



# **CPP MID-PERIOD REVIEW: INDEPENDENT EXPERT REPORT**

*Aurora Energy Limited*

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# GLOSSARY

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Acronym	Description
<b>AMP22</b>	Asset Management Plan for RY22
<b>AMP23</b>	Asset Management Plan for RY23
<b>ADR22</b>	Annual Delivery Report for RY22
<b>ADR23</b>	Annual Delivery Report for RY23
<b>DER</b>	Distributed Energy Resources (DER)
<b>PPDP</b>	Project and Programme Delivery Plan
<b>RY22</b>	The regulatory year covering 1 April 2021 to 31 March 2022
<b>RY23</b>	The regulatory year covering 1 April 2022 to 31 March 2023

# EXECUTIVE SUMMARY

As part of Aurora Energy's (Aurora) Customised Price Path (CPP) Determination for 1 April 2021 to 31 March 2026, the Commerce Commission (Commission) established additional disclosure requirements for Aurora. These requirements were incorporated into the Electricity Distribution Information Disclosure Determination 2012 (the Determination)<sup>1</sup>. The Determination included the requirement for a mid-period review to be undertaken by an independent expert.

Aurora engaged Energy Networks Consulting to undertake the review to assess Aurora's progress in, and make any recommendations for improvement on, plans related to four areas of practice set out in the Additional Disclosures. The review was required to only consider publicly available information, expressly including the Additional Disclosures and the Asset Management Plans for RY22 and RY23 (AMP22 and AMP23). The practice areas required to be covered by the review and a summary of our overall assessment of each are described in Table E1.

We note that, under the terms of reference for this report, our findings reflect only the information publicly available. Where we state information was insufficient, this is not to be construed that the information does not exist nor that Aurora has not made prudent decisions for managing their network.

*Table E1 Summary of the mid-period review requirements and outcome*

Clause	Description	Outcome
2.8.5A(1)	Delivering on time the capital and operational expenditure projects and programmes described in Aurora's PPDP under 2.5.4(2).	●
2.8.5A(2)	Developing low voltage network practices referred to in clause 2.5.4(1)(a).	●
2.8.5A(4)	Developing asset management practices and process as referred to in clause 2.5.4(1)(e)(i) to (iii).	●
2.8.5A(5)	Developing practices for identifying and reducing safety risks referred to in clause 2.5.4(1)(e)(iv).	●

Where:

●	Has demonstrated progress and delivery
●	Progress has been demonstrated, but there are some areas of insufficient publicly available information to be able to provide a 'Green' rating

In the following sections we summarise the key findings that lead to our assessment presented in Table E1. A list of our recommendations, for each of the practice areas, is set out in section 6.

<sup>1</sup> The additional reporting requirements for Aurora were added to the Determination as part of the August 2021 amendment.

## Capital and Operational expenditure

We found that Aurora has demonstrated that it has generally progressed capital and operational expenditure as set out in the Project and Programme Delivery Plan (PPDP).

We found that for the service interruptions and emergencies (opex) expenditure category, the underlying driver for expenditure was not consistent with the category expenditure. That is, the network reliability exhibited deterioration, typically meaning there were more outages, however the operational expenditure on service interruptions decreased compared to the forecast. The ADR23 identified an outage that may have contributed significantly to SAIDI and SAIFI without adding significant operational costs as it was a single outage, but we were unable to determine if it was the cause of the apparent inconsistency based on the information available.

We examined asset replacement and renewal capex in further detail due to more information available on unit rates and volumes. We found there has been reduced replacement of asset volumes under the asset replacement and renewal expenditure category and evidence was provided to demonstrate that unit rates had significantly increased. However, Aurora did not explicitly state if the replacement volumes were adjusted to ensure this expenditure category stayed within the allowance, or if the assets were in better condition than forecast resulting in fewer replacements.

We found that while inflation is likely to have contributed to the increased unit rates, the change in scope identified for pole replacements in Dunedin and Queenstown and the high cost of small distribution cable replacement projects appears to account for the majority of the cost difference. We also found that volumes were lower than forecast for zone substation, distribution cables and protection assets without sufficient explanation of the drivers or resulting change in risk.

Vegetation management appears to be progressing on track and has transitioned from a five year cycle to a three year cycle. However, the method of reporting the percentage of the network inspected and maintained requires clarification to confirm the project is progressing on a three year cycle. The vegetation management program demonstrated Aurora's ability to reallocate funding between regions in response to the issues identified and rate of progress in each region.

Our assessment of the individual projects identified in the PPDP found that they had mostly been delivered on time and where there were delays, the reasons appear to be driven by external events largely beyond the control of Aurora. There was ambiguity regarding some projects which were not clearly and consistently identified across the ADRs, AMPs and PPDP. This made tracking the progress of some projects difficult and we were unable to assess progress of delivery for these projects.

Throughout RY22 and RY23 Aurora has demonstrated consistent communication about the status of its investment programs across multiple media. However, we found that Aurora could improve their reporting on reprioritisation and substitution of capital and operational expenditure<sup>2</sup> as only limited detail was provided for a few cases.

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<sup>2</sup> Clause 2.5.4(2)(c) of the Information Disclosure Determination 2012

### Low voltage network practices

Aurora recognises that increased penetration of Distributed Energy Resources (DER) has potential to create significant network issues including poor power quality on the low voltage network. Voltage issues have not yet been directly attributed to DERs due to the relatively small amount on the network (approximately 9MW). However, with the rate of uptake during the past 10 years, there are likely to be issues in the near future if actions are not taken to manage the low voltage network.

Aurora has set out plans to manage and improve monitoring of the low voltage network. We found that Aurora has demonstrated progress on developing low voltage monitoring and practices to address identified voltage quality issues, however it has not provided sufficient data to verify the actual performance of power quality and compliance with the Electricity (Safety) Regulations 2010.

While we have identified areas for improvement and made recommendations, we consider that Aurora's plans, as set out in the ADRs and their AMPs, are consistent with industry practice and that overall they are progressing with the plans for improvement of the low voltage network practices as set out in the Development Plan.

### Asset management practices

Aurora has demonstrated progress in improving their asset management and risk assessment practices, consistent with the Development Plan.

The approach to asset management is aligned with industry practice, however, there was insufficient information publicly available to assess whether they had progressed against all the initiatives set out in the Development Plan. The focus on improving asset data quality and systems was evident through the investments made and disclosed. We consider asset and network data to be an essential enabler for all asset management activities, especially risk analysis.

Aurora has also demonstrated ongoing development of their risk framework through the incorporation of asset condition and additional consequences into their risk models. These changes are significant improvements and demonstrate Aurora's progress.

However, we also identified some areas for improvement and where their approach needs to be clarified:

- A number of the identified initiatives did not have publicly available information so we were unable to assess their progress under the scope of this review. Not all of these should be made public but some risk items would strengthen the AMP and provide transparency for customers. This includes the investment approval process.
- Criticality was not applied to distribution and LV cables or distribution switchgear, which means these assets are currently being managed based on asset age. We consider these assets should over time incorporate asset condition and consequence analysis.
- There is some ambiguity regarding the risk framework applied. In AMP23, chapter 5.3 describes a risk framework combining asset health and consequence of failure to determine the risk per asset fleet and the required programme of investment. However, in chapter 8 Aurora presents an age-based view of the asset fleet and states that replacements are prioritised based on criticality. This difference makes it difficult to understand the actual approach being applied in practice.

**Identifying and reducing safety risks**

We found that Aurora has demonstrated that its practices and initiatives are helping to reduce network safety risk through the application of a sound risk framework. We note that in the Safety Plan, Aurora presents a risk view of the network using location as a proxy for public risk. We consider that this is a sound approach for Aurora progress in asset management.

Overall, we consider that Aurora is well placed to continue maturing and developing their approach to risk assessment and mitigation across the different asset fleets in their network.



# 1. BACKGROUND

As part of Aurora Energy's (**Aurora**) Customised Price Path Determination (**CPP Determination**) for 1 April 2021 to 31 March 2026, the Commerce Commission (**Commission**) established additional disclosure requirements for Aurora. These requirements were incorporated into the Electricity Distribution Information Disclosure Determination 2012 (the **Disclosure Determination**) through an amendment in August 2021.

## 1.1 Reporting requirements in CPP Determination

In the Determination, the Commission required Aurora to publish documents that disclose information in a readily understandable form to enable interested persons to understand Aurora's plans and delivery. The documents relevant to this review include the:

- Project and programme delivery plan (PPDP);
- Development Plan (including plans to develop low voltage network practices and asset management practices and processes); and
- Safety delivery plan.

## 1.2 Requirement for independent review

Clause 2.8.5A of the Disclosure Determination requires a mid-period review to be undertaken by an independent expert to assess the progress in, and any recommendations for improvement on, specific aspects of the additional disclosures as listed in Table 1. Each of the clauses referenced in the table above are provided in full at Appendix A.

Table 1 Review practice areas and requirements

Clause	Description	In scope
<b>2.8.5A(1)</b>	<i>Delivering on time the capital and operational expenditure projects and programmes described in Aurora's PPDP under 2.5.4(2).</i>	Yes
<b>2.8.5A(2)</b>	<i>Developing low voltage network practices referred to in clause 2.5.4(1)(a).</i>	Yes
<b>2.8.5A(3)</b>	<i>Developing Aurora's consultation practices with consumers as referenced in clause 2.4.5A.</i>	<b>No</b> <sup>1</sup>
<b>2.8.5A(4)</b>	<i>Developing asset management practices and process as referred to in clause 2.5.4(1)(e)(i) to (iii).</i>	Yes
<b>2.8.5A(5)</b>	<i>Developing practices for identifying and reducing safety risks referred to in clause 2.5.4(1)(e)(iv).</i>	Yes

Note 1: An alternative Independent Expert was engaged by Aurora to complete the review required by Clause 2.8.5A(3). Clause 2.8.5A allows for Aurora to procure one or more Independent Expert's to undertake the mid-term review.



## 1.3 Independence

Energy Networks Consulting meets the requirements of being an independent expert as defined by clause 1.4.3 of the Disclosure Determination.

Michael Van Doornik, director of Energy Networks Consulting and leading the review, is qualified to offer professional services to clients and provide an opinion on the areas set out in Table 1 above. This is based on over 18 years professional experience in the electricity industry, supported by qualifications as a Chartered Professional Engineer, Lead Auditor for Quality Management Systems as well as Certified Asset Management Assessor.

Energy Networks Consulting has engaged Zubin Meher-Homji, director of Dynamic Analysis Pty Ltd, to provide review and quality assurance for the report.

Neither Michael nor Zubin have any:

- direct or indirect relationship with, or interest in, Aurora, that is likely to involve a conflict of interest between his duties to Aurora and to the Commission.
- relationships or interest in Aurora that is likely to constitute, or be perceived to constitute, a conflict of interest.

As required by clause 2.8.5B(1)(c) of the Determination, the Commission has approved Energy Networks Consulting to undertake this review.

Please refer to Appendix B for additional information regarding Michael and Zubin's qualifications and professional experience.

## 1.4 Scope of the review

The scope of this review is to provide an opinion on Aurora's progress in, and any recommendations for improvement on, the areas of practice listed in Table 1 above. The review can only take account of publicly available information, and is required to consider the following, as specified in Clause 2.8.5B(3) of the Disclosure Determination:

- 2022 and 2023 asset management plans;
- 2022 and 2023 annual delivery reports;
- Project and Programme Delivery Plan;
- Aurora's customer charter;
- Consumer compensation arrangement;
- Development Plan;
- Safety Delivery Plan, and
- Any other relevant publicly available information.

As discussed in section 1.2, the requirement to review the development of consultation practices with consumers, Clause 2.8.5A (3), was **excluded** from the scope of our review<sup>3</sup>.

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<sup>3</sup> Two documents referenced by 2.8.5B(3) were not reviewed as they were not relevant to the areas of practice included in our scope of works. These were the Customer compensation arrangement documentation and Aurora's Customer Charter.

## 1.5 Approach

This review was undertaken as a desktop review of documents set out section 1.4 above together with other publicly available information. The full list of documents is included in Appendix C. Additional information was not sought from Aurora, given that this is an independent report that can only take into account publicly available information.

Aurora and the Commission were both provided a draft report for review. For transparency, we have included a table in Appendix D that identifies any material feedback made and how we addressed it.

We developed objective criteria to provide a framework for providing an independent opinion on Aurora's progress in the relevant practice areas identified in Table 1, and to identify any improvements on these areas. The criteria consider the adequacy of information to demonstrate progress or need for improvement, the quality of the information provided, and whether the information was provided in a readily understandable form.

We have applied the Harvey Ball assessment methodology<sup>4</sup> to score progress against each of the criteria. The gradings are set out in Table 2.

*Table 2 Assessment gradings based on a modified Harvey Ball approach*

Finding	Description
●	Has demonstrated progress and delivery
◐	Progress has been demonstrated, but there are some areas of insufficient information to be able to provide a 'Green' rating
◑	Has demonstrated some progress but areas for improvement are evident, or delays in delivery have been identified
◒	Progress has not been demonstrated.
○	Unable to be assessed. There was insufficient publicly available information provided to enable an assessment of progress.

<sup>4</sup> The Harvey Ball assessment methodology is a common approach that uses visual icons to represent the degree to which a criterion is met.

## 2. PROJECT AND PROGRAMME DELIVERY PLAN

The Project and Programme Delivery Plan (PPDP) is required to describe Aurora's capital and operational expenditure projects and programmes for the CPP regulatory period, 1 April 2021 to 31 March 2026.

The PPDP must also explain how Aurora plans to communicate any changes to the plan, reprioritisation or substitution of capital and operational expenditure projects or programmes during the period.

Progress against these plans is required to be assessed as part of the mid-period review.

