electricity users	Orion's Relationship Manager works closely with major customers to ensure their future electricity requirements are known and taken into account	High	Reasonable
	EV – heavy transport	Orion has not forecasted any specific point load	Low	Reasonable
	EV – light transport	Orion states that government forecast is used but regionalised to Orion supply region. While the approach is reasonable, the regionalisation approach requires alignment with the assumptions used by other EDBs and Transpower	Low	Unable to determine
	Process heat	Based on DETA study of New Zealand Process Heat Fuel Future, and assume a mid-point being converted	Low	Unable to determine

	Domestic heat pumps	Orion has assumed the installation of domestic heat pumps is essentially completed and hence not factored into future demand growth forecast	High	Reasonable
	Demand response	Orion internal estimate	High	Unable to determine
	Load management	Loss of hot water control of 31MW by 2035 is speculative.	Low	Unable to determine
	Energy efficiency (negative growth)	Orion internal estimate	High	Unable to determine
Demand forecasting Inputs & modelling	**Accuracy**	**Reasonable**	**Assessment rating**	**Average**
	The assessment rating is based on the following considerations: » Scenario assessment has not been used to deal with uncertainties of forecasting inputs. Orion stated in the AMP (2023) they plan to develop rigorous and structured energy scenarios over the next twelve months to improve their confidence in future demand. It is not clear how relevant assumptions align with those used by Transpower, in particular, the "accelerated electrification" scenario. » S-curve is assumed for the uptake of process heat conversion which is a reasonable approach. With the S-curve construct, the uncertainties are to do with the saturation penetration, the inflexion point (where uptake starts to accelerate), and the year at which the saturation occurs. Orion has used a midpoint from the DETA study to estimate the MW impact at saturation point. It also assumes a sharp rise of adoption to occur at FY30 and reaching saturation at FY35. The midpoint assumption is reasonable but the timing of adoption is highly uncertain. It is not clear if Orion has carried out sensitivity analysis on the timing. » For process heat conversion, it is not clear if Orion has considered direct supply from GXP rather than from its supply network. » For contribution of EV to peak demand, the use of 0.5kW as contribution to household ADMD appears to be sound[24].			

[24] A study by CSIRO in Australia indicates that each EV will contribute 2kW (50% of a normal household consumption) to the maximum demand whereas research by the EV Council of Australia concludes that the contribution is only 0.25kW

Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Good**
	The assessment rating is based on the following considerations: » Orion is quoting significant unit rate increases for all its capex categories due to (1) supply chain cost increases (due to COVID), (2) inflation, and (3) permitting and working in road corridors. As examples, Orion quotes that overhead pole cost has increased from [C-I-C] in 2017 to [C-I-C] in 2023 per pole. The estimated project cost for a 66kV cable circuit between two ZSs have increased from [C-I-C] in FY21 to [C-I-C] in FY23. » It is not clear for the system growth capex increase, what proportion is caused by unit/project cost increase » Orion has allowed for flexibility payment in its Opex forecast but it is not clear how much demand/growth capex reduction will be achieved with the flexibility payment » Orion has devoted one whole chapter in the AMP to discuss how they will lift their ability to deliver the enlarged program of works. The discussions tend to be on a conceptual level, with no assurance that the challenges can be met.			
Trigger point	Forecasting inputs with low certainty (EV – light and process heat conversion) are very sensitive to government policies and incentives. It should also be noted that process heat may not all be converted from gas into electricity as there exists other possible substitution fuels such as wood pellets and biofuels.			
Dependencies & Risks	The risks are overbuilding infrastructure that may not be required, or underbuilding leading to capacity constraints and impact on supply reliability.			
Sensitivities	It is not clear if Orion has conducted sensitivity analysis on the assumptions used in their demand forecast and address the sensitivity analysis results in its expenditure forecast.			
Assumptions	It is not clear how relevant assumptions align with government policies and the “accelerated electrification” scenario used by Transpower.			

[C-I-C] – Commercial in confidence information

CONSUMER CONNECTIONS				
Annual **CAPEX**	$28,069,510 (21-23) $59,469,053 (26-30)			
% contribution to overall capex increase	18%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Population growth	From historic trends, Stats NZ and local council forecasts. Orion supplies Selwyn which had the highest population growth of any Territorial authority between 2018-2022 at 25%.	High	Reasonable
	Increase in economic activities	Reflected in stronger sub-division, commercial and industrial activities	High	Reasonable
	Major process heat conversion	Process heat conversion to electricity is likely to occur due to government policies. The timing of such projects is subject to high uncertainty especially a few years out	Medium	Unable to determine
	EV adoption	From government forecast but regionalise it to Orion supply region	Low	Unable to determine
	Demand response	Orion internal estimate	High	Unable to determine
	Load management	Loss of hot water control of 31MW by 2035 is speculative	Low	Unable to determine
	Energy efficiency (negative growth)	Orion internal estimate	High	Unable to determine

Forecasting Inputs & modelling	Accuracy	Insufficient Information for Analysis	Assessment rating	Good

Forecasting Inputs & modelling

The assessment rating is based on the following considerations:

- Orion uses a mixture of bottom-up and top-down forecasting techniques depending on the type of consumer connections. For example bottom-up is used for forecast of mass market and sub-divisions based on historic trend, local knowledge and developer information. Top-down approach is used for EV adoption, process heat conversion, efficiency improvement and impact of demand response and load management.
- In our view, the approach taken by Orion is reasonable and should result in a reasonably accurate short term forecast (2 to 3 years) for all market segments except for mass market which we have some reservations. The mass market forecast is primarily based on historical trends. Trend analysis is useful where the inputs to the quantity being analyse exhibit relatively consistent patterns historically over time. In times of less stable social and economic environment, augmenting the trend analysis with related top down data and information (eg population & income growth forecast) will improve forecast accuracy.
- Forecast beyond 2 to 3 years will inherently have a higher degree of uncertainties and variability as customers and developers generally won't commit beyond 2 to 3 years. For major process heat conversion, Orion has based its forecast on DETA study including customer surveys which showed Orion can expect industry conversion due primarily to decarbonisation efforts, to add peak load of between 8% (55MW) to 33% (215MW) to its current maximum peak demand. Orion stated that the significant range of uncertainty is due to the uncertainty around the availability and cost of biomass as a zero carbon alternative to electricity in the network area. To take into account of uncertainty, Orion forecasts are based on a mid-point being converted – 135MW or around a 20% increase to its current peak demand. Orion has also assumed a S-curve for the conversion rate with a steep rise starting from FY30. It's not clear how Orion arrived at 'mid-point' being converted. Furthermore, given the relatively low number of industrial customers, it is possible that some major industrial process heat conversion will be connected directly to Transpower.

Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Good**
	The assessment rating is based on the following considerations: » Orion uses historic project costs to forecast consumer connection capex » For process heat conversion, Orion uses [C-I-C] /MW » It is not clear if Orion has escalated the historic costs based on its forecast of future costs » IAEngg does not have access to granular connection project costs (other than the [C-I-C] /MW above) to confirm if the unit/project costs are appropriate			
Trigger point	Forecasting inputs from electrification have issue of low certainty (EV – light, process heat conversion) as these are very sensitive to government policies and incentives. It should also be noted that process heat conversion from gas into electricity is affected by the presence of other substitution fuels such as wood pellets and biofuels.			
Dependencies & Risks	Consumer connection capex is only spent when there are requests from customers. The risk of over or underbuilding infrastructure is low. The risks for Orion are to do with budget provision and potentially with resource allocation (e.g. not enough resource to connect customers if there is a surge of connection applications not anticipated). Budget risk is partially offset with capital contribution from customers.			
Sensitivities	With relatively stable native demand growth, future demand growth is very sensitive to the assumptions made with regard to process heat conversion and EV uptake.			
Assumptions	It is not clear how relevant assumptions align with government policies and the “accelerated electrification” scenario used by Transpower.			

[C-I-C] – Commercial in confidence information

ASSET REPLACEMENT & RENEWAL

Annual **CAPEX**	$34,697,641 (21-23) $81,558,450 (26-30)			
% contribution to overall capex increase	**44%**			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Asset end-of-life	Orion uses bottom-up approach to determine assets to be replaced or CBRM model to forecast volumes. This driver accounts for 83% ($334M over 2026-30) of the AR&R expenditure	Medium	Unable to determine
	Climate adaptation	Orion uses top-down approach to estimate the asset replacement requirements. This driver accounts for 17% ($70M over 2026-30) of the AR&R expenditure	Medium	Unable to determine
Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**High**
	The assessment rating is based on the following considerations: » Demand forecast that underpins the asset replacement & renewal expenditure is based primarily on actual asset health, criticality and conditions as revealed via asset condition monitoring, resulting in specific replacement sites in the program of works » For low cost high volume assets, Condition based Risk Management (CBRM) model that considers asset criticality, statistical information such as asset age profile, and recent failure rates is used. » Orion has separately itemised asset replacement for climate adaptation. The focus areas – aged overhead conductor replacement, high risk pole replacement, coastal assets – appear to be reasonable			

	Accuracy	Insufficient Information for Analysis	Assessment rating	Insufficient Information for Analysis
Expenditure forecasting approach	» Orion is quoting significant unit rate increases for all its capex categories due to (1) supply chain cost increases (due to COVID), (2) inflation, and (3) permitting and working in road corridors. As examples, Orion quotes that overhead pole cost has increased from [C-I-C] in 2017 to [C-I-C] in 2023 per pole. The estimated project cost for a 66kV cable circuit between two ZSs have increased from [C-I-C] in FY21 to [C-I-C] in FY23. » Specifically for AR&R, Orion states that there has been significant increase in material costs e.g., 10% for switchgear and distribution transformers. Wooden pole material has doubled. Traffic management cost increase in the range between 40%-45%. » For the AR&R expenditure in 2026-30, 83% ($334M) could be classified as BAU replacement i.e. replacement based on asset conditions. It appears volume increase is only modest but the significant expenditure increase is to do with unit/project cost increase. » IAEngg finds the cost increase to be very high but could not determine if it is justifiable » For asset replacement due to climate adaptation ($70M), it is not clear if cost/benefit has been performed » It is not clear if Orion has considered overlap between its system growth and asset replacement programs » It is not clear if Orion has explored asset life extension versus asset replacement			
Trigger point	An industry approach or standard for climate adaptation will provide the certainty of the proposed expenditure.			
Dependencies & Risks	The risk of under-investment in climate adaptation is impact on supply reliability during extreme weather conditions.			
Sensitivities	IAEngg has not been provided with details of cost-benefit or sensitivity analysis of the proposed program of work and hence not in a position to assess the sensitivities of the expenditure to outturn differences.			
Assumptions	Actual asset conditions are accurately predicted by the condition assessment/CBRM model.			

[C-I-C] – Commercial in confidence information

7.9.6 Opex category assessment – Top Contributors

SYSTEM OPERATIONS & NETWORK SUPPORT				
Annual OPEX	$20,565,651 (21-23) $29,172,400 (26-30)			
% contribution to overall opex increase	17%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Salary and wage growth	Salary and wage growth is currently high and may increase further as competition for skilled resources heats up.	High	Unable to determine
	Purchase of data	Purchase of data required to provide network visibility	High	Unable to determine
	Increase in use of flexibility service	Not sure how much is allowed for flexibility payment and the capex reduction it will achieve	Medium	Unable to determine
	Increase in network scale	» Increased maintenance as the electricity network grows » Increase in head count » Increase in training	High	Unable to determine

<table>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td rowspan="2">Expenditure forecasting approach</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">IAEngg has no access to other granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td>Trigger point</td><td colspan="4">There is no trigger point for this expenditure</td></tr>
<tr><td>Dependencies & Risks</td><td colspan="4">Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.</td></tr>
<tr><td>Sensitivities</td><td colspan="4">Orion has not carried out sensitivity analysis of opex based on different capex scenario</td></tr>
<tr><td rowspan="2">Assumptions</td><td colspan="4">» The opex forecast is based on significant increase in asset base as a result of increased capex allowance</td></tr>
<tr><td colspan="4">» Cost increase is above CPI</td></tr>
</table>

BUSINESS SUPPORT				
Annual **OPEX**	$17,625,706 (21-23) $39,459,200 (26-30)			
% contribution to overall opex increase	**43%**			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Salary and wage growth	Salary and wage growth is currently high and may increase further as competition for skilled resources heats up.	High	Unable to determine
	Increase in network scale	» Increased maintenance as the electricity network grows » Increase in head count » Increase in training	High	Unable to determine

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point for this expenditure			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Orion has not carried out sensitivity analysis of opex based on different capex scenario			
Assumptions	» The opex forecast is based on significant increase in asset base as a result of increased capex allowance » Cost increase in above CPI			

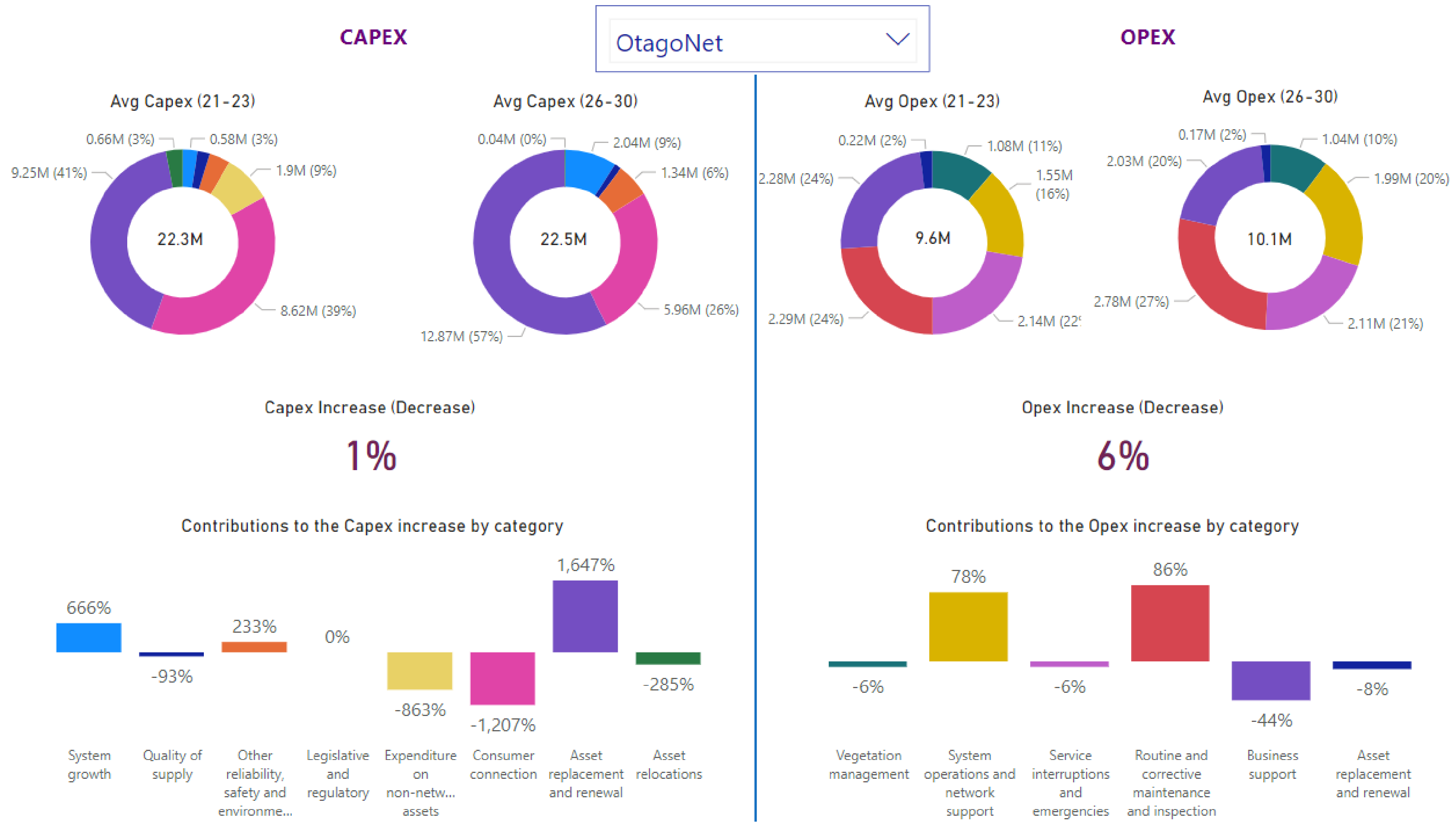
ROUTINE & CORRECTIVE MAINTENANCE & INSPECTION				
Annual **OPEX**	$14,425,720 (21-23) $28,570,600 (26-30)			
% contribution to overall opex increase	**28%**			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Salary and wage growth	Salary and wage growth is currently high and may increase further as competition for skilled resources heats up.	High	Unable to determine
	Increased contracting costs	Increased contracting cost reflecting competition for scarce resources.	High	Unable to determine
	Increase in network scale	Increased maintenance as the electricity network grows.	High	Unable to determine

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of vegetation management) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Orion has not carried out sensitivity analysis of this opex category based on different capex scenario			
Assumptions	» The opex forecast is based on significant increase in asset base as a result of increased capex allowance » Cost increase is above CPI			

OtagoNet

7.10 OtagoNet

7.10.1 Expenditure Dashboard



7.10.2 Business overview (2022 data)

Parameter	Value
Customers	**18,567**
Peak demand	**68 MW**
Electricity volume	**450 GWh**
System length	**4,638 km**
Underground	**231 km**
Overhead	**4,407 km**
Current Reliability performance	
» Total SAIDI	**419.3**
» Total SAIFI	**3.158**

7.10.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☐	No ☒
Future DSO role/open access network	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.10.4 Summary of Capex and Opex Categories assessed

IAEngg did not undertake further assessment of Otagonet's OPEX forecast as it was below the assessment threshold.

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☒
Asset replacement and renewal	☒
Asset relocations	☐
Reliability, Safety & Environment (combined)	☒
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☐
System operations and network support	☐
Business support	☐

7.10.5 CAPEX category assessment – Top Contributors

SYSTEM GROWTH				
Annual **CAPEX**	$576,756 (21-23) $2,040,946 (26-30)			
% contribution to overall capex increase	666%[25]			
Growth drivers	**Driver**	**Comment**	**Certainty**	**Reasonableness**
	Population Growth, Housing density & utilisation	High Population growth rate is forecasted in the Queenstown - Lakes district, Frankton area. Long term population growth is expected to be 15.6% by 2033, high growth rate is forecasted to continue due to high development in the area.	High	Reasonable
	Electric Heating	OtagoNet is forecasting the effect of heat pump conversion to be small, estimated to be about 0.5% growth in demand over the next 10 years.	Medium	Unable to determine
	Electric Vehicles	OtagoNet is forecasting some demand growth towards the end of the ten-year planning period	Low	Unable to determine

[25] Even though the overall capex has decreased, there are still some capex categories that are forecasted to increase and they are offset by decrease in other capex categories. For details refer to EDB dashboard.

Demand forecasting Inputs & modelling	Accuracy	Reasonable	Assessment Rating	Average
	The assessment rating is based on the following considerations: » OtagoNet carries out Demand forecasting based on historical trends and takes into account other demand drivers which may lead to change in future demand » OtagoNet considers growth per substation as the most appropriate level for identifying constraints on the network. Projected substation demands indicates expected growth forecast and OtagoNet uses these projections as basis for Network development planning. » OtagoNet also carries out internal prudent growth forecast with appropriate contingency planning. » The overall impact of the future demand drivers is a 1.2% per annum maximum demand growth rate. » OtagoNet utilises both bottom-up & top-down techniques for Demand forecasting			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
	» Prior to any investment in any infrastructure OtagoNet evaluates non-network solutions like load control, demand-side management solutions, install generation or energy storage, use of high – technology devices & network reconfiguration » Depending on the network constraints OtagoNet identifies possible development options to meet demand and uses cost-based decision tools (NPV calculations & risk analysis) to evaluate options. » IAEngg cannot comment on the appropriateness of the forecast without examining the underlying data or how they compare to other EDBs			

Trigger point	» Customer Behavioural Changes » Ongoing electricity demand growth (residential, commercial, and industrial) » Electrification of transport » Demands for decarbonisation » Greater reliance on renewable energy
Dependencies & Risks	There is a risk that if there is material change in things like economic growth, Government policies affecting population growth etc. it might result in significant budget variances.
Sensitivities	It is not evident in the AMP if OtagoNet has completed a sensitivity study and addressed the sensitivity analysis results in its expenditure forecast.
Assumptions	» General demand growth for existing customers tracks close to projected rates. » Small scale (household) distributed generation is expected to have little coincidence with network peak demand, and therefore will have little impact on network configuration within the ten-year planning horizon

- Electric vehicle adoption rate are within the national forecast range. Consumers respond well to price signals so that vehicle charging occurs mainly off-peak
- Future technologies that may impact work methodologies are not priced into cost estimates
- No significant changes in national energy policy
- No significant changes to the shift towards cost-reflective pricing
- No material deviation from historical failure rates
- No material changes to customer expectations of service levels
- No significant changes to requirements regarding resource consenting, easements, land access (private, commercial, local, and national authorities)
- Resourcing is sufficient for projected works programme
- Little change in safety & work practice regulations
- Inflation for electricity industry input costs track close to expected (CPI forecasts by Treasury, where specific forecasts unavailable)
- Cost impact of equipment size step changes is assumed to remain minor with labour cost being a large proportion of works
- Step changes in underlying growth are considered unlikely based on historical trending over a long period
- Population growth for sizing of equipment is based on the high projection
- Abnormal price movements caused by major external events (war, terrorism, union action, natural disaster) affecting pricing of equipment or labour substantially are difficult to predict and not allowed for in estimates.

ASSET REPLACEMENT AND RENEWAL

Annual CAPEX	$9,251,292 (21-23)	$12,873,281 (26-30)		
% contribution to overall capex increase	**1647%**[26]			
Growth drivers	**Driver**	**Comment**	**Certainty**	**Reasonableness**
	Asset Health Condition	Inspection and testing programmes identifying assets reaching end-of-life or asset condition	High	Reasonable
Forecasting Inputs & modelling	**Accuracy**	**Reasonable**	**Assessment Rating**	**Good**
	The assessment rating is based on the following considerations: » OtagoNet are currently using an internal decision-making approach for replacement or renewal of assets based on the network asset category. » OtagoNet uses Commerce Commission's Optimised Deprival Valuation (ODV) asset life to initiate asset replacement work with the actual replacement done based on condition, remaining economic life and work efficiency.			

[26] Even though the overall capex has decreased, there are still some capex categories that are forecasted to increase and they are offset by decrease in other capex categories. For details refer to EDB dashboard.

	Accuracy	Insufficient Information for Analysis	Assessment Rating	Insufficient Information for Analysis
Expenditure forecasting approach	The assessment rating is based on the following considerations: » Annual inspection & testing programme results leads to development of Annual replacement program of works based on the network asset category. » IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	» Asset Inspections » Operational/public safety » Risk management » Declining service levels » Accessibility for maintenance » Obsolescence			
Dependencies & Risks	» Rapid increase in the rate of failure of a certain asset fleet ex:poles due to external weather events			
Sensitivities	IAEngg has not been provided with details of cost-benefit analysis of the proposed program of work and hence not in a position to assess the sensitivities of the expenditure.			

Assumptions	» Service life of assets tend towards industry accepted expected life for each specific asset type and operating environment » No material deviation from historical failure rates » Resourcing is sufficient for projected works programme » Little change in safety & work practice regulations » Inflation for electricity industry input costs track close to expected (CPI forecasts by Treasury, where specific forecasts unavailable) » Cost impact of equipment size step changes are assumed to remain minor with labour cost being a large proportion of works » Abnormal price movements caused by major external events (war, terrorism, union action, natural disaster) affecting pricing of equipment or labour substantially are difficult to predict and not allowed for in estimates.

RELIABILITY, SAFETY & ENVIRONMENT

Annual CAPEX	$1,300,627 (21-23) $1,610,257 (26-30)			
% contribution to overall capex increase	**140%**[27]			
Growth drivers	**Driver**	**Comment**	**Certainty**	**Reasonableness**
	Safety	Programmes have been initiated to address safety concerns on the network and to be compliant with EEA guide	High	Reasonable
	Communications Infrastructure	Programmes to build a higher capacity backbone network to support enhanced communications across the network, build a resilient IP network & to move to a digital mobile radio platform	High	Reasonable
	Network Automation	Automation programs to increase network reliability by installing additional remote switching devices on the network	High	Reasonable

[27] Even though the overall capex has decreased, there are still some capex categories that are forecasted to increase and they are offset by decrease in other capex categories. For details refer to EDB dashboard.

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
	Programmes have been put in place to mitigate the safety issues & to improve communications infrastructure on the network, IAEngg could not find details of a cost-benefit analysis against this CAPEX category in the AMP			
Expenditure Forecasting Approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
	IAEngg cannot comment on the appropriateness of the forecasted expenditure without examining the underlying data or how they compare to other EDBs			
Trigger point	Network Reliability & Safety			
Dependencies & Risks	The risk is network not in compliance with Electricity (Safety) Regulations			
Sensitivities	IAEngg has not been provided with details of cost-benefit analysis of the proposed program of work and hence not in a position to assess the sensitivities of the expenditure.			
Assumptions	No material deviation from historical failure rates Little change in safety & work practice regulations			

7.10.6 Opex category assessment – High Level Insights from IAEngg

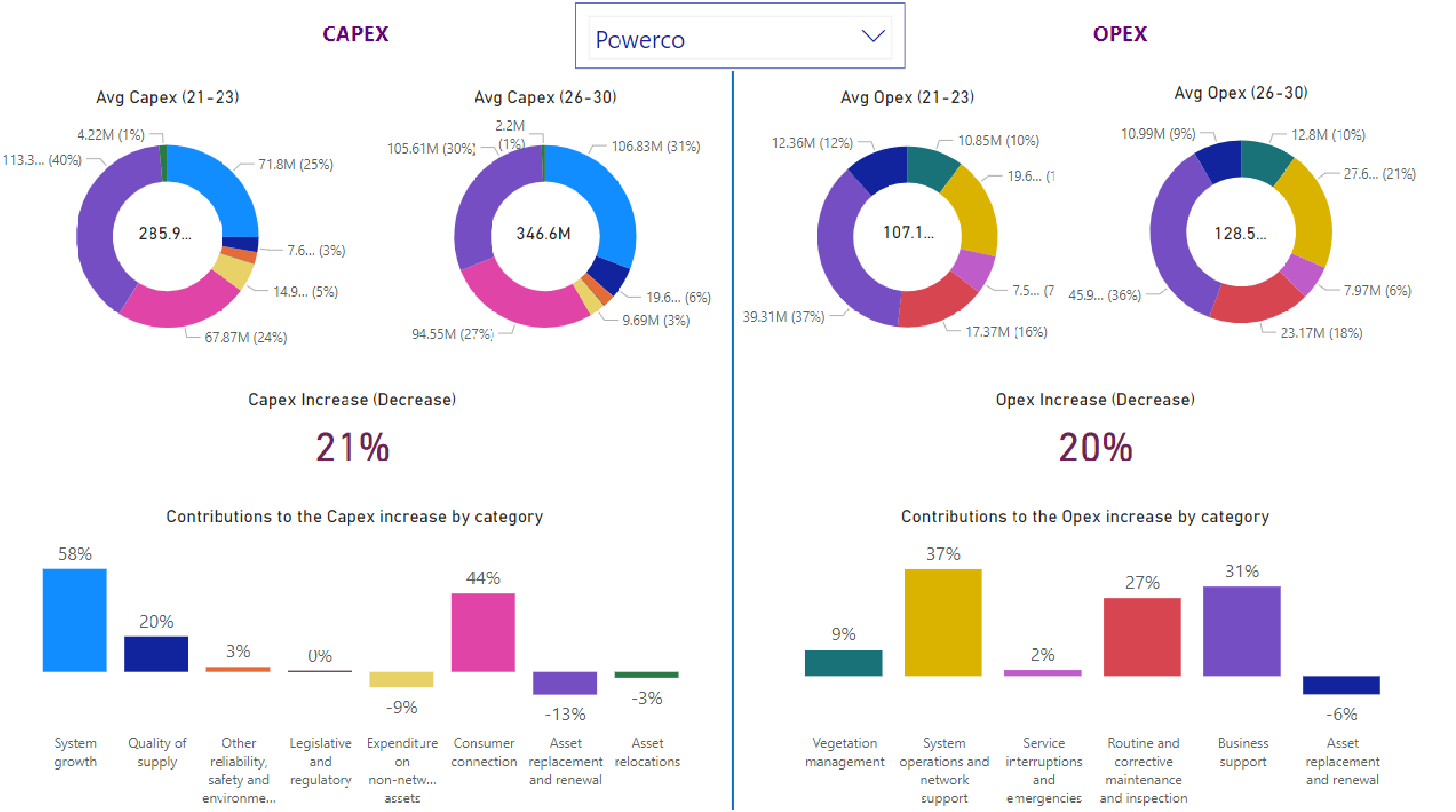
GENERAL COMMENTS ON OPEX	
Annual OPEX	$9,555,534 (21-23) $10,118,794 (26-30)
% overall opex increase / decrease	6%

- OtagoNet opex expenditure forecast doesn't have a significant step change
- An increase in OPEX budget is forecasted from 2025-26 onwards, This is in anticipation of increased maintenance activity, since 2020 – 2025 period is deemed as constrained renewal period by EIL
- OtagoNet network is predominantly overhead, vegetation issues are pronounced which explains the higher costs, AMP states increase in the cost for 2023/24 & 2024/25 is to address a backlog of trimming but reasons for the backlog are not evident in the AMP.
- The main uncertainty in the OPEX spend will be in the expenditure of Service interruptions and emergencies as this category is highly reactive

POWERCO

7.11 Powerco

7.11.1 Expenditure Dashboard



7.11.2 Business overview (2022 data)

Parameter	Value
Customers	352,563
Peak demand	986MW
Electricity volume	4,994GWh
Line length	28,935km
Distribution and LV Underground	6,929km
Distribution and LV Overhead	20,282km
Current Reliability performance	
» Total SAIDI	411
» Total SAIFI	2.6

7.11.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – commercial EV charging	Yes ☐	No ☒	Yes ☐	No ☒
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☐	No ☒	Yes ☐	No ☒
LV visibility	Yes ☒	No ☐	Yes ☒	No ☐
Future DSO role/open access network	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Expenditure provision in AMP (Y/N)		Amount of expenditure provision ($k)	
			Capex	Opex
Increased frequency of natural disasters	Yes ☐	No ☒	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☐	No ☒	Yes ☐	No ☒
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.11.4 Summary of Capex and Opex Categories assessed

Capex Categories	Assessed Further
Consumer connection	☒
System growth	☒
Asset replacement and renewal	☐
Asset relocations	☐
Reliability, Safety & Environment (combined)	☒
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☒
Asset replacement and renewal	☐
System operations and network support	☒
Business support	☒

7.11.5 CAPEX category assessment – Top Contributors

SYSTEM GROWTH				
Annual CAPEX	$71,802,264 (21-23) $106,832,600 (26-30)			
% contribution to overall capex increase	58%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Increase in economic activities (organic growth)	Generally based on strong economic growth experienced in recent years.	Medium	Reasonable
	Expansion plans of large electricity users e.g. OceanaGold Mine	Powerco works closely with major customers to ensure they have an electrical supply that provides the capacity and security they need, at a time that suits their plans.	High	Reasonable
	EV – light transport	It is not clear how the assumptions align with those used by government policies, other EDBs and Transpower	Low	Unable to determine
	Process heat	It is not clear how the assumptions align with those used by government policies, other EDBs and Transpower	Low	Unable to determine

	Small gas conversion	It is not clear how the assumptions align with those used by government policies, other EDBs and Transpower	Low	Unable to determine
	DER/DSR	DER and DSR already exist in Powerco so there are historic data that can be used to predict how the driver grows and the offsetting effect it has on peak demand growth	Medium	Reasonable
	Open access network/DSO	"No-regret" investment has been targeted	Medium	Unable to determine
Demand forecasting Inputs & modelling	**Accuracy**	**Reasonable**	**Assessment rating**	**Good**
	The assessment rating is based on the following considerations: » Scenario assessment has been used to deal with uncertainties of forecasting inputs » The use of S-curve for uptake of new technologies is a sound approach. With the S-curve construct, the uncertainties are to do with the saturation penetration, the inflexion point (where uptake starts to accelerate), and the year at which the saturation occurs. » Process heat conversion has the highest impact on network maximum demand in the 2026-2030 period. While we have no specific data to confirm if Powerco's assumptions about the saturation penetration (60%) and saturation timing (around 2033) are correct, we note that process heat conversion generally requires significant upfront customer capital contribution so this will partly offset any inaccuracies in the capex forecast.			