### 2.1 Summary of Review findings

Based on the review requirements set out in Clause 2.8.5A of the Determination (see Appendix A), we have identified the key review elements to be assessed. We have applied the criteria set out in Table 2 of our report to assess the progress in, and any recommendations for improvement on, delivering on time the capital and operational expenditure projects and programs set out in the Project and Programme Delivery Plan.

Table 3: Assessment gradings of review elements developed from the Information Disclosure requirements

Description	Outcome
Demonstrate delivery of capital expenditure	●
Demonstrate delivery of replacement asset volumes and unit rates	◐
Demonstrate delivery of operational expenditure	●
Demonstrate delivery of expenditure by region as forecast	●
Demonstrate delivery of identified projects on time	◐
Communication of changes to the forecast, including reprioritisation or substitution	◐

### 2.2 Analysis

In this section, we identify the analysis that supports our findings. We have predominately sourced the data from the PPDP, AMPs and ADR's. We have also considered data in the Information Disclosure schedules together with other publicly available information, listed in Appendix C. Our analysis is set out to follow the sequence of the review elements listed in Table 3.

## 2.2.1 Industry context

To assess the accuracy of Aurora's forecasting compared to peer businesses and provide industry context for the variation between the planned and actual expenditure, we have used data available from annual Information Disclosures.

As part of the information disclosures, EDBs must disclose their actual expenditure for the regulatory year and forecast expenditure for the following 10 year period<sup>5</sup>. This enables assessment of forecasting accuracy, taking into account industry wide drivers, and provides a method to assess Aurora's performance relative to peer EDBs.

To align with the timeframes of the data assessed in this report, we have compared the actual expenditure of all EDBs for RY21, RY22 and RY23 against the forecast made in the AMP for RY21. We recognise that there are limitations with the use of RY21 as the reference year, however, it is based on publicly available data that has been audited and therefore can be relied on for a high level comparison. The outcome is shown in Figure 1 below.

The chart demonstrates that the variation between actual and forecast expenditure varies significantly between EDBs and across the three years assessed. Most EDBs were within 10% of their forecast for RY21 and RY22, however in RY23 most EDBs exceeded their forecast by more than 10%. The increased expenditure compared to forecast in RY23 that is observed across all networks is consistent with higher than expected inflation broadly experienced during that year<sup>6</sup>. While a detailed review of the drivers of the observed variations is out of scope for this report, we note that EDBs need to manage their networks in response to new information and to external events, which will result in differences between actual and forecast expenditure. A prudent business will manage their response to any events through reprioritisation of works to meet their allowances while managing risk and performance.

Overall, we found that Aurora's performance, with respect to meeting the forecast expenditure, was similar to or better than peer businesses.

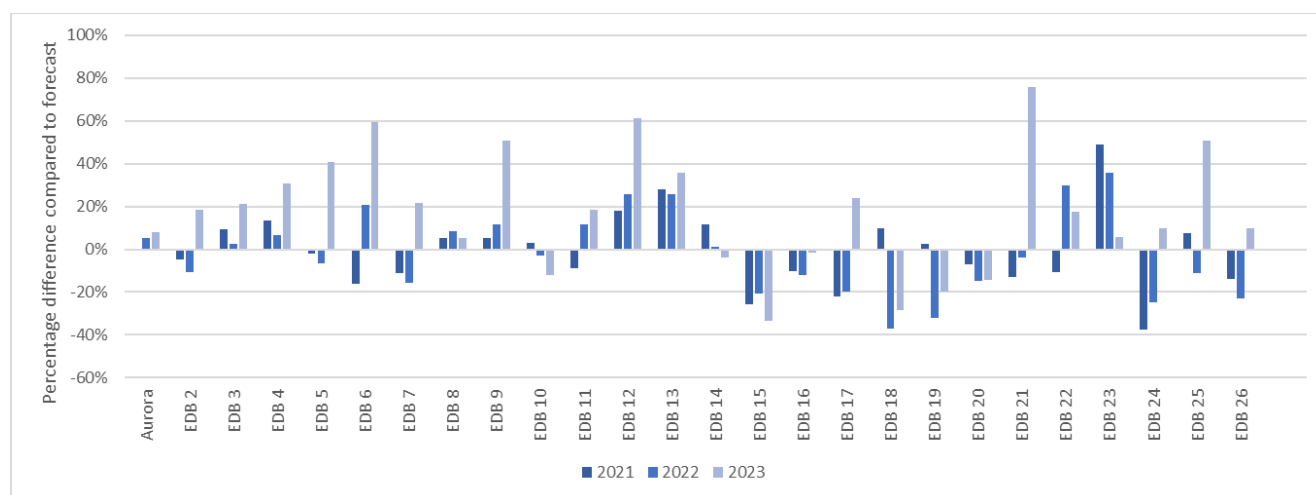


Figure 1 Accuracy of forecasting by EDBs compared to Aurora

<sup>5</sup> The forecast information must be submitted with the AMP and the actual expenditure for the year must be submitted within 5 months of the end of the regulatory year.

<sup>6</sup> We note that four of the five EDBs that reported an underspend in RY23 had a history of underspend compared to the forecast so there may be other drivers influencing their performance.

## 2.2.2 Materiality of expenditure

In making our assessments on delivery, we have considered the relative materiality of capital and operational expenditure categories. Figure 2 identifies the actual expenditure incurred for capital expenditure categories for RY22 and RY23. It shows that Asset Replacement and Renewal is the most material category for capital expenditure and will have the largest impact on delivery of the plan. Consumer Connections are the second most significant, followed by System Growth.

Figure 3 identifies the actual expenditure for operating expenditure categories for RY22 and RY23. The three most material categories are System Operations and Network Support, Business Support, and Routine and Corrective Maintenance. They are relatively similar in value.

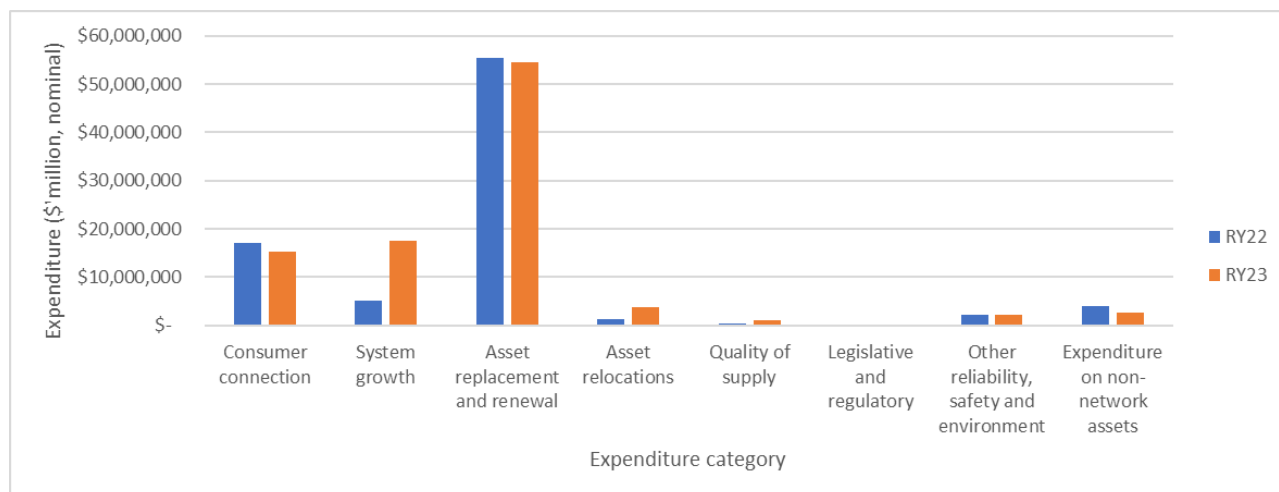


Figure 2 Comparison of the relative value of each capital expenditure category

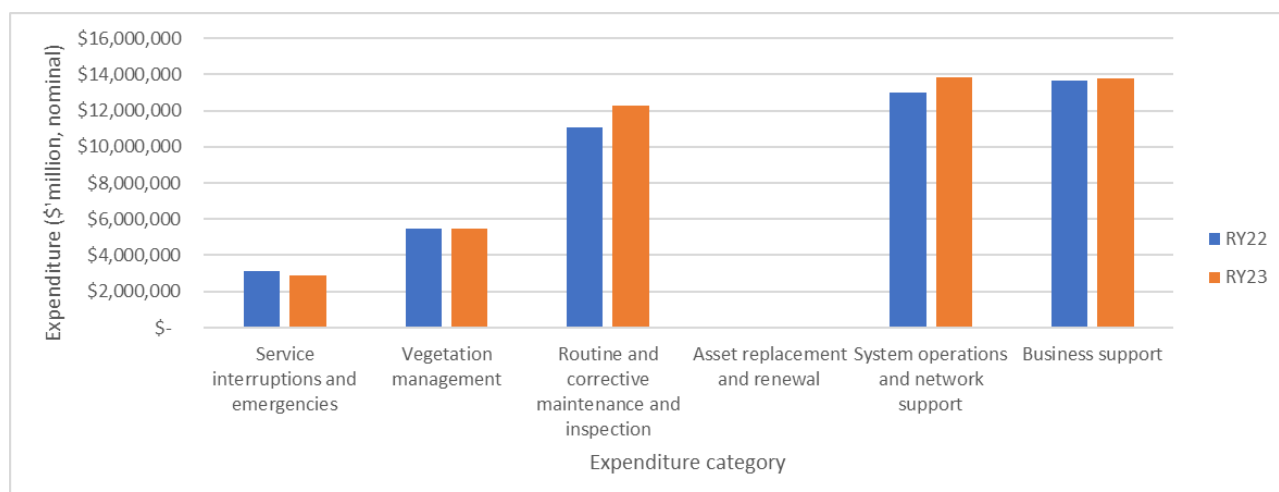


Figure 3 Comparison of the relative value of each operational expenditure category

A further consideration in our assessment is to understand whether actual delivery will be impacted by high levels of inflation experienced in New Zealand since 2022.

In the CPP application an inflation rate of approximately 2% was forecast (1.95% in RY22, 2.02% in RY23 and then 2% for the subsequent years)<sup>7</sup>. The expenditure reported by Aurora in both ADRs, the PPDP and both AMPs are in nominal dollars unless specifically stated otherwise, meaning that the forecast set out in the PPDP is adjusted to include inflation. The PPDP does not provide the inflation assumptions applied to the forecast.

Using the CPI data available from Stats NZ<sup>8</sup> we assessed the likely impact of inflation<sup>9</sup>. The average inflation for the five years preceding the CPP (from 2017 to 2021) was 1.3%, in 2022 it increased to 6.9% and in 2023 to 6.7%, making a compound increase since the Aurora's CPP determination in 2021 of 14%. Hence, actual inflation up to RY23 has been approximately 10% above the forecast included in the CPP.

The impact of the increased inflation is expected to materialise as either increased expenditure required to deliver the plan and/or reduced volumes of assets replaced or added to the network to remain within the allowance. This has been taken into account in our findings. An additional driver of variation between forecast and actual expenditure are the unit rates applied during to forecast versus the actual cost. In the ADR23, Aurora notes that their maturity with respect to cost estimation is still developing and they have established initiatives to improve their cost estimation practices. We note that this is a driver and assess the impact of changes to unit rates in the following sections, however review of the estimation processes and their progress was out of scope of this review.

### 2.2.3 Delivery of capital expenditure

This section compares the progress of capital plans based on an assessment of actual and forecast expenditure including reasons for any material variation. We have assumed a materiality threshold of 10% and \$1 million<sup>10</sup> to identify where we focus our analysis. Expenditure categories where the actual expenditure varies by greater than or less than 10% and \$1 million are highlighted in red in Table 4, otherwise they are highlighted in green.

Table 4 shows the percentage variation of the actual expenditure set out in the ADR compared to the forecast expenditure set out in the PPDP. A positive change indicates that the actual expenditure was higher than the forecast expenditure and a negative change indicates the actual expenditure was lower than forecast. The 'Period to date' column compares the total expenditure so far during this period for RY22 and RY23.

<sup>7</sup> Aurora Energy, Customised Price-Quality Path CPP Financial Model 12-June-2020, page 6

<sup>8</sup> CPI All Groups for New Zealand, Seasonally adjusted, March quarter

<sup>9</sup> We have used CPI data as it is publicly available and is only intended to provide indicative guidance on the impact of inflation.

<sup>10</sup> This is consistent with the Commission's requirement for Aurora to provide details for projects or programmes that exceed the expenditure forecast by 20% and \$1 million when reporting in the ADR.

Table 4 Comparison of actual to forecast expenditure

Expenditure category	RY22	RY23	Period to date
<b>Capital expenditure</b>	<b>13%</b>	<b>7%</b>	<b>10%</b>
Consumer connection	46%	12%	28%
System growth	-29%	38%	14%
Asset replacement and renewal	10%	-3%	3%
Asset relocations	-52%	39%	-6%
Quality of supply	-10%	-17%	-15%
Legislative and regulatory	NA	NA	NA
Other reliability, safety and environment	100%	100%	100%
Expenditure on non-network assets	7%	-32%	-14%

The table demonstrates that Aurora is incurring higher expenditure than the capital expenditure allowance. We note that this may be a consequence of inflation adding to the costs of the projects and/or due to the accuracy of Aurora's cost estimation.

In any case, we note significant variation at a category level. In the following sections, we analyse categories of expenditure where the variation in expenditure exceeds 10% and \$1 million (shaded red in Table 4) to determine if they are reasonable or if Aurora could take steps to improve the management of their capital plans.

Overall, based on the volumes reported for replacement and the expenditure reported in both growth and replacement categories, we consider that Aurora has demonstrated progress in delivery of capital expenditure plans.

While volumes were down in RY22, Aurora had generally caught up in RY23, so in aggregate only a few asset types had volumes delivered that were significantly lower than forecast. Refer to section 2.2.4 for more detailed analysis of the volume of assets replaced.

As noted before, variation in the material areas of capital expenditure have been explained with respect to external factors such as forecast demand.

We have separately assessed asset replacement and renewal in section 2.2.2. This is because there is more information on volumes and unit costs that enable a 'deeper dive' into delivery of plans.

### Consumer connections

We identified there has been an increase in expenditure during both RY22 and RY23 compared to the forecast. The total number of new connections were 1,128 and 1,278, respectively<sup>11</sup> which are similar to the average number of connections during the three years preceding the CPP application. There was not sufficient publicly available information to determine if the increased expenditure was a result of specific large connection(s) or the impact of inflation.

However, we note that the PPDP identifies that a new zone substation (Dunstan ZSS) and associated lines was categorised as a consumer connection which may have contributed to the unexplained variation. AMP22 identified that the zone substation was under construction. Consequently, AMP23 identified that the substation was no longer needed for the original customer and had been

<sup>11</sup> As reported in the Information Disclosures Schedule 9e(i) for RY22 and RY23



repurposed. It is not clear based on the information provided if this was a significant contributor to the higher expenditure in RY22.

Under Aurora's CPP determination, the Input Methodologies have been amended to include an allowance for a 'Capacity event'. The 'Capacity event' allows for the expenditure allowance to be increased provided certain criteria are met. Should the expenditure be accepted as a Capacity Event, the allowance would effectively be adjusted to include the additional expenditure in this category. As seen in Table 5, the result would be that the difference in the customer connections category would reduce to zero (no other categories are affected), and the total capital expenditure would be within 5% of the forecast, demonstrating good management of total expenditure.

*Table 5 Impact of an approved capacity event on Consumer Connections and total Capital Expenditure*

Expenditure category	RY22	RY23	Aggregate
<b>Capital expenditure</b>	<b>5%</b>	<b>5%</b>	<b>5%</b>
Consumer connection	0%	0%	0%

We recommend that Aurora provides additional information to explain the underlying driver for the variation in Customer Connection expenditure.

### System growth

There was a significant underspend in RY22 followed by an overspend in RY23. The cause of the under expenditure in RY22 is identified in AMP22 as design issues that deferred project expenditure. We consider further information could have been provided on the nature of the design issues, for example whether it related to expansion of scope or on-site issues with construction.

The over expenditure in RY23 was identified in the ADR to be caused by projects required to meet unforeseen demand. In particular this included reinforcement to support the Clyde township in Central Otago, increased scope for the Omakau zone substation, and bringing forward the Arrowtown 33kV Ring Upgrade project. Some of the higher costs associated with new projects or increased scope were offset by delays in the Smith Street to Willowbank 33kV cable link project in Dunedin due to coordination with the city council. In aggregate, the expenditure on system growth was above forecast and the progress of identified projects (section 2.2.7) indicates delivery is generally progressing in line with the plan.

We recognise that network investment needs change during the period and system growth expenditure is typically a response to external drivers that require an increase in capacity. While inflation may have contributed to increased costs, additional planning and site studies could help to control unexpected expansion of the scope and on-site issues during construction.

Overall, we consider that there has been demonstration of progress in delivery of this category of expenditure, including adequate information on drivers of variance.

### Asset relocation

Aurora forecasts asset relocations based on historical trend and adjustments for known projects. However, as relocations are customer driven, Aurora does not have full control of the timing or expenditure of this category.

In aggregate, actual capital expenditure is relatively consistent with the forecast, however there is significant difference in RY22 and RY23. AMP22 states that asset relocations are externally driven based on customer request, hence the expenditure can vary from year to year and forecasts are based on historical trends. AMP23 identified that the under expenditure in RY22 was caused by a NZTA project which was deferred and resulted in the reduction in relocations expenditure.

In the ADR23, Aurora provided more detail to explain the over expenditure that occurred in RY23, including the specific projects. We note that in Dunedin there was reduced expenditure required for asset relocation and the funds were re-allocated to power quality projects, demonstrating Aurora's ability to reallocate and reprioritise expenditure.

We consider that there has been demonstration of progress with this category of capital expenditure and that information provided in the AMPs and ADRs has been adequate to explain the material drivers of variation from the forecast.

### **Quality of supply**

Aurora stated that due to the variable number of customer enquiries and the reactionary approach to remediating any power quality issues, the expenditure can vary significantly from year to year. The absolute value of the difference is significantly less than \$1 million in both years and in aggregate, so we do not consider this category raises any significant concerns.

### **Other Reliability, Safety and Environment**

There was no work forecast under this category but expenditure has been incurred for the installation of generators at the Omakau and Camp Hill zone substations in the Central Otago region. The ADR23 states the generators are required to ensure compliance with Aurora's security of supply guideline, however, there is no evidence provided for why this project was not planned and expenditure was not included in the forecast. As noted above, Aurora have re-allocated funds to this project from an asset relocation project that was below budget, demonstrating an ability to prioritise the capital expenditure allowance.

### **Non-network assets**

This expenditure category was forecast in the PPDP but is not required to be reported against in the ADRs<sup>12</sup>. To address the information gap, data was sourced from the Information Disclosures Schedule 6(a)(ix). We found the expenditure in RY22 was within 10% of forecast, but significantly below the forecast in RY23.

AMP23 stated that the reduction in expenditure was a result of a shift to Software as a Service (SaaS) in ICT. Where there are significant changes in the approach to managing assets, we recommend Aurora provides a detailed explanation to explain the underlying driver for the change and to demonstrate why the new approach is more efficient from a total expenditure view. We note that this would also impact the expenditure incurred on operating expenditure, and further information should be provided on substitutions between expenditure categories.

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<sup>12</sup> The non-network asset category is not listed in the Electricity Distribution Information Disclosure Determination 2012, Attachment C, Clause 1.6.1 and Clause 1.7.1(b).

## 2.2.4 Delivery of replacement asset volumes and unit rates

We have reviewed the asset volumes that had been installed and changes in unit rates compared to the forecast in the PPDP. This provides for an additional lens to determine if capital plans are being delivered, in addition to expenditure analysis discussed in section 2.2.1 above.

We note that our review has been limited to the asset replacement and renewal expenditure category, where there is sufficient information on unit costs. Since the actual volumes of assets for RY22 were not provided at the same level of detail, we were only able to undertake this assessment for RY23 information.

We undertook detailed analysis to determine the key drivers of the changes to total costs by assessing the contribution to the total cost of the unit rate and the volumes delivered.

We considered distribution and zone substation assets separately as:

- Distribution assets are typically high volume and low value, so a small change in volumes does not typically make a material difference to overall cost.
- Zone substation assets are typically low volume but high value, so a small change in volumes can have a material difference in overall expenditure.

As shown in Table 6, we found that the change in unit rates resulted in an increase of 42% of total expenditure. However, this was offset by the reduction in volumes of distribution assets, which decreased total cost by 5% and a reduction in zone substation assets which resulted in a decrease in expenditure of 39%. The net impact of these changes was a net decrease in the Asset replacement and renewal expenditure category of approximately 3%. This result aligns with the top down assessment in Table 4.

*Table 6 Summary of key drivers for changes in expenditure and the percentage impact on category expenditure*

Calculation	Outcome (% change)
Unit rates (Difference in cost to deliver RY23 volumes using PPDP unit rates compared to RY23 unit rates)	+42%
Volumes (Difference in cost to deliver RY23 volumes using PPDP unit rates and PPDP volumes using PPDP rates)	-5%
Zone Substation assets (Difference in cost by excluding zone substation assets from expenditure) <sup>Note 1</sup>	-39%
<b>Total impact on actual compared to forecast expenditure</b>	<b>-3%</b>

Note 1: there were no unit rates in RY23 for zone substation assets so the change using PPDP volumes and unit rates was applied as a suitable proxy.

The key drivers of higher unit costs changes were identified as being caused by:

- Pole replacements in Dunedin and Queenstown that involved more complex poles with additional associated assets and/or multiple voltage levels. This increased the effective average unit rate for pole replacement in these two regions.
- A number of unexpected reactive distribution cable replacement projects. Reactive replacement has higher unit costs than planned works due to factors such as traffic management, mobilisation and civis.

In total these assets account for \$12 million above the PPDP forecast, which was largely offset by not incurring expenditure on the zone substation assets which were forecast to cost \$11.7 million. The change in the cost of poles accounts for \$9 million and underground cables for \$3 million. The replacement unit rate for poles in each region is shown in Table 7.

Table 7 Unit rate for pole replacements by region

Region	PPDP Unit rate	RY23 Unit rate	% change
Dunedin	\$12,670	\$21,507	70%
Central Otago	\$12,670	\$13,295	5%
Queenstown	\$12,670	\$17,091	35%

Aurora's focus has been on replacing high volumes of poles to rapidly minimise safety risk to the public. Previously Aurora has been targeting the 'simple' poles but is now progressing onto the more complex poles in Dunedin and Queenstown, such as those with multiple circuits, multiple voltages and attachments such as distribution transformers or switches. Aurora has identified that the increased scope of pole replacement has also increased the effective unit rate.

The unit rates of poles increased by a weighted average of 30%, which is a real increase of approximately 14% when adjusted for inflation<sup>13</sup>. The increased scope and complexity of poles that are identified to have been targeted during RY23 provides a reasonable justification for the real increase. It is also supported by the replacements in Central Otago which are identified to have only experienced a moderate increase to the unit rate of 5% due to escalating costs. The unit rate is not specifically identified to have increased in Central Otago as a result of scope change as it is for Dunedin and Queenstown. We consider that this provides a reasonable justification for the increased cost of pole replacement across the network.

It appears that Aurora has changed its plan for the replacement of zone substation assets. This has enabled Aurora to remain within the overall capex allowance. However, no additional information was provided to assess if the change to this project was prudent and efficient.

We recognise that there are variations in replacement volumes from year to year based on the outcomes of field inspection and short term deliverability constraints. However, there are three asset classes where we consider the variation in delivery to be more than accounted for by the annual variation. These asset classes are:

- Zone substation indoor switchgear. The volumes planned for RY22 and RY23 have not been completed. There was no justification provided for this or identification of which substations the planned replacements are located in.
- Distribution cables. The volume of replacements are significantly behind the plan in the PPDP and while Aurora identified a number of small projects that incurred significant cost, it has not provided adequate information to explain the total reduction in replacement volumes.

<sup>13</sup> This excluding distribution cable. Due to a number of small projects that were reactive and aimed at fault restoration, the unit rate of distribution cable replacement appeared excessively high and is expected to be much lower and closer to the PPDP forecast for larger projects.

- Protection systems. In ADR23, Aurora notes that multiple old relays are replaced with a single modern relay, and they also identify where protection has been replaced at specific zone substations and where replacement is currently underway. While this provides some context to the protection replacement program, the volume of relay replacements reported in the section 8.2 of the ADR23 is significantly behind the plan in the PPDP.

The remainder of the replacements are for distribution assets where replacements volumes could be addressed relatively quickly and are likely to be identified for replacement based on field inspection.

The analysis of replacement volumes and unit costs suggests that there has been progress on delivery, but there are some programs that have not been delivered to the extent forecast in the PPDP. Two years of data is not sufficient to determine a trend to forecast delivery by the end of the CPP period, however, we note that for most asset classes the volumes forecast to be replaced decreases over the CPP period which will improve Aurora's ability to meet the forecast in aggregate.

For some programs such as poles, we consider there is adequate information to demonstrate that the lower volumes and higher unit costs relate to more complex replacement scope. However, we note there is insufficient information to assess if volume reductions for zone substations, distribution cables or protection systems are justified on a risk basis.

More generally, the above analysis demonstrates that comparing actual expenditure to forecast expenditure only provides a limited means of assessing delivery of plans. We consider there is opportunity for Aurora to improve the granularity of information on unit costs and volumes across material expenditure programs, similar to what is published for the Asset Replacement and Renewal category. This would help provide a more sophisticated understanding of whether plans are being delivered and the reasons for variation.

We note that Aurora must manage their network based on new information that becomes available during the CPP period and adjust the delivery of volumes and expenditure to account for external factors such as inflation or increased growth. Therefore, Aurora's approach to reprioritise their expenditure to minimise overall risk is important.

### 2.2.5 Delivery of operational expenditure

This section compares the actual operational expenditure by category to the forecast and assesses the reasons for any material variation. Table 4 shows the percentage variation of the actual expenditure compared to the forecast expenditure. A positive change indicates that the actual expenditure was higher than the forecast expenditure and a negative change indicates the actual expenditure was lower than forecast. We have indicated in red where the variation is higher than 10%. The 'Period to date' column compares the total expenditure so far during this period for RY22 and RY23.

Table 8 Comparison of actual to forecast expenditure

Expenditure category	RY22	RY23	Period to date
<b>Operational expenditure</b>	<b>-2%</b>	<b>0%</b>	<b>-1%</b>
Service interruptions and emergencies	-34%	-40%	-37%
Vegetation management	-2%	4%	1%
Routine and corrective maintenance and inspection	5%	21%	13%
Asset replacement and renewal	NA	NA	NA
System operations and network support	-2%	-3%	-2%
Business support	3%	-1%	1%

The table demonstrates that Aurora is broadly within the operational expenditure allowance. We consider that Aurora has demonstrated progress in delivering the Systems Operations and Network support, Business Support, Vegetation Management, and Quality of Supply categories based on expenditure levels compared to forecast.

We note that the System Operations and Network Support and Business Support expenditure categories are predominately based on staff work hours, so is mostly reliant on retaining the forecast number of employees.