	For contribution of EV to peak demand, the use of 0.6kW as contribution to household ADMD appears to be sound[28]. The assumption, however, about EV penetration reaching 28% by 2030 is unsubstantiated and appears to be high relative to current EV penetration. For electrification of domestic gas, the 1.6kW ADMD contribution looks reasonable.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Good**
	The assessment rating is based on the following considerations: Powerco assessed the demand growth against asset capacity to arrive at a sub-transmission & zone substation forecast program of work and the expenditure For 11kV and LV developments, Powerco used a number of historic cost information to convert the demand growth into routine ($2.1M per MW) and customer connection ($1.6M per MW) capex Demand growth by EV will impact both sub-transmission, zone substation, 11kV, LV & customer connection. Powerco used $5.2M per MW to convert the demand growth into capex requirements.			

[28] A study by CSIRO in Australia indicates that each EV will contribute 2kW (50% of a normal household consumption) to the maximum demand whereas research by the EV Council of Australia concludes that the contribution is only 0.25kW

	» IAEngg cannot comment on the appropriateness of the various long run average costs used above without examining the underlying data or how they compare to other EDBs » It is positive that Powerco has stated their intention to adopt the smart system evolution pathway to reduce the amount of capex requirements however it is not clear how this has been factored into the AMP expenditure forecast and how much capex reduction is forecasted with the smart system evolution pathway.
Trigger point	Forecasting inputs with low certainty (EV – light, process heat conversion, small gas conversion) are very sensitive to government policies and incentives. It should also be noted that process heat may not all be converted from gas into electricity as there exists other possible substitution fuels such as wood pellets and biofuels.
Dependencies & Risks	The risks are overbuilding infrastructure that may not be required, or underbuilding leading to capacity constraints and impact on supply reliability.
Sensitivities	Based on the more granular information provided by Powerco, the demand growth at 2033 (from 2023) comprises approximately 150MW native growth, 90MW of process heat conversion, 55MW of EV – light transport (with EV control) and 15MW of domestic gas conversion. It can be seen that the demand growth is very sensitive to the assumptions made with regard to process heat conversion and EV uptake.

	If these assumptions are on the low side, Powerco could be faced with not having enough network capacity to supply the additional load leading to delay in new customer connections and supply reliability. Conversely if the assumptions are on the high side, Powerco could have built additional infrastructure that at best, may not be required until a few years later or at worst, not required at all because the new assets are in the wrong locations. It is not clear if Powerco has conducted sensitivity analysis on the assumptions used in the base scenario and address the sensitivity analysis results in its expenditure forecast.
Assumptions	Powerco has used the “base” scenario for forecasting demand and expenditure in 2026-30. It is not clear how the base scenario aligns with government policies and the “accelerated electrification” scenario used by Transpower.

<table>
<tr><th colspan="5">CONSUMER CONNECTIONS</th></tr>
<tr><td>Annual
CAPEX</td><td colspan="4">$67,873,188 (21-23) $94,551,200 (26-30)</td></tr>
<tr><td>% contribution to overall capex increase</td><td colspan="4">23%</td></tr>
<tr><td rowspan="3">Growth drivers</td><td>Driver</td><td>IAEngg Comments</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td>Increase in economic activities</td><td>Generally based on strong economic growth experienced in recent years.</td><td>High</td><td>Reasonable</td></tr>
<tr><td>Electrification</td><td>Follow the same demand growth trend as in System Growth Capex</td><td>Low</td><td>Unable to determine</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment rating</td><td>Good</td></tr>
<tr><td colspan="4">The assessment rating is based on the following considerations:

Consumer connection capex is assumed to follow the same trend line as demand growth (base scenario). Start point of the forecast has been baselined to the consumer connection capex in FY22.</td></tr>
<tr><td rowspan="2">Expenditure forecasting approach</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment rating</td><td>Good</td></tr>
<tr><td colspan="4">The assessment rating is based on the following considerations:

» For 11kV and LV developments, Powerco used a number of historic cost information to convert the demand growth into routine ($2.1M per MW) and customer connection ($1.6M per MW) capex</td></tr>
</table>

	» Demand growth by EV will impact both sub-transmission, zone substation, 11kV, LV & customer connection. Powerco used $5.2M per MW to convert the demand growth into capex requirements, and then split the capex into the three categories including consumer connection capex. » IAEngg cannot comment on the appropriateness of the various long run average costs used above without examining the underlying data or how they compare to other EDBs
Trigger point	As consumer connection forecast uses the same trend line as demand growth outlined above in System Growth capex, its forecasting input from electrification has similar issue of low certainty (EV – light, process heat conversion, small gas conversion) as these are very sensitive to government policies and incentives. It should also be noted that process heat conversion from gas into electricity is affected by the presence of other substitution fuels such as wood pellets and biofuels.
Dependencies & Risks	Consumer connection capex is only spent when there are requests from customers. The risk of over or underbuilding infrastructure is low. The risks for Powerco are to do with budget provision and potentially with resource allocation (e.g. not enough resource to connect customers if there is a surge of connection applications not anticipated). Budget risk is partially offset with capital contribution from customers.
Sensitivities	Based on the more granular information provided by Powerco, the demand growth at 2033 (from 2023) comprises approximately 150MW native growth, 90MW of process heat conversion, 55MW of EV – light transport (with EV control) and 15MW of domestic gas conversion. It can be seen that the demand growth is very sensitive to the assumptions made with regard to process heat conversion and EV uptake. However, as consumer connection capex is only spent when customer requests to connect, the risk of over or underbuilding infrastructure is low.
Assumptions	Powerco has used the “base” scenario for forecasting demand and expenditure in 2026-30. It is not clear how the base scenario aligns with government policies and the “accelerated electrification” scenario used by Transpower.

<table>
<tr><th colspan="5">RELIABILITY, SAFETY & ENVIRONMENT</th></tr>
<tr><td>Annual
CAPEX</td><td colspan="4">$13,697,748 (21-23) $27,694,800 (26-30)</td></tr>
<tr><td>% contribution to overall capex increase</td><td colspan="4">44%</td></tr>
<tr><td rowspan="2">Growth drivers</td><td>Driver</td><td>IAEngg Comments</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td>Network automation</td><td>Baseline and enhanced automation programs to increase network visibility & remote switching, laying foundation to transition to an open-access network and supports the future distribution system operator (DSO) role.</td><td>Medium</td><td>Unable to determine</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment rating</td><td>Medium</td></tr>
<tr><td colspan="4">The assessment rating is based on the following considerations:
It is not clear if cost-benefit analysis has been carried out for the automation programs and whether the flexibility and visibility should be enhanced now without clear view of what are the future rules for open-access network and DSO role</td></tr>
</table>

Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg does not find the information in the AMP that allows it to assess how the expenditure of the automation programs is determined			
Trigger point	Government releases regulatory policies on open-access network & DSO roles			
Dependencies & Risks	The risk exists whereby the capability established by the automation programs is not required to support open-access network and future DSO role.			
Sensitivities	IAEngg has not been provided with details of cost-benefit or sensitivity analysis of the proposed program of work and hence not in a position to assess the sensitivities of the expenditure to outturn differences.			
Assumptions	Not stated in the AMPs			

7.11.6 Opex category assessment – Top Contributors

SYSTEM OPERATIONS & NETWORK SUPPORT				
Annual OPEX	$19,676,321 (21-23) $ 27,634,000 (26-30)			
% contribution to overall opex increase	37%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Salary and wage growth	Salary and wage growth is currently high and may increase further as competition for skilled resources heats up.	High	Unable to determine
	Increased contracting costs	Increased contracting costs reflecting competition for scarce resources.	High	Unable to determine
	Migration to cloud service	The uptake of new digital solutions, including cloud services, with associated higher data network, software maintenance or subscription costs.	High	Unable to determine

	Increase in use of flexibility service	Flexibility payment amounts to around $5,800 pa in 26-30. An anticipated substantial increase in the use of flexibility services (Opex) as an alternative to (more costly) Capex alternatives. Powerco has provided their estimate of flexibility opex based on $150 per kW per year and the capex deferral benefit of $5,000 per kW which shows a good business case. Majority of the flexibility service is directed towards reducing EV demand on the network.	Medium	Reasonable
	Increase in network scale	Increased maintenance as the electricity network grows.	High	Unable to determine
	Increase in communication costs	Powerco quoted increased communications costs as more intelligent devices are rolled out	High	Unable to determine
	Increase in research and development, or pilot programmes, which are heavier on operating expenditure		Medium	Unable to determine

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	Apart from flexibility service where Powerco has provided granular cost data through the 1-1 EDB meeting, IAEngg has no access to other granular data which allows IAEngg to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	Apart from flexibility service where Powerco has provided granular cost data through the 1-1 EDB meeting, IAEngg has no access to other granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point for this expenditure			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Powerco has carried out limited sensitivity analysis on network demand impact if flexibility service is not as effective in reducing EV demand under its capex scenario analysis			
Assumptions	Majority of the flexibility service is directed towards reducing EV demand on the network.			
	Cost increase is above CPI			

BUSINESS SUPPORT				
Annual **OPEX**	$39,311,311 (21-23) $ 45,972,000 (26-30)			
% contribution to overall opex increase	**31%**			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Salary and wage growth	Salary and wage growth is currently high and may increase further as competition for skilled resources heats up.	High	Unable to determine
	Increased contracting costs	Increased contracting costs reflecting competition for scarce resources.	High	Unable to determine
	Migration to cloud service	The uptake of new digital solutions, including cloud services, with associated higher data network, software maintenance or subscription costs.	High	Unable to determine

<table>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td rowspan="2">Expenditure forecasting approach</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td>Trigger point</td><td colspan="4">There is no trigger point for this expenditure</td></tr>
<tr><td>Dependencies & Risks</td><td colspan="4">Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.</td></tr>
<tr><td>Sensitivities</td><td colspan="4">Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.</td></tr>
<tr><td>Assumptions</td><td colspan="4">Cost increase is above CPI</td></tr>
</table>

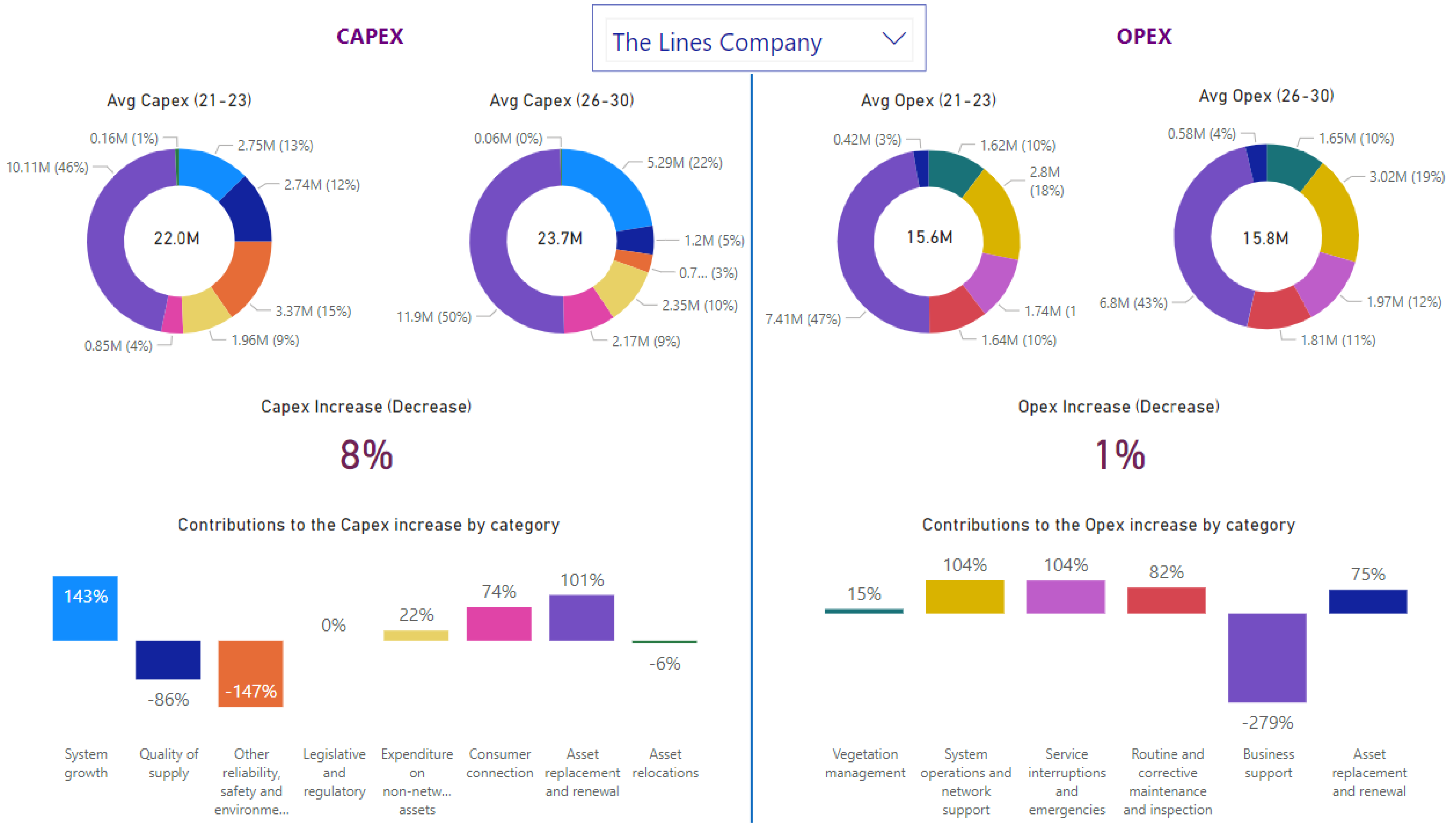
ROUTINE & CORRECTIVE MAINTENANCE & INSPECTION				
Annual OPEX	$17,366,151 (21-23) $23,174,800 (26-30)			
% contribution to overall opex increase	27%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Salary and wage growth	Salary and wage growth is currently high and may increase further as competition for skilled resources heats up.	High	Unable to determine
	Increased contracting costs	Increased contracting cost reflecting competition for scarce resources.	High	Unable to determine
	Increase in network scale	Increased maintenance as the electricity network grows.	High	Unable to determine

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of vegetation management) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.			
Assumptions	Cost increase is above CPI			

the lines company

7.12 The Lines Company

7.12.1 Expenditure Dashboard



7.12.2 Business overview (2022 data)

Parameter	Value
Customers	23,999
Peak demand	78 MW
Electricity volume	368 GWh
System length	4,440 km
Underground	392 km
Overhead	4,048 km
Current Reliability performance	
» Total SAIDI	335.4
» Total SAIFI	3.351

7.12.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential gas to electricity conversion	Yes ☐	No ☒	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☐	No ☒	Yes ☐	No ☒
Future DSO role/open access network	Yes ☒	No ☐	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.12.4 Summary of Capex and Opex Categories assessed

Capex Categories		Assessed Further
	Consumer connection	☒
	System growth	☒
	Asset replacement and renewal	☒
	Asset relocations	☐
	Reliability, Safety & Environment (combined)	☐
	Non-network	☐

Opex Categories		Assessed Further
	Service interruptions and emergencies	☐
	Vegetation management	☐
	Routine and corrective maintenance and inspection	☐
	Asset replacement and renewal	☐
	System operations and network support	☐
	Business support	☐

7.12.5 CAPEX category assessment – Top Contributors

CONSUMER CONNECTIONS				
Annual CAPEX	$851,175 (21-23) $2,165,000 (26-30)			
% contribution to overall capex increase	74%			
Growth drivers	**Driver**	**Comment**	**Certainty**	**Reasonableness**
	Greater Industrialisation	Construction of new processing plants	High	Reasonable
	Decarbonisation	Government's climate change initiatives has triggered transition of fossil fuels to electricity in industrial processes	Medium	Unable to determine
Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Average**
	The assessment rating is based on the following considerations: » Regular engagement of The Lines Company (TLC) with the relatively small number of major industrial/commercial customers on their planning up to the project detail level to obtain best estimates of load requirements » TLC forecast $15m to support industrial growth and large generation that are at various stages of finalization » IAEngg acknowledges network is sparsely populated with long circuit lengths in rugged terrains. » IAEngg was unable to identify any other forecast inputs related to the mass market load growth, AMP states growth is based on assumptions.			

	Accuracy	Insufficient Information for Analysis	Assessment Rating	Average
Expenditure forecasting approach	The assessment rating is based on the following considerations: » For Large customers through the major project process a bottom-up estimate approach is adapted by TLC » From the AMP it is not clear on what basis or method TLC uses to convert mass market load growth demand into customer connection capex » IAEngg cannot comment on the appropriateness of the forecast without examining the underlying data or how they compare to other EDBs			
Trigger point	1. Economic factors 2. Population Growth 3. Decarbonisation (New central governments policy on Net Zero Emissions by 2050)			
Dependencies & Risks	Consumer connection capex is driven by customer requests. The risk of over or underbuilding infrastructure is low. Budget risk is partially offset with capital contribution from customers.			

Sensitivities	Demand increase is very sensitive to population growth and economic factors. However, as consumer connection capex is only spent when customer requests to connect, the risk of over or underbuilding infrastructure is low.
Assumptions	» TLC are able to attract and retain staff and have access to contractors via the wider market to fulfil our capital programme. » Conditions that affect TLC business (weather, business costs and operating environment) do not vary materially. » Access to capital and inflation remains stable. » The regulatory environment does not change significantly over the planning period. » The availability of resource and equipment is not materially changed from current market conditions, i.e., is not materially impacted by pandemic or other natural or un-natural material events. » The ongoing impact of COVID-19 does not materially affect our revenue or prevent us from delivering planned works through lack of availability of material or resource. » Material uncertainties may arise from formalisation of a design and developing customer needs.

<table>
<tr><th colspan="5">SYSTEM GROWTH</th></tr>
<tr><td>Annual
CAPEX</td><td colspan="4">$2,753,028 (21-23) $5,290,000 (26-30)</td></tr>
<tr><td>% contribution to overall capex increase</td><td colspan="4">143%</td></tr>
<tr><td rowspan="3">Growth drivers</td><td>Driver</td><td>Comment</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td>Process heat conversion</td><td>TLC expects a short-term step-change in its total system demand over the next five-year period it is supported by Deta’s customer survey and its own intelligence collected through customer engagement.</td><td>Low</td><td>Reasonable</td></tr>
<tr><td>Transport electrification EVs (light)</td><td>TLC has aligned its EV uptake with the Ministry of Transport (MOT) model for New Zealand EV growth but reduced by 20% based on assumption EV uptake will be slower than other areas of New Zealand</td><td>Low</td><td>Reasonable</td></tr>
<tr><td rowspan="2">Demand forecasting Inputs & modelling</td><td>Accuracy</td><td>Reasonable</td><td>Assessment Rating</td><td>Good</td></tr>
<tr><td colspan="4">The assessment rating is based on the following considerations:
» TLC have completed a scenario analysis including all the growth drivers including decarbonisation drivers</td></tr>
</table>

	» TLC have considered the mid growth assumption scenario for the planning period which will result in a compounded annual growth rate of 4.3% p.a as against to TLC's historic CAGR of ~0.5% p.a. There are significant uncertainties associated with this forecasted CAGR. » TLC has aligned its EV uptake to MOT based scenario but reduced by 20% to recognise that the TLC network customers are likely to be slower than other areas of New Zealand to transition to EV's based on their customer demographics. This is a reasonable assumption although we felt that TLC should carry out a sensitivity study of '20% reduction' factor on peak demand. » TLC has calculated total marginal cost to provide capacity (including increased capacity of regional supply points, zone substations and lines) to their network as ~$2.95m per MW increase » The growth forecasts has been developed with a top-down approach and bottom up approach
Expenditure forecasting approach	**Accuracy** — **Insufficient Information for Analysis** — **Assessment Rating** — **Good** The assessment rating is based on the following considerations: » Prior to any investment in any infrastructure TLC evaluates non-network solutions available like load control, demand-side management solutions, use of emerging technologies & network reconfiguration » To meet demand & security requirements based on the identified constraints a network project list is developed and alternative options are assessed prior to finalising a proposed solution and the recommended solution is estimated & included in the expenditure forecasts.

	» IAEngg cannot comment on the appropriateness of the costs used without examining the underlying data or how they compare to other EDBs
Trigger point	Forecasting inputs with low certainty (EV – light & process heat conversion) are very sensitive to government policies and incentives. It should also be noted that process heat may not all be converted from gas into electricity as there exists other possible substitution fuels such as wood pellets and biofuels.
Dependencies & Risks	The risks are building additional capacity early results in an overinvestment, whereas building additional capacity too late may have much greater consequences such as equipment damage or inability to supply the load customer requested.
Sensitivities	The demand growth is very sensitive to the assumptions made with regard to decarbonisation. If these assumptions are on the low side, TLC face issue of not having enough network capacity to supply the additional load leading to delay in new customer connections and supply reliability. Conversely if the assumptions are on the high side, TLC could have built additional infrastructure that at best, may not be required until a few years later or at worst, not required at all because the new assets are not in the right locations.

Assumptions	» TLC are able to attract and retain staff and have access to contractors via the wider market to fulfil our capital programme. » Conditions that affect TLC business (weather, business costs and operating environment) do not vary materially. » Access to capital and inflation remains stable. » The regulatory environment does not change significantly over the planning period. » The availability of resource and equipment is not materially changed from current market conditions, i.e., is not materially impacted by pandemic or other natural or un-natural material events. » The ongoing impact of COVID-19 does not materially affect our revenue or prevent us from delivering planned works through lack of availability of material or resource. » Material uncertainties may arise from formalisation of a design and developing customer needs. » The cost to support decarbonisation should be the long run marginal cost of capacity

ASSET REPLACEMENT AND RENEWAL

Annual CAPEX	$10,113,709 (21-23)	$11,901,400 (26-30)		
% contribution to overall capex increase	**101%**			
Growth drivers	**Driver**	**Comment**	**Certainty**	**Reasonableness**
	Asset Health	Focus is on maintaining appropriate levels of asset health based on condition, age & several other factors.	High	Reasonable
	Safety of staff, contractors & public	Replacement of assets that present a higher safety risk.	High	Reasonable
	Reliability	Targeted renewal of Assets that are degraded or have the potential to degrade affecting reliability of service due to faults.	High	Reasonable
	Obsolescence	Replace/Renewal of existing assets that are incompatible with modern systems & standards, lacks necessary functionality or no longer supported by manufacturer.	High	Reasonable

<table>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td>Reasonable</td><td>Assessment Rating</td><td>Good</td></tr>
<tr><td colspan="4">The assessment rating is based on the following considerations:

TLC adapted a condition based scoring method which indicates the condition of the assets at their last inspection. This is one key input TLC has used for planning & prioritising asset renewal programme. TLC also considers other inputs like criticality of the assets to determine the consequence of that asset failing and together they come up with an overall asset risk. TLC are replacing overhead lines and cables simply based on age rather than condition. This is an exception to other assets. TLC asset lifecycle modelling is a work in progress and TLC has an ongoing project to improve asset data accuracy. This seems to be a reasonable approach to identifying the assets that require replacement.</td></tr>
<tr><td rowspan="2">Expenditure forecasting approach</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment Rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">» IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td>Trigger point</td><td colspan="4">Asset Health Condition, immediate safety concern & deteriorating reliability performance</td></tr>
<tr><td>Dependencies & Risks</td><td colspan="4">The risk is there are significant material uncertainties in TLC’s asset renewal forecast due to its asset data quality.</td></tr>
</table>

Sensitivities	IAEngg has not been provided with details of cost-benefit analysis of the proposed program of work and hence not in a position to assess the sensitivities of the expenditure.
Assumptions	» Aerial Inspections programme will assist TLC understand the condition of their network assets better (Improved data quality) and it may result in a significant departure from the line renewal expenditure plan » Availability of resource, equipment and capital is consistent with current market experience, i.e., not materially impacted by a pandemic or other natural or un-natural disasters. These include: o Availability of internal and contracted resources required for project delivery o Costs and availability of equipment supply o Finance being accessible and at rates that are not inconsistent with the current market at the time of preparing the AMP.

7.12.6 Opex category assessment – High Level Insights

GENERAL COMMENTS ON OPEX	
Annual **OPEX**	$15,629,410 (21-23) $15,847,133 (26-30)
% overall capex increase / decrease	**1%**

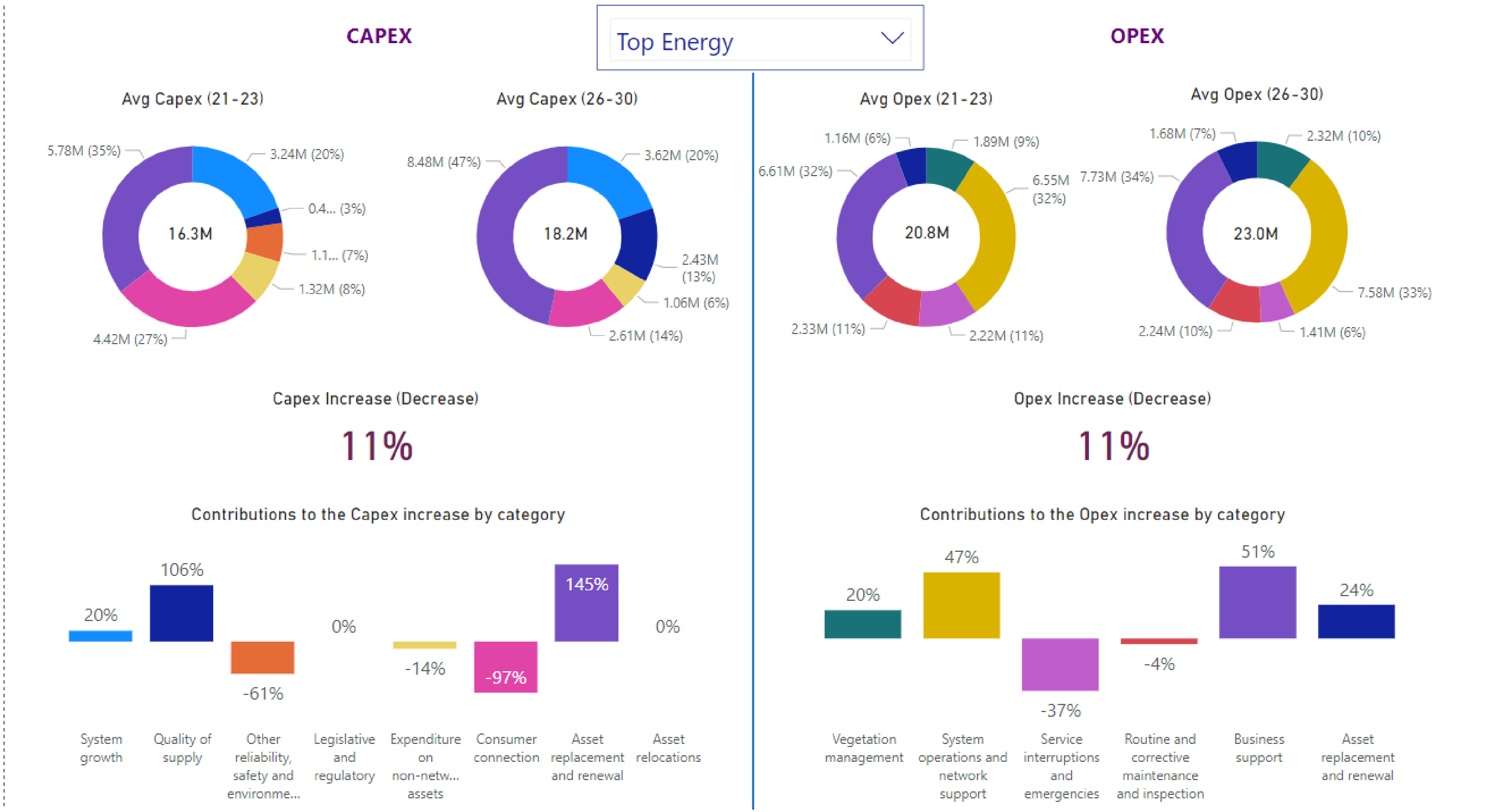
- The challenges faced by TLC from decarbonisation and climate change are heavily influenced by its demographics - geographic terrain characteristics and relatively small customer base spread over a large geographical area.
- TLC recognised that as electricity become primary energy source, less tolerance for network outages. Given its network age and heavily vegetated rural nature, it is reasonable for TLC to focus its resilience response on vegetation management and asset renewal. Given the relatively old age of its assets, it's reasonable for asset renewal forecast to be age based in the short term. For mid to long term, asset renewal should be condition based for prudency and efficiency reasons, and TLC have already started the journey towards condition based asset replacement.