In the following sections, we analyse categories of expenditure where the variation in expenditure exceeds 10% and \$1 million (shaded red) to determine if they are reasonable or if Aurora could take steps to improve the management of their capital and operational plans. This includes service interruptions and emergencies, and routine and corrective maintenance and inspection. We also assessed vegetation management.

Overall, we consider that Aurora has demonstrated delivery of the operational plans particularly in the material categories of expenditure. However, we note the material under-spend in service interruptions and emergencies requires further clarity given the higher trend in unplanned SAIDI and SAIFI. We also consider further information is required to assess delivery of vegetation management plans.

### Service interruptions and emergencies

We identified that expenditure in the service interruptions and emergencies category decreased materially. Aurora identified that there was a lower amount of reactive maintenance required.

However, assessed unplanned SAIDI and SAIFI increased from RY21 to RY22 for the Queenstown region and increased from RY22 to RY23 for all three regions. This is an apparent inconsistency as when reliability deteriorates, we would expect more expenditure to be required to manage the interruptions.

The ADR23 feeder performance discussion identifies a single event where the Upper Clutha line had an outage that resulted in a significant contribution of SAIDI and SAIFI. This may contribute to high SAIDI and SAIFI without materially impacting the interruptions and emergencies expenditure as it is a single outage. However, there is limited detail provided and we are unable to assess if this outage fully accounts for the inconsistency identified.

On the public evidence available, we are unable to assess if Aurora is delivering this category of operating expenditure. We recommend that significant variations between the driver of expenditure and the actual expenditure incurred are clearly explained.



## Routine and corrective maintenance and inspection

We identified that expenditure in the routine and corrective maintenance and inspection category was higher than forecast, particularly in RY23. Aurora identified this as being due to additional effort being spent to:

- Improve asset information through improved inspection and data collection processes, and
- Correct more asset defects in Dunedin and Central Otago.

We found these reasons to be consistent with other information presented in the ADRs and AMPs. On this basis, we consider that Aurora is progressed in delivering this category of operating expenditure.

## Vegetation management

Aurora reported the percentage of the network that was subject to vegetation management in both the ADR22 and ADR23, however, it was provided in different formats<sup>14</sup>. ADR22 only provided the completion of the whole network while RY23 only provided the data by region.

Aurora states in the AMP22 and AMP23 that they are moving from a five-year cycle that ended in RY22 to a three year cycle that started in RY23.

To provide a comparison, we used the total circuit length of each region to calculate the total circuit length inspected and maintained on a whole of network basis. The results are shown in Table 9.

Table 9 Vegetation management for the whole network

Nature of work - ADR23	RY22 Actual	RY23 Actual
Percentage of network inspected	51%	43%
Percentage of network felled, trimmed, removed or sprayed	26%	43%

We also reviewed the comparison of actual inspections and maintenance compared to forecast that was reported in ADR23 by region, and is shown in Table 10.

Table 10 Vegetation management by network region

Nature of work - ADR23	Dunedin		Central Otago and Wānaka		Queenstown	
	Forecast	Actual	Forecast	Actual	Forecast	Actual
Percentage of network inspected	40%	31%	47%	45%	60%	69%
Percentage of network felled, trimmed, removed or sprayed	34%	34%	46%	42%	53%	66%

We consider that the data indicates that Aurora is progressing with the inspections and maintenance at a rate that is consistent with the forecast amounts. However, the percentages of network inspected and maintained do not align with the stated 3 year inspection cycle. For a three year cycle we would expect approximately 33% of the network to be inspected annually but the actual data shows 45% for Central Otago and 69% for Queenstown.

<sup>14</sup> There were different reporting requirements set out in the Electricity Distribution Information Disclosure Determination 2012, Attachment C for ADR22 covered under Clause 1.6 and all subsequent ADRs covered by Clause 1.7. Notably, Clause 1.7 specifies reporting by Pricing Region whereas Clause 1.6 does not.



The reported numbers suggest either over-delivery or that the difference is likely to relate to how the inspections are scheduled and how definitions are applied to calculate the percentages. We recommend that Aurora provides additional supporting information to clarify the inconsistency between the approach and the reported data.

The expenditure under the vegetation category is broadly in line with the PPDP forecast overall, but has varied by up to 50% compared to the forecast for each region. Aurora identified that higher costs were incurred in Dunedin and Queenstown where they focused on areas with higher density of vegetation that were prone to causing faults, whereas there were lower costs in Central Otago. Aurora appears to have reprioritised expenditure between regions throughout the year based on requirements and progress of the program.

## 2.2.6 Delivery of expenditure by region

The ADR22 did not provide a breakdown of expenditure by region so we are not able to provide a detailed view. However, Table 11 provides a summary of total expenditure by region against forecast for RY23.

Table 11 shows that there is significant variation in expenditure for each region compared to forecast, but in aggregate the expenditure is largely consistent with the forecast.

The reasons for the differences between the regions are explained above and include:

- Different external drivers for expenditure on customer connections and system growth.
- The complexity of asset replacements, particularly poles, with resulted in different unit rates.
- Reliability performance resulting in different levels of reactive expenditure being required.
- Reprioritisation and reallocation of expenditure for vegetation management.

*Table 11 Summary of actual compared to forecast expenditure by region for RY23*

Capital expenditure	Forecast	Actual	Difference
Dunedin	\$ 39.0	\$ 32.1	-18%
Central Otago	\$ 37.6	\$ 46.3	23%
Queenstown	\$ 14.0	\$ 18.7	33%
Operational expenditure	Forecast	Actual	Difference
Dunedin	\$ 26.7	\$ 27.1	2%
Central Otago	\$ 13.9	\$ 13.7	-2%
Queenstown	\$ 7.7	\$ 7.5	-2%

## 2.2.7 Delivery of identified projects on time

As noted in the above sections, delay or early completion of projects was a factor in over and under expenditure. Table 12 below lists each of the 19 projects identified in the PPDP, their expected completion date, an indication of their status and a reason for the assessment based on information provided in the ADRs and AMPs.

We found that eight projects had largely been completed on time or had valid reasons for deferral. We found there were five projects that had been deferred and one project that should have been completed but was not identifiable based on the publicly available information.

We also found that there was insufficient information provided on six projects. Five of these are not planned for completion until RY25 or RY26 so we consider it reasonable that these are not yet discussed in detail. One project was planned for completion in RY22 but we were not able to identify it in the information available.

Overall, we considered that Aurora has demonstrated progress with project delivery, however some delays in delivery have not been identified and areas of improvement are evident. In summary:

- Eight projects were clearly delivered and supported by adequate information.
- Two projects – Smith St to Willowbank cables and Cardrona transformer replacement – appear to have been completed or are on track to be completed on schedule, but there is insufficient information provided to be certain.
- Three projects had insufficient information to identify the status of the projects. They may have been completed, but we could not positively ascertain the outcome. We note that two of these were low value below \$200,000 so may not have been identified individually due to materiality.
- The Upper Clutha voltage support project was delayed due to external factors. The delay was stated to be a few months but resulted in delivery during the following regulatory year.

Based on this assessment, Aurora delivered 10 / 12 projects (83%) according to schedule, demonstrating good delivery performance. Detailed assessment for each project is set out in Table 12 below.

Table 12 Progress of projects individually identified in the PPDP with expenditure planned for RY22 or RY23

Project	Planned delivery	Assessment	Comment
<b>Arrowtown 33 kV Ring Upgrade</b>	RY23-RY24	●	Involves installing 9km cable from Frankton to Arrowtown. It appears to be on track with civils completed in RY23. Completion in RY24 is realistic.
<b>Omakau New Zone Substation</b>	RY22-RY24	●	ADR23 states this project is in progress with completion expected in RY24
<b>Smith Street to Willowbank Inter-tie</b>	RY23-RY24	⦿	ADR23 states the contract has been awarded with ducting to be installed in RY24. Appears to be at risk of falling behind schedule. Coordination issues with Dunedin City Council identified as the reason.
<b>New Arrowtown substation</b>	RY23-RY24	●	Appears to be on track. Feasibility study completed in RY23 and land purchase decision planned in RY24.
<b>Lindis transformer fans installation</b>	RY24	●	Completed ahead of schedule in Nov 22 (RY23)
<b>Upper Clutha voltage support</b>	RY22-RY23	⦿	Not completed on time. Supply chain issues caused delay. Completion now planned after 2023 Winter (RY24). Reasonable justification given supply chain issues globally.
<b>Arrowtown zone substation reconfiguration</b>	RY22	○	This project was not identifiable based on the detail provided in the AMPs and ADRs.

<b>Transfer switch for Roaring MEG generation</b>	RY23	●	Completed on time.
<b>Frankton GXP Special Protection Scheme (SPS) interface</b>	RY22	⦿	Identified in AMP 22 to be completed by winter 22. However, AMP 23 states Transpower is replacing/augmenting the Frankton GXP transformers to resolve the capacity constraint. It is not clear if this project has been completed or if the issue will be resolved through an alternative project. Further information is required to clarify the outcome of the project.
<b>CML – MEG – CA line route feasibility study</b>	RY22	○	This project was not identifiable in the ADR or AMP for RY22 or RY23.
<b>Omakau generators</b>	RY22	●	This appears to have been completed in RY23. However, the scope of this project is not defined. ADR23 states back up diesel generators were installed in RY23 and the IDs Schedule 6a(viii) identifies the expenditure.
<b>Camp Hill generators</b>	RY22	●	This appears to have been completed in RY23. however, the scope of this project is not defined. ADR23 states back up diesel generators were installed in RY23 and the IDs Schedule 6a(viii) identifies the expenditure.
<b>Riverbank new transformer</b>	RY23-RY25	●	ADR23 states design works have started. Limited detail provided. Noting that lead time for a 24MVA transformers is typically up to 18 months, completion in RY25 appears to be realistic, but with risk of delay.
<b>Cardona substation transformer replacement</b>	RY22-RY23	⦿	ADR23 identified the Cardona substation upgrade was completed in RY24. Appears to be this project based on description in PPDP.

The projects listed in Table 13 were identified in the PPDP to only incur expenditure starting in RY24 or later and therefore there we did not expect the AMPs or ADRs to identify any material expenditure to have been incurred to date.

Table 13 Progress of projects individually identified in the PPDP that are planned to start after RY23

Project	Planned delivery
Arrowtown Zone Substation 33 kV Indoor Switchgear	RY25-RY26
Frankton zone substation upgrade	RY24-RY25
Upper Clutha Special Protection Scheme	RY24-RY25
Upper Clutha auto transformer replacement	RY24-RY26
Lindis Crossing second transformer	RY26

### 2.2.8 Communication of changes to the forecast

Aurora has undertaken significant communication and engagement with the community. This has included regular news articles available on their website (approx. 12-16 per year), the "Your Network, Your News" newsletter which is published twice a year, and social media. In the newsletters, there was also evidence of community forums being held and multiple methods to contact Aurora.

The communication has focused on the progress of works, completion of projects and the changed approach to managing the network. Online messaging has focused on identifying planned works in specific areas that may affect the community.

However, there is limited discussion regarding how the works program has been reprioritised to manage unforeseen circumstances. Only the May 2023 newsletter identified that reduced expenditure in responding to faults enables additional funding to be reallocated to planned maintenance.

The description of the projects and programs completed in the ADR22 and the projects discussed in the newsletters did not align with the projects and programs set out in the PPDP. Additionally, many of the projects and programs set out in the PPDP were not identified in the AMP22. This made it difficult to reconcile progress of project development and delivery against the plan set out in the PPDP.

## 2.3 Findings

We found that Aurora has demonstrated that it has generally progressed capital and operational expenditure as set out in the PPDP.

We found that expenditure was significantly above the allowance for customer connections capex.

We found that for the service interruptions and emergencies (opex) expenditure category, the underlying driver for expenditure was not consistent with the category expenditure. That is, the network reliability exhibited deterioration, meaning there were more outages, however the operational expenditure on service interruptions decreased compared to the forecast. We note the potential for the outage event of the Upper Clutha line to have contributed a significant amount of SAIDI and SAIFI without materially affecting operational expenditure, however we could not find sufficient publicly available information to fully explain the apparent inconsistency.

We note that there has been reduced replacement of asset volumes under the asset replacement and renewal expenditure category and evidence was provided to demonstrate that unit rates had significantly increased. However, Aurora did not explicitly state if the volumes replaced was adjusted to manage the category expenditure to within the budget. Further, there was insufficient information provided to understand how the changed volumes affected network risk.

We found that while inflation is likely to have contributed to the increased unit rates, the change in scope identified for pole replacements in Dunedin and Queenstown and the high cost of small distribution cable replacement projects appears to account for the majority of the cost difference. We also found that volumes were lower than forecast for zone substation, distribution cables and protection assets without sufficient explanation of the drivers or risks.

Vegetation management appears to be progressing on track and has transitioned from a five year cycle to a three year cycle. However, the method of reporting the percentage of the network inspected and maintained requires clarification to confirm the project is progressing on a three year cycle. The vegetation management program demonstrated Aurora's ability to reallocated funding between regions in response to the issues identified and rate of progress in each region.

Our assessment of the individual projects identified in the PPDP found that they had mostly been delivered on time and where there were delays, the reasons appear to be driven by external events largely beyond the control of Aurora. There was ambiguity regarding some projects which were not specifically identified with the same name in the ADRs and AMPs as in the PPDP. This made tracking the progress of some projects difficult.

Throughout RY22 and RY23 Aurora has demonstrated consistent communication about the status of its investment programs across multiple media. However, we found that Aurora could improve their reporting on reprioritisation and substitution of capital and operational expenditure<sup>15</sup> as only limited detail was provided for a few cases. Providing more explicit statements on what was reprioritised and the reasoning for it would be beneficial for assessing the prudence of how Aurora is managing their assets as new information or new constraints emerge.

## 2.4 Recommendations

We identified the following improvements for Aurora to consider:

- Where there are material changes in the approach to managing an asset type, we recommend providing additional information to justify the change in approach.
- Where there is a divergence between expenditure in an expenditure category and the trend of the underlying investment driver for that category (for example service interruptions and emergencies expenditure compared to network reliability performance), we recommend Aurora provides further information to explain the inconsistency.
- We recommend that sufficient data be provided across all categories on volumes and unit costs to provide a better understanding of whether Aurora is meeting its forecast delivery programs. This should be accompanied by information which identifies the nature of the variation and how the change in volumes impacted risks.
- Consistent use of project names and references between the various documents to help facilitate interested parties to track information and project progress.
- Expand the communication to customers to explicitly discuss how and why reprioritisation and substitution of capital or operational expenditure was undertaken, as required by clause 2.5.4(2)(c) of the Information Disclosure Determination 2012, and the impact on network risk.

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<sup>15</sup> Clause 2.5.4(2)(c) of the Information Disclosure Determination 2012

### 3. LOW VOLTAGE PRACTICES

Aurora is required to publish a Development Plan which describes its plans to develop and improve planning and practices for its electricity distribution business functions.

It must include plans to develop and improve its practices for the low voltage network, covering:

- how voltage quality is monitored;
- achieving compliance with voltage requirements under the Electricity (Safety) regulations;
- responding to voltage quality issues; and
- communicating the work being undertaken to affected customers.

Progress in the areas identified above are required to be assessed as part of the mid-period review.

#### 3.1 Summary of review findings

Based on the review requirements set out in Clause 2.8.5A of the Determination which are available in Appendix A, we have established the following review elements to assess the progress in, and any recommendations for improvement on, developing low voltage network practices for the low voltage parts of the network. We have assessment gradings based on the criteria in Section 1.5.

Table 14 sets out the review elements developed from the Information Disclosure requirements that were used to assess the progress in developing low voltage network practices.

*Table 14 Assessment grading of review elements developed from the Information Disclosure requirements*

Description	Outcome
Demonstrated plans for monitoring voltage quality on the low voltage parts of Aurora's network	●
Demonstrated delivery of the LV monitoring plans	◐
Evidence demonstrating compliance with applicable voltage requirements of the Electricity (Safety) Regulations 2010 on the low voltage parts of Aurora's network.	◐
Good industry practice is applied to manage voltage quality issues.	●
Demonstration of communication with affected consumers regarding the planned work on the low voltage network to address poor voltage quality.	◐

## 3.2 Analysis

In this section, we identify the analysis that underpins our findings on how Aurora has delivered the planned works set out in their Development Plan with respect to improving low voltage network practices. We do this by assessing the publicly available information that we relied upon to form our opinion against each of the criteria.

### 3.2.1 Industry context

While Aurora's low voltage roadmap is focused on power quality, it appears to encompass the key elements identified by other businesses as enablers for more advanced functionality that are required to enable management of the network as the penetration of DER increases.

Our review of AMPs found that most EDBs have developed a road map or strategy that describes how they intend to develop their networks in response to increasing penetration of Distributed Energy Resources (DER), increasing automation and climate drivers. Typically, the strategies involve a combination of:

- Improving visibility and understanding of LV networks.
- Gaining access to operational data through smart meters or deploying meters.
- Development of supporting ICT assets and systems.
- Development of analytics platforms to identify where and how constraints are likely to emerge.
- Identification of responses may be required.

A number of peer EDBs have a stronger focus on a long term objective of developing open access networks which will enable more control to dynamically manage constraints and connected devices.

### 3.2.2 Monitoring voltage quality on the low voltage network

Monitoring of low voltage networks is comprised of the following components:

- **Capturing operational data** through devices installed on the network. These may be permanently or temporarily installed monitoring devices deployed around the distribution network, meters at zone substations or customer (smart) meters.
- The **systems required** to gather and analyse the data. To understand the low voltage areas across the entire network, this will need to be completed through Information and Communications Technology (ICT) systems to automate the data collection and collate it into a useable format for analysis.
- The **analysis of the data** to develop insights into the network and to be able to make decision on where problems are emerging and where investment may be required.

In the Development Plan, Aurora sets out a roadmap for improving their management of the low voltage network and power quality, as shown in Figure 4 below. As can be seen below, the roadmap captures key elements of a sound plan to monitor low voltage networks.



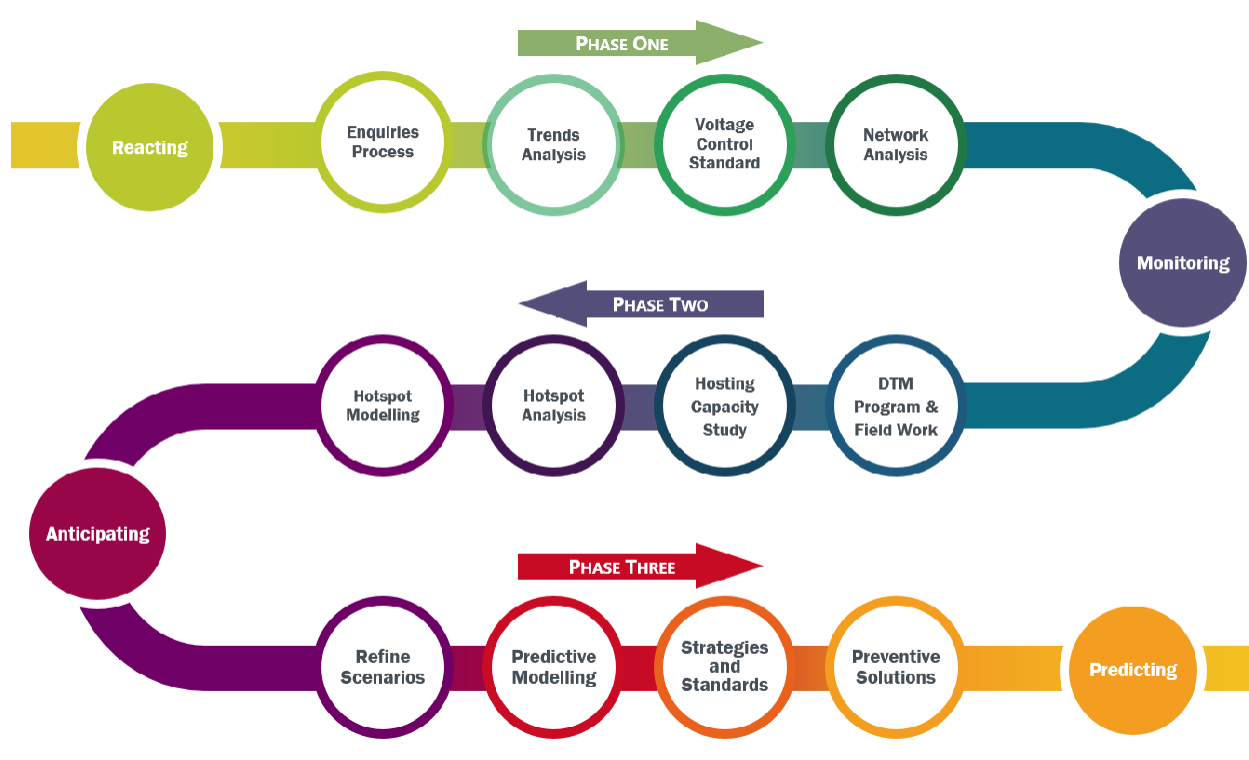


Figure 4 Aurora's low voltage network practices development roadmap

Table 15 summarises our assessment of Aurora's progress against the phases and initiatives set out in their roadmap. This assessment is based on information provided in the AMP and ADR for RY22 and RY23. We consider that Aurora is progressing according to their plan. Our detailed assessment is described below. We note that the areas we have identified as black in our assessment are scheduled to occur in RY24 and onwards. The activities that Aurora had sought to achieve in RY22 and RY23 have been achieved.

Table 15 Summary of progress against roadmap

Phase	Phase name	Initiatives	Timeframe	Status	Assessment
1	Reacting to Monitoring	Enquiries process, trend analysis, voltage standard, network analysis	RY22	Completed	●
2	Monitoring to Anticipating	Hosting capacity study	RY23	Completed	●
2	Monitoring to Anticipating	Network scenarios	RY23	Completed	●
2	Monitoring to Anticipating	Hotspot modelling	RY24		○
3	Anticipating to Predicting	Refine scenarios	RY24		○
3	Anticipating to Predicting	Predictive modelling	RY24		○
3	Anticipating to Predicting	Standards and strategies	RY25		○
2	Monitoring to Anticipating	DTM Programme and Field Work	RY26	In progress	◐
3	Anticipating to Predicting	Preventive solutions	RY26		○

## Capturing operational data

The Network Evolution Plan in AMP23 describes how Aurora is deploying Distribution Transformer Monitoring (DTM) and indicates that they are working towards obtaining data from other sources including smart meters and third parties.

The ADR23 also confirms that 40 DTMs have been deployed on the network as of 31 August 2023 and Aurora will continue deploying DTMs through to RY26. Our review of the AMPs of other network businesses finds that Aurora's approach is consistent with industry practice for obtaining data on the low voltage network. We consider that the approach to developing systems and current capability is consistent with the roadmap set out in the low voltage network practices section of the Development Plan.

However, we have assessed the DTM roll out initiative as 'half green' as the full scope of the program is not clearly defined so we are not able to assess what proportion of the initiative has been completed or the distribution of those DTMs across the three regions.

## Systems required

The Development Plan does not provide sufficient information on improvements or additional capability required to gather data in a suitable format to enable management of low voltage networks.

However, in both the AMP22 and AMP23 Aurora describes the current ICT systems and ICT strategy which will support their initiatives to improve their low voltage network and power quality management practices. In particular, the ICT strategy sets a timeframe of RY25 to RY27 to extend the operational technology<sup>16</sup> systems into management of the low voltage network.

In these documents, Aurora demonstrates that it already has some of the capability and systems required to access and use the low voltage network data once it is available. This includes:

- The Upper Clutha flexibility management system which is currently operational and is used to manage distributed energy resources (DER)<sup>17</sup> to resolve network constraints on a sub transmission line. While this is implemented at sub transmission level, it demonstrates that Aurora has systems in place for DER management and they are starting their low voltage visibility initiatives with background and recent experience with similar systems.
- The ADR22 states that systems are already in place to provide the DTM data to the relevant engineers and it enables them to identify power quality problems, and a more proactive approach to power quality management on low voltage networks.

Our review of other AMPs finds that the systems Aurora plans to implement to manage the data and provide control of DER (if required) is consistent with industry practice.

We consider that the approach to developing systems and current capability is consistent with the roadmap set out in the low voltage network practices section of the Development Plan.

<sup>16</sup> Operational technology refers to ICT systems that interact with, control or retrieve data from field devices. These systems include SCADA, Advanced Distribution Management System (ADMS) and Outage Management System (OMS)

<sup>17</sup> DERs generally refer to assets that generate or have potential to export energy into the network at LV and distribution levels. These typically include solar PV, battery storage and electric vehicles.

### Analysis of the data

In the ADR22 and ADR23 Aurora describes their progress against the roadmap and state that they have completed studies and processes. The documentation is not publicly available so cannot be verified by this report.

However, the ADR22 and ADR23 demonstrate that Aurora has progressed according to their roadmap including:

- Improvements to the enquiry process, such as complaints management and monitoring. The outcome of this is evident through the complaints reported in ADR23.
- Improvements to internal documentation analysis tools that report on specific power quality complaints by customers.
- Developing a PowerFactory model that is used to identify voltage constraints.
- Completing a hosting capacity study to assess the impact of solar and electric vehicles on the network and where future power quality issues may occur. This study was used to update the network congestion policy. We note that the Network Congestion Guide that is available to the public on Aurora's website has not been updated (it is still Version 1 published on 8/4/2021).

Our review of other AMPs finds that Aurora's planned approach to data analytics is consistent with industry practice for obtaining data on the low voltage network.

We consider that the approach to developing systems and current capability is consistent with the roadmap set out in the low voltage network practices section of the Development Plan.

### 3.2.3 Demonstrated delivery of the low voltage monitoring plans

We have reviewed the expenditure set out in the ADRs to identify relevant expenditure and how it aligns with the progress and strategies described in the ADRs and the AMPs.

We found that there is insufficient granularity in the ADRs or AMPs to identify specific expenditure associated with low voltage network practices as it is incorporated into the larger information disclosure categories. Therefore, we are unable to provide an opinion on whether or not the level of expenditure is appropriate for delivering the improvement in low voltage network practices.

We recommend that Aurora provide specific expenditure information on the costs of monitoring the low voltage network in comparison to its PPDP. Where there is a variation, Aurora should provide more information to explain the difference and how it relates to the roadmap initiatives.

### 3.2.4 Achieving compliance with applicable voltage requirements

Aurora has demonstrated their understanding of the requirement to be compliant with the Electricity (Safety) Regulations 2010 on the low voltage parts of their network, however, there has been no data made publicly available to demonstrate Aurora's performance against the requirements.

In other jurisdictions, EDBs report the number, extent and cause of any breaches of power quality requirements. This can be based on monitoring the entire network (such as through smart meter data) or as a sample across the network based on temporary voltage monitoring. With the roll out of DTM, together with the intention to obtain access to smart meter data and planned improvements to SCADA and OMS, Aurora should be able to provide performance data.

We expect that the quality and completeness of the data that Aurora can report will improve over time and become more granular as they progress through their low voltage practices roadmap and implement the enabling systems.