TOP ENERGY®

Te Puna Hihiko

7.13 Top Energy

7.13.1 Expenditure Dashboard



7.13.2 Business overview (2022 data)

	Parameter	Value
	Customers	**33,263**
	Peak demand	**77 MW**
	Electricity volume	**330 GWh**
	System length	**4,102 km**
	Underground	**931 km**
	Overhead	**3,171 km**
	Current Reliability performance	
	» Total SAIDI	**456.3**
	» Total SAIFI	**4.924**

7.13.3 Capex and Opex Growth Drivers

Drivers for capex growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☐	No ☒
DER connection growth	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential gas to electricity conversion	Yes ☐	No ☒	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☒	No ☐
Future DSO role/open access network	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.13.4 Summary of Capex and Opex Categories assessed

IAEngg did not undertake further assessment of Top Energy's CAPEX forecast as it was below the assessment threshold.

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☐
Asset replacement and renewal	☐
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☒
System operations and network support	☒
Business support	☒

7.13.5 CAPEX category assessment – High Level Insights from IAEngg

GENERAL COMMENTS ON CAPEX		
Annual CAPEX	$16,335,662 (21-23)	$18,202,551 (26-30)
% overall capex increase / decrease	11%	

- AMP states Top Energy has sufficient capacity to accommodate the expected consumer demand over the AMP planning period under all growth scenarios excluding a developing constraint in the supply to the Kerikeri area
- Top Energy has estimated that peak demand will grow at 1.8% p.a. over the next 10 years, this compares with ICP growth of 1.5% and allows for some domestic gas conversion.
- Top Energy has not been any significant growth in electricity sales since 2013 it's because any growth in demand had been taken up by the installation of small-scale rooftop solar generation behind the meter. EDB currently have 10.6MW of such generation installed, which generates around 18.5GWh per annum, or more than 5% of the total electricity delivered to consumers. The rate of installation of behind the meter solar generation continues apace. Top Energy don't see any drivers for a significant increase in sales in the short term. Top Energy does not see a need for significant growth expenditure in the short term.

- Our view is Top Energy's focuses are on asset renewal & network reliability during this planning period and they are the major driver of CAPEX & OPEX. Top Energy's is implementing a 11kV network development plan to arrest the current deterioration in the reliability of the 11kV network and to stabilise network reliability at its average historic level.

- Top Energy is accelerating replacement of assets that require renewal as they near the end of their economic life.

- Top Energy uses the industry standard practice of monitoring asset condition using asset health indicators and apply management strategies appropriate to an asset's position in its lifecycle. Assets approaching the end of life are assessed based on its criticality in respect of the safety risk and the outage impact of an in-service failure. Asset replacement and renewal programmes are prioritised by risk, which is a function of both the probability and consequence of an in-service asset failure. This approach to asset renewal seems to be reasonable & it aligns with common industry practices.

- Forecast under Consumer connections is associated with the connection works of three new solar farms, much of this work to be funded by customer capital contributions.

7.13.7 Opex category assessment – Top Contributors

<table>
<tr><th colspan="9">SYSTEM OPERATIONS & NETWORK SUPPORT</th></tr>
<tr><td>Annual OPEX</td><td colspan="8">$6,554,257 (21-23) $7,583,933 (26-30)</td></tr>
<tr><td>% contribution to overall opex increase</td><td colspan="8">47%</td></tr>
<tr><td rowspan="2">Growth drivers</td><td colspan="2">Driver</td><td colspan="3">Comment</td><td colspan="2">Certainty</td><td>Reasonableness</td></tr>
<tr><td colspan="2">Real time operations of the network</td><td colspan="3">Costs associated with operating the network in real time, including the cost of managing and staffing the network control centre</td><td colspan="2">High</td><td>Unable to determine</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td colspan="2">Insufficient Information for Analysis</td><td colspan="2">Assessment Rating</td><td colspan="3">Insufficient Information for Analysis</td></tr>
<tr><td colspan="8">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
</table>

	Accuracy	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
Expenditure forecasting approach	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point for this expenditure			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Expenditure may not be prudent or efficient if over-forecast.			
Assumptions	An annual inflation rate of 5% for operational expenditure is assumed for FY2025. An annual inflation rate of 2% for operational expenditure is assumed for FY2026 onwards.			

<table>
<tr><th colspan="7">BUSINESS SUPPORT</th></tr>
<tr><td>Annual OPEX</td><td colspan="6">$6,606,188 (21-23) $7,725,598 (26-30)</td></tr>
<tr><td>% contribution to overall opex increase</td><td colspan="6">51%</td></tr>
<tr><td rowspan="3">Growth drivers</td><td colspan="2">Driver</td><td colspan="2">Comment</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td colspan="2">Corporate Services</td><td colspan="2">Cost of business support functions which includes governance, commercial, human resource, regulatory, finance and other support services</td><td>High</td><td>Unable to determine</td></tr>
<tr><td colspan="2">Planning and implementing asset management strategies</td><td colspan="2">Cost of Staffing Asset Management Team</td><td>High</td><td>Unable to determine</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td colspan="2">Insufficient Information for Analysis</td><td>Assessment Rating</td><td colspan="2">Insufficient Information for Analysis</td></tr>
<tr><td colspan="6">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
</table>

Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point for this expenditure			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Expenditure may not be prudent or efficient if over-forecast.			
Assumptions	An annual inflation rate of 5% for operational expenditure is assumed for FY2025. An annual inflation rate of 2% for operational expenditure is assumed for FY2026 onwards.			

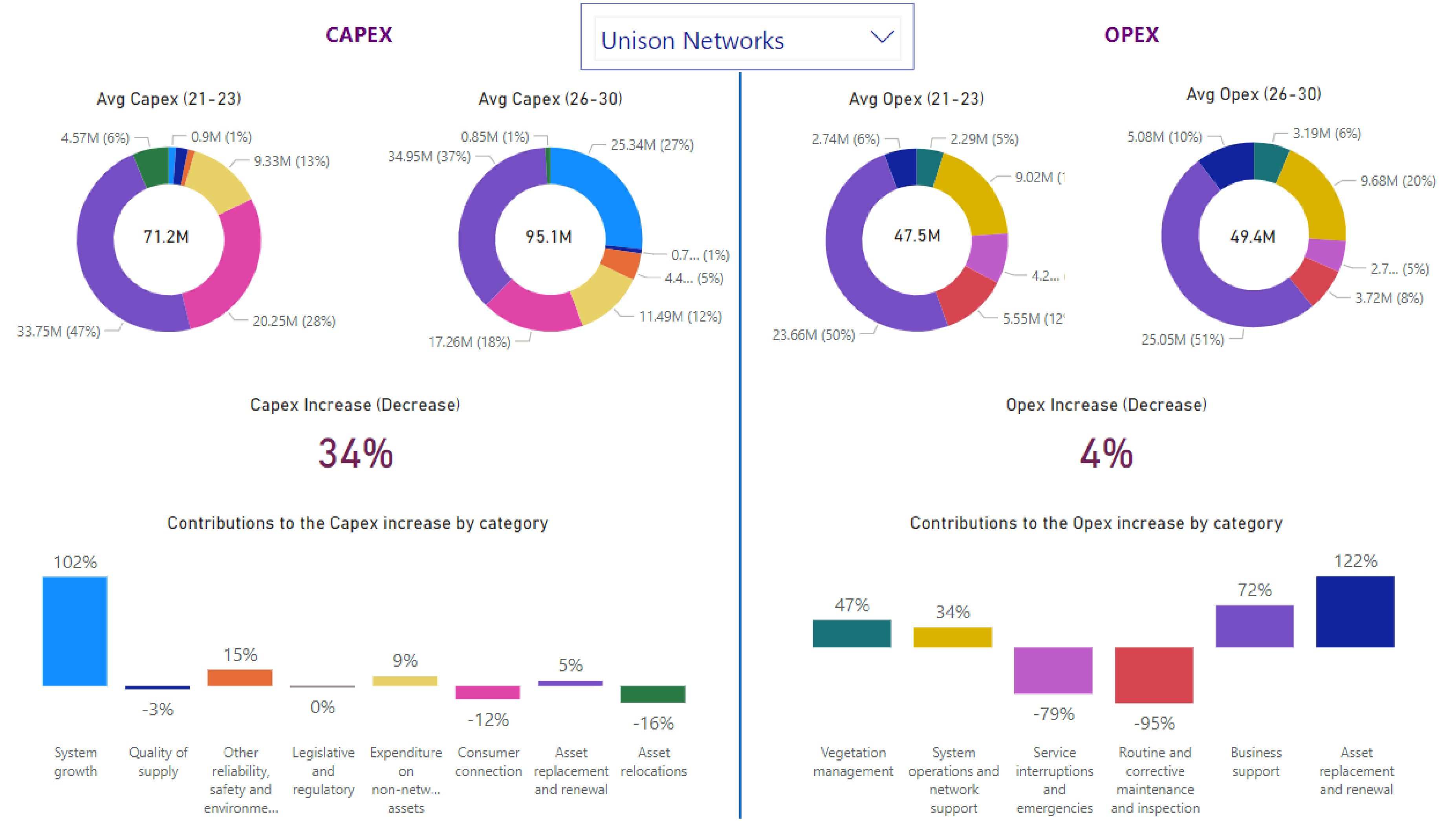
<table>
<tr><th colspan="7">ASSET REPLACEMENT & RENEWAL</th></tr>
<tr><td>Annual OPEX</td><td colspan="6">$1,155,875 (21-23) $1,679,800 (26-30)</td></tr>
<tr><td>% contribution to overall opex increase</td><td colspan="6">24%</td></tr>
<tr><td rowspan="2">Growth drivers</td><td colspan="2">Driver</td><td colspan="2">Comment</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td colspan="2">Defects identified by Asset Inspections</td><td colspan="2">Asset inspections identifying a problem related to part of an asset, such as insulator on a crossarm are replaced under this OPEX category</td><td>High</td><td>Unable to determine</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td colspan="2">Insufficient Information for Analysis</td><td>Assessment Rating</td><td colspan="2">Insufficient Information for Analysis</td></tr>
<tr><td colspan="6">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
</table>

Expenditure forecasting approach	Accuracy	Insufficient Information for Analysis	Assessment Rating	Insufficient Information for Analysis
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	Asset Inspection programmes			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of vegetation management) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.			
Assumptions	The forecasts are largely based on defect rates gathered during routine asset inspections, together with adjustments as necessary to accommodate estimated changes in failure rates with changes in the age profile of assets in a specific category			

unison

7.14 Unison Networks

7.14.1 Expenditure Dashboard



7.14.2 Business overview (2022 data)

	Parameter	Value
	Customers	**116,893**
	Peak demand	**354MW**
	Electricity volume	**1,647GWh**
	Line length	**9,377km**
	Distribution and LV Underground	**3,755km**
	Distribution and LV Overhead	**5,132km**
	Current Reliability performance	
	» Total SAIDI	**196**
	» Total SAIFI	**2.03**

7.14.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☒	No ☐
Future DSO role/open access network	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☐	No ☒	Yes ☐	No ☒
Capex/Opex tradeoff	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.14.4 Summary of Capex and Opex Categories assessed

IAEngg did not undertake further assessment of Unison Networks OPEX forecast as it was below the assessment threshold.

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☒
Asset replacement and renewal	☐
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☐
System operations and network support	☐
Business support	☐

7.14.5 CAPEX category assessment – Top Contributors

SYSTEM GROWTH				
Annual CAPEX	$899,059 (21-23) $25,340,400 (26-30)			
% contribution to overall capex increase	102%			
Growth drivers	Driver	IAEngg Comments	Certainty	Reasonableness
	Underspent in base year	Unison has been affected by ongoing COVID impacts and supply chain issues and was severely impacted by Cyclone Gabrielle in early 2023. The base year (2021-23) expenditure was very low but ramping up to an annual average of $14,576,000 in 2024-25. Taken this into consideration, the forecast growth capex increase is about $10M pa when compared with the proposed spend in FY24 & 25.	High	Reasonable
	Organic growth	Forecast increase in connection and organic demand growth align with the growth projections of commercial & industrial customers and the local councils.	High	Reasonable
	Process heat electrification	Based on regular contact of Relationship Manager with large industry customers.	High	Reasonable

	De-carbonisation	Unison states that it has made modest allowance to support early adopters of EV and DER. However, it is not clear what allowance has been made.	High	Unable to determine
Demand forecasting Inputs & modelling	**Accuracy**	**Reasonable**	**Assessment rating**	**Good**
	The assessment rating is based on the following considerations: » Unison has the benefits of foresight by investing early into network visibility and control capability (smart networks, LV visibility & flexibility). This gives the capability to perform both top-down and bottom-up demand forecasts, and to verify diversity factors and ADMD used in demand forecasting. » Rely on the re-opener mechanism if demand growth is significantly higher than expected. » Scenario-based demand forecasting planned to be introduced but not yet used for the 2023 demand forecast.			
Expenditure forecasting approach	**Accuracy**	**Reasonable**	**Assessment rating**	**Good**
	The assessment rating is based on the following considerations: » Demand forecast is used to identify substations and HV lines that required reinforcement based on ratings and security of supply standards. This produces a program of works for expenditure forecasting, consisting of both material projects (>$250k) and non-material projects (<$250k). » Flexibility is being considered by building a flexibility opportunity calculator as part of ENA Future Network Forum. » The smart network capability mentioned above is used to actively track uptake of EV and DER and allows Unison to invest at appropriate time, rather than ahead of time.			

	» Only modest allowance in demand and expenditure for early adopters of de-carbonisation. » In terms of delivery of the annual works programme, The AMP refers to recent external factors which have exacerbated an already constrained labour market putting pressure on Unison's in-house contractor's ability to deliver the annual works programme. These factors include: o significant industrial growth expected in Unison's two-to-five-year planning horizon o an increase in customer driven work o electrification of process heat o ongoing COVID impacts and supply chain issues, and o an Australian market becoming more readily accessible to New Zealand workers. Unison has outlined the approach taken to strengthen the capability of its sole in-house contractor, Unison Contracting Services Limited (UCSL), including acquisition of a high voltage engineering service company, to catch up on existing as well as meet the requirements of the future expanded work programs.
Trigger point	There is no trigger point as Unison is placing high reliance on being able to detect abnormal load growth and to respond accordingly.
Dependencies & Risks	The risks are overbuilding infrastructure that may not be required, or underbuilding leading to capacity constraints and impact on supply reliability. With the network visibility tools that Unison has deployed, the risks are lower compared with EDBs who do not have the capability.
Sensitivities	If de-carbonisation activities pick up pace, Unison could be faced with not having enough network capacity to supply the additional load leading to delay in new customer connections and supply reliability. Conversely if de-carbonisation is delayed, Unison could have built infrastructure that is not required.
Assumptions	Workforce availability to deliver the works program

7.14.6 Opex category assessment – Top Contributors

GENERAL COMMENTS ON OPEX		
Annual **OPEX**	$47,499,401 (21-23)	$49,426,000 (26-30)
% contribution to overall opex increase	**4%**	

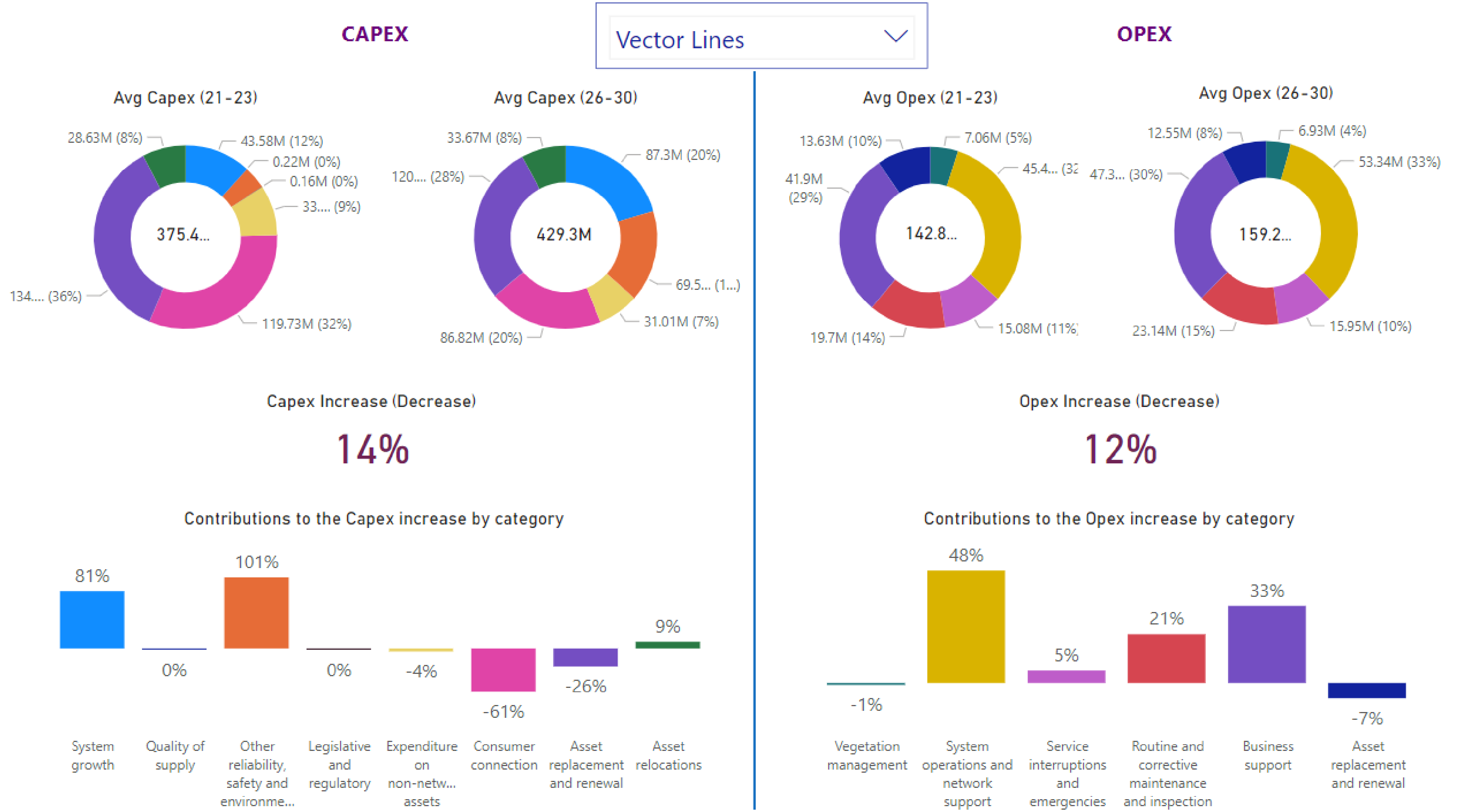
Vegetation management cost has increased since FY22 to address additional risks identified by the use of LiDAR, and the increase in traffic management costs.

System interruptions and emergencies opex cost is higher in base year due to recent weather events. It is forecast to return back to normal levels from FY24 onwards.

Opex cost is subjected to material cost increase post COVID and competition for scarce resource with Australia.

7.15 Vector

7.15.1 Expenditure Dashboard



7.15.2 Business overview (2022 data)

	Parameter	Value
	Customers	**593,440**
	Peak demand	**1,807MW**
	Electricity volume	**8,375GWh**
	Line length	**19,280km**
	Distribution and LV Underground	**10,439km**
	Distribution and LV Overhead	**7,892km**
	Current Reliability performance	
	» Total SAIDI	**222**
	» Total SAIFI	**1.56**

7.15.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☐	No ☒	Yes ☐	No ☒
LV visibility	Yes ☒	No ☐	Yes ☒	No ☐
Future DSO role/open access network	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP	
Increased frequency of natural disasters	Yes ☐	No ☒	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☐	No ☒	Yes ☐	No ☒
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.15.4 Summary of Capex and Opex Categories assessed

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☒
Asset replacement and renewal	☐
Asset relocations	☐
Reliability, Safety & Environment (combined)	☒
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☒
Asset replacement and renewal	☐
System operations and network support	☒
Business support	☒

7.15.5 CAPEX category assessment – Top Contributors

SYSTEM GROWTH				
Annual CAPEX	$43,575,225 (21-23) $87,295,615 (26-30)			
% contribution to overall capex increase	81%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Population growth (organic growth)	Short-term growth (10-year) based on internal forecast. Long-term growth based on latest data available from StatsNZ and Auckland Council. Migration policy and economic outlook present uncertainties for residential and commercial customer growth.	Medium	Reasonable
	Large customers	A strong increase in system growth investment ($254m) is forecast to support large customer load requirements such as data centres and transport electrification ($71m) and large-scale residential developments including Kainga Ora ($55m). The trends have started in 2024 and 2025 and Vector expects the trend to continue.	High	Reasonable

	EV – light transport	There is no official EV uptake forecast for Auckland region. Vector's estimate of 37.5% is based on government 2035 target (30%) adjusted to reflect higher EV proportion in Auckland. It is not clear how the assumptions align with those used by government, other EDBs and Transpower	Low	Unable to determine
	Process heat	For SME gas conversion (buildings and schools), Vector uses DETA report, GIDI funding priorities and Vector gas AMP assumptions. For I&C gas conversions (dairy, meat & wood processing), Vector uses DETA report and GIDI funding priorities. The uncertainty lies in future government funding amount, priorities and policies contained in the yet-to-be published NZ Gas Transition Plan. It is also not clear how the assumptions align with those used by government policies, other EDBs and Transpower	Low	Unable to determine
	Small gas conversion	Vector uses in own gas AMP assumptions. The uncertainty lies in future government incentives, priorities and policies contained in the yet-to-be published NZ Gas Transition Plan. It is also not clear how the assumptions align with those used by government policies, other EDBs and Transpower	Low	Unable to determine

	DER/DSR (negative growth factor)	DER and DSR already exist in Vector so there are historic data that can be used to predict how the driver grows and the offsetting effect it has on peak demand growth	Medium	Reasonable
	Energy efficiency (negative growth factor)	Vector has carried out analysis of energy efficiency and applied the negative growth as an offset to the demand growth	High	Reasonable

Demand forecasting Inputs & modelling	**Accuracy**	**Reasonable**	**Assessment rating**	**Excellent**
	The assessment rating is based on the following considerations: » Scenario assessment has been used to deal with uncertainties of forecasting inputs » Vector's demand forecast is based on the "pop" scenario however it is not clear how this scenario relates to the "accelerated electrification" scenario proposed by Transpower and scenarios run by other EDBs. » To address the uncertainty in peak demand forecast, Vector has focused on the development of flexibility tools to reduce network investment (Symphony Scenario). This reduces the risk of investing in long-life network assets which may later found to be under-utilised » Vector employs both down-down and bottom-up forecast models, as bottom-up models are important to forecast growth capex in the MV and LV networks			

	» Bottom-up models are informed by LV visibility tools such as LV monitors and smart meter data, customer segmentation and analysis » The use of S-curve for uptake of new technologies is a sound approach. With the S-curve construct, the uncertainties are to do with the saturation penetration, the inflexion point (where uptake starts to accelerate), and the year at which the saturation occurs. » Data centre and EV uptake have the highest impact on network maximum demand in the 2026-2030 period (an increase of 300MW by 2032). While we have no specific data to confirm if Vector's forecast of data centre increase trend is correct, an increasing trend is not surprising driven by work-from-home and IT outsourcing/co-location trends, and increasing awareness of data centre management to build their energy-intensive data centres in parts of the world where electricity generation is seen to be "cleaner. » For contribution of EV to peak demand, the use of 1kW as contribution to household ADMD during summer and 0.4 kW during winter is supported by trial results and appears to be sound[29]. The assumption, however, about EV penetration reaching 37.5% by 2035 is unsubstantiated and appears to be high relative to current EV penetration.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Good**
	The assessment rating is based on the following considerations: » The demand forecast from the Symphony scenario is converted into expenditure by a bottom-up build of system growth projects. IAEngg has not examined the program of work and hence cannot comment on its appropriateness.			

[29] A study by CSIRO in Australia indicates that each EV will contribute 2kW (50% of a normal household consumption) to the maximum demand whereas research by the EV Council of Australia concludes that the contribution is only 0.25kW

	» LV growth projects are separately forecasted (no details provided) as there is no LV network model. Less than 10% of the system growth capex is in LV. » Investments into enabling platforms underpins the Symphony scenario and include increasing residential hot water control, control of rooftop solar and battery, and control of home EV charging. IAEngg considers this a sound approach as this reduces the risk of investing in long-life network assets which may later found to be under-utilised » Vector has a 100% customer contribution policy which reduces the risk of under-forecast of decarbonisation capex impact.
Trigger point	Forecasting inputs with low certainty (EV – light, process heat conversion, small gas conversion) are very sensitive to government policies and incentives. It should also be noted that process heat may not all be converted from gas into electricity as there exists other possible substitution fuels such as wood pellets and biofuels.
Dependencies & Risks	The risks are overbuilding infrastructure that may not be required, or underbuilding leading to capacity constraints and impact on supply reliability.
Sensitivities	The demand growth is very sensitive to the assumptions made with regard to data centre development and EV uptake. If these assumptions are on the low side, Vector could be faced with not having enough network capacity to supply the additional load leading to delay in new customer connections and supply reliability. Conversely if the assumptions are on the high side, Vector could have built additional infrastructure that at best, may not be required until a few years later or at worst, not required at all because the new assets are in the wrong locations.
Assumptions	Vector has used the “Symphony” scenario for forecasting demand and expenditure in 2026-30. It is not clear how the scenario aligns with government policies and the “accelerated electrification” scenario used by Transpower.

RELIABILITY, SAFETY & ENVIRONMENT

Annual CAPEX	$15,466,409 (21-23) $69,527,141 (26-30)			
% contribution to overall capex increase	**101%**			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Reliability improvement (due to breach in reliability standard)	» Program of fault Passage Indicator (FPI) installation from FY26 onwards, with an annual spend of $0.36M » A step-up in "Network automation & isolation" capex of $2.7M per year from FY26 onwards	High	Insufficient Information for Analysis
	Climate resilience – system security	Sub-transmission line undergrounding and four sub-transmission cable replacement projects ($27m) in FY26.	Low	Insufficient Information for Analysis
	Climate resilience – asset hardening	» Network hardening for increase in wind speed consists of the use of CCT, replacement of wood with composite crossarm (a step-up of around $2.7M per annum – compared with FY24-25 – from FY26-33), increasing use of lightning arresters, overhead conductor renewals » Network hardening for hot dry summers consists of replacement of expulsion drop-out fuses by the current limiting equivalent ($300k per annum)	Low	Insufficient Information for Analysis

	Climate resilience – floods and inundation	Network hardening for floods & inundation of $27M per annum starting in FY26	Low	Insufficient Information for Analysis
Demand forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Medium**
	The assessment rating is based on the following considerations: » It is not clear if cost-benefit analysis has been carried out for the climate resilience programs, whether they are targeted at the appropriate areas and whether the quantities are optimal.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	The assessment rating is based on the following considerations: » No information is available on the conversion of work quantities into expenditure			
Trigger point	Government and industry agree on a resilience standard to be applied to resilience investment			
Dependencies & Risks	The effect of climate change is likely to be over the longer-term. Vector has not provided evidence to support the number of serious climatic events that are likely to occur in 2026-30 and hence the prudency of its resilience investment.			
Sensitivities	IAEngg has not been provided with details of cost-benefit analysis of the proposed program of work and hence not in a position to assess the sensitivities of the expenditure to outturn differences.			
Assumptions	Not stated in the AMPs			

7.15.6 Opex category assessment – Top Contributors

SYSTEM OPERATIONS & NETWORK SUPPORT				
Annual OPEX	$45,431,898 (21-23) $53,342,659 (26-30)			
% contribution to overall opex increase	48%			
Growth drivers	**Driver**	**IA Engg Comments**	**Certainty**	**Reasonableness**
	Salary and wage growth	Inflationary pressures, competition for resources and new skillset required e.g ADMS	High	Unable to determine
	Symphony tools	Higher flexibility payments, software tools (in the form of cloud service & SaaS) and analysis	High	Unable to determine
	Higher network data cost	Smart meter data procurement	High	Reasonable
	Removal of supplier rebates	Not sure what this item is	High	Unable to determine
	Increase in insurance premiums		High	Unable to determine

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point for this expenditure			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.			
Assumptions	Cost increase is above CPI			

BUSINESS SUPPORT				
Annual **OPEX**	$41,899,799 (21-23) $47,333,194 (26-30)			
% contribution to overall opex increase	**33%**			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Salary and wage growth	Inflationary pressures and competition for resources	High	Unable to determine
	Increased corporate cost allocation	Allocated corporate costs have increased due to higher insurance premiums, personnel costs and professional fees	High	Unable to determine
	Migration to cloud service	Increased investment in digitalisation as well as increased costs due to SaaS services being now being recognised as OPEX	High	Unable to determine

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point for this expenditure			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.			
Assumptions	Cost increase is above CPI			

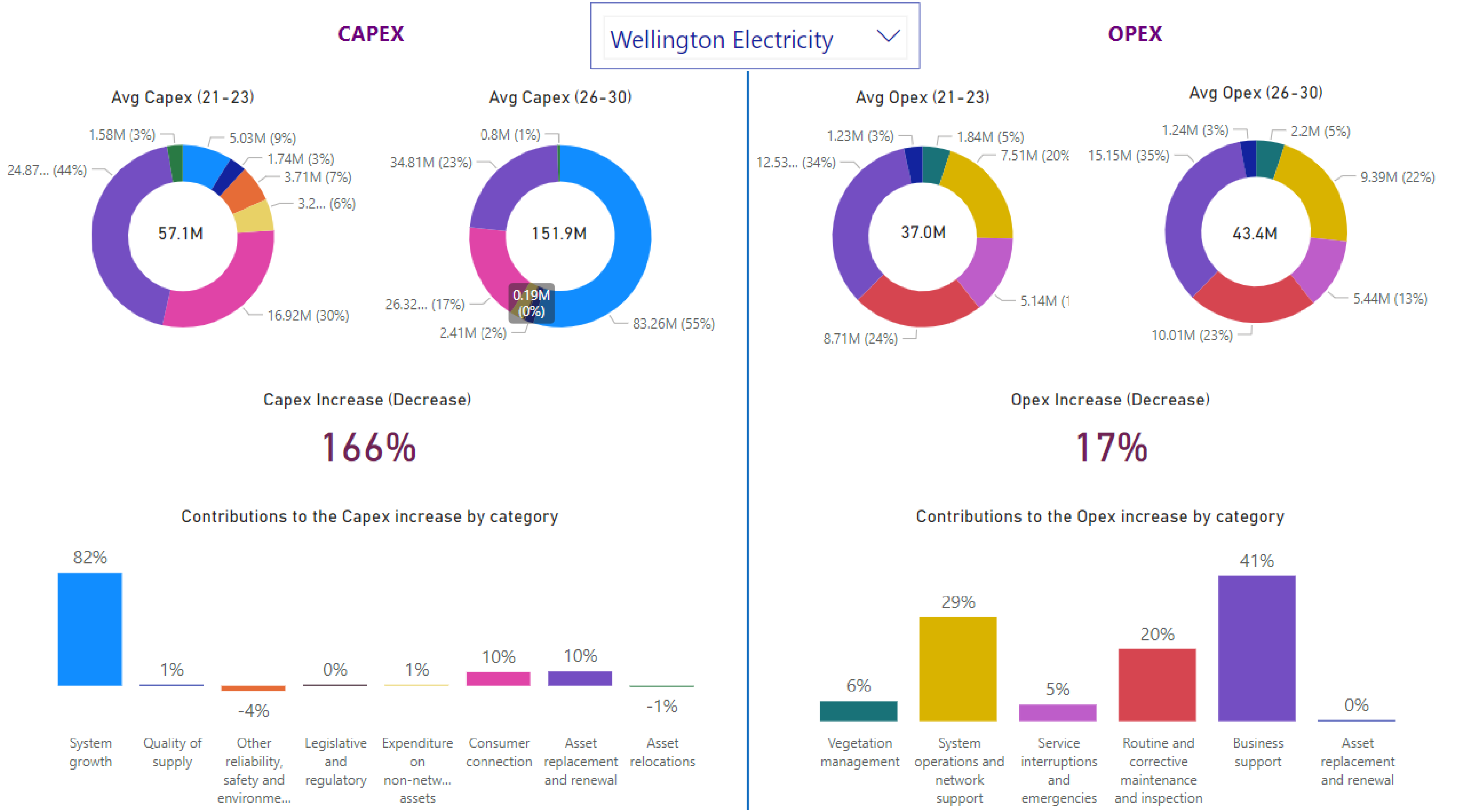
ROUTINE & CORRECTIVE MAINTENANCE & INSPECTION				
Annual OPEX	$19,704,975 (21-23) $23,140,752 (26-30)			
% contribution to overall opex increase	21%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Opex reallocation	An increase in Routine and Corrective Maintenance is largely due to time and materials planned maintenance activities reallocated from corrective maintenance (included in asset replacement & renewal), offset by a decrease in asset replacement and renewal expenses	High	Unable to determine
	Increased maintenance activity	No specific details provided	High	Unable to determine

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of vegetation management) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.			
Assumptions	Cost increase is above CPI			

wellington electricity™

7.16 Wellington Electricity

7.16.1 Expenditure Dashboard



7.16.2 Business overview (2022 data)

	Parameter	Value
	Customers	**171,955**
	Peak demand	**579 MW**
	Electricity volume	**2267 GWh**
	System length	**4,800 km**
	Underground	**3,089 km**
	Overhead	**1,717 km**
	Current Reliability performance	
	» Total SAIDI	**40.3**
	» Total SAIFI	**0.472**

7.16.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☒	No ☐
Future DSO role/open access network	Yes ☒	No ☐	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.16.4 Summary of Capex and Opex Categories assessed

Capex Categories	Assessed Further
Consumer connection	☒
System growth	☒
Asset replacement and renewal	☒
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☒
Asset replacement and renewal	☐
System operations and network support	☒
Business support	☒

7.16.5 CAPEX category assessment – Top Contributors

SYSTEM GROWTH				
Annual **CAPEX**	$5,025,695 (21-23)	$83,260,000 (26-30)		
% contribution to overall capex increase	82%			
	Driver	**IAEngg Comments**	**Certainty**	**Reasonableness**
Growth drivers	Population Growth	Generally based on new dwellings consented in the Wellington region across the four local authorities. Driven by growth in apartments within the wellington CBD and subdivision growth along the northern belt	High	Reasonable
	Electrification of Public Transport	WELL forecast peak demand growth in the next three years is greater than 4% per year, significantly higher than the long-term 2% per year average. WELL has several large public transport electrification programmes currently in progress.	Medium	Reasonable
	Electric Vehicles – Light & Commercial	WELL forecast is based on the trend of EV vehicle uptake in the network & Government's Clean Car Discount programme in 2021	Low	Reasonable

	Transition from Gas	WELL's forecast assumes that electricity will replace fossil gas, but the Emission Reduction Plan includes the possibility of natural gas being replaced with renewable gas sources.	Low	Not Reasonable
	Demand Management Capability (Flexibility Services)	The Flexibility services are work in progress and they are yet to be developed to the scale needed.	Low	Unable to determine
Demand forecasting Inputs & modelling	**Accuracy**	**Reasonable**	**Assessment Rating**	**Excellent**
	The assessment rating is based on the following considerations: » WELL's has developed 2 x separate forecast one is a 10 year AMP forecast & other one is the 30-year growth forecast which includes ERP drivers. » Scenario assessment has been used to deal with uncertainties of forecasting inputs » 10 Year AMP forecast develops separate summer and winter demand forecasts using historical trends in peak demand with the addition of confirmed future step changes and apply a demand management buffer to it. The growth scenarios are aggregated 'bottom-up' from feeder level to provide GXP, regional, and system wide forecasts allowing for diversity at each level. » As per the AMP 30 Year growth forecast is a bottom-up aggregation of 18 different models each model includes low, expected, and high-demand scenarios, forecasting the contribution to total peak demand in 2050. Energy conversion rates, appliance consumption rates, and efficiency improvement rates have been derived from external sources. A growth curve is then applied to each scenario, spreading the growth over the 30-year study period. It takes into consideration several factors and variables to arrive at the expected scenarios. » The 10 year growth curves & 30 year growth curves are compared and the 10 year AMP forecast is calibrated accordingly. Based on this forecast the network constraint list is developed, several options modelled and assessed for each constraint. The options are then costed and included in the AMP based on the priority.			

	» To address uncertainty in peak demand forecast, WELL has developed demand management tools to deliver new growth using the existing network. Demand management tools are used to manage congestion by redistributing electricity usage across WELL. This has allowed WELL to meet new growth without needing to build expensive new network capacity, minimising the cost to customers. » Public Transport electrification has the highest impact on network maximum demand over the next 5 years which is expected to grow at a rate of 5% p.a. This is due to the Committed or highly likely public transport electrification upgrades and new EV charging stations within the Wellington Electricity network
Expenditure forecasting approach	**Accuracy** **Insufficient Information for Analysis** **Assessment Rating** **Good** The assessment rating is based on the following considerations: » Prior to any investment in any infrastructure WELL's first step is to evaluate non-network solutions like load control, demand-side management solutions, use of emerging technologies & network reconfiguration » WELL models its 33kV and 11kV networks using a historical growth model and step changes. The step changes are classified into three categories. The certain and highly likely category is used to determine network constraints. » A network constraint list is developed and several options are modelled and assessed for each of the identified constraints, the options are costed based on similar or recent projects. » There is a crossover between asset lifecycle renewals, and reinforcement to support system growth. WELL developed draft programme for Asset renewal based on health-criticality models & Reinforcement based on load forecasting. The programmes were compared to identify assets appearing in both, these assets remained in the programme where the need arises soonest and were removed from other programmes. WELL uses this approach for only for the Zone substation and sub-transmission assets. » WELL's CAPEX programme rationalises the investment programme so that new assets have both the capacity needed to meet future growth expectations and are replaced before they adversely impact quality.

Trigger point	Forecasting input with low certainty like Transition from gas is very sensitive to government policies. It should also be noted that not all gas consumers on the network will convert to electricity as government is looking at other potential alternatives like renewable gas sources.
Dependencies & Risks	The risks are building additional capacity early results in an overinvestment, whereas building additional capacity too late may have much greater consequences such as equipment damage or inability to supply customer load.
Sensitivities	WELL has confirmed it conducted a high-level sensitivity study but has not considered loads such as traction that might cause power quality issues. It is not clear in the AMP if well has addressed the sensitivity analysis results in its expenditure forecast.
Assumptions	» The use of load control is assumed to remain as per current practice » The impact from distributed generation and new decarbonisation loads such as the gas transition is included » It is assumed that growth in peak demand (MW) and volume (GWh) will accelerate through the period due to decarbonisation policies leading to increased use of electricity in place of fossil fuels » It is assumed that the current Emissions Reduction Plan will remain in place for the duration of this Plan. This Plan assumes that New Zealand will transition from natural gas as a residential fuel to electricity by 2050, with the majority of this transition occurring outside the Planning Period covered by this Plan. » It is assumed that the delivery of this Plan will not be being disrupted by a HILP event such as a major earthquake.

ASSET REPLACEMENT AND RENEWAL

Annual CAPEX	$24,872,061 (21-23)		$34,809,800 (26-30)	
% contribution to overall capex increase	**10%**			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Asset Health Deterioration	Replacement of WELL's two largest asset fleets, The zone substation power transformer fleet and the underground cable fleets are coming to the end of their technical lives.	High	Reasonable
Forecasting Inputs & modelling	**Accuracy**	**Reasonable**	**Assessment Rating**	**Good**
	The assessment rating is based on the following considerations: WELL uses EEA Asset Health indicator guide 2016 in combination with Asset criticality indicator (ACI) developed by WELL. The form of asset risk forecasting used for each fleet varies depending on the type of asset being modelled. See reference table below provided by WELL.			

FLEET TYPE	EXAMPLES	CHARACTERISTICS	METHOD
Low volume, high value	Subtransmission cables, power transformers	Extensive condition monitoring	Individual replacement plans
high volume, Low value	Poles, distribution transformers	Routine condition assessment	Population survival curves
Linear assets	Distribution cables	Limited options for condition assessment. Repaired on failure.	Population fault rates
Short life assets	Batteries	High condition assessment cost relative to replacement cost	Time-based replacement

Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Good**

The assessment rating is based on the following considerations:

- There is a crossover between asset lifecycle renewals, and reinforcement to support system growth. WELL developed draft programme for Asset renewal based on health-criticality models & Reinforcement based on load forecasting. The programmes were compared to identify assets appearing in both, these assets remained in the programme where the need arises soonest and were removed from other programmes. WELL uses this approach for only for the Zone substation and sub-transmission assets. CAPEX programme rationalises the investment programme so that new assets have both the capacity needed to meet future growth expectations and are replaced before they adversely impact quality.

Trigger point	Asset Health Condition
Dependencies & Risks	Forecasted growth eventuating is a dependency which will assist in bringing forward replacement of ageing fleet of power transformers & sub-transmission cables.
Sensitivities	IAEngg has not been provided with details of cost-benefit analysis of the proposed program of work and hence not in a position to assess the sensitivities of the expenditure to outturn differences.
Assumptions	It is assumed that the delivery of this Plan will not be being disrupted by a HILP event such as a major earthquake.

<table>
<tr><th colspan="5">CONSUMER CONNECTIONS</th></tr>
<tr><td>Annual
CAPEX</td><td colspan="4">$16,924,706 (21-23) $26,318,396 (26-30)</td></tr>
<tr><td>% contribution to overall capex increase</td><td colspan="4">10%</td></tr>
<tr><td rowspan="3">Growth drivers</td><td>Driver</td><td>IAEngg Comments</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td>Housing Intensification</td><td>Generally based on strong economic growth experienced in recent years.</td><td>High</td><td>Reasonable</td></tr>
<tr><td>Electrification</td><td>Government’s climate change initiatives has triggered large new high voltage connections for electrification of public transport and the transition away from fossil fuel to electricity for business and commercial energy use.</td><td>Medium</td><td>Unable to determine</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment Rating</td><td>Good</td></tr>
<tr><td colspan="4">The assessment rating is based on the following considerations:
WELL has used multiple sources of information (listed below) as inputs to develop the forecast for this CAPEX category.
» The number of new dwellings consented in the Wellington Region across the four local authorities covered by WELL’s network,
» Historical trends on the network
» WELL’s forward Work Programme
» Large substation connection requests
» Gas to Electricity conversions (Homes & Businesses)</td></tr>
</table>

Expenditure forecasting approach	Accuracy	Insufficient Information for Analysis	Assessment Rating	Good
	The assessment rating is based on the following considerations: » WELL uses historic trends to convert the demand growth into customer connection capex » Demand growth by EV & Gas to Electricity conversions to impact both sub-transmission, zone substation, 11kV, LV & customer connection. » IAEngg cannot comment on the appropriateness of the various long run average costs used above without examining the underlying data or how they compare to other EDBs			
Trigger point	1. Economic factors 2. New Federal governments policy on Net Zero Emissions by 2050 3. Population Growth 4. Transport Electrification 5. Transition from gas to Electricity			
Dependencies & Risks	Consumer connection capex is driven by customer requests. The risk of over or underbuilding infrastructure is low. The risks for WELL are to do with budget provision and potentially with resource allocation (e.g. not enough resource to connect customers if there is a spike in connection applications due to higher economic activity). Budget risk is partially offset with capital contribution from customers.			

Sensitivities	Demand increase is very sensitive to population growth and economic factors. However, as consumer connection capex is only spent when customer requests to connect, the risk of over or underbuilding infrastructure is low.
Assumptions	» The use of load control is assumed to remain as per current practice » The impact from distributed generation and new decarbonisation loads such as the gas transition is included, and » It is assumed that growth in peak demand (MW) and volume (GWh) will accelerate through the period due to decarbonisation policies leading to increased use of electricity in place of fossil fuels » It is assumed that the current Emissions Reduction Plan will remain in place for the duration of this Plan. This Plan assumes that New Zealand will transition from natural gas as a residential fuel to electricity by 2050, with the majority of this transition occurring outside the Planning Period covered by this Plan » It is assumed that the delivery of this Plan will not be being disrupted by a HILP event such as a major earthquake.

7.16.6 Opex category assessment – Top Contributors

SYSTEM OPERATIONS & NETWORK SUPPORT				
Annual OPEX	$7,514,564 (21-23) $9,385,293 (26-30)			
% contribution to overall opex increase	29%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Salary and wage growth	Salary and wage growth, which is currently at exceptional levels and could increase even more as competition for skilled resources heats up.	High	Unable to determine
	Increased contracting costs	Increased contracting costs, again reflecting competition for scarce resources.	High	Unable to determine
	LV visibility Data	Secure customer data is required to provide LV visibility (both access to data and funding to purchase it). WELL has forecasted spend of $1.2 million every year for the next 3 years & $1.4million every year from FY29-FY33	High	Unable to determine
	Increase in network scale	Increased maintenance as the electricity network grows.	High	Unable to determine

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
	Apart from LV visibility data WELL hasn't provided granular cost data for this OPEX category, which makes it difficult to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
	Apart from LV visibility data WELL hasn't provided granular cost data for this OPEX category, which makes it difficult to determine accuracy or approach.			
Trigger point	There is no trigger point for this expenditure			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	N/A			
Assumptions	Cost increase is above CPI			

BUSINESS SUPPORT				
Annual OPEX	$12,526,997 (21-23) $15,145,752 (26-30)			
% contribution to overall opex increase	41%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Salary and wage growth	Electrification is a global challenge, which is resulting in strong competition for scarce resources both regionally and internationally. This will certainly have an impact on the salary and wage growth.	High	Unable to determine
	Increased contracting costs	Increased contracting costs, again reflecting competition for scarce resources.	High	Unable to determine
	New functions to deliver WELL's Strategy	PMO, Data analytics & Procurement – to support the doubling of CAPEX programmes	High	Unable to determine
	New Insurances	Forecast to be 3-5% of total OPEX	High	Unable to determine

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
	Apart from PMO, Data analytics & Procurement WELL hasn't provided granular cost data for this OPEX category, which makes it difficult to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point for this expenditure			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.			
Assumptions	Cost increase is above CPI			

<table>
<tr><th colspan="5">ROUTINE & CORRECTIVE MAINTENANCE & INSPECTION</th></tr>
<tr><td>Annual OPEX</td><td colspan="4">$8,707,402 (21-23) $10,006,200 (26-30)</td></tr>
<tr><td>% contribution to overall opex increase</td><td colspan="4">20%</td></tr>
<tr><td rowspan="2">Growth drivers</td><td>Driver</td><td>IAEngg Comment</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td>Increase in network scale</td><td>Increased maintenance & inspections as the electricity network grows.</td><td>High</td><td>Unable to determine</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment Rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td rowspan="2">Expenditure forecasting approach</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment Rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
</table>

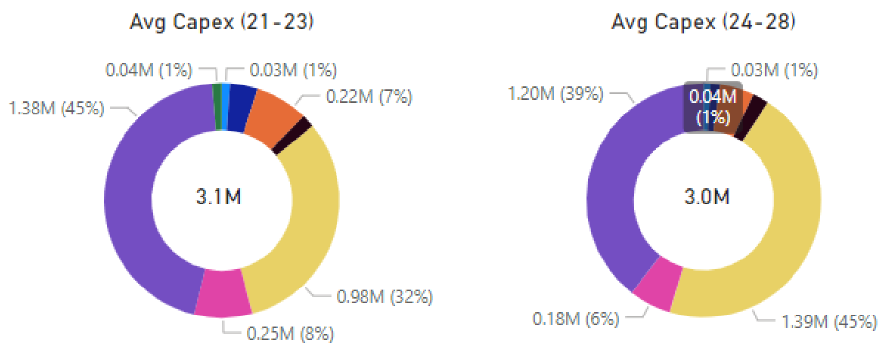
Trigger point	Asset Inspection programmes
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of vegetation management) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.
Sensitivities	Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.
Assumptions	Cost increase is above CPI

7.17 Buller Electricity Ltd

7.17.1 Expenditure Dashboard

Buller Electricity

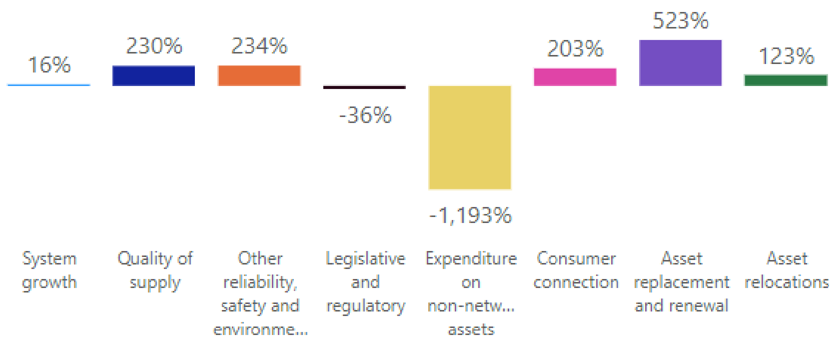
CAPEX



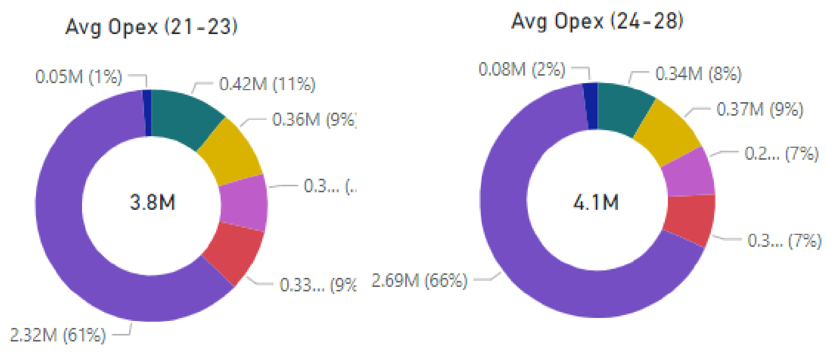
Capex Increase (Decrease)

-1%

Contributions to the Capex decrease by category



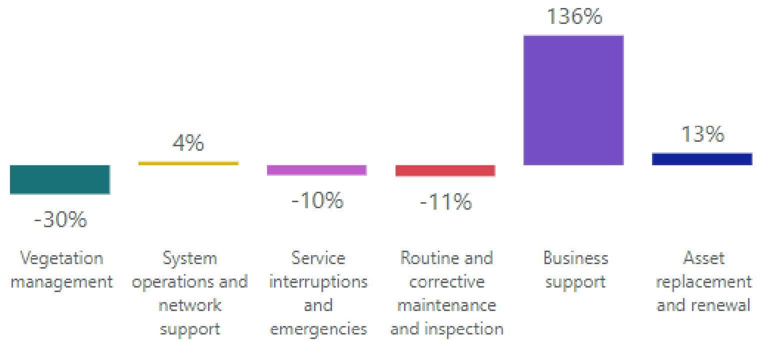
OPEX



Opex Increase (Decrease)

7%

Contributions to the Opex increase by category



7.17.2 Business overview (2022 data)

	Parameter	Value
	Customers	**4,757**
	Peak demand	**11 MW**
	Electricity volume	**50 GWh**
	Line length	**649 km**
	Distribution and LV Underground	**60 km**
	Distribution and LV Overhead	**482 km**
	Sub-transmission	**107 km**
	Current Reliability performance	
	» Total SAIDI	**282 minutes**
	» Total SAIFI	**2.09**

7.17.3 Capex and Opex Growth Drivers

Drivers for capex growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – commercial EV charging	Yes ☐	No ☒	Yes ☐	No ☒
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential gas to electricity conversion	Yes ☐	No ☒	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☒	No ☐
Future DSO role/open access network	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☐	No ☒	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.17.4 Summary of Capex and Opex Categories assessed

IAEngg did not undertake further assessment of Buller Energy's CAPEX & OPEX forecast as it was below the assessment threshold.

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☐
Asset replacement and renewal	☐
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☐
System operations and network support	☐
Business support	☐

7.17.5 CAPEX category assessment – Top Contributors

GENERAL COMMENTS ON CAPEX	
Annual **CAPEX**	$3,082,795 (21-23) $3,048,638 (24-28)
% overall capex increase / decrease	**-1%**
	Compared with other EDBs, Buller Electricity Ltd (BEL) is a small network (see Business Overview section above). Geographically, BEL network covers a long narrow coastal strip of land at the top of South Island. Based on historical records and knowledge of local developments, BEL has adopted a minimal 0.4% annual demand growth rate for domestic, commercial and light industrial load. Forecast peak demand is expected to be well within the capacity of almost all substations and lines and as such, BEL has allocated minimal future expenditure for demand growth in the AMP. BEL tabled in the AMP details of significant renewal and replacement projects (that include $500k for software system upgrades and $863k for the workshop buildings) and RSE projects in the AMP for YE2024 to YE2026. Whilst there was insufficient available information for IAEngg to perform analysis and assessment on forecasting inputs, modelling or approach, given the small network size and no change in total capex, IAEngg's view is that BEL's capex forecast is within reasonable bounds.

7.17.6 Opex category assessment – Top Contributors

GENERAL COMMENTS ON OPEX	
Annual OPEX	$3,789,312 (21-23) $4,059,674 (24-28)
% overall opex increase /decrease	7%

BEL stated that due to its geographical location, the majority of their assets are affected by severe corrosion due to the harsh coastal environment, and a high proportion of the network requiring vegetation control work. BEL's maintenance budgets are generally based on historical trending with vegetation management is based on inspection and data collection. IAEngg's view is that the 7% increase in overall opex forecast is not unexpected because of the pressure on costs due to significant changes around Traffic Management regulations, the way the Tree Regulations are being applied and real increase in labour costs. Contractor competition is low due to Buller's isolation from major contracting markets and we concur with BEL's view that in the face of huge renewal and upsizing programs in other areas that are paying electrical trades and engineers well beyond what BEL could effectively afford to pay, BEL is facing big challenges in recruiting and retaining trades, technical and professional staff.

CENTRALINES
LIMITED

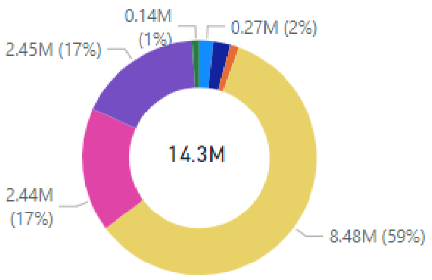
7.18 Centralines

7.18.1 Expenditure Dashboard

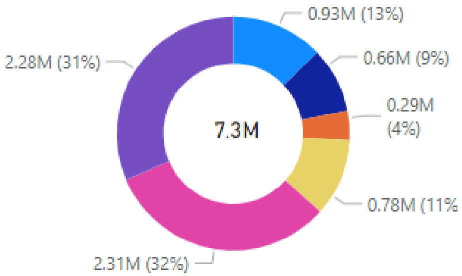
Centralines

CAPEX

Avg Capex (21-23)



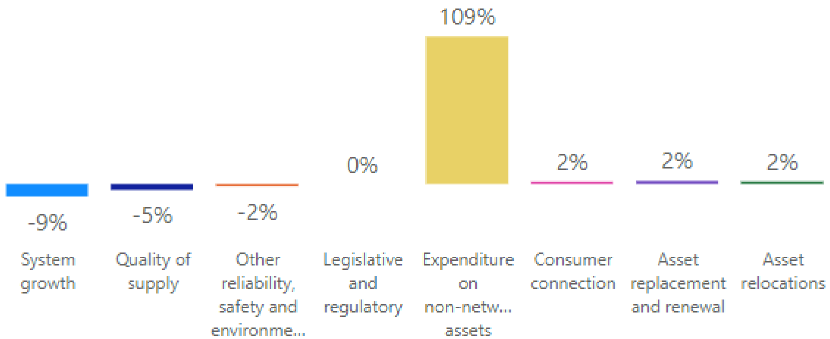
Avg Capex (24-28)



Capex Increase (Decrease)

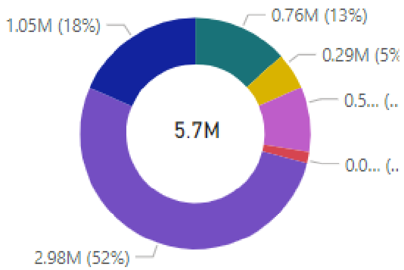
-49%

Contributions to the Capex decrease by category

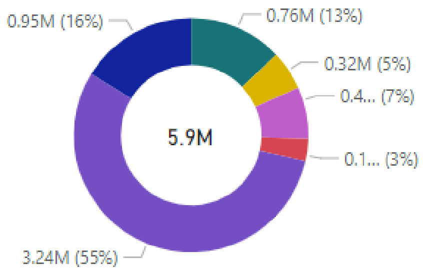


OPEX

Avg Opex (21-23)



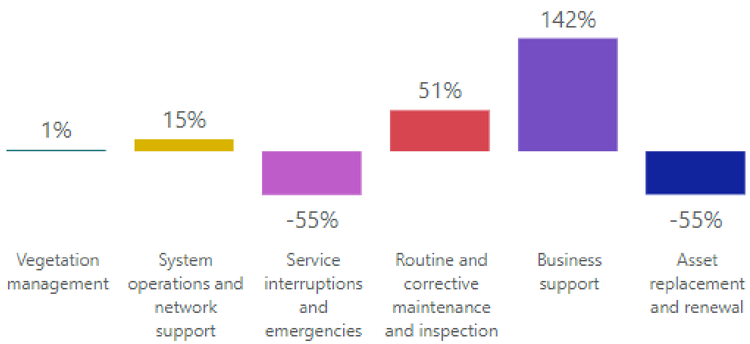
Avg Opex (24-28)



Opex Increase (Decrease)

3%

Contributions to the Opex increase by category



7.18.2 Business overview (2022 data)

	Parameter	Value
	Customers	**9054**
	Peak demand	**22MW**
	Electricity volume	**108GWh**
	Line length	**1836km**
	Distribution and LV Underground	**138km**
	Distribution and LV Overhead	**1698km**
	Current Reliability performance	
	» Total SAIDI	**214.8**
	» Total SAIFI	**2.180**

7.18.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – commercial EV charging	Yes ☐	No ☒	Yes ☐	No ☒
Demand growth – residential EV charging	Yes ☐	No ☒	Yes ☐	No ☒
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential gas to electricity conversion	Yes ☐	No ☒	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☒	No ☐
Future DSO role/open access network	Yes ☒	No ☐	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.18.4 Summary of Capex and Opex Categories assessed

IAEngg did not undertake further assessment of Centralines CAPEX and OPEX forecasts as they were both below the assessment thresholds

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☐
Asset replacement and renewal	☐
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☐
System operations and network support	☐
Business support	☐

7.18.5 CAPEX category assessment – Top Contributors

GENERAL COMMENTS ON CAPEX	
Annual CAPEX	$14,288,334 (21-23) $7,250,000 (24-28)
% overall capex increase / decrease	-49%
	Centralines demand growth for this planning period is anticipated to be driven by customer-driven works. Centralines network customers have indicated "the current trade-offs between reliability and price are appropriate" based on this Centralines network infrastructure investment has been limited to minor upgrades on worst-performing feeders to improve reliability. Centralines safety-driven upgrades are to remain relatively minor for the planning period one of the reasons being the level of investment in renewals and replacement. The forecast is high this financial year since Centralines are focusing on completing backlog of deferred projects due to cyclone Gabrielle. Centralines CAPEX spend proportion based on 21-23 to 24-28 average is relatively high on three sub-categories: Customer Connection, Asset replacement and renewal and Reliability, Safety and Environment. There is no significant material changes noted on the forecast figures. Based on the forecast changes for the various stay-in-business capex category, it is consistent with Centralines plan to use external contracting resources to complete the backlog of deferred projects.