We consider that Aurora is progressing with the development of practices to manage voltage quality and to report on voltage compliance in the future, however, we are unable to verify the actual performance without the data being publicly available.

### 3.2.5 Responding to identified voltage quality issues

The number of voltage complaints by type and region were provided in ADR23. In Table 16, we have provided the aggregate data for the whole network with the weighted average time to resolve.

We note that voltage complaints were the highest overall, and also the highest in both Dunedin and Central Otago and ranked fourth in Queenstown. The average time to resolve the issues ranged from 11 days in Queenstown up to 43 days in Central Otago with a weighted average of 31 days across the network.

On its website, Aurora states they aim to respond to complaints within 2 business days and resolve complaints within 20 working days. However, we recognise that power quality issues are likely to take longer to resolve due to the need to undertake network measurements for a period of time to identify the cause of the voltage issue and then complete any works that may be required.

Once a complaint has been made, Aurora manages each issue individually to resolve the issue. All power quality issues are managed reactively and are initiated by a customer complaint. However, Aurora's low voltage network practice development roadmap demonstrate that they are working toward a more proactive approach, and are in the process of implementing the systems and deploying the field devices to enable this improvement.

While Aurora has reported the number of complaints about voltage (power quality), they have not reported the cause or what actions were typical involved to resolve the issue. This additional information would be useful to assess if there are emerging systemic issues on the network and if average response time was reasonable, particularly given the large range in times to resolve issues that has been reported.

While we have identified some areas for improvement, our review of other AMPs finds that Aurora's approach to managing voltage quality is consistent with industry practice.

We consider that the approach to developing systems and current capability is consistent with the roadmap set out in the low voltage network practices section of the Development Plan.

Table 16 Number of voltage complaints by network region

Network region	Number of voltage complaints	Average time to resolve (Business days)
Dunedin	22	22
Central Otago and Wanaka	19	43
Queenstown	9	11
<b>Network average</b>	<b>46</b>	<b>31</b>

### 3.2.6 Communicating work on voltage quality to affected consumers

Voltage quality issues are currently only identified through customer complaints and each complaint is managed individually. Therefore, there are direct communications with the affected customers, but the type and extent of communications is not publicly available.

We reviewed other available information sources to identify alternative means of communication of power quality, including the ADRs, AMPs, the Newsletter, Community Updates and the News items published on the Auroara website. We did not find any information regarding power quality being published to identify issues to the affected community.

Based on the processes set out in the AMP and on Aurora's website, we consider that Aurora is taking the appropriate actions to communicate directly with affected customers, however, we did not find evidence of broader communications to the community who may also be affected by the issue.

We consider there is an opportunity to improve the communication of voltage quality through disclosing actual performance and clearly identifying impacted areas. This could be done through the AMP or newsletter. When performance information is published, then it encourages action to be taken to address any non-compliances. Trending performance over time will then help identify if the actions being taken are effective and providing value to customers.

## 3.3 Findings

Aurora has not observed voltage issues being directly attributed to DERs due to the relatively small amount of DER on the network of approximately 9MW. However, with the rate of uptake during the past 10 years, there are likely to be issues in the near future if actions are not taken to manage the low voltage network.

Aurora recognises that changes to customer usage and behaviour as a result of the increased penetration of DERs has significant potential to create issues on the network including poor power quality and has set out plans to manage and improve monitoring of the low voltage network. We consider that this is prudent and consistent with approaches undertaken by other networks.

We found that Aurora has demonstrated progress on developing low voltage monitoring and practices to address identified voltage quality issues, however it has not provided sufficient data to verify the actual performance of power quality and compliance with the Electricity (Safety) Regulations 2010.

While we have identified areas for improvement and made recommendations, we consider that Aurora's plans, as set out in the ADRs and their AMPs, are consistent with industry practice and that overall, they are progressing with the plans for improvement of the low voltage network practices as set out in the Development Plan.

### 3.4 Recommendations

We propose the following recommendations for Aurora to consider:

- Aurora provides specific expenditure information on the costs of monitoring the low voltage network in comparison to its PPDP. Where there is a variation, Aurora should provide more information to explain the difference and how it relates to the roadmap initiatives.
- Aurora publishes the actual performance of power quality on the network to demonstrate how their investments are improving outcomes for customers. This could include:
  - The number of instances where voltage standards were breach (exceeding  $\pm 6\%$ , total harmonic distortion) and actions taken to rectify the issues.
  - Geographic representation or breakdown by area(s) affected.
  - Expand the reporting of complaints to include the cause of the voltage issue.
  - The percentage of the network being monitored via DTM and smart meter data.
- Improve communication of the low voltage quality issues identified and the works being undertaken to address those issues. An existing medium could be used such as the Newsletter, Community Updates or the News items published on their website.
- Update the Congestion Guide that is available on Aurora's website to ensure it reflects, and is consistent with, any changes made to the Congestion Policy. We note that the network Congestion Guide is version 1 and was last updated on 8/4/2021.

## 4. ASSET MANAGEMENT PRACTICES

Aurora is required to publish a Development Plan which describes its plans to develop and improve planning and practices for a number of electricity distribution business functions.

It must include plans to develop and improve its asset management practices and processes, including their:

- asset health models so they are informed by asset condition data;
- understanding of asset criticality so that it informs Aurora's strategies for replacement and renewal; and
- asset risk framework to enable risk based decision making.






Progress in these areas is required to be assessed as part of the mid-period review.

### 4.1 Summary of review findings

Based on the review requirements set out in Clause 2.8.5A of the Determination which are available in Appendix A, we have established the following review elements to assess the progress in, and any recommendations for improvement on, developing asset management practices and processes with respect to asset health models, asset criticality and the asset risk framework.

Table 14 sets out the criteria developed from the Information Disclosure requirements that were used to assess the progress in developing asset management practices.

*Table 17 Assessment criteria developed from the Information Disclosure requirements*

Description	Outcome
Progress against the Development Plan	 Note 1
Asset health models are informed by asset condition data	
Asset criticality informs asset replacement and renewal strategies	
The asset risk framework enables risk-based decisions	
The asset risk framework considers appropriate risk factors (ie reliability, environmental, high-impact low-probability event, and safety risk as appropriate)	

**Note 1:** There were a number of initiatives where there was not sufficient data publicly available to make an assessment. These have been excluded from our scoring of this criteria.



## 4.2 Analysis

In this section, we assess how Aurora has progressed with the planned works set out in their Development Plan with respect to improving Asset Management practices. We do this by assessing the publicly available information that we relied upon to form our opinion against each of the criteria.

### 4.2.1 Industry context

Risk analysis is commonly undertaken using a matrix style analysis which uses the probability of an event occurring along one axis of the matrix and the consequence of the event along the other axis to classify the level of risk. This approach has its basis in NZS 31000 which is the industry standard for risk management. In addition to NZS31000, there are other guidelines that businesses use to either inform or quantify elements of their risk analysis and how the probabilities and consequences are determined. Commonly used guidelines in New Zealand include:

- Electricity Engineers Association's Asset Health Indicator Guide which focuses on ranking the health and condition of assets, and
- UK based regulator, the Office of Gas and Electricity Market, Common Network Asset Indices Methodology which sets out principles for quantifying risk into dollar values.

Across the electricity industry there is a trend towards quantification of risk into dollar values which provides more granularity between asset risks and can be used by other business processes such as cost benefit analysis.

In New Zealand, the AMPs demonstrate that most EDBs apply the matrix approach to risk analysis, however, a minority EDBs have evidence in their AMPs of starting to progress towards quantification of risk into dollar values, notably Vector, Powerco and NorthPower.

Our assessment of Aurora's approach to risk management has found that their risk assessment framework applies the matrix approach by using asset health as a metric for the likelihood of failure and asset criticality as a metric of consequence for failure. We consider that this approach is consistent with the majority of other EDBs in New Zealand and aligned to the risk management standard and commonly applied guidelines.

## 4.2.2 Progress against the Development Plan

The table below summarises Aurora's self-assessment of their progress against the plan for improving asset management and our assessment based on the publicly available information. Our reasoning for making the assessment shown in Table 18 are set out in the following sections.

Table 18 Assessment of Aurora's progress against asset management improvement initiatives

KEY ACTIVITIES / MILESTONES	RY22	RY23	RY24	RY25	RY26	ASSESSMENT
<b>Strategy and Planning</b>						
Strategic Asset Management Plan (SAMP)						○
Fleet Strategies and Plans						○
Asset Information						●
Asset Failure Modes						○
<b>Define and Evaluate Risk</b>						
Asset Health						●
Asset Criticality						◐
Risk Evaluation						◐
<b>Asset Management Decision Making</b>						
Align decision-making with risk						●
Define and monitor risk control effectiveness						○
Define and document investment approval process						○
Live asset risk evaluation (aspirational)						○
<b>Risk Management and Review</b>						
Review our critical business risks						○
Risk treatment plan and ownership						○
Governance Reporting						○

Note: since these documents are not publicly available, we were not able to undertake an independent assessment of progress. However, the ADR23 is certified by board directors and therefore we consider Aurora's self-assessment of progress to be adequate.

**Strategy and Planning**

Aurora set out specific initiatives in the Development Plan regarding improvements to asset data collection and quality. We have not undertaken a detailed review of their progress against those initiatives, however, we note that throughout our review we have identified Aurora's focus on asset data and the progress being made in improving the data availability and quality. In particular, we note the expenditure on the development of an Asset Management System was identified in the Information Disclosures for RY22 in Schedule 6a(ix) under Atypical expenditure. This demonstrates Aurora's progress in managing asset information.

In the ADR23 Aurora stated that they have started developing the SAMP, asset fleet strategies and completed a first draft of the failure modes effects analysis. Aurora has provided a self assessment of progress in the ADR23 which shows the SAMP being behind schedule compared to the PPDP as the approach appears to have changed to develop it concurrently with the fleet strategies. The remaining items are shown to be progressing according to schedule. As these are not public documents, there is insufficient information available to undertake an independent assessment of Aurora's progress with these initiatives.

**Define and Evaluate Risk**

Aurora has provided sufficient evidence to demonstrate consistent application of asset health assessment as a proxy for probability of failure by calculating the Asset Health Indices. They have also started to expand the inputs to include condition data.

Asset criticality has been applied, as a proxy for consequence of failure, for all assets except underground distribution cables and distribution switchgear. In these cases, only an age based Asset Health Index (AHI) has been used to determine risk. Further detail is provided in section 4.2.4.

As a result, risk evaluation is broadly being calculated based on probability and consequence of failure, aside from these two asset categories.

We consider that Aurora is generally progressing according to the Development Plan and has identified an improved risk framework in AMP23, refer to section 4.2.5, however there is a minor deficiency in the methodology applied to underground distribution cables and distribution switchgear that should be addressed.

**Asset Management Decision Making**

We found that Aurora is progressing with the development of their risk assessment framework as set out in the Development Plan. Aurora has provided a self assessment of progress in the ADR23 regarding the risk control effectiveness process and investment approval process which shows these initiatives progressing according to schedule. However, as these are not public documents there was insufficient publicly available information to undertake an independent assessment of Aurora's progress with these initiatives.

**Risk Management and Review**

The ADR identified progress in these initiatives, however the information was not available publicly so we are unable to assess Aurora's progress in with these initiatives.

### 4.2.3 Asset health models are informed by asset condition data

Aurora has historically used age as a proxy for asset condition, however, in the AMP23, they identify that out of the 10 asset categories identified in Table 19 below, four have condition inputs that form part of the Asset Health Index and two categories (sub transmission conductors and sub transmission cables) are forecast based on specific studies and knowledge of the assets, hence incorporating asset condition.

We note that using age as a proxy for asset condition is a common approach for distribution assets where there is less condition data readily obtainable. This approach is used to forecast replacement budgets, however actual replacements are undertaken based on asset inspection results. As a result, the methodology applied typically incorporates a calibration step to ensure any forecast replacement volumes are consistent with actual historical replacement volumes.

Aurora has demonstrated ongoing development of their approach to incorporate asset condition into their risk models. We consider this is a significant improvement upon current practice and demonstrates Aurora's progress in their asset management practices, consistent with the Development Plan.

Table 19 Summary of inputs that demonstrate how criticality informs asset replacement strategies

Category	Probability (Health)	Criticality (Consequence)	Focus
<b>Support structures</b>	Age	Safety (location)	Safety and reliability
<b>OH Conductor – Sub T</b>	Specific individual assessment		Safety and reliability
<b>OH Conductor – Dist, LV</b>	Age	Prioritised by Safety criticality (location) and delivery	Safety
<b>UG Cables – Sub T</b>	Specific individual assessment		Reliability
<b>UG Cables – Dist, LV</b>	Age	No criticality framework yet, prioritised by Cast Iron Potheads which pose a safety risk	Safety
<b>Zone substations – transformers</b>	Age and condition inputs	Criticality factor based on load supplied and security of supply	Reliability
<b>Zone substations – indoor switchgear</b>	Age and condition inputs	Criticality factor based on load supplied and security of supply	Reliability
<b>Zone substations – outdoor switchgear</b>	Age and condition inputs	Indirectly by alignment with other ZSS works.	Reliability
<b>Distribution switchgear</b>	Age, Modified by type obsolescence for ground mounted switchgear.	Criticality not applied	Safety
<b>Distribution transformers</b>	Age	Safety criticality (location) for pole mounted only	Safety

#### 4.2.4 Asset criticality informs asset replacement and renewal strategies

The AMP shows that the AHI is used to develop the forecast volumes and the criticality is used to prioritise the replacement where the data is available. The key inputs applied for each major asset class for the probability of failure and consequence of failure are described in Table 19 above. This demonstrates that some form of asset criticality forms the basis of the replacement plans for most of the asset categories, and the inputs used are tailored based on the asset type and availability of information.

Aurora has identified plans for development of criticality factors where criticality is currently not applied to prioritise the forecast program of works.

#### 4.2.5 The asset risk framework enables risk-based decisions

In the AMP23, Aurora sets out their new framework that applies common industry methodologies, such as those set out by the Electricity Engineers Association (EEA) and the Office of Gas and Electricity Markets UK (Ofgem) to develop a full risk assessment that is implemented in a risk matrix format.

The risk matrix, shown in Figure 5, identifies how risk is categorised based on the likelihood and consequence of failure. It defines an intolerable risk appetite boundary that identifies the intolerable risks that must be addressed, forming the basis of the forecast works, with additional replacements of assets outside of the 'intolerable' quadrant assessed based on merit (such as cost benefit analysis). Aurora considers this approach to be broadly consistent with an "As Low as Reasonably Practicable" (ALARP) approach to risk reduction.

		Risk Impact				
		Immaterial	Minor	Moderate	Severe	Catastrophic
Likelihood	Almost Certain	Low	Medium	High	Extreme	Extreme
	Likely	Low	Low	Medium	High	Extreme
	Possible	Low	Low	Medium	High	High
	Unlikely	Insignificant	Insignificant	Low	Medium	High
	Rare	Insignificant	Insignificant	Low	Medium	Medium

Risk Appetite Boundary

Figure 5 Risk levels as defined by Aurora's new risk framework

Aurora identifies that while they have developed their methodology, they are currently limited to only applying criticality based on safety criteria (using the asset location) for distribution assets but include additional factors such as demand and security of supply for zone substation assets. They plan to continue to develop this methodology to incorporate additional inputs for both asset condition (probability of failure) and asset criticality (consequence of failure).

However, the information provided in the AMP23 indicates that the replacement forecast is predominately based on the AHI, as defined by age and any condition inputs applied, with the

output modified by the criticality factor as described in Table 19 rather than through application of the new risk based framework<sup>18</sup>.

The difference between the description of the risk framework in chapter 5.3 of AMP23 and the apparent application of a different approach in chapter 8 of AMP23 created uncertainty regarding the actual risk framework being applied. We note that there is evidence in the Safety Plan (discussed in section 5) of the new risk framework being applied.

We recommend that Aurora clarifies the methodology applied to develop their asset renewals forecast and, if the new risk based approach is applied, present a summary of the network risk rather than AHI for the current and future states of the network.

We consider that the approach applied in the AMP is an improvement from a purely age based forecast developed for the CPP application. The updated framework is another significant improvement by incorporating additional consequence factors and applying methodologies commonly used in the electricity industry. This demonstrates Aurora's progress in their asset management practices, consistent with the Development Plan.

#### **4.2.6 The asset risk framework considers appropriate risk factors**

The current factors considered by Aurora in their risk framework are:

- Asset age as a proxy for condition and therefore probability of failure.
- Asset condition inputs are applied for some asset classes to modify the asset age and therefore the probability of failure.
- Asset location for distribution assets as a proxy for public safety consequence. The higher the likelihood of the public being close by, the higher the assets criticality. Considerations for determining the criticality included proximity of schools, shops and road classifications.
- Demand supplied and security of supply are applied as a consequence of failure on reliability. Considerations include magnitude and type (ie CBD or rural) of load supplied, zone substation security (ie N or N-1), and the ability to transfer load.

Aurora has identified in the AMP23 that they will continue to develop their risk framework to include additional inputs and factors as appropriate for each asset class and subject to the required data being available and reliable.

In our experience, reliability and safety typically account for the majority of the risk value for electricity distribution assets<sup>19</sup>. Therefore, we consider that the factors being considered are appropriate at this stage of their maturity in asset management. However, with the risk framework established, we would expect additional consequence factors to be incorporated within a reasonable timeframe.

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<sup>18</sup> In Chapter 8 Renew and Dispose of the AMP23, Aurora describes the AHI breakdown for each asset class and how criticality has been applied to prioritise replacements.

<sup>19</sup> We note that some networks have specific risks unique to their circumstance that may differ from this generalisation such as fire risk in south east Australia or earthquake risk in parts of New Zealand.

## 4.3 Findings

Our review found that Aurora has demonstrated progress in improving their asset management and risk assessment practices, consistent with the Development Plan.

The approach to asset management is aligned with industry practice, however, there was insufficient information publicly available to assess whether they had progressed against all the initiatives set out in the Development Plan. The focus on improving asset data quality and systems was evident through the investments made and disclosed. We consider asset and network data to be an essential enabler for all asset management activities, especially risk analysis.

Aurora has demonstrated ongoing development of their risk framework through the incorporation of asset condition and consequences into their risk models, with the inclusion of broader consequences than safety. These changes are significant improvements and demonstrate Aurora's progress.

However, we also identified some areas for improvement and where their approach needs to be clarified:

- A number of the identified initiatives did not have publicly available information so we were unable to assess their progress under the scope of this review. Not all of these should be made public but some items such, as the investment approval process and critical business risk, would strengthen the AMP and provide transparency for customers.
- Criticality was not applied to distribution and LV cables or distribution switchgear, which means these assets are currently being managed based on asset age.
- There is some ambiguity regarding the risk framework applied. In AMP23, chapter 5.3 describes a risk framework combining asset health and consequence of failure to determine the risk per asset fleet and the required programme of investment. However, in chapter 8 Aurora presents an age based view of the asset fleet and states that replacements are prioritised based on criticality. This difference makes it difficult to understand the actual approach being applied.

## 4.4 Recommendations

We identified the following improvement for Aurora to consider:

- Clarifying how the risk methodology is applied to each asset fleet (ie any asset specific inputs or considerations) to develop the forecast works program in the AMP.
- Presenting the network risk profile to show the current state and future state (with and without the planned investment) rather than focusing on only asset health.
- Providing additional information on the development of asset management processes that are described as specific initiatives in the Development Plan. We recommend including the following in the AMP:
  - A summary of the SAMP
  - A summary of the fleet management Plans and/or the development process
  - An overview of the investment approvals process
  - A list of the critical business risks, as they relate to network assets and providing electricity services to customers. This should also describe actions being undertaken to address the risks. We note that this is done in a limited fashion for network resilience.



- Apply criticality factors to the distribution cables, LV cables and distribution switchgear to ensure all asset fleets are being assessed against the existing risk framework.
- While continuing to progress and develop the risk framework Aurora should start to consider a path to fully quantify their risk analysis. This would ensure their practices remain aligned to industry practice and the analysis results can be used as an input to a cost benefit analysis and project justification.

## 5. IDENTIFYING AND REDUCING SAFETY RISKS

In its Development Plan, Aurora must include plans to develop and improve its asset management practices and processes, including practices for identifying and reducing safety risks. This includes through the use of frameworks to prioritise safety issues and justify investments to reduce the likelihood of occurrence.

Progress in these areas is required to be assessed as part of the mid-period review.

### 5.1 Review criteria

Based on the review requirements set out in Clause 2.8.5A of the Determination which are available in Appendix A, we have established the following review elements to assess the progress in, and any recommendations for improvement on, developing asset management practices and processes with respect to identifying and reducing safety risks.

9 sets out the criteria developed from the Information Disclosure requirements that were used to assess the progress in identifying and reducing safety risks.

*Table 20 Assessment grading of review elements developed from the Information Disclosure requirements*

Description	Outcome
Development of practices for identifying and reducing safety risks (in relation to Aurora's supply of electricity distribution services.)	●
Demonstrated practices to prioritise identified safety issues and reduce the likelihood of those safety risks materialising.	●

### 5.2 Analysis

In this section, we assess how Aurora has progressed with the planned works set out in their Development Plan with respect to improving Asset Management practices, with a focus on practices for identifying and reducing safety risks. We do this by assessing the publicly available information that we relied upon to form our opinion against each of the criteria.

#### 5.2.1 Development of practices for identifying and reducing safety risks

Practices for identifying and reducing risk involve both capital and operational programmes. Our assessment of Aurora's progress is set out below for each of the expenditure categories.

## Capital expenditure

As discussed in section 4, Aurora has developed and improved its practices regarding asset management with a primary focus on managing network safety. Aurora is continuing to develop the risk framework and is also actively pursuing initiatives to improve asset data and data quality.

To monitor progress, Aurora identified five asset categories that have the most potential to impact public safety. These asset categories cover the most common assets around the network that are generally located in publicly accessible locations, so provide a good overview of network safety risk:

- Support structures
- Overhead conductors
- Distribution switchgear
- Distribution transformers
- Underground cables (exposed parts and terminations)

These asset fleets were assessed using the risk framework as described in in section 4.2 and the number of assets identified to have intolerable risks have been reported for RY21 through to RY23, as shown in Table 1. We note that this information is not currently provided in the AMP, which focuses on asset health, but is available in the ADR. Aurora should consider including the output of their updated risk framework in the AMP.

Table 21 Trend of the number of assets with 'intolerable' risk

SAFETY SENSITIVE FLEETS	NUMBER OF UNITS ABOVE TOLERANCE			ASSESSMENT
	ACTUALS AS AT 31 MARCH 21	ACTUALS AS AT 31 MARCH 22	ACTUALS AS AT 31 MARCH 23	
<b>Poles</b>	2,487	2,089	461	●
<b>Crossarms</b>	7,664	7,209	8,488	◐
<b>Subtransmission Conductor (km)</b>	66	51.5	29	●
<b>Distribution Conductor (km)</b>	76	49.2	60	●
<b>LV Conductor (km)</b>	72	76.8	51	●
<b>Subtransmission Cables (km)</b>	8	8.2	5	●
<b>Distribution Cables (km)</b>	32	18.5	4	●
<b>LV Cables (km)</b>	23	25.4	27	●
<b>Ground Mounted Switchgear</b>	199	164	340	◐
<b>Pole Mounted Switches</b>	197	210	63	●
<b>Low Voltage Enclosures</b>	1,102	1,113	1,111	●
<b>Reclosures and Sectionalisers</b>	8	7	9	●
<b>Ground Mounted Distribution Transformers</b>	101	106	12	●
<b>Pole Mounted Distribution Transformers</b>	120	123	126	●

We note that since age is a key input to the risk framework, as assets age their condition will deteriorate and more assets will have a higher probability of failing. So, while Aurora implements programmes to replace assets and reduce the volume of 'intolerable' risk, additional assets will transition into the 'intolerable' risk category. Hence, the rate of replacement needs to allow for the current and future asset fleet condition.

As shown in Table 21, the volume of intolerable risks is decreasing for most asset classes. In the case of cross arms and ground mounted switchgear, Aurora clarified that new and improved asset data has resulted in more assets being identified in deteriorated condition than previously reported, hence the number of assets with 'intolerable' risk has increased.

We consider that improving the understanding of the network is essential and that changes in asset fleet condition due to improved data are a good outcome. If the risk is known it can be managed, but if it is not known, then no action can be taken to manage it.

### **Operational expenditure**

The ADR23 and risk framework set out in the AMP23 focus on managing risk through asset replacement, however inspection and maintenance is an essential enabler for managing network safety risk.

In the Safety Plan and the AMP23, Aurora describes their risk-based approach to developing their inspection and maintenance programme. They apply a time-based/cyclic preventative maintenance and inspection programme with the time interval based on several factors, including asset risk. The outcome of the inspection program, as well as any defects identified through reactive works, is used to inform both the corrective maintenance programme and replacement programme.

The AMP23 also identified that enabling staff to ensure safety during operational tasks is a focus of the processes and procedures that have been established. This includes initiatives such as improving asset data and data quality, standardising symbols and alarms in the ADMS to reduce the chance for human error, redesigning the switching approval process to ensure safety is considered, and monitoring compliance of contractors with training and qualification requirements.

Our review of expenditure in section 2 found that Aurora has largely met its operational expenditure forecast but additional expenditure was allocated to routine and corrective maintenance and inspection due to a focus on improving asset data. This is consistent with the approach to the risk framework and to ensure network safety risks can be identified.

We consider that Aurora's has demonstrated that its practices and initiatives are helping to identify and reduce network safety risk.

## **5.2.2 Demonstrated practices to prioritise identified safety issues and reduce the likelihood of those safety risks materialising.**

Throughout the information reviewed, Aurora has demonstrated a focus on managing network safety through the application of the risk framework.

Aurora has demonstrated they have applied the risk framework to forecast the volumes of assets requiring replacement, justify the need for replacement and to monitor the effectiveness of the programmes through trending of the number of assets that are assessed to pose 'intolerable risk' for the five asset classes most relevant to safety.

Aurora's approach for establishing and implementing operational initiatives, as demonstrated by the actual expenditure, supports that processes to reduce the likelihood of risks materialising have been applied.

We consider that Aurora has demonstrated practices to identify and prioritise identified safety issues through the application of a risk frameworks.

### 5.3 Findings

We found that Aurora has demonstrated that its practices and initiatives are helping to identify, reduce and monitor progress in reducing network safety risk through the application of a sound risk framework.

### 5.4 Recommendations

Ensure that the ADRs and AMPs align with information in the Safety Delivery Plan on the volume of assets that represented key network safety risks. The information should also show how volumes have changed and the reason. This would provide clarity and further demonstrate Aurora is effectively addressing network safety risk.

Aurora should also include the output of their updated risk framework in the AMP, rather than focusing on asset health. This would improve alignment of the AMP and asset management practices with the risk framework.