7.18.6 Opex category assessment – Top Contributors

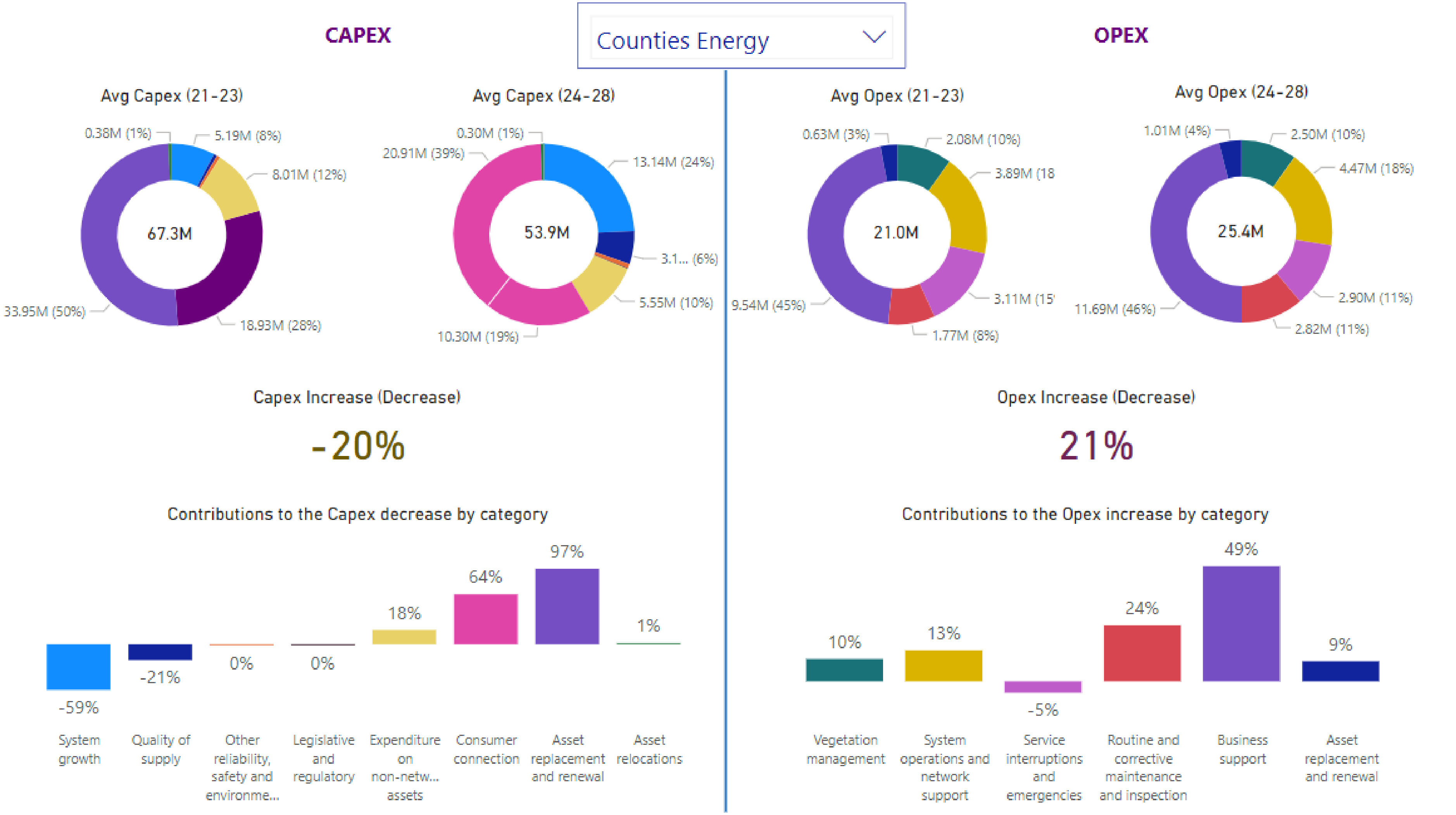
GENERAL COMMENTS ON OPEX	
Annual OPEX	$5,684,276 (21-23) $5,866,000 (24-28)
% overall opex increase /decrease	3%

Centralines OPEX spend proportion based on 21-23 to 24-28 average is relatively high on three sub-categories: Business support, System operations & network support and Routine & Corrective maintenance and inspection. IAEngg was unable to locate any further details on these sub-categories in Centralines Asset Management Plan. There is no material changes noted on the forecast figures. Given there is pressure on costs due to, real increase in labour costs and additional staff might be needed to assist the business to deal with changes in its operating environment, it is reasonable to expect a material cost increases in opex, the 3% increase in overall opex forecast is not unexpected..

Counties Energy

7.19 Counties Energy

7.19.1 Expenditure Dashboard



7.19.2 Business overview (2022 data)

Parameter	Value
Customers	45785
Peak demand	129MW
Electricity volume	656GWh
Line length	3,500km
Distribution and LV Underground	1,190km
Distribution and LV Overhead	2,310km
Current Reliability performance	
» Total SAIDI	356.9
» Total SAIFI	3.931

7.19.3 Capex and Opex Growth Drivers

Drivers for capex growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☒	No ☐
Future DSO role/open access network	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for opex growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.19.4 Summary of Capex and Opex Categories assessed

IAEngg did not undertake further assessment of Counties Energy CAPEX forecasts as it was below the assessment thresholds

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☐
Asset replacement and renewal	☐
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☒
Asset replacement and renewal	☐
System operations and network support	☒
Business support	☒

7.19.5 CAPEX category assessment – Top Contributors

GENERAL COMMENTS ON CAPEX	
Annual **CAPEX**	$67,251,856 (21-23) $53,861,587 (24-28)
% overall capex increase / decrease	**-20%**
	Counties energy demand is experiencing growth from industrial/commercial developments and new multi-stage residential subdivisions. The connection growth is in the order of 2-3% per annum. This seems to be driven primarily by the growth of Auckland the proximity to Hamilton and Tauranga. Counties energy has completed significant works in the recent past which has created additional installed distribution capacity well ahead of the uptake in demand driven by connection growth. Counties Energy is forecasting the connection growth to be compounded because of decarbonisation, particularly in transport and industrial process heating. Counties energy CAPEX spend proportion based on 21-23 to 24-28 average is relatively high on three sub-categories: Customer Connection, System growth and Asset replacement and renewal. Significant residential growth is driving the demand mainly in the eastern region of the network, based on the number of proposed dwellings Counties Energy has forecasted the spend for the next 10 years. To address the capacity constraint due to forecasted load growth Counties Energy are investing in building 2 x new zone substations. A significant spend is forecasted to replace the high voltage and low voltage distribution lines. age, condition, failure rate and performance issues being the drivers for this.

7.19.6 Opex category assessment – Top Contributors

<table>
<tr><th colspan="5">SYSTEM OPERATIONS & NETWORK SUPPORT</th></tr>
<tr><td>Annual OPEX</td><td colspan="4">$3,889,790 (21-23) $4,466,966 (24-28)</td></tr>
<tr><td>% contribution to overall opex increase</td><td colspan="4">13%</td></tr>
<tr><td rowspan="2">Growth drivers</td><td>Driver</td><td>IAEngg Comments</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td>Unidentified Drivers</td><td>Drivers not detailed in the Asset Management Plan</td><td>Unable to determine</td><td>Unable to determine</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
</table>

	Accuracy	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
Expenditure forecasting approach	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point for this expenditure			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	N/A			
Assumptions	None stated in the AMP			

<table>
<tr><th colspan="5">BUSINESS SUPPORT</th></tr>
<tr><td>Annual OPEX</td><td colspan="4">$9,540,801 (21-23) $11,690,963 (24-28)</td></tr>
<tr><td>% contribution to overall opex increase</td><td colspan="4">49%</td></tr>
<tr><td rowspan="2">Growth drivers</td><td>Driver</td><td>IAEngg Comments</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td>Unidentified Drivers</td><td>Drivers not detailed in the Asset Management Plan</td><td>Unable to determine</td><td>Unable to determine</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td rowspan="2">Expenditure forecasting approach</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td>Trigger point</td><td colspan="4">There is no trigger point for this expenditure</td></tr>
<tr><td>Dependencies & Risks</td><td colspan="4">Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.</td></tr>
<tr><td>Sensitivities</td><td colspan="4">N/A</td></tr>
<tr><td>Assumptions</td><td colspan="4">None stated in the AMP</td></tr>
</table>

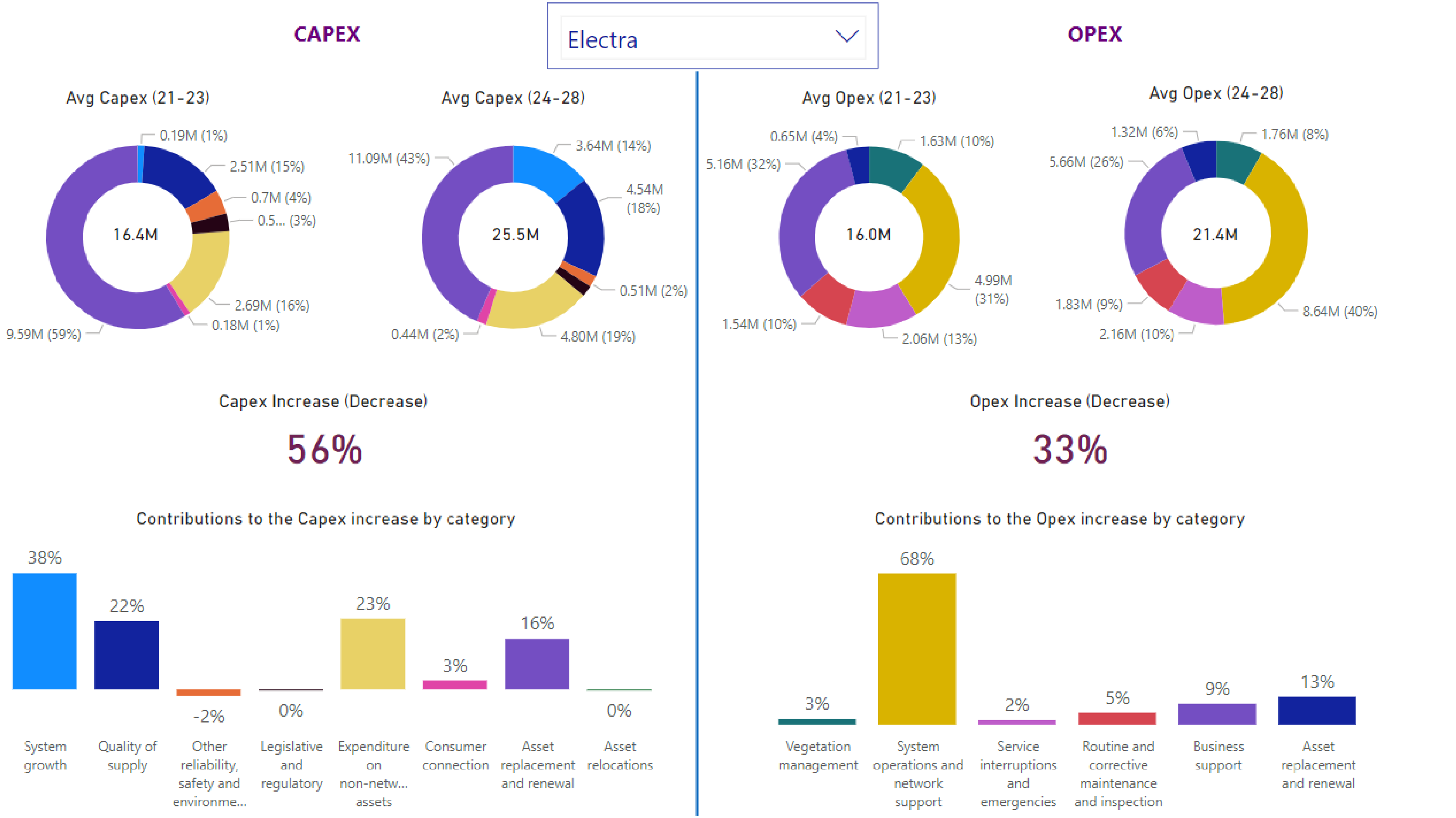
<table>
<tr><th colspan="7">ROUTINE & CORRECTIVE MAINTENANCE & INSPECTION</th></tr>
<tr><td>Annual OPEX</td><td colspan="6">$1,771,039 (21-23) $2,815,740 (24-28)</td></tr>
<tr><td>% contribution to overall opex increase</td><td colspan="6">24%</td></tr>
<tr><td rowspan="2">Growth drivers</td><td>Driver</td><td colspan="3">IAEngg Comments</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td>Unmanned aerial vehicles (UAV) & Light Detection and Ranging (LIDAR) survey</td><td colspan="3">Use of latest technologies UAV & LiDAR to enhance the traditional inspection surveys for both network assets & vegetation control.</td><td>High</td><td>Unable to determine</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td colspan="2">Assessment rating</td><td colspan="2">Insufficient Information for Analysis</td></tr>
<tr><td colspan="6">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td rowspan="2">Expenditure forecasting approach</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td colspan="2">Assessment rating</td><td colspan="2">Insufficient Information for Analysis</td></tr>
<tr><td colspan="6">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td>Trigger point</td><td colspan="6">Asset Inspection programmes</td></tr>
<tr><td>Dependencies & Risks</td><td colspan="6">Possible impact to other opex items (e.g. deferral of vegetation management) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.</td></tr>
<tr><td>Sensitivities</td><td colspan="6">Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.</td></tr>
<tr><td>Assumptions</td><td colspan="6">None stated in the AMP</td></tr>
</table>

Electra

EMPOWERING YOUR FUTURE

7.20 Electra

7.20.1 Expenditure Dashboard



7.20.2 Business overview (2022 data)

	Parameter	Value
	Customers	**45,950**
	Peak demand	**111MW**
	Electricity volume	**424 GWh**
	Line length	**2,354km**
	Distribution and LV Underground	**798km**
	Distribution and LV Overhead	**1,556km**
	Current Reliability performance	
	» Total SAIDI	**100.7**
	» Total SAIFI	**1.557**

7.20.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☒	No ☐
Future DSO role/open access network	Yes ☒	No ☐	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.20.4 Summary of Capex and Opex Categories assessed

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☒
Asset replacement and renewal	☐
Asset relocations	☐
Reliability, Safety & Environment (combined)	☒
Non-network	☒

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☒
System operations and network support	☒
Business support	☒

7.20.5 CAPEX category assessment – Top Contributors

SYSTEM GROWTH				
Annual CAPEX	$188,422 (21-23)	$3,635,116 (24-28)		
% contribution to overall capex increase	38%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Residential and non-residential connection growth	Electra's population growth rate is based on external sources of information like Sense Partners study & local council housing updates.	Medium	Reasonable
	Residential and non-residential electricity intensity	Electra's electricity intensity changes (negative growth) are aligned with the Te Mauri Hiko (accelerated electrification) scenario	Medium	Reasonable

	Uptake of Electric vehicles	Electra has based its Electric Vehicle uptake on the Te Mauri Hiko (accelerated electrification) scenario moderated by regional household income levels and current vehicle numbers	Low	Reasonable
	Electrification of residential and commercial gas	Electra has aligned its residential and commercial gas to electricity conversion rate with the Te Mauri Hiko (accelerated electrification)	Low	Reasonable
	Electrification of industrial process heat	Electra has made a conservative assumption of 50% of Te Mauri Hiko (accelerated electrification) scenario with regards to the electrification of low temperature industrial process heat conversion	Low	Reasonable
	Residential & Industrial demand response	Electra has considered the demand response changes for both controlled and uncontrolled scenarios	Low	Reasonable
	Distributed energy resources (DERs)	Electra has based its growth in DER as per Te Mauri Hiko (accelerated electrification) scenario and it has been moderated for relative sunshine hours	Low	Reasonable

<table>
<tr><td rowspan="2">Demand forecasting Inputs & modelling</td><td>Accuracy</td><td>Reasonable</td><td>Assessment rating</td><td>Good</td></tr>
<tr><td colspan="4">The assessment rating is based on the following considerations:
» Electra are currently using a scenario based forecasting model utilising probabilistic analysis technique to identify the emerging constraints. The forecast has been separated as uncontrolled and controlled demand to address uncertainties in demand response.
» Electra have aligned or adjusted with the Te Mauri Hiko (accelerated electrification) scenarios for most of their growth drivers.
» Electra has developed their network demand forecast with a combination of both top-down & bottom up approach.</td></tr>
<tr><td rowspan="2">Expenditure forecasting approach</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">The assessment rating is based on the following considerations:
» Electra’s first step is to evaluate non-network solutions like load control, demand-side management solutions, use of emerging technologies & network reconfiguration prior to any investment in any infrastructure
» Electra has assessed the demand growth against asset capacity to identify network constraints, options/solutions are then costed and converted into forecast program of work and included in the AMP based on a risk based priority
» IAEngg cannot comment on the appropriateness of the 14% average CAPEX/OPEX decarbonisation forecast impact expenditure without examining the underlying data or how they compare to other EDBs</td></tr>
</table>

Trigger point	Forecasting inputs with low certainty (EV – light, process heat conversion, small gas conversion) are very sensitive to government policies and incentives. It should also be noted that process heat may not all be converted from gas into electricity as there are other possible substitution fuels.
Dependencies & Risks	The risks are overbuilding infrastructure that may not be required, or underbuilding leading to capacity constraints and impact on supply reliability.
Sensitivities	It is not evident in the AMP if Electra has completed a sensitivity study and addressed the sensitivity analysis results in its expenditure forecast.
Assumptions	» The district population is projected to grow at 1.8% per year over the next ten years. » Covid-19 pandemic had little impact on the maximum demand (MD) of Electra's zone substations as zone MDs increased between 1% to 12% per annum from 2019 to 2022 » Subsidies for EV, electrification of energy demand is expected to increase in the coming years » That EV fast charging rates may increase from the current 50kW to 300kW as vehicle size and range increases and the recharging period emerges as the barrier to EV uptake » The number of roof-top solar and battery installations will increase, possibly to the point of creating localised voltage disturbances » Penetration of LED streetlighting increases, leading to further reductions kWh sales » Government's climate change initiatives will see substitution of electricity for oil (transport) and coal (industrial)

NON-NETWORK

Annual **CAPEX**	$2,694,054 (21-23)	$4,797,933 (24-28)		
% contribution to overall capex increase	23%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Information Technology Expenditure	Capital expenditure is focused on OT hardware renewal, network asset information & management, Safety & security, control & respond and Business Information systems	High	Unable to determine
	Buildings & Property, Vehicles, Tools, plant and machinery	control room optimisation, New Depot project, Purchase of Vehicles (heavy duty trucks), plant and equipment are accounted in the CAPEX expenditure	High	Unable to determine

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	» IAEngg has no access to granular data to determine accuracy or to assess.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	» Replace assets at the end of their economic life or if they are considered to be obsolete due to a change or strategic initiative » IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	Business Strategy/Asset Condition/Asset Age/obsolescence			
Dependencies & Risks	Possible impact to other Capex items if this category is under-forecasted. Conversely, expenditure may not be prudent or efficient if the Capex item is over-forecasted.			
Sensitivities	N/A			
Assumptions	N/A			

RELIABILITY, SAFETY & ENVIRONMENT (COMBINED)				
Annual **CAPEX**	$3,726,156 (21-23) $5,549,812 (24-28)			
% contribution to overall capex increase	**21%**			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Network automation & sectionalisation	Baseline and enhanced automation programs to increase network visibility & remote switching, laying foundation to transition to an open-access network and supports the future distribution system operator (DSO) role.	Medium	Unable to determine
	Network Reliability	Smart technology initiatives to support & improve network performance, network security & public safety	Medium	Unable to determine

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	The assessment rating is based on the following considerations: It is not evident in the AMP if Electra has done a cost-benefit analysis for the proposed network reliability & automation initiatives.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg does not find the information in the AMP that allows it to assess how the expenditure of the programs is determined.			
Trigger point	Network Performance & Reliability			
Dependencies & Risks	Failures of protection & control systems have significant implication on supply reliability and safety.			
Sensitivities	IAEngg has not been provided with details of cost-benefit or sensitivity analysis of the proposed program of work and hence not in a position to assess the sensitivities of the expenditure to outturn differences.			
Assumptions	Not stated in the AMP			

7.20.6 Opex category assessment – Top Contributors

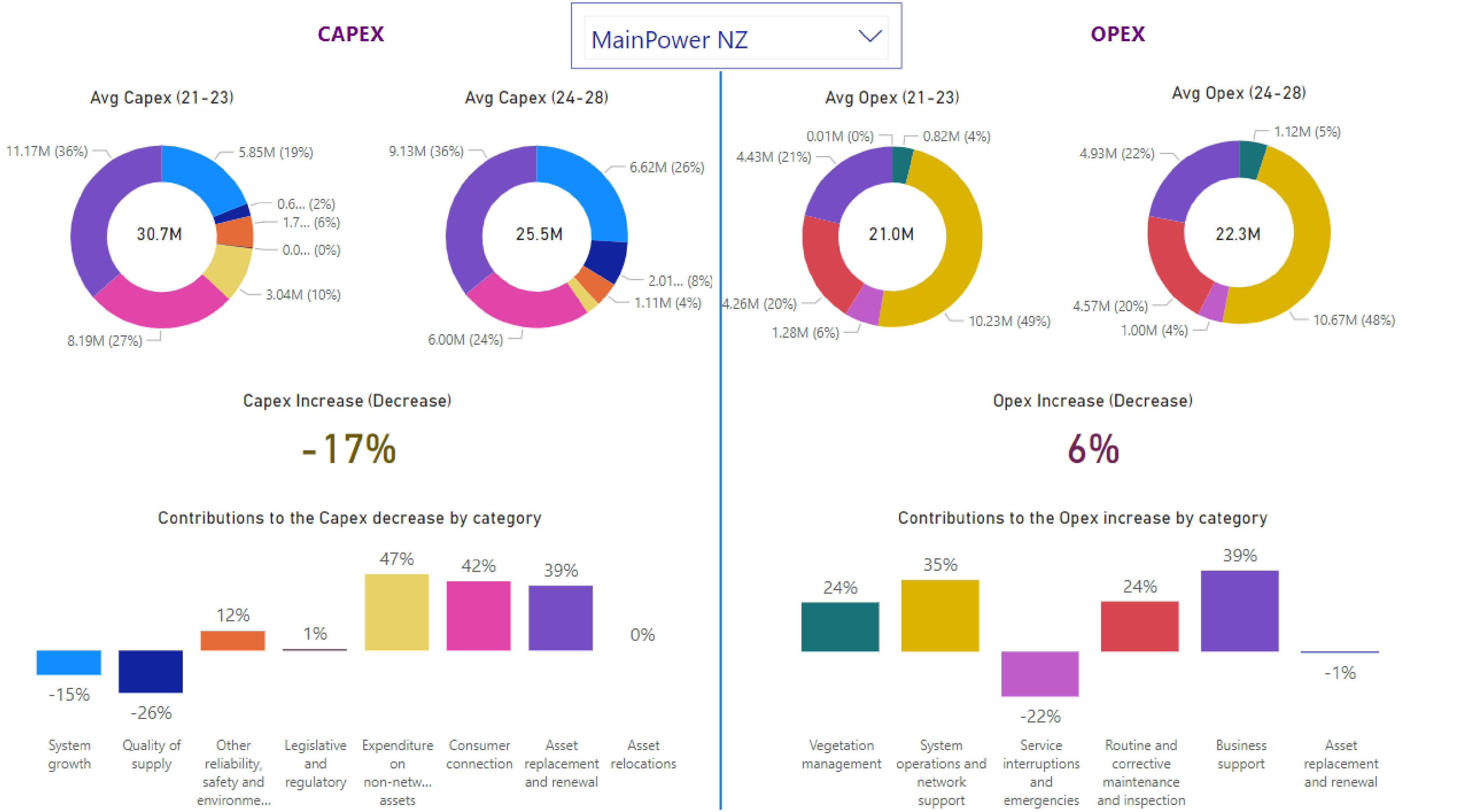
SYSTEM OPERATIONS & NETWORK SUPPORT					
Annual OPEX	$4,991,918 (21-23) $8,638,002 (24-28)				
% contribution to overall opex increase	68%				
Growth drivers	**Driver**	**IAEngg Comments**		**Certainty**	**Reasonableness**
	Unidentified	Information not available in the Asset Management Plan		Unable to determine	Unable to determine
Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**	
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.				
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**	
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.				
Trigger point	There is no trigger point for this expenditure				
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.				
Sensitivities	N/A				
Assumptions	None stated in the AMP				

<table>
<tr><th colspan="7">BUSINESS SUPPORT</th></tr>
<tr><td>Annual OPEX</td><td colspan="6">$5,164,793 (21-23) $5,664,996 (24-28)</td></tr>
<tr><td>% contribution to overall opex increase</td><td colspan="6">9%</td></tr>
<tr><td rowspan="2">sGrowth drivers</td><td colspan="2">Driver</td><td colspan="2">IAEngg Comments</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td colspan="2">New systems & Studies commissioned</td><td colspan="2">Roll out of new systems such as the EAM, ISO 55001 and Huringa Pūngao energy transformation initiatives are the cost drivers of this OPEX category</td><td>High</td><td>Unable to determine</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td colspan="2">Insufficient Information for Analysis</td><td>Assessment rating</td><td colspan="2">Insufficient Information for Analysis</td></tr>
<tr><td colspan="6">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td rowspan="2">Expenditure forecasting approach</td><td>Accuracy</td><td colspan="2">Insufficient Information for Analysis</td><td>Assessment rating</td><td colspan="2">Insufficient Information for Analysis</td></tr>
<tr><td colspan="6">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td>Trigger point</td><td colspan="6">There is no trigger point for this expenditure</td></tr>
<tr><td>Dependencies & Risks</td><td colspan="6">Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.</td></tr>
<tr><td>Sensitivities</td><td colspan="6">N/A</td></tr>
<tr><td>Assumptions</td><td colspan="6">None stated in the AMP</td></tr>
</table>

ASSET REPLACEMENT AND RENEWAL				
Annual **OPEX**	$652,889 (21-23) $1,323,277 (24-28)			
% contribution to overall opex increase	13%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Capacity reinforcement & Reactive Maintenance	Electra is forecasting an increase in operational costs especially on the Low voltage network due to system growth as a result of decarbonisation	Medium	Unable to determine
Forecasting Inputs & modelling	**Accuracy** — **Insufficient Information for Analysis**	**Assessment rating** — **Insufficient Information for Analysis**		
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy** — **Insufficient Information for Analysis**	**Assessment rating** — **Insufficient Information for Analysis**		
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	Results of Asset Inspection Program			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of vegetation management) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	Expenditure may not be prudent or efficient if over-forecast.			
Assumptions	No Assumptions stated in the AMP			

7.21 Mainpower NZ LTD

7.21.1 Expenditure Dashboard



7.21.2 Business overview (2022 data)

	Parameter	Value
	Customers	**43,131**
	Peak demand	**124 MW**
	Electricity volume	**624 GWh**
	Line length	**5,170 km**
	Distribution and LV Underground	**1,108 km**
	Distribution and LV Overhead	**4,062 km**
	Current Reliability performance	
	» Total SAIDI	**272.6**
	» Total SAIFI	**2.375**

7.21.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☐	No ☒
LV visibility	Yes ☒	No ☐	Yes ☐	No ☒
Future DSO role/open access network	Yes ☒	No ☐	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.21.4 Summary of Capex and Opex Categories assessed

IAEngg did not undertake further assessment of MainPower NZ Ltd's CAPEX and OPEX forecasts as they were both below the assessment thresholds.

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☐
Asset replacement and renewal	☐
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☐
System operations and network support	☐
Business support	☐

7.21.5 CAPEX category assessment – Top Contributors

GENERAL COMMENTS ON CAPEX	
Annual **CAPEX**	$30,662,351 (21-23) $25,494,270 (24-28)
% overall capex increase / decrease	-17%
	MainPower NZ has forecast virtually no demand growth on the network level this is due to offsetting effect from embedded generation. Mainpower's forecast indicated that many zone substations will be loaded beyond their security class capability at year 10 if high EV growth is included in the forecast. Mainpower has assumed that EV-charging loads will not significantly affect electricity distribution network constraints within the (AMP) planning period. Mainpower stated that its electricity distribution network performance (quality of supply) is unduly affected by defective equipment and planned works and needs improvement. IAEngg's view is that considering the decrease in forecast spent for non-network asset which accounts for almost half of decrease in overall capex (likely to be one-off item) and peak network demand growth is stagnant, a flat overall capex forecast growth is reasonable. Based on the forecast changes for the various stay-in-business capex category, it is consistent with MainPower NZ plan to re-allocate resources to improve quality of supply.

7.21.6 Opex category assessment – Top Contributors

GENERAL COMMENTS ON OPEX		
Annual OPEX	$21,021,894 (21-23)	$22,294,156 (24-28)
% overall opex increase /decrease	6%	

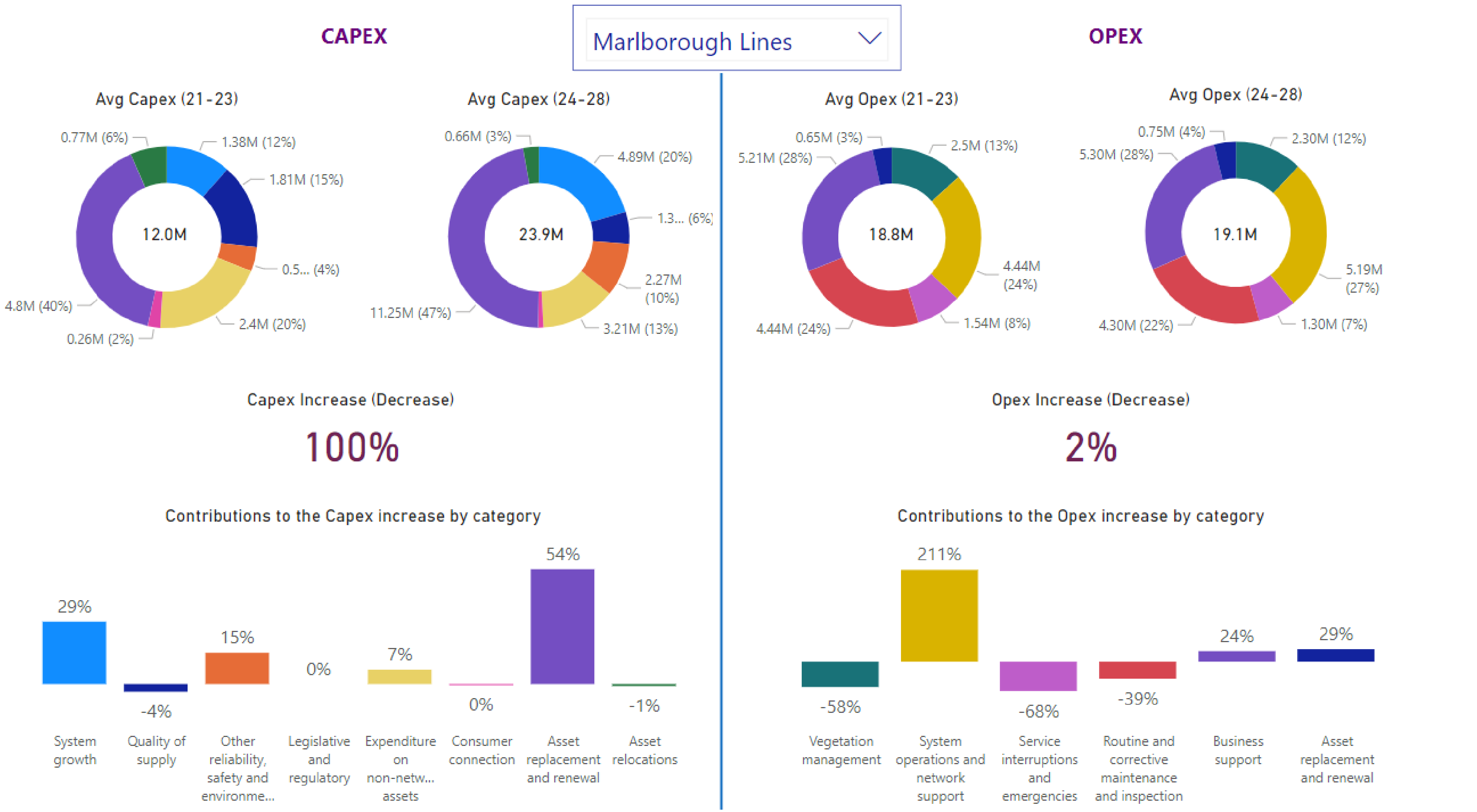
IAEngg was unable to locate System operations & network support and business support sub-categories in the AMP. We noted Mainpower plans to increase tree scoping from 5 yearly to 2 yearly. Accepting there is pressure on costs due to significant changes around Traffic Management regulations and also in the way the Tree Regulations are being applied, real increase in labour costs and additional staff might be needed to assist the business to deal with changes in its operating environment due to decarbonisation of the economy, it is reasonable to expect there will be material cost increases in opex, the 6% increase in overall opex forecast is not unexpected.

Marlborough Lines

Energising Marlborough's Future

7.22 Marlborough Lines Ltd

7.22.1 Expenditure Dashboard



7.22.2 Business overview (2022 data)

	Parameter	Value
	Customers	**26,630**
	Peak demand	**75 MW**
	Electricity volume	**387 GWh**
	Line length	**3,424 km**
	Distribution and LV Underground	**556 km**
	Distribution and LV Overhead	**2,545 km**
	Sub-transmission	**303 km**
	Current Reliability performance	
	» Total SAIDI	**243 minutes**
	» Total SAIFI	**1.93**

7.22.3 Capex and Opex Growth Drivers

Drivers for capex growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☐	No ☒
Future DSO role/open access network	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☐	No ☒	Yes ☐	No ☒
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.22.4 Summary of Capex and Opex Categories assessed

IAEngg did not undertake further assessment of Marborough Lines Ltd's OPEX forecast as it was below the assessment thresholds.

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☒
Asset replacement and renewal	☒
Asset relocations	☐
Reliability, Safety & Environment (combined)	☒
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☐
System operations and network support	☐
Business support	☐

7.22.5 CAPEX category assessment – Top Contributors

SYSTEM GROWTH				
Annual **CAPEX**	$1,383,906 (21-23) $4,889,886 (24-28)			
% contribution to overall capex increase	**29%**			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Increase in economic activities (organic growth)	MLL's sole GXP indicated organic growth rate to be approximately 0.75% p.a.	High	Reasonable
	Expansion plans of large electricity users e.g. KiwiRail	MLL expected a step change in 2025 caused by the electrification of the KiwiRail ferries. Without project details, IAEngg was unable to assess whether part or all of the new zone substation and major 33kV network upgrades/re-arrangement works associated with the electrification of KiwiRail's ferry should be classified as Consumer Connection.	High (customer requirements) Medium (timing)	Unable to determine

	EV – light transport	MLL's high-level EV and/or PV hosting capacity assessment in late 2021 showed limited capacity available in some parts of the LV network. MLL expected that EV numbers in Marlborough will increase at such a rate that it will be able to respond to meet the demand.	Medium	Unable to determine (due to lack of relevant data)
	Process heat	MLL's industrial consumer survey in May 2021 indicated that there is significant fossil fuel heating and other load in Marlborough, primarily wineries, food processing and hospital load. MLL will continue to engage with its consumers with high thermal loads to ascertain timing of changes and details as part of its planning.	Low	Unable to determine
	Small gas conversion	Insufficient information in the AMP	Low	Unable to determine
	DER/DSR	MLL receives approximately 200 applications per year for the connection of new, or alteration of existing, small-scale distributed generation (SSDG). There are eight installations with generation embedded into MLL's network at 11kV or above. The potential wind resource in the Marlborough Sounds and on the East Coast is significant.	Medium	Unable to determine
	Open access network/DSO	IAEngg did not come across any discussion of this subject.	Low	Unable to determine

Demand forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**N/A**
	IAEngg did not come across any detail discussion of this subject in the AMP.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**N/A**
	IAEngg did not come across the information needed in the AMP to form an option of the accuracy or reasonableness.			
Trigger point	Forecasting inputs with low certainty (EV – light, process heat conversion, small gas conversion) are very sensitive to government policies and incentives. It should also be noted that process heat may not all be converted from gas into electricity as there exists other possible substitution fuels such as wood pellets and biofuels.			
Dependencies & Risks	With the current global crisis, all demand forecast, in particular medium and long term forecast, have a much higher degree of uncertainties. The risks are overbuilding infrastructure that may not be required, or underbuilding leading to capacity constraints and impact on supply reliability.			
Sensitivities	IAEngg did not come across any detail discussion of this subject in the AMP.			
Assumptions	Some of the significant assumptions made by MLL include that within the AMP planning period, 1) no major disasters; 2) no inflation shock; 3) no (unforeseen) significant changes to load forecasts; 4) no significant changes to regulatory regime and requirements. IAEngg considered these are reasonable assumptions given MLL is a relatively small community owned EDB and don't have scale of economy to sustain a full capability work force..			

ASSET REPLACEMENT AND RENEWAL				
Annual CAPEX	$10,113,709 (21-23) $11,246,101 (24-28)			
% contribution to overall capex increase	54%			
Growth drivers				
Forecasting Inputs & modelling	Accuracy	Insufficient Information for Analysis	Assessment Rating	Insufficient Information for Analysis
	Marborough Lines' AMP included a fleet management section which provides a good summary of key MLL asset classes, their populations, condition and specifics of their preventive maintenance regimes and renewal. MLL has increase its network capex forecast significantly from its recent historical levels of approximately $10m to $12m per annum, to above $20m per annum. MLL stated the increase reflects the major customer driven growth projects and in the later years, MLL's intention on focusing more expenditure towards distribution asset replacement and renewal as outlined in the AMP. The more significant increases in RY2024 through to RY2028 reflect the material "one off" projects for 33kV network improvements, the proposed Waitohi/Picton zone substation and the Kaituna zone substation. The summary is qualitative in nature and IAEngg did not come across detailed quantitative information to enable it to assess the accuracy or reasonableness of the forecast.			
Expenditure forecasting approach	IAEngg did not come across detailed quantitative information to enable it to assess the accuracy or reasonableness of the forecast.			
Trigger point	N/A			
Dependencies & Risks	N/A			
Sensitivities	N/A			
Assumptions	N/A			

RELIABILITY, SAFETY & ENVIRONMENT (COMBINED)				
Annual **CAPEX**	$517,702 (21-23)	$2,272,838 (24-28)		
% contribution to overall capex increase	15%			
Growth drivers				
Forecasting Inputs & modelling	Accuracy	Insufficient Information for Analysis	Assessment rating	Insufficient Information for Analysis
Expenditure forecasting approach	From 2020 MLL has been working on a major programme to enhance the reliability, security, and safety of its sub-transmission 33kV core network around the Blenheim area. Seven of MLL's zone substations are involved in this work plus a number of 33kV lines. MLL is moving these substations from operating in a traditional radial network to operating as a meshed network. Some line sections are removed while new line sections are constructed. Protection systems are upgraded to those of mesh arrangement. This initiative is anticipated to complete by 2025. As stated in Asset Replacement Renewal assessment above, the significant increases in capex from RY2024 through to RY2028 reflect the material "one off" projects for 33kV network improvements, the proposed Waitohi/Picton zone substation and the Kaituna zone substation. IAEngg did not find the information in the AMP that allows it to assess the accuracy or approach. We also did not find the information on the cost benefit of investing to re-arrange its sub-transmission network from radial to a meshed network and willingness of customers to pay for the resulting reliability improvements.			
Trigger point	N/A			
Dependencies & Risks	N/A			
Sensitivities	N/A			
Assumptions	N/A			

7.22.6 Opex category assessment – Top Contributors

GENERAL COMMENTS ON OPEX		
Annual **OPEX**	$18,785,104 (21-23)	$19,140,000 (24-28)
% overall opex increase /decrease	2%	

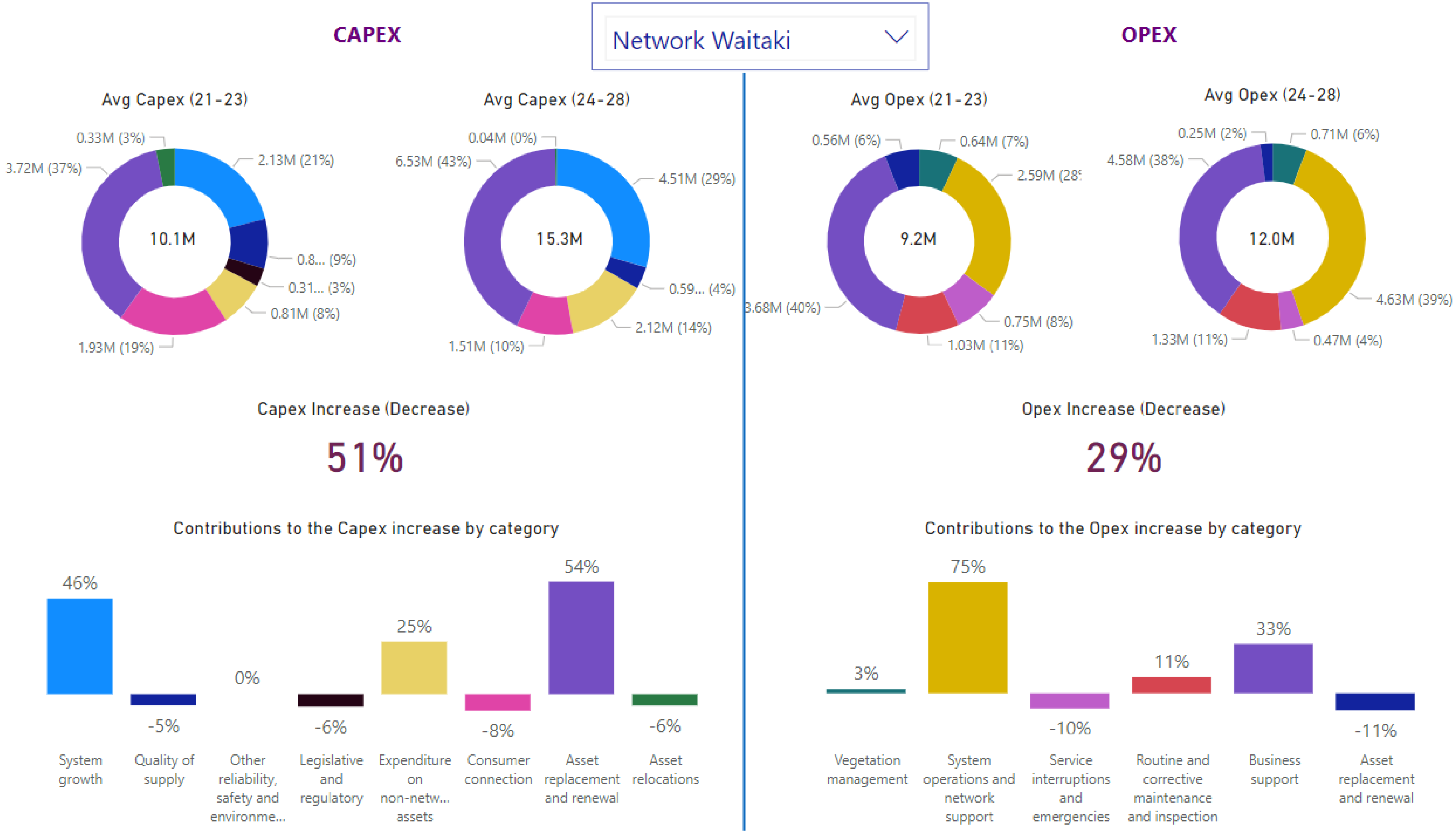
Marlborough Lines' forecast opex requirements have been based on recent levels of historical expenditure and current information on assets. Whilst the increase in overall annual Opex for FY24 – FY28 (compared to FY21 – FY23) is marginal (2%), Marlborough Lines have forecast significant increase in asset replacement & renewal (16%) and system operations and network support (17%). These forecast increases are offset by forecast decrease in vegetation management (-8%) and service interruptions & emergencies (-16%). IAEngg's view is that there will cost increased due to due to significant changes around Traffic Management regulations and also in the way the Tree Regulations are being applied and real increase in labour & material costs. IAEngg did not come across the necessary information it needs to assess the reasonableness of the increase.

Network Waitaki

Powering North Otago

7.23 Network Waitaki

7.23.1 Expenditure Dashboard



7.23.2 Business overview (2022 data)

	Parameter	Value
	Customers	**13,201**
	Peak demand	**61MW**
	Electricity volume	**238GWh**
	Line length	**1,903km**
	Distribution and LV Underground	**192km**
	Distribution and LV Overhead	**1,711km**
	Current Reliability performance	
	» Total SAIDI	**166.9**
	» Total SAIFI	**1.960**

7.23.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – commercial EV charging	Yes ☐	No ☒	Yes ☐	No ☒
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☒	No ☐
Future DSO role/open access network	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.23.4 Summary of Capex and Opex Categories assessed

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☒
Asset replacement and renewal	☒
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☒

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☒
Asset replacement and renewal	☐
System operations and network support	☒
Business support	☒

7.23.5 CAPEX category assessment – Top Contributors

SYSTEM GROWTH				
Annual CAPEX	$2,126,979(21-23) $4,511,776(24-28)			
% contribution to overall capex increase	46%			
Growth drivers	Driver	IAEngg Comments	Certainty	Reasonableness
	Population Growth	Based on district council growth scenario and historic average growth rate in the network	Medium	Reasonable
	Electric Vehicles	Electric vehicle uptake has been aligned with published industry projections	Medium	Reasonable
	Distributed Generation (DG) (negative growth factor)	DG growth scenario are aligned with scenarios on Boston Consulting Group decarbonisation roadmap	Low	Unable to determine

	Energy Efficiency (negative growth factor)	Network Waitaki has carried out analysis of energy efficiency and applied the negative growth as an offset to the demand growth	High	Reasonable
	Heat Pumps	Wood burners seems to dominate domestic heating, Waitaki area is not subject to clean air rules, as per Network Waitaki demand growth is this area will be minimal	Low	Unable to determine
	Process Heat Decarbonisation	Process heat conversion is looked at as the dominant driver for growth during the first five years of the planning period, forecast is based on Transpower & EECA study & pipeline of committed projects	Medium	Reasonable
Demand forecasting Inputs & modelling	**Accuracy**	**Reasonable**	**Assessment rating**	**Good**
	The assessment rating is based on the following considerations: » Network Waitaki demand forecasting is based on historic feeder loadings that are extrapolated using Local Council planning documents for each area/district. » Network Waitaki has used Long Term Plan 2021-2031 documents of Local Councils for forward projections in demand. The district population growth is translated to network feeder growth. » Identified industrial spot load information and planned load transfers are included as inputs in the network feeder growth.			

	» A bottom-up estimate from the network feeder level all the way to GXP level has been developed by consolidating the forecasts at different levels and allowing for diversity across the elements in the forecast development process. » Scenario assessment has been used to deal with uncertainties of forecasting inputs, The use of S-curve for uptake of new growth areas is a sound approach. » Process heat conversion has the highest impact on network maximum demand during the first half of the planning period. » For contribution of EV to peak demand, the use of 0.6kVA – 1.5 kVA as contribution to household ADMD appears to be reasonable. The assumption, about EV penetration reaching 9% by 2032 appears to be reasonable compared to current EV penetration. » Network Waitaki has taken a combination of top-down & bottom-up approach to come up with overall future network demand.
Expenditure forecasting approach	**Accuracy** — **Insufficient Information for Analysis** — **Assessment rating** — **Insufficient Information for Analysis** The assessment rating is based on the following considerations: » Prior to any investment in any infrastructure Network Waitaki evaluates non-network solutions available like load control, demand-side management solutions, use of emerging technologies & network reconfiguration

	» To meet demand & security requirements based on the identified constraints a network project list is developed and alternative options are assessed prior to finalising a proposed solution and the recommended solution is estimated & included in the expenditure forecasts. » IAEngg cannot comment on the appropriateness of the costs used without examining the underlying data or how they compare to other EDBs
Trigger point	Forecasting inputs with low certainty (EV – light & process heat conversion are very sensitive to government policies and incentives. It should also be noted that process heat may not all be converted from gas into electricity as there exists other possible substitution fuels such as wood pellets and biofuels.
Dependencies & Risks	The risks are overbuilding infrastructure that may not be required, or underbuilding leading to capacity constraints and impact on supply reliability.
Sensitivities	It is not clear if Network Waitaki has conducted sensitivity analysis on the assumptions used in the expected growth scenario and address the sensitivity analysis results in its expenditure forecast.

Assumptions	
Assumptions	» The Electricity Act 1992 requires that uneconomic lines are continued to be operated – No change to this existing legislative and regulatory requirement » Land use development will happen at a steady gradual rate, and that this rate will not significantly deviate from past trends » Growth based projects will continue to be funded from the combination of contributions from developers and additional income from increased consumer demand, in line with the Capital Contributions Policy. » There will be no significant advances in the core technology of electricity distribution that could render the existing network obsolete » Distributed generation will continue to develop with no significant changes to the rates of uptake experienced to date. » Frequency of storms will be at double historical rates

ASSET REPLACEMENT AND RENEWAL				
Annual **CAPEX**	$3,721,006 (21-23)	$6,528,483 (24-28)		
% contribution to overall capex increase	54%			
Growth drivers	**Driver**	**Comment**	**Certainty**	**Reasonableness**
	Asset Health	Focus is on maintaining appropriate levels of asset health based on condition, age & several other factors.	High	Reasonable
	Load Increase	Localised load growth leading to network assets being replaced for capacity or voltage support prior to practical end of life of assets	High	Reasonable
Forecasting Inputs & modelling	**Accuracy**	**Reasonable**	**Assessment Rating**	**Good**
	The assessment rating is based on the following considerations: Network Waitaki has adapted a health index based method which uses multiple factors to determine the condition of the asset, where condition of the asset is not available asset age acts as a replacement trigger. The health index also correlates to the Probability of Failure of each individual asset. Network Waitaki are currently working on improving the gaps in asset data quality to enhance data accuracy. The above approach is what Network Waitaki has taken for planning & prioritising asset renewal programme.			

	Accuracy	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
Expenditure forecasting approach	» Network Waitaki's expenditure forecasting for Asset replacement and renewal is based on historical replacement costs and projected replacement volumes » IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	Asset Health Condition & Load increases immediate safety concern & deteriorating reliability performance			
Dependencies & Risks	Rapid increase in the rate of failure of a certain asset fleet due to external weather events			
Sensitivities	IAEngg has not been provided with details of cost-benefit analysis of the proposed program of work and hence not in a position to assess the sensitivities of the expenditure.			
Assumptions	» The Electricity Act 1992 requires that uneconomic lines are continued to be operated – No change to this existing legislative and regulatory requirement » There will be no significant advances in the core technology of electricity distribution that could render the existing network obsolete » Frequency of storms will be at double historical rates.			

NON-NETWORK				
Annual **CAPEX**	$807,056 (21-23)	$2,117,800 (24-28)		
% contribution to overall capex increase	25%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Information Technology Expenditure	Capital expenditure is focused on IT hardware renewal, replacing ageing software and enhancing business operations	High	Unable to determine
	Buildings & Property, Vehicles, Tools, plant and machinery	Redevelopment of yard, construction of operations building & control room, Purchase of Vehicles, plant and equipment are accounted in the CAPEX expenditure	High	Unable to determine

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	» IAEngg has no access to granular data to determine accuracy or to assess.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	» Replace assets at the end of their economic life or if they are considered to be obsolete due to a change or strategic initiative » IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	Business Strategy/Asset Condition/Asset Age/obsolescence			
Dependencies & Risks	Possible impact to other Capex items if this category is under-forecasted. Conversely, expenditure may not be prudent or efficient if the Capex item is over-forecasted.			
Sensitivities	N/A			
Assumptions	None stated in the AMP			

7.23.6 Opex category assessment – Top Contributors

SYSTEM OPERATIONS & NETWORK SUPPORT						
Annual OPEX	$2,593,525 (21-23)	$4,625,444 (24-28)				
% contribution to overall opex increase	75%					
Growth drivers	Driver	IAEngg Comments			Certainty	Reasonableness
	Unidentified	Information not available in the Asset Management Plan			Unable to determine	Unable to determine
Forecasting Inputs & modelling	Accuracy	Insufficient Information for Analysis	Assessment rating	Insufficient Information for Analysis		
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.					
Expenditure forecasting approach	Accuracy	Insufficient Information for Analysis	Assessment rating	Insufficient Information for Analysis		
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.					
Trigger point	There is no trigger point for this expenditure					
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.					
Sensitivities	N/A					
Assumptions	None stated in the AMP					

<table>
<tr><th colspan="5">BUSINESS SUPPORT</th></tr>
<tr><td>Annual OPEX</td><td colspan="4">$3,680,512(21-23) $4,584,476 (24-28)</td></tr>
<tr><td>% contribution to overall opex increase</td><td colspan="4">33%</td></tr>
<tr><td rowspan="2">Growth drivers</td><td>Driver</td><td>IAEngg Comments</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td>Unidentified</td><td>Information not available in the Asset Management Plan</td><td>Unable to determine</td><td>Unable to determine</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td rowspan="2">Expenditure forecasting approach</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td>Trigger point</td><td colspan="4">There is no trigger point for this expenditure</td></tr>
<tr><td>Dependencies & Risks</td><td colspan="4">Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.</td></tr>
<tr><td>Sensitivities</td><td colspan="4">N/A</td></tr>
<tr><td>Assumptions</td><td colspan="4">None stated in the AMP</td></tr>
</table>

ROUTINE & CORRECTIVE MAINTENANCE & INSPECTION

Annual **OPEX**	$1,032,046 (21-23)		$1,327,400 (24-28)			
% contribution to overall opex increase	**11%**					
Growth drivers	**Driver**	**IAEngg Comments**			**Certainty**	**Reasonableness**
	Increase in network scale	Increased network inspection & maintenance as the electricity network grows.			High	Unable to determine
Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**		**Assessment rating**	**Insufficient Information for Analysis**	
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.					
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**		**Assessment rating**	**Insufficient Information for Analysis**	
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.					
Trigger point	Asset Inspection programmes					
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of vegetation management) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.					
Sensitivities	Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.					
Assumptions	None stated in the AMP					

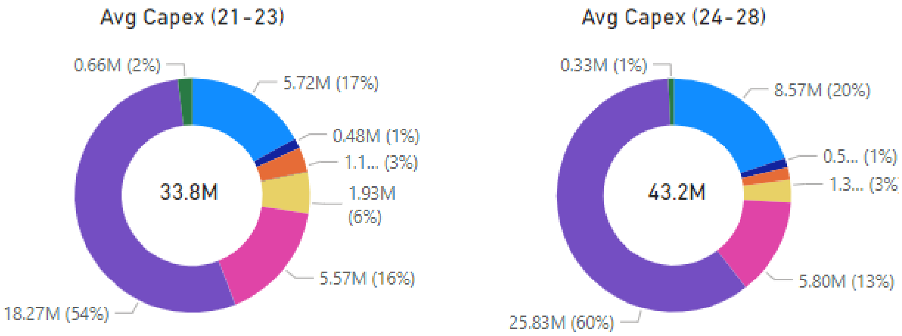
Northpower

7.24 Northpower

7.24.1 Expenditure Dashboard

Northpower

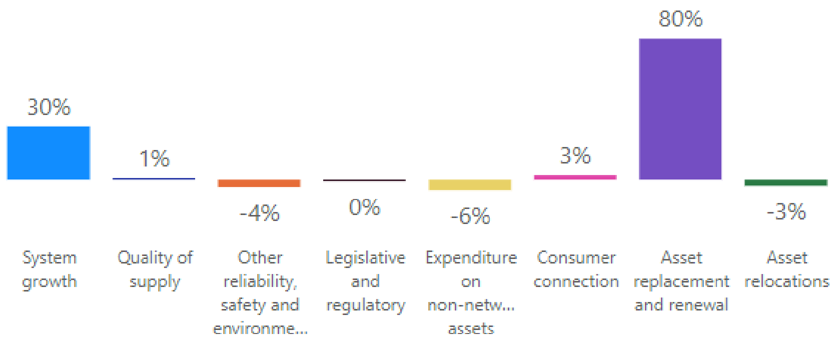
CAPEX



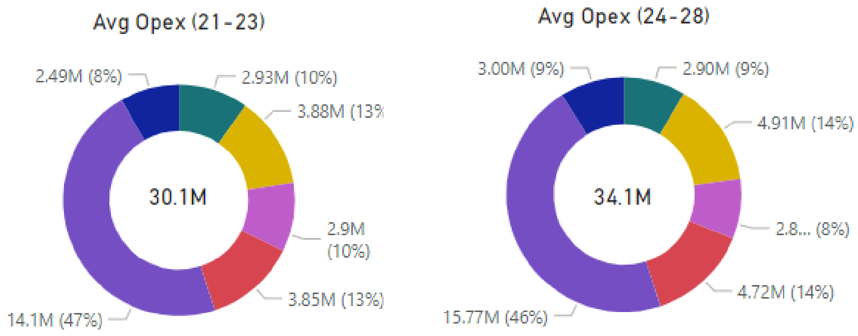
Capex Increase (Decrease)

28%

Contributions to the Capex increase by category



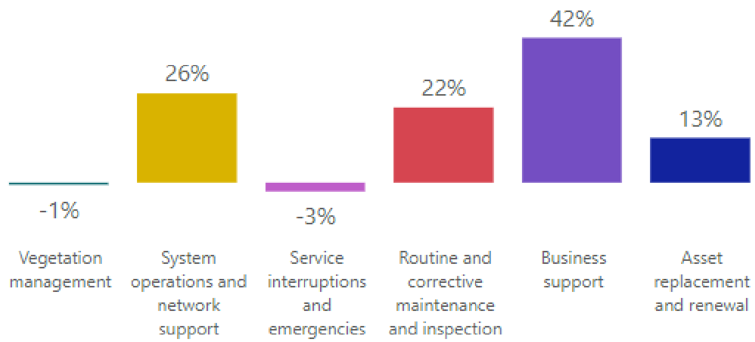
OPEX



Opex Increase (Decrease)

13%

Contributions to the Opex increase by category



7.24.2 Business overview (2022 data)

	Parameter	Value
	Customers	**62,040**
	Peak demand	**182 MW**
	Electricity volume	**1,042 GWh**
	Line length	**6,152 km**
	Distribution and LV Underground	**1,139 km**
	Distribution and LV Overhead	**5,013 km**
	Current Reliability performance	
	» Total SAIDI	**278.6**
	» Total SAIFI	**4.341**

7.24.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒		Yes ☒	
DER connection growth	Yes ☒			No ☒
Demand growth – commercial EV charging	Yes ☒		Yes ☒	
Demand growth – residential EV charging	Yes ☒		Yes ☒	
Demand growth – process heat conversion	Yes ☒		Yes ☒	
Demand growth – residential gas to electricity conversion	Yes ☒			No ☒
Climate resilience	Yes ☒		Yes ☒	
Ageing assets	Yes ☒		Yes ☒	
LV visibility	Yes ☒		Yes ☒	
Future DSO role/open access network		No ☒		No ☒
New regulations		No ☒		No ☒
Emerging regulations		No ☒		No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.24.4 Summary of Capex and Opex Categories assessed

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☒
Asset replacement and renewal	☒
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☒
Asset replacement and renewal	☐
System operations and network support	☒
Business support	☒

7.24.5 CAPEX category assessment – Top Contributors

SYSTEM GROWTH				
Annual CAPEX	$5,720,073 (21-23) $8,572,248 (24-28)			
% contribution to overall capex increase	30%			
	Driver	IAEngg Comments	Certainty	Reasonableness
Growth drivers	Accuracy	Insufficient Information for Analysis	Assessment rating	Insufficient Information for Analysis
	Increase in economic activities (organic growth) Expansion plans of large electricity users EV – light transport Process heat Small gas conversion DER/DSR Open access network/DSO	Northpower AMP included a general discussion of the potential impacts these growth drivers would have on its operation and its responses. Northpower did not provide any detail analysis of each of the growth drivers and specific investments provisions.	Unable to determine	Unable to determine

Demand forecasting Inputs & modelling	**Accuracy**	**Medium**	**Assessment rating**	**Insufficient Information for Analysis**
	Northpower utilised a bottom up build process to develop its peak demand forecast starting at HV feeder level, to zone substation then sub-transmission level. An underlying MD growth rate is developed based on historical trends, local Council projections (population and dwelling). The underlying peak demand is adjusted by known step load changes and estimate of DER contributions. IAEngg did not find any mention of development of an alternate top down forecast at the sub-transmission level to validate / reconcile with bottom up forecast.			

Expenditure forecasting approach	**Accuracy**	**Medium**	**Assessment rating**	**Insufficient Information for Analysis**
	Northpower approach to expenditure forecast is consistent with industry practice which typically involves 1) forecast demand; 2) Identify network needs; 3) Option analysis; and 4) Project definition. Northpower forecast a 50% increase in annual system growth capex for FY24-28 compared FY21-23 as part of its plan to augment the capacity of the network supplying the Northland region (Kensington substation upgrade and constructing new zone substation at Mangawhai) to meet the forecast load growth. Based on limited information available from the AMP, IAEngg's view is that investment is required although we are unable to assess whether the proposed option is the most economic option to minimise cost to customers in the long term.			
Trigger point	N/A			
Dependencies & Risks	N/A			
Sensitivities	N/A			
Assumptions	Northpower's relevant assumption that relationships between growth drivers (e.g. ICP growth) and future demand will continue to apply in the short term and that in the medium term the increasing adoption of new technologies may alter these relationships. This is a reasonable assumption albeit at a high level. Without knowing the details of this assumption, IAEngg is unable to assess the validity of all the different facets of this relationship.			

<table>
<tr><th colspan="5">ASSET REPLACEMENT & RENEWAL</th></tr>
<tr><td>Annual
CAPEX</td><td colspan="4">$18,267,786 (21-23) $25,831,780 (24-28)</td></tr>
<tr><td>% contribution to overall capex increase</td><td colspan="4">80%</td></tr>
<tr><td rowspan="3">Growth drivers</td><td>Driver</td><td>IAEngg Comments</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td>Overhead lines</td><td rowspan="2">Northpower’s AMP included a reasonable detailed asset data and explanation of their approach to maintaining and renewing their electricity network assets portfolios throughout their lifecycle stages. IAEngg understands that Northpower have started a transition towards condition-based asset management, which should lead to more optimal timing for assets renewal.</td><td rowspan="2">High</td><td rowspan="2">Reasonable</td></tr>
<tr><td>Zone substations</td></tr>
</table>

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Good**
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Good**
	IAEngg has not been provided with the volumes and unit rates to confirm the reasonableness and accuracy of the expenditure increase			
sTrigger point	Optimal timing of replacement / refurbishment projects subject to outcome of condition assessments.			
Dependencies & Risks	N/A			
Sensitivities	N/A			
Assumptions	Primarily age based asset management			

7.24.6 Opex category assessment – Top Contributors

	SYSTEM OPERATIONS & NETWORK SUPPORT				BUSINESS SUPPORT
Annual OPEX	$3,878,462 (21-23) $4,907,488 (24-28)				$14,098,804 (21-23) $15,767,994 (24-28)
% contribution to overall opex increase	26%				42%
Growth drivers	**Driver**	**IAEngg Comments**		**Certainty**	**Reasonableness**
	Salary and wage growth Increased contracting costs Migration to cloud service Increase in use of flexibility service	Northpower has combined Business support and System operations & network support into a category called Non-network opex. Northpower have forecast a modest uplift into FY24, reflecting the need for increased capability to manage the network and meet the challenges to deliver a renewable future as well as a resilient infrastructure. Northpower expects that these levels of expenditure will largely continue for the remainder of the period. IAEngg did not find detail justification for the step change in this opex category especially with System Operations & Network		High	Insufficient Information for Analysis

	Increase in network scale Increase in communication costs Increase in research and development, or pilot programmes, which are heavier on operating expenditure	Support which has increased by 27% when compared to FY21-FY23. Otherwise, accepting there is pressure on these costs due to significant changes around Traffic Management regulations and also in the way the Tree Regulations are being applied, real increase in labour costs and additional staff might be needed to assist the business to deal with changes in its operating environment due to decarbonisation of the economy, it is reasonable to expect there will be material cost increases in these opex categories. IAEngg did not come across the necessary information it needs to assess the reasonableness of the increase.				
Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**		**Assessment rating**	**Insufficient Information for Analysis**	
	IAEngg has no access to other granular data which allows IAEngg to determine accuracy or approach.					
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**		**Assessment rating**	**Insufficient Information for Analysis**	
	IAEngg has no access to other granular data which allows IAEngg to determine accuracy or approach.					
Trigger point	N/A					
Dependencies & Risks	N/A					
Sensitivities	N/A					
Assumptions	N/A					

ROUTINE & CORRECTIVE MAINTENANCE & INSPECTION

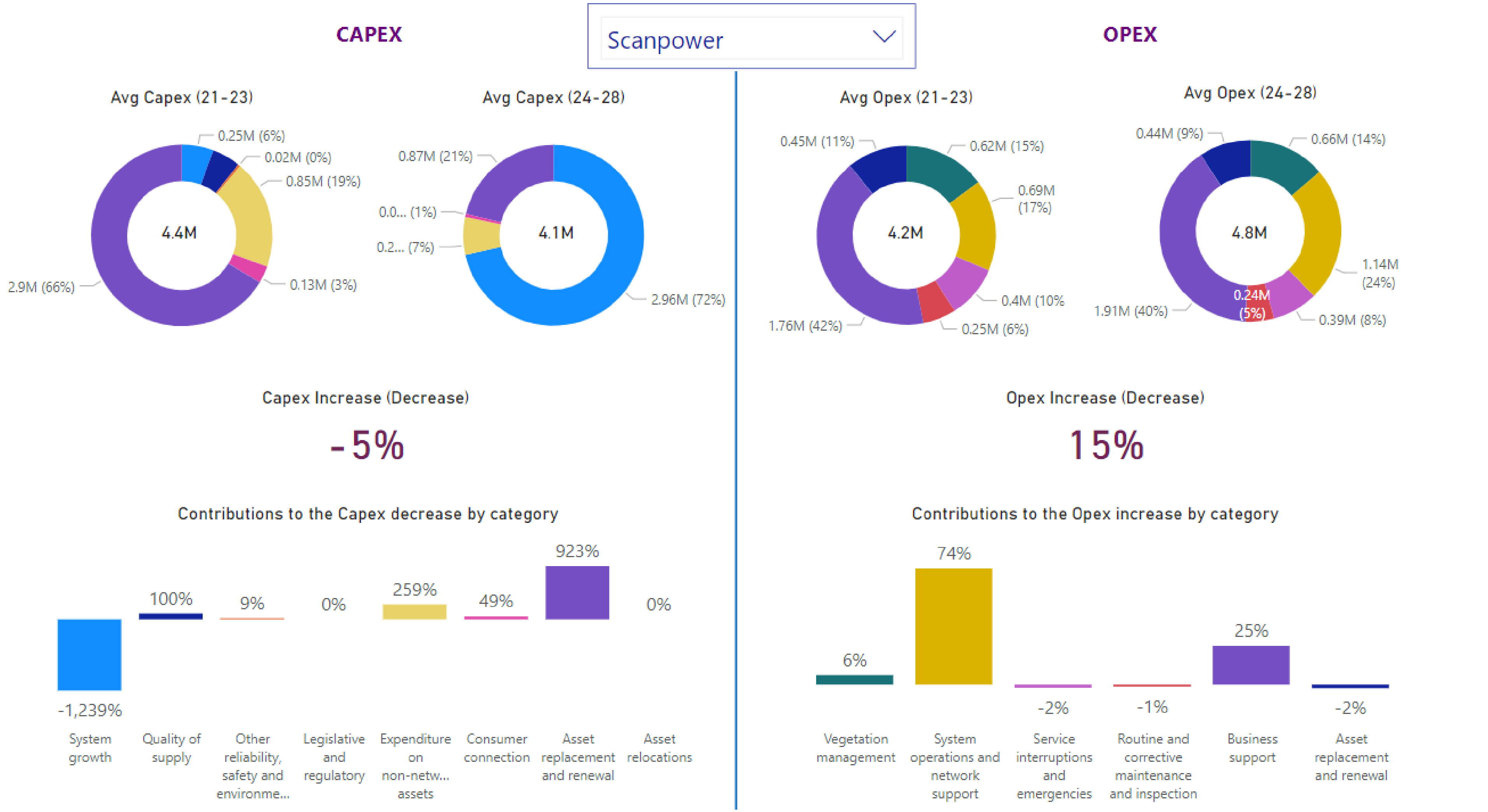
Annual **OPEX**	$3,851,402 (21-23) $4,716,918 (24-28)			
% contribution to overall opex increase	**22%**			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Overhead conductors	Of this portfolio-specific spend, the largest proportion is in overhead lines, making up approximately 31% of the portfolio maintenance. This is consistent with Northpower's (capex) plan to invest significantly more in asset renewal, the largest proportion (62%) of is in the overhead lines portfolio. The average age of Northpower's conductor fleet is 38 years, with sub-transmission, distribution, and LV conductors at 52, 36 and 39 years respectively. Northpower expect to replace 12% of conductor lines over the next 10 years. The expected replacements mainly comprise copper and ACSR type conductors that have reached their expected end of life.	High	Reasonable

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data such as volumes and unit rates which allows IAEngg to determine accuracy or approach.			
Trigger point	N/A			
Dependencies & Risks	N/A			
Sensitivities	N/A			
Assumptions	N/A			

SCANPOWER

7.25 Scanpower

7.25.1 Expenditure Dashboard



7.25.2 Business overview (2022 data)

Parameter	Value
Customers	6731
Peak demand	16MW
Electricity volume	77GWh
Line length	1049km
Distribution and LV Underground	97km
Distribution and LV Overhead	952km
Current Reliability performance	
» Total SAIDI	177.4
» Total SAIFI	0.900

7.25.3 Capex and Opex Growth Drivers

Drivers for capex growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒		Yes ☒	
DER connection growth		No ☒		No ☒
Demand growth – commercial EV charging	Yes ☒		Yes ☒	
Demand growth – residential EV charging	Yes ☒		Yes ☒	
Demand growth – process heat conversion	Yes ☒		Yes ☒	
Demand growth – residential gas to electricity conversion	Yes ☒		Yes ☒	
Climate resilience	Yes ☒		Yes ☒	
Ageing assets	Yes ☒		Yes ☒	
LV visibility		No ☒	Yes ☒	No ☒
Future DSO role/open access network		No ☒		No ☒
New regulations		No ☒		No ☒
Emerging regulations		No ☒		No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☐	No ☒	Yes ☐	No ☒
Climate resilience	Yes ☐	No ☒	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.25.4 Summary of Capex and Opex Categories assessed

IAEngg did not undertake further assessment of Scanpower CAPEX forecasts as it was below the assessment thresholds.

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☐
Asset replacement and renewal	☐
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☐
System operations and network support	☒
Business support	☒

7.25.5 CAPEX category assessment – Top Contributors

GENERAL COMMENTS ON CAPEX		
Annual **CAPEX**	$4,360,476 (21-23)	$4,141,394 (24-28)
% overall capex increase / decrease	-5%	
	Scanpower network is the smallest in New Zealand in physical term and operates predominantly in rural area. Over the past thirteen years, electricity consumption on the network has declined by ~15%. Scanpower as part of network planning has completed scenario analysis to determine future loading and to identify network constraints, Scanpower is foreseeing a rapid uptake of electric vehicles & step load increases due to process heat conversion over the next five to ten years. Scanpower CAPEX spend proportion based on 21-23 to 24-28 average is relatively high on System growth area, Scanpower is planning on building a new 33kV Sub-transmission system and is forecasting to spend approximately $23 million over 8 years on this project. This is to cater for the forecasted load growth resulting from decarbonisation & connection growth.	

7.25.6 Opex category assessment – Top Contributors

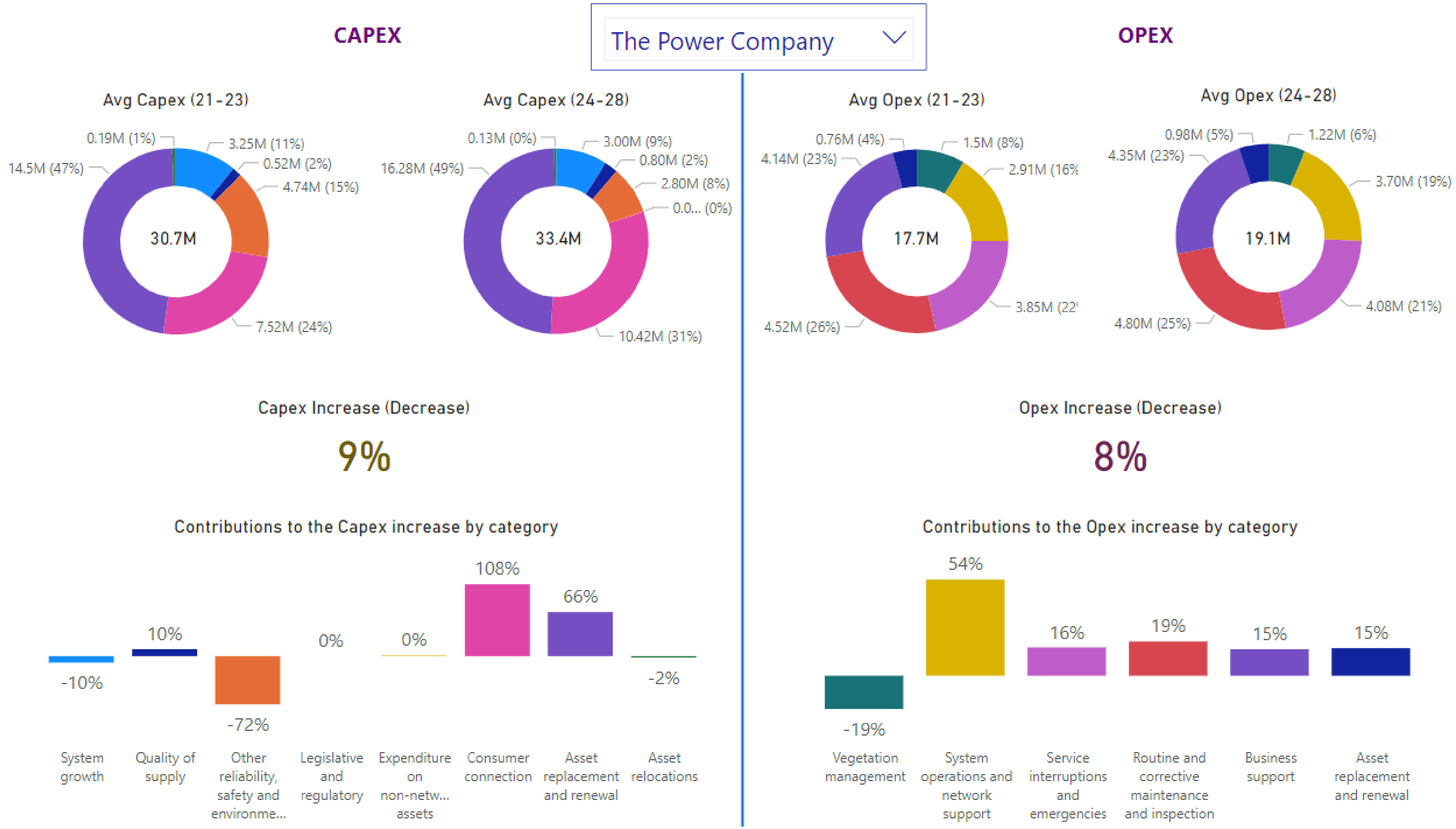
SYSTEM OPERATIONS & NETWORK SUPPORT				
Annual OPEX	$688,201 (21-23)	$1,142,266 (24-28)		
% contribution to overall opex increase	74%			
Growth drivers	Driver	IAEngg Comments	Certainty	Reasonableness
	Unidentified Drivers	Drivers not detailed in the Asset Management Plan	Unable to determine	Unable to determine
Forecasting Inputs & modelling	Accuracy	Insufficient Information for Analysis	Assessment rating	Insufficient Information for Analysis
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Expenditure forecasting approach	Accuracy	Insufficient Information for Analysis	Assessment rating	Insufficient Information for Analysis
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point for this expenditure			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	N/A			
Assumptions	None stated in the AMP			

<table>
<tr><th colspan="9">BUSINESS SUPPORT</th></tr>
<tr><td>Annual OPEX</td><td colspan="8">$1,755,510 (21-23) $1,907,393 (24-28)</td></tr>
<tr><td>% contribution to overall opex increase</td><td colspan="8">25%</td></tr>
<tr><td rowspan="2">Growth drivers</td><td colspan="2">Driver</td><td colspan="4">IAEngg Comments</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td colspan="2">Unidentified Drivers</td><td colspan="4">Drivers not detailed in the Asset Management Plan</td><td>Unable to determine</td><td>Unable to determine</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td colspan="2">Insufficient Information for Analysis</td><td colspan="2">Assessment rating</td><td colspan="3">Insufficient Information for Analysis</td></tr>
<tr><td colspan="8">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td rowspan="2">Expenditure forecasting approach</td><td>Accuracy</td><td colspan="2">Insufficient Information for Analysis</td><td colspan="2">Assessment rating</td><td colspan="3">Insufficient Information for Analysis</td></tr>
<tr><td colspan="8">IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.</td></tr>
<tr><td>Trigger point</td><td colspan="8">There is no trigger point for this expenditure</td></tr>
<tr><td>Dependencies & Risks</td><td colspan="8">Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.</td></tr>
<tr><td>Sensitivities</td><td colspan="8">N/A</td></tr>
<tr><td>Assumptions</td><td colspan="8">None stated in the AMP</td></tr>
</table>

PowerNet

7.26 The Power Company Ltd

7.26.1 Expenditure Dashboard



7.26.2 Business overview (2022 data)

Parameter	Value
Customers	36,897
Peak demand	161 MW
Electricity volume	794 GWh
Line length	8,862 km
Distribution and LV Underground	382 km
Distribution and LV Overhead	7,577 km
Sub-transmission	905 km
Current Reliability performance	
» Total SAIDI	367 minutes
» Total SAIFI	3.46

7.26.3 Capex and Opex Growth Drivers

Drivers for capex growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☐	No ☒
Future DSO role/open access network	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☐	No ☒
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.26.4 Summary of Capex and Opex Categories assessed

IAEngg did not undertake further assessment of TPCL's CAPEX and OPEX forecasts as they were both below the assessment thresholds.

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☐
Asset replacement and renewal	☐
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☐
System operations and network support	☐
Business support	☐

7.26.5 CAPEX category assessment – Top Contributors

GENERAL COMMENTS ON CAPEX		
Annual CAPEX	$30,726,994 (21-23)	$33,423,305 (24-28)
% overall capex increase /decrease	9%	

TPCL have forecast a significant increase in Customer Connection CAPEX over the FY24-FY28 assessment period based on a number of enquiries to supply data centres. IAEngg's assessment of the certainty as medium as TPCL have indicated that there have been no firm agreements as yet. This significant increase in Customer Connection CAPEX is offset by a large decrease in 'Other RSE' resulting in a very modest overall increase of only 9% in average total annual CAPEX.

For the AMP planning period, TPCL stated that they see most of their network expenditure remaining on conventional electricity network assets and practices because of the high certainties at this early stage of transitioning to net zero carbon emission by 2050 and it would be imprudent to materially adjust investment and asset management plans now to make provision for uncertain needs. IAEngg's view is that TPLC's wait-and-see approach to capex investment to support the decarbonisation of New Zealand economy is a reasonable approach in the short term because of the uncertainties. IAEngg's view is that it would be prudent for TPCL to make some provision (derived from scenario studies) in the medium to long term budgets as part of TPLC's strategic and financial planning. The scenario studies on planning for investment in major new long life assets will minimise risk of asset stranding in a net zero carbon emission future.

7.26.6 Opex category assessment – Top Contributors

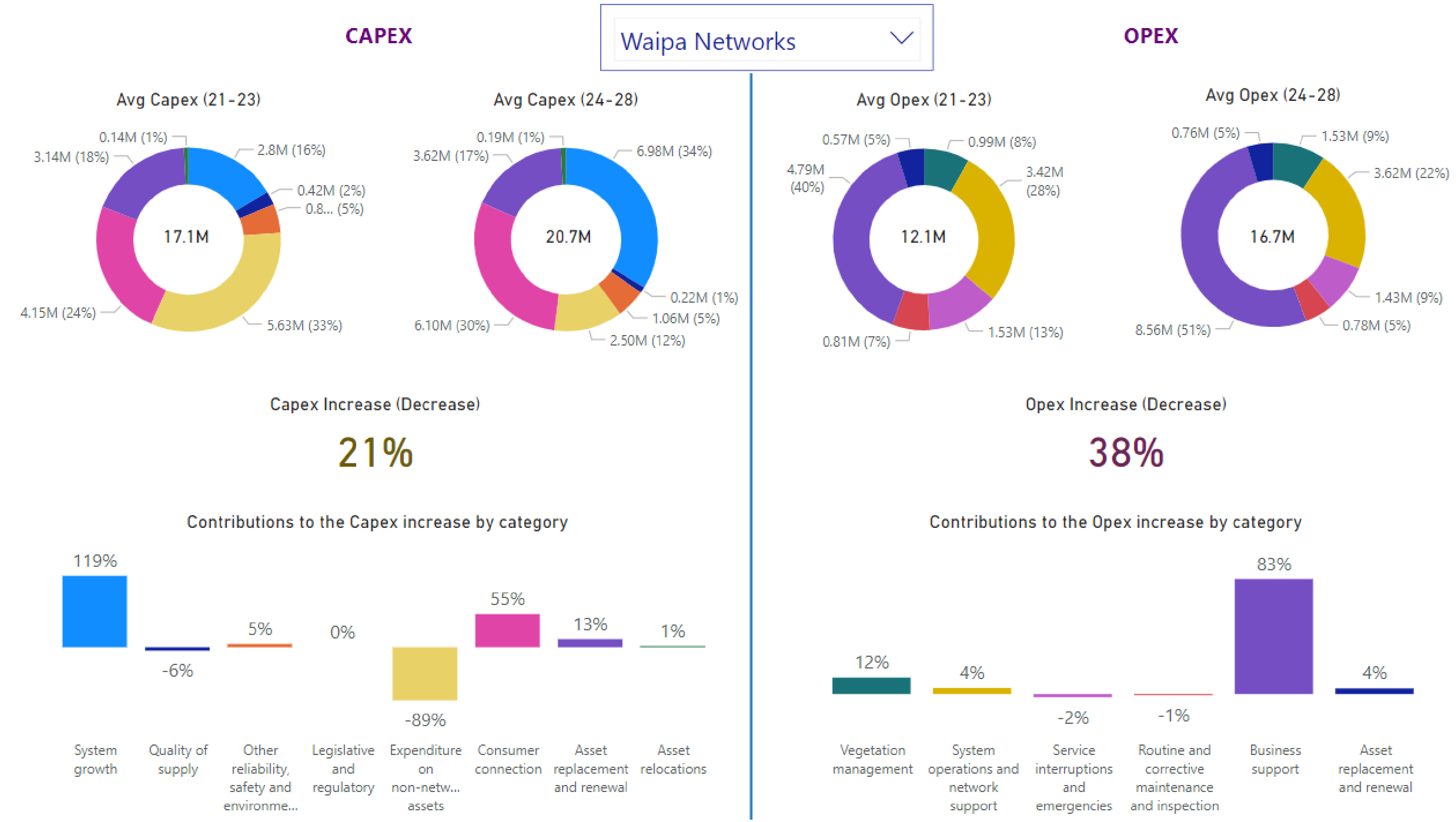
GENERAL COMMENTS ON OPEX		
Annual OPEX	$17,673,098 (21-23)	$19,149,444 (24-28)
% overall opex increase /decrease	8%	

TPCL stated in its APM that since the previous full AMP, regulations around Traffic Management have changed significantly. There are also some changes in the way the Tree Regulations are being applied. These changes are adding additional cost to both Capital and Operational activities. IAEngg agrees with TPCL's reasons for the increase. IAEngg is unable to assessment the reasonableness of quantum due to lack of information such as what actions TPCL will take to minimise the increase.

WAIPĀ NETWORKS

7.27 Waipa Networks

7.27.1 Expenditure Dashboard



7.27.2 Business overview (2022 data)

Parameter	Value
Customers	28,033
Peak demand	86 MW
Electricity volume	420 GWh
Line length	2,292 km
Distribution and LV Underground	491 km
Distribution and LV Overhead	1,736 km
Sub-transmission	36 km
Current Reliability performance	
» Total SAIDI	340 minutes
» Total SAIFI	2.37

7.27.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – commercial EV charging	Yes ☐	No ☒	Yes ☐	No ☒
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☐	No ☒
Future DSO role/open access network	Yes ☒	No ☐	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.27.4 Summary of Capex and Opex Categories assessed

Capex Categories	Assessed Further
Consumer connection	☒
System growth	☒
Asset replacement and renewal	☒
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☒
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☐
System operations and network support	☐
Business support	☒

7.27.5 CAPEX category assessment – Top Contributors

	SYSTEM GROWTH		CONSUMER CONNECTIONS	
Annual CAPEX	$2,795,503 (21-23) $6,983,600 (24-28)		$4,151,346 (21-23) $6,100,600 (24-28)	
% contribution to overall capex increase	119%		55%	
	Driver	**IAEngg Comments**	**Certainty**	**Reasonableness**
Growth drivers	Increase in economic activities (organic growth)	Waipa Networks presently sees no indicators of a decline of the strong historical growth in connections and combined with expansion signals from their industrial customers, forecast system demand to increase from 90MW in FY2022 to 148 MW in FY2033 (CAGR of 4.6%). Waipa stated that its forecast is aligned with the local council's strategic growth plan. IAEngg's view is that this is a relatively high growth rate with serious implications on Waipa's medium to long term consumer connection and augmentation capex requirements.	High (next 2-3 years) Medium (medium to long term)	Reasonable

	Expansion plans of large electricity users e.g. APL and Fonterra	Waipa Networks tabled two large developments (APL and Fonterra) that have signalled significant load step changes within 5 -10 years. Waipa Networks committed in the AMP planning period to establish two zone substations (Forrest zone substation & Victoria (or Bardowie) zone substation) by 2025 and purchase one zone substation land (future Leamington zone substation). As the customers have indicated that their projects are still subject to various consents and approvals, IAEngg presumes Waipa Networks would obtain customers' commitment before proceeding with the proposed major works.	medium	Reasonable (with regular review)
	EV – light transport	Waipa Networks stated their demand forecasts still need to specifically identify the electrification of process heat, residential and commercial gas, or the impact of changes in hot water demand response and controllable distributed energy resources (DERs). Some considerations for EV charging have been included. For the FY24 submission we will include forecasts which incorporate distributed generation, electric vehicles, and provide an initial view into process heat conversion estimates.	Low	Insufficient Information for Analysis
	Process heat			
	Small gas conversion			
	DER/DSR			
	Open access network/DSO	IAEngg did not come across any detail discussion of this subject in the AMP.		

Demand forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	Apart from a statement "Our forecast is aligned with the local council's strategic growth plan and new industrial demand associated with new development in Hautapu, expansion of existing industrial customers, and the likely decommissioning of a cogeneration plant at Fonterra's Te Awamu", IAEngg did not come across any detail discussion of this subject in the AMP. Waipai Networks is a relatively small network and it likely that its Asset Managers would have a very good understanding of its customer base, network management and operational issues.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Good**
	IAEngg is unable to assess the accuracy of forecast or approach due to lack of information.			
Trigger point	N/A			
Dependencies & Risks	Waipa Networks' Cambridge area sub-transmission network constraints and large development plan involves high upfront capital costs and long life assets. If not done already, studies should be carried out to ascertain the risks under different economic and decarbonisation scenarios.			
Sensitivities	N/A			
Assumptions	N/A			

<table>
<tr><th colspan="5">ASSET REPLACEMENT & RENEWAL</th></tr>
<tr><td>Annual
CAPEX</td><td colspan="4">$3,142,659 (21-23) $3,616,200 (24-28)</td></tr>
<tr><td>% contribution to overall capex increase</td><td colspan="4">13%</td></tr>
<tr><td rowspan="4">Growth drivers</td><td>Driver</td><td>IAEngg Comments</td><td>Certainty</td><td>Reasonableness</td></tr>
<tr><td>Asset Condition</td><td rowspan="3">Waipa Networks' asset health assessment over the past three AMPs shows the asset classes showing a high proportion of low health are wood poles (a relatively small fleet), crossarms, 11kV pole-mounted switches and fuses, and pole-mounted transformers. Accuracy of the health assessment will depend on the proportion of fleet where inspections have been completed.</td><td rowspan="3">medium</td><td rowspan="3">Insufficient Information for Analysis</td></tr>
<tr><td>Performance</td></tr>
<tr><td>Environmental condition</td></tr>
<tr><td rowspan="2">Forecasting Inputs & modelling</td><td>Accuracy</td><td>Insufficient Information for Analysis</td><td>Assessment rating</td><td>Insufficient Information for Analysis</td></tr>
<tr><td colspan="4">At presently, Waipa Networks' asset health assessment is a mix of age and condition-based, with forecasting of health deterioration predominately based on asset age. Waipa Networks stated that their renewal forecasts will evolve over the next 2-3 years they complete inspections at fleet level to capture condition information and their forecasting approach evolves. Assuming the evolution of Waipa's renewal forecast approach include moving to primarily condition based assessment supported by a good inspection regime, IAEngg's believe Waipa's forecasting accuracy will improve to a high level.</td></tr>
</table>

	Accuracy	Insufficient Information for Analysis	Assessment rating	Insufficient Information for Analysis
Expenditure forecasting approach	Waipa Networks' strategy is to replace assets that deteriorate to health grade H1 and H2 if at critical locations except for certain asset classes, such LV cables (excluding those supplying critical customers) and rural pole mount transformers, where the failure mode has low safety and environmental risk. Where possible, our renewal work is prioritised based on asset criticality and risk. Waipa Networks' replacement strategy is a reasonable one. However, IAENgg is unable to assess the accuracy of expenditure forecast due to lack of data.			
Trigger point	Asset Inspections			
Dependencies & Risks	Waipa Networks is aware of a view that the quantity of low health assets may have been overstated by either the EEA age-based health assessment, the quality of the age data, or conservativism in the observation-based condition assessment.			
Sensitivities	The proposed replacement programs are sensitive to availability of resources to undertake the work.			
Assumptions	The health assessment results for the inspected population can be extrapolated to the population where inspection are still pending.			

7.27.6 Opex category assessment – Top Contributors

	BUSINESS SUPPORT		VEGETATION MANAGEMENT	
Annual OPEX	**$4,785,120** (21-23) **$8,557,000** (24-28)	**$86,514k** (AMP2022 indexed to 2023$ CPI 6.23%) **$85,570k** (AMP2023 in 2023$)	**$986,717** (21-23) **$1,532,600** (24-28)	**$10,959k** (AMP2022 indexed to 2023$ CPI 6.23%) **$15,323k** (AMP2023 in 2023$)
% contribution to overall opex increase	83%	--	12%	--

Growth drivers	Driver	IAEngg Comments	Certainty	Reasonableness
	Salary and wage growth	Waipa Networks stated additional staff and resources to assist in operational delivery, health and safety management and engineering for technical and asset	medium	Unable to determine

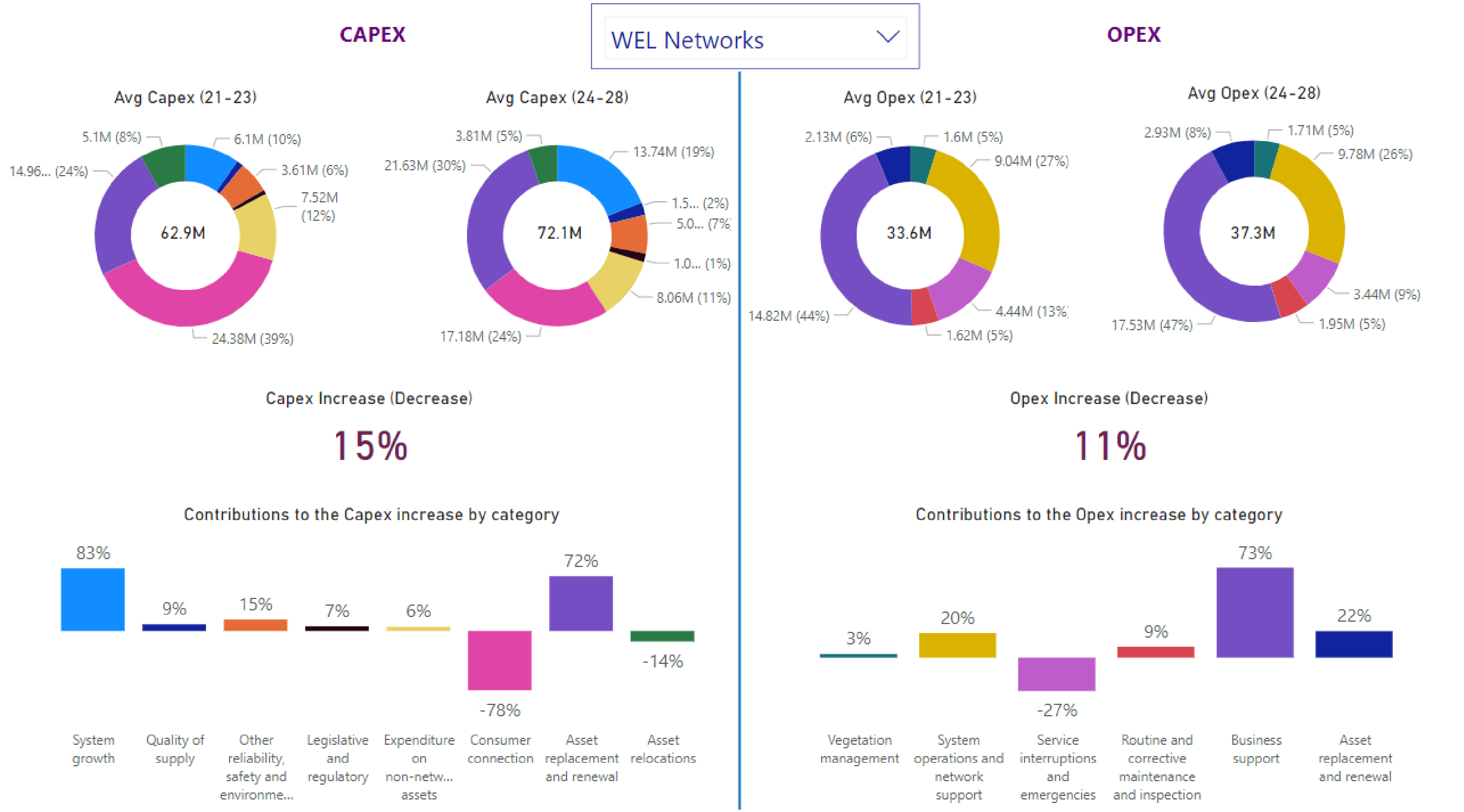
	Increased contracting costs Migration to cloud service Asset condition / aging Vegetation management Network performance	management improvements have added to operational costs compared to levels seen in 2020/22. Waipa made no material changes to corrective and preventative maintenance, and inspection and testing programmes. However, Waipa Networks expects work volumes to increase because of the increase in the number of assets and the progressive aging of the network, and as a result, forecast expenditure on routine and corrective maintenance and inspection to increase by 4% (compared to the 2022 AMP), asset replacement and renewal (opex) to increase by 14% (compared to the 2022 AMP) due to a forecast increase in work on transformers, switchgear and voltage regulator. IAEngg' s view is that Waipa's reasons for increases is basically sound. IAEngg unable to determine the reasonableness of the quantum due to lack of information.		
Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	Waipa Networks stated opex has been adjusted in recent years to match expected levels of activity in faults, corrective maintenance and asset replacement and renewal etc. Waipa Networks expects that this expenditure will remain relatively constant over the period in real terms. There is potential for more planned maintenance routines for zone sub-stations to increase costs in the second half of the period, this will be confirmed with the revised approach to replacement forecasting. IAEngg has no access to how Waipa Networks determines 'expected levels of activity in faults, corrective maintenance etc, which allows IAEngg to determine accuracy or approach of the adjustment methodology, process and assumptions.			

	Accuracy	Insufficient Information for Analysis	Assessment rating	Insufficient Information for Analysis
Expenditure forecasting approach	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach. Waipa Networks has provided a summary of key difference in opex compared to 2022 AMP: » Faults and vegetation individually increase from ~$0.9m to ~$1.2m annually to reflect our current performance; » Increased Asset Replacement and Renewal to start with the proactive voltage regulator and recloser maintenance program and RMU partial discharge tactical inspection; and » The non-network opex has reduced spending in System Operation and Network Support due to a correction to the historical figures			
Trigger point				
Dependencies & Risks	The opex is sensitive to how Waipa Networks determine the expected levels of (opex) activities. IAEngg is also not sure whether scenario and/or sensitivities studies are carried out.			
Sensitivities	Diversion of budget from other areas if under-forecast potentially affecting EDB customer service and reliability performance. Expenditure may not be prudent or efficient if over-forecast.			
Assumptions	N/A			

WEL Networks

7.28 WEL Networks

7.28.1 Expenditure Dashboard



7.28.2 Business overview (2022 data)

	Parameter	Value
	Customers	**96,894**
	Peak demand	**308MW**
	Electricity volume	**1,331GWh**
	Line length	**5,570km**
	Distribution and LV Underground	**2,498km**
	Distribution and LV Overhead	**3,072km**
	Current Reliability performance	
	» Total SAIDI	**159.0**
	» Total SAIFI	**2.090**

7.28.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☒	No ☐
Future DSO role/open access network	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☒	No ☐
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☒	No ☐	Yes ☒	No ☐
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.28.4 Summary of Capex and Opex Categories assessed

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☒
Asset replacement and renewal	☒
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☐
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☒
System operations and network support	☒
Business support	☒

7.28.5 CAPEX category assessment – Top Contributors

SYSTEM GROWTH				
Annual CAPEX	$6,099,405 (21-23) $13,743,359 (24-28)			
% contribution to overall capex increase	83%			
Growth drivers	Driver	IAEngg Comments	Certainty	Reasonableness
	Residential Growth	Generally based on new dwellings consented in the WEL region across the three local authorities. Hamilton city council is forecasting drop in numbers for the next two years. WEL base case projections are conservative for the first two years of the Asset Management Plan	Medium	Reasonable
	Commercial and Industrial Growth	Forecasts is based on the council land zoning, commercial readiness & availability and connection application numbers. WEL has also used the historic average growth rate and committed connection contracts to establish the base forecast	Medium	Reasonable

	Electric Vehicles Uptake	WEL forecast demand growth in based on two independent studies commissioned by WEL, energy demand is estimated from taking into consideration several other factors including local and national statistical estimates	Low	Unable to determine
	Process Heat Electrification	WEL forecast is based on Transpower's TE Mauri Hiko report, industry surveys and various other publications	Low	Unable to determine
	Electrification of Domestic Heating	WEL has used national and regional census data to forecast this demand	Low	Unable to determine

Demand forecasting Inputs & modelling				
	Accuracy	**Reasonable**	**Assessment Rating**	**Good**

The assessment rating is based on the following considerations:

- WEL has taken into account a wide range inputs for developing the demand forecast
- WEL has used scenario analysis for assessing future network scenarios, the growth projections includes process heat conversion electric vehicle and economic growth.
- The inputs are based on Customer enquiries and applications, Discussions with developers, Census and survey information, Local and global economic indicators, Current intensity of demand by land area, Demand trends, WEL independent studies, Transpower's Te Mauri Hiko Report & various industrial surveys
- WEL has used a combination of bottom-up & top-down techniques in their network demand forecasting

	Accuracy	Insufficient Information for Analysis	Assessment Rating	Insufficient Information for Analysis
Expenditure forecasting approach	The assessment rating is based on the following considerations: » Prior to any investment in any infrastructure WEL evaluates non-network solutions available like load control, demand-side management solutions, use of emerging technologies & network reconfiguration » To meet demand & security requirements based on the identified constraints a network project list is developed and alternative options are assessed prior to finalising a proposed solution and the recommended solution is estimated & included in the expenditure forecasts. » IAEngg cannot comment on the appropriateness of the costs used without examining the underlying data or how they compare to other EDBs			
Trigger point	Forecasting inputs with low certainty (EV – light, process heat conversion, domestic heating conversion) are very sensitive to government policies and incentives. It should also be noted that process heat may not all be converted from gas into electricity as there are other possible substitution fuels.			
Dependencies & Risks	The risks are overbuilding infrastructure that may not be required, or underbuilding leading to capacity constraints and impact on supply reliability.			
Sensitivities	It is not evident in the AMP if WEL has completed a sensitivity study and addressed the sensitivity analysis results in its expenditure forecast.			

Assumptions	- New Zealand will be facing a recession in FY24
	- Residential subdivisions impact of a potential short recession
	- The 44MW embedded co-generation plant at Te Rapa to be decommissioned in June 2023
	- The 64MW embedded wind farm generation at Te Uku will not be available to meet demand following a major power outage
	- The current level of load control (primarily domestic hot water) will continue through the AMP period, including renewal and maintenance of load management systems.
	- Increasing uptake of light passenger, slow charging EVs, including:
	  o Customer uptake of network managed charging
	  o Customer demand elasticity to pricing
	- Industrial development of:
	  o Ruakura Inland Port (TGH SuperHub) will be directly connected to Transpower HAM33 GXP
	  o Ohinewai Sleepyhead Industrial & Residential Estate will start development in 2026
	  o Northgate Industrial Park will populate in 2028
	  o Airport industrial zone will commence in 2027
	  o Horotiu industrial zone will commence in 2027
	- Large electrification of industrial plant will be implemented only towards the end of the AMP period
	  o Dampened demand forecast in the initial two years of the AMP period due to a possible recession.

ASSET REPLACEMENT AND RENEWAL

Annual CAPEX	$14,961,993 (21-23) $21,628,322 (24-28)			
% contribution to overall capex increase	**72%**			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Asset Health Deterioration	Asset Age and condition determined by inspection and testing are driving WEL networks asset replacement & renewal program	High	Reasonable
Forecasting Inputs & modelling	**Accuracy**	**Reasonable**	**Assessment Rating**	**Good**
	The assessment rating is based on the following considerations: » WEL uses Condition Based Risk Management (CBRM) modelling to determine the asset health index (AHI) and risks associated with each assets. It is a risk based approach to plan asset renewals. » Failure mode effects and criticality analysis (FMECA) and whole of life cycle costs are used to achieve network assets level of service in a cost-effective method. CBRM tool has been used by WEL to determine each asset class renewal strategy.			

	Accuracy	**Insufficient Information for Analysis**	**Assessment Rating**	**Insufficient Information for Analysis**
Expenditure forecasting approach	The assessment rating is based on the following considerations: » WEL has developed CBRM models for all of its key asset classes to determine health and risk profiles of each of the asset category and have used these to develop capital expenditure projects. » The capital expenditure for 2024-2028 is dominated by replacement and renewal of end of life wooden cross arm replacements, ground mounted transformer replacements & Oil filled Ring main unit replacements. » IAEngg cannot comment on the forecast expenditure under this CAPEX category without examining the underlying data which is not available in the AMP			
Trigger point	Asset Health Condition			
Dependencies & Risks	Rapid increase in the rate of failure of a certain asset fleet poles due to extreme weather events			
Sensitivities	IAEngg has not been provided with details of cost-benefit analysis of the proposed program of work and hence not in a position to assess the sensitivities of the expenditure to outturn differences.			
Assumptions	WEL has assumed the change in labour and materials is limited to the assumed inflationary pressures, rather than modelling specific trends in network components or specific labour market rates for trades.			

7.28.6 Opex category assessment – Top Contributors

SYSTEM OPERATIONS & NETWORK SUPPORT				
Annual OPEX	$9,042,457 (21-23) $9,783,910 (24-28)			
% contribution to overall opex increase	20%			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Business functions costs	Expenditure associated with all the below business functions comes under this OPEX category » Asset Management which includes Asset Information and Strategy, Network Planning, Maintenance Strategy, Network Design, Customer Projects, Development and Automation, System Control and Engineering » Distribution Design and Capital Projects » Customer Support and Procurement	High	Unable to determine

Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point for this expenditure			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	N/A			
Assumptions	WEL has assumed the change in labour and materials is limited to the assumed inflationary pressures, rather than modelling specific trends in network components or specific labour market rates for trades.			

BUSINESS SUPPORT				
Annual **OPEX**	$14,817,817 (21-23) $17,528,000 (24-28)			
% contribution to overall opex increase	**73%**			
Growth drivers	**Driver**	**IAEngg Comments**	**Certainty**	**Reasonableness**
	Corporate Function costs	Expenditure associated with all the below corporate functions comes under this OPEX category » Finance, Commercial and Technology which includes, Information Services, GIS, Procurement, Regulatory and Metering Services » People and Performance which including Health and Safety, Business Assurance, Organisational Development and Human Resources	High	Unable to determine

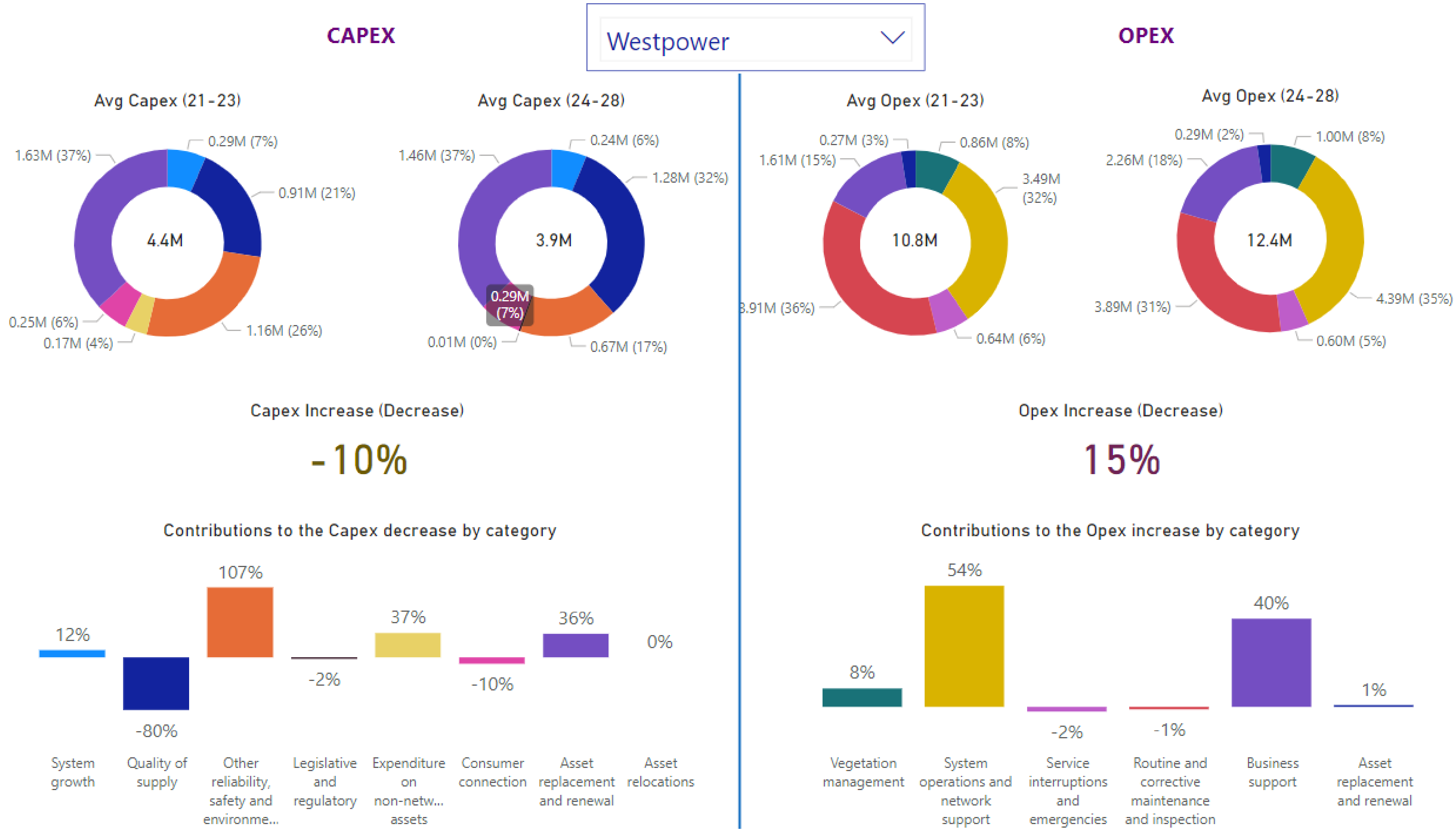
Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.			
Trigger point	There is no trigger point for this expenditure			
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of maintenance) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.			
Sensitivities	N/A			
Assumptions	WEL has assumed the change in labour and materials is limited to the assumed inflationary pressures, rather than modelling specific trends in network components or specific labour market rates for trades.			

ASSET REPLACEMENT AND RENEWAL					
Annual OPEX	$2,133,117 (21-23) $2,929,240 (24-28)				
% contribution to overall opex increase	22%				
Growth drivers	**Driver**	**IAEngg Comments**		**Certainty**	**Reasonableness**
	Network Faults & Immediate Safety Concerns to public & staff	Asset requiring immediate replacement as a result of Corrective maintenance or preventative maintenance		Medium	Unable to determine
Forecasting Inputs & modelling	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**	
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.				
Expenditure forecasting approach	**Accuracy**	**Insufficient Information for Analysis**	**Assessment rating**	**Insufficient Information for Analysis**	
	IAEngg has no access to granular data which allows IAEngg to determine accuracy or approach.				
Trigger point	Results of Asset Inspection Program				
Dependencies & Risks	Possible impact to other opex items (e.g. deferral of vegetation management) if this opex item is under-forecasted. Conversely, expenditure may not be prudent or efficient if the opex item is over-forecasted.				
Sensitivities	Expenditure may not be prudent or efficient if over-forecast.				
Assumptions	WEL has assumed the change in labour and materials is limited to the assumed inflationary pressures, rather than modelling specific trends in network components or specific labour market rates for trades.				

Westpower

7.29 Westpower Ltd

7.29.1 Expenditure Dashboard



7.29.2 Business overview (2022 data)

	Parameter	Value
	Customers	**14,007**
	Peak demand	**45 MW**
	Electricity volume	**220 GWh**
	Line length	**2,205km**
	Distribution and LV Underground	**275 km**
	Distribution and LV Overhead	**1,697 km**
	Sub-transmission	**331 km**
	Current Reliability performance	
	» Total SAIDI	**231 minutes**
	» Total SAIFI	**1.98**

7.29.3 Capex and Opex Growth Drivers

Drivers for **capex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Dwelling growth	Yes ☒	No ☐	Yes ☒	No ☐
DER connection growth	Yes ☒	No ☐	Yes ☒	No ☐
Demand growth – commercial EV charging	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – residential EV charging	Yes ☒	No ☐	Yes ☐	No ☒
Demand growth – process heat conversion	Yes ☒	No ☐	Yes ☐	No ☐
Demand growth – residential gas to electricity conversion	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☒	No ☐
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
LV visibility	Yes ☒	No ☐	Yes ☐	No ☒
Future DSO role/open access network	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

Drivers for **opex** growth	Considered in AMP (Y/N)		Expenditure provision in AMP (Y/N)	
Increased frequency of natural disasters	Yes ☒	No ☐	Yes ☐	No ☒
Climate resilience	Yes ☒	No ☐	Yes ☐	No ☒
Ageing assets	Yes ☒	No ☐	Yes ☒	No ☐
Labour costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Material costs above CPI	Yes ☒	No ☐	Yes ☒	No ☐
Network scale escalator	Yes ☒	No ☐	Yes ☒	No ☐
Capex/Opex tradeoff	Yes ☐	No ☒	Yes ☐	No ☒
New regulations	Yes ☐	No ☒	Yes ☐	No ☒
Emerging regulations	Yes ☐	No ☒	Yes ☐	No ☒

7.29.4 Summary of Capex and Opex Categories assessed

IAEngg did not undertake further assessment of Westpower's CAPEX forecast as it was below the assessment threshold.

Capex Categories	Assessed Further
Consumer connection	☐
System growth	☐
Asset replacement and renewal	☐
Asset relocations	☐
Reliability, Safety & Environment (combined)	☐
Non-network	☐

Opex Categories	Assessed Further
Service interruptions and emergencies	☐
Vegetation management	☒
Routine and corrective maintenance and inspection	☐
Asset replacement and renewal	☐
System operations and network support	☒
Business support	☒

7.29.5 CAPEX category assessment – Top Contributors

GENERAL COMMENTS ON CAPEX	
Annual CAPEX	$4,406,703 (21-23) $3,946,400 (24-28)
% overall capex increase / decrease	-10%

Westpower is relatively a small network covering a region where the population is expected to remain relatively static over the next 20 years (Statistics New Zealand, subnational population projections 1996 – 2043). Westpower has forecast no significant increase or muted increase to its underlying load growth for its four regions. Westpower expects future load growth driven principally by coal-fired boiler conversions and other economic developments and activities. The drop in capex budget for 2023/24 from $6,946k (in previous AMP) to $5,525k for this AMP is due partly to the deferral of the Dobson Zone Substation T6 replacement to the 2024/25 financial year to enable the proposed HKK10 – 11 kV circuit reconfiguration to proceed. Otherwise, underlying CAPEX is consistent with previous years, reflecting the ongoing lack of any significant demand drivers that would otherwise require investment in network growth. Westpower appears to adopt a wait-and-see approach to capex investment to support the decarbonisation of New Zealand economy. This is a reasonable approach in the short term because of the uncertainties. IAEngg's view is that some provision (derived from scenario studies) should be made in the medium to long term budgets as part of Westpower's strategic and financial planning.

7.29.6 Opex category assessment – Top Contributors

	BUSINESS SUPPORT		SYSTEM OPERATIONS & NETWORK SUPPORT	
Annual OPEX	$1,612,451 (21-23) $ 2,264,762 (24-28)		$3,493,310 (21-23) $4,389,867 (24-28)	
% contribution to overall opex increase	40%		54%	
Expenditure forecasting approach	Certainty	Medium	Assessment rating	Insufficient Information for Analysis
	Westpower used different opex sub-categories in the AMP and appears not to include relevant information and/or data which allows IAEngg to determine accuracy or approach. It is possible the forecast increase is to cover additional staff to assist in operational delivery, increased resources in health and safety management, in engineering for technical and asset management improvements to increase Westpower's capability to meet the new challenges posed by decarbonisation of New Zealand's economy and climate change.			

VEGETATION MANAGEMENT				
Annual OPEX	$862,388 (21-23) $1,000,000 (24-28)			
% contribution to overall opex increase	8%			
General comments on vegetation management opex	Accuracy	Medium	Assessment Rating	Insufficient Information for Analysis
	Westpower's location on the West Coast of the South Island means that much of the infrastructure passes through native rainforest, the vast majority of which comes under the management of the Department of Conservation and for which Westpower has no means of recovering vegetation management costs. Westpower used different opex sub-categories in the AMP and appears not to include relevant information and/or data which allows IAEngg to determine accuracy or approach. However, the increase appears to be in line with significant changes to regulations around Traffic Management, changes in the way the Tree Regulations are being applied and real increase in labour cost. All these changes are adding additional cost to both Capital and Operational activities.			

8

ATTACHMENT

8 ATTACHMENT

8.1 Conversion of expenditure values in AMPs to $2023

The inflators used to convert AMP expenditure values $2023 was based on indices provided by the ComCom.

To determine these indices, **COMCOM CARRIED OUT THE FOLLOWING STEPS**:

For actual LCI index values, Stats NZ LCI Index of all salary and wage rates / All sectors combined (SG53Z9) were used. For actual PPI index values, Stats NZ PPI Inputs Index, All Industries (SQN900000) were used. For actual CGPI index values, Stats NZ CGPI Index, All groups (S2GG) were used.

These index values were smoothed with an equal 25% weighting of current and the previous three quarters.

Index_value_smoothed_March2020 = (Index_value_March2020 + ... Dec2019 + ... Sep2019 + ... Jun2019) / 4

Capex used the GCPI value calculated as per above. For Opex, values were calculated with a 60% / 40% weighting of LCI/ PPI.

For each index, the annual inflation figure was calculated as the annual change in the smoothed index values, as at the March quarter.

Index_%ch_2020 = (Index_ value_ smoothed_March2020 / Index_ value_ smoothed_March2019) – 1

Based on the above methodology, the **INDICES PROVIDED BY THE COMCOM ARE:**

Cost inflators	2019	2020	2021	2022	2023
Network opex index of cost inflator	1.0000	1.0213	1.0332	1.0806	1.1389
Non-network opex index of cost inflator	1.0000	1.0213	1.0332	1.0806	1.1389
Capex index of cost inflator	1.0000	1.0285	1.0484	1.1328	1.2593

Source: 'Input-cost-inflators-model-EDB-DPP3-final-determination-27-November-2019 (5)'

Table 15 - Cost escalators provided by ComCom.

The indices provided by the ComCom were based on the year 2019. IAENgg required escalators to convert 2021 and 2022 dollars into constant 2023 dollars. The ratio between 2021 and 2022 against 2023 was calculated as shown below.

Index to 2023	21 to 23	22 to 23
Network opex index of cost inflator	1.1023	1.0540
Non-network opex index of cost inflator	1.1023	1.0540
Capex index of cost inflator	1.2012	1.1117

Source: IAEngg calculation

Table 16 - Cost escalators calculated and used by IAEngg to convert expenditure into constant $2023