## 6. TABLE OF RECOMMENDATIONS

### Project and Programme Delivery Plan (Chapter 2)

- Where there are material changes in the approach to managing an asset type, we recommend providing additional information to justify the change in approach.
- Where there is a divergence between expenditure in an expenditure category and the trend of the underlying investment driver for that category (for example service interruptions and emergencies expenditure compared to network reliability performance), we recommend Aurora provides further information to explain the inconsistency.
- We recommend that sufficient data be provided across all categories on volumes and unit costs to provide a better understanding of whether Aurora is meeting its forecast delivery programs. This should be accompanied by information which identifies the nature of the variation and how the change in volumes impacted risks.
- Consistent use of project names and references between the various documents to help facilitate interested parties to track information and project progress.
- Expand the communication to customers to explicitly discuss how and why reprioritisation and substitution of capital or operational expenditure was undertaken, as required by clause 2.5.4(2)(c) of the Information Disclosure Determination 2012, and the impact on network risk.

### Low Voltage Plans (Chapter 3)

- Aurora provides specific expenditure information on the costs of monitoring the low voltage network in comparison to its CPP Determination. Where there is a variation, Aurora should provide more information to explain the difference and how it relates to the roadmap initiatives.
- Aurora publishes the actual performance of power quality on the network to demonstrate how their investments are improving outcomes for customers. This could include:
  - The number of instances where voltage standards were breach (exceeding  $\pm 6\%$ , total harmonic distortion) and actions taken to rectify the issues.
  - Geographic representation or breakdown by area(s) affected.
  - Expand the reporting of complaints to include the cause of the voltage issue.
  - The percentage of the network being monitored via DTM and smart meter data.
- Improve communication of the low voltage quality issues identified and the works being undertaken to address those issues. An existing medium could be used such as the Newsletter, Community Updates or the News items published on their website.
- Update the Congestion Guide that is available on Aurora's website to ensure it reflects, and is consistent with, any changes made to the Congestion Policy. We note that the network Congestion Guide is version 1 and was last updated on 8/4/2021.

### Asset Management Plans (Chapter 4)

- Clarifying how the risk methodology is applied to each asset fleet (ie any asset specific inputs or considerations) to develop the forecast works program in the AMP.
- Presenting the network risk profile to show the current state and future state (with and without the planned investment) rather than focusing on only asset health.
- Provide additional information on the development of asset management processes that are described as specific initiatives in the Development Plan. We recommend including the following in the AMP:

- A summary of the SAMP
- A summary of the fleet management Plans and/or the development process
- An overview of the investment approvals process
- A list of the critical business risks, as they relate to network assets and providing electricity services to customers. This should also describe actions being undertaken to address the risks. We note that this is done in a limited fashion network resilience.
- Apply criticality factors to the distribution cables, LV cables and distribution switchgear to ensure all asset fleets are being assessed against the existing risk framework.
- While continuing to progress and develop the risk framework Aurora should start to consider a path to fully quantify their risk analysis. This would ensure their practices remain aligned to industry practice and the analysis results can be used as an input to a cost benefit analysis and project justification.

### Identifying and Reducing Safety Risks (Chapter 5)

- Ensure that the ADRs and AMPs align with information in the Safety Delivery Plan on the volume of assets that represented key network safety risks. The information should also show how volumes have changed and the reason. This would provide clarity and further demonstrate Aurora is effectively addressing network safety risk.
- Aurora should also include the output of their updated risk framework in the AMP, rather than focusing on asset health. This would improve alignment of the AMP and asset management practices with the risk framework.



# APPENDIX A: COMPLETE WORDING OF THE REVIEW REQUIREMENTS

Clause 2.8.5A of the Determination requires a mid-period review to be undertaken by an independent expert to assess the progress in, and any recommendations for improvement on, specific aspects of the additional disclosures:

2.8.5A By 1 March 2024, Aurora must publicly disclose one or more reports, procured and prepared in accordance with clause 2.8.5B, that provide an opinion from one or more independent experts on Aurora's progress in, and any recommendations for Aurora to improve on, each of the following:

- 1) delivering on time the capital expenditure and operational expenditure projects and programmes described in Aurora's project and programme delivery plan under clause 2.5.4(2);
- 2) developing low voltage network practices referred to in clause 2.5.4(1)(a);
- 3) developing Aurora's consultation practices with consumers, including those regarding changes to Aurora's customer charter, consumer compensation arrangement, and the additional pricing methodology disclosures under clause 2.4.5A;
- 4) developing asset management practices and processes referred to in clause 2.5.4(1)(e)(i) to (iii) and
- 5) developing practices for identifying and reducing safety risks referred to in clause 2.5.4(1)(e)(iv).

The clauses referred to in the description are set out in full in the following sections.

## **Clause 2.8.5A(1) requires the mid-period review to cover clause 2.5.4(2) related to the Project and Programme Development Plan:**

2.5.4 Aurora must do the following:

- 2) by 31 March 2022, publicly disclose Aurora's 'project and programme delivery plan' that describes:
  - (a) the capital expenditure and operational expenditure projects and programmes Aurora plans to deliver over the CPP regulatory period, including where and when Aurora plans to deliver those projects and programmes;
  - (b) whether, and if so how and why, the projects and programmes in paragraph (a), and the capital expenditure and operational expenditure required for those projects and programmes, as applicable, differ in material respects to:
    - (i) *the capital expenditure and operational expenditure projects and programmes outlined in Aurora's application for the Aurora CPP; and*
    - (ii) *the capital expenditure and operational expenditure provided for in the Aurora CPP;*
  - (c) how Aurora plans to communicate with consumers and other stakeholders when it needs to reprioritise or substitute capital expenditure or operational expenditure projects or programmes during the CPP regulatory period;

**Clause 2.8.5A(2) requires the mid-period review to cover clause 2.5.4A(1)(a) related to low voltage network practices:**

2.5.4 Aurora must do the following:

- 1) by 31 March 2022, publicly disclose Aurora's 'development plan' that describes how Aurora plans to develop and improve its—
  - (a) low voltage network practices for—
    - (i) *monitoring voltage quality on the low voltage parts of Aurora's network;*
    - (ii) *achieving compliance with applicable voltage requirements of the Electricity (Safety) Regulations 2010 on the low voltage parts of Aurora's network;*
    - (iii) *responding to voltage quality issues when they are identified; and*
    - (iv) *communicating to affected consumers the work on voltage quality that Aurora is doing on its low voltage network;*

**Clause 2.8.5A(3) requires the mid-period review to cover clause 2.4.4A related to consultation practices with consumers:**

This requirement is out of scope of this report.

**Clause 2.8.5A(4) requires the mid-period review to cover clause 2.5.4(1)(e)(i) to (iii) related to asset management practices:**

2.5.4 Aurora must do the following:

- 1) by 31 March 2022, publicly disclose Aurora's 'development plan' that describes how Aurora plans to develop and improve its—
  - (e) asset management practices and processes, including, where appropriate, to develop and improve Aurora's—
    - (i) *asset health models so that they are informed by network asset condition data;*
    - (ii) *understanding of asset criticality so that it informs Aurora's strategies for asset replacement and renewal;*
    - (iii) *asset risk framework so that Aurora can make risk-based decisions in relation to its supply of electricity distribution services, including where appropriate, based on reliability risk, environmental risk, high-impact low-probability event risk, and safety risk; and*

**Clause 2.8.5A(5) requires the mid-period review to cover clause 2.5.4(1)(e)(iv) related to identifying and reducing safety risks:**

2.5.4 Aurora must do the following:

- 1) by 31 March 2022, publicly disclose Aurora's 'development plan' that describes how Aurora plans to develop and improve its—
  - (e) asset management practices and processes, including, where appropriate, to develop and improve Aurora's—
    - (iv) *practices for identifying and reducing safety risks in relation to Aurora's supply of electricity distribution services, including by using frameworks to prioritise identified safety issues and to justify investments to reduce the likelihood of those issues arising;*

# APPENDIX B: PROFILE OF THE REVIEW TEAM

Profiles for Michael Van Doornik and Zubin Meher-Homji are provided below to demonstrate their qualifications and experience are suitable for undertaking this review.

## Michael Van Doornik

Qualifications:

- Bachelor of Science
- Bachelor of Electrical and Computer Systems Engineering (Hons)
- Master of Applied Finance
- Chartered Professional Engineer (MIEAust)
- Certified Asset Management Assessor (WPiAM)
- Lead Auditor for Quality Management Systems

Michael is currently the director for Energy Networks Consulting which focuses on assisting electricity networks across Australia and New Zealand manage their assets, comply with regulations, and make robust investment decisions. He has over 17 years' experience working as both an engineer and management consultant with extensive experience in delivering strategy, due diligence, business cases, asset management and regulatory advice across a range of energy and infrastructure assets. His advice is underpinned by a strong engineering and commercial background gained from working as National Executive for the Strategic Asset Management at WSP, post graduate studies in finance and operating his own consulting business. Michael has a track record of working across Australia, New Zealand and South East Asia and has managed national teams of up to 60 professionals.

Michael has significant industry experience in strategic asset management, risk analysis and management, financial modelling, data analysis, audit of non-financial information, developing business cases and power systems engineering.

Some recent relevant projects that demonstrate my experience and capability to complete this review are listed below.

### *First review and assessment of CPP requirements, Aurora Energy (2022)*

Assessed the five plans required by Aurora's enhanced disclosure requirements. We developed a set of criteria based on the Determination and the final reasons paper, then assessed if the plan addressed each of the criteria and the robustness of the information provided. We worked with Aurora to help improve the plans to ensure they were compliant and met the Commissions expectations.

### *State of the network report, Vector Limited (2020 and 2022)*

Completed and assessment of Vector's asset management and network planning processes in response to a request from Vector's owners. The review involved assessment of asset management practices, approaches to risk assessment and management, demand forecasting, network planning and data systems.

*Development of the regulatory pricing submission, Power and Water Corporation (2021-23)*

Assisted Power and Water develop the expenditure forecast for replacement and augmentation network expenditure for the 2024-29 regulatory determination. Key tasks included developing a risk quantification procedure and template, investigating and analysing network issues to define remediation works, developing a business case template and completing the business case and cost benefit analysis, contribution to and review of business documents and general advice to the business regarding the capital expenditure forecast.

*Initial gap analysis of Aurora's CPP application, Aurora Energy, (2019-20)*

We undertook a high-level review of an early version of Aurora Energy's CPP application to identify high-risk items and to prioritise where they should focus their effort for maximum impact. A number of models, including the reliability forecast and cost benefit models, were reviewed and recommendations made for improvement. In addition, we undertook limited benchmarking.

*Connection Policy review and update, South Australian Power Networks (2022)*

Reviewed SAPN's customer connection policy and made updates to reflect the Australian Energy Market Commission's rule change in 2021 regarding distributed energy resources and the allowance for charging for export services. This involve review of existing practices of SAPN and their peer businesses, interviews and workshops with staff and developing a report suitable for submission to the regulator.

*Audit of non-financial information, multiple clients (2014-2020)*

Audited non-financial performance information, for multiple distribution network service providers, as required by the Australian Energy Regulator. Involved interviewing staff, data analysis, reporting and presenting to the executive group.

## **Zubin Meher-Homji**

**Qualifications:**

- Bachelor of Economics
- Masters of Economics (Econometrics)
- Currently completing PHD in Economics

Zubin is currently the director for Dynamic Analysis, a specialist firm in regulation and transformation of electricity networks. Zubin has over 15 years experience working with ten distribution and two transmission networks, the Australian Energy Regulator, and consumer bodies in Australia. His core skill is developing capital expenditure proposals for networks and improvements in asset management planning and strategy. Zubin has also been involved in project managing compliance with regulatory instruments including network responses to Regulatory Information Notices to ensure compliance with the assurance requirements are satisfied.

Examples of recent projects that demonstrate knowledge of best practice asset management and prudent capital expenditure planning include:

*Power and Water Transmission and Distribution Annual Planning Report (2020-22)*

Developed and drafted Power and Water's annual distribution report which specifies key elements of the asset management process and key improvements such as risk quantification. The report

summarises key drivers of capital expenditure including condition of assets, demand growth, and connecting renewables to the energy system. The report is required to comply with the National Electricity Rules and to inform stakeholders of developments on the network

*WA Government - Expert customer panel - advice on prudence of Western Power capital proposal (2022)*

Provided technical advice on the efficiency and prudence of Western Power's access arrangement including plans to invest in stand alone power systems, plans to re-invest in ageing network infrastructure, and new renewable energy zones. The advice was relied upon by the local regulator in making its final decision.

*Ausgrid - Develop compliant asset management strategy (2015)*

Developed an end to end asset management system that ensured compliance with a new asset management standard in Australia, as part of a compliance requirement imposed on the organisation as part of privatisation. This was to ensure that the overall asset management framework met stringent requirements for maintaining system reliability and incorporated stakeholder feedback.

*Power and Water - Regulatory Information Notice (2019)*

Prepared the basis of preparation for Power and Water's response to a regulatory information notice. This involved documenting the steps involved in extracting and reporting data on asset management performance and capital expenditure spends, including explanations for variations from allowance. The report was essential to the auditor's verification of the accuracy and truth of the data.

*Energy Networks Australia - Long term capital expenditure capital and price forecasts*

Developed a comprehensive model that forecasts categories of capital expenditure to 2050 for all Australian networks based on replacement and peak demand drivers taking into account new developments in the energy sector. The project was used to demonstrate the important role electric vehicle uptake and prudent charging will play in reducing electricity prices, but also showed how ageing networks will require an increase in capital expenditure.

## APPENDIX C: DOCUMENTATION REVIEWED

As part of our review, we considered the following documents, in whole or specific sections, as relevant to the review.

### Asset management plans and schedules

2023-2033-Asset-Management-Plan.pdf

Aurora-Energy-AMP-2022.pdf

Aurora-Energy-AMP-Schedules-2022-FINAL.xlsx

Aurora-Energy-AMP-Schedules-2023-11a-13-FINAL.xlsx

### Aurora's additional CPP disclosure documentation

Aurora-Energy-Annual-Delivery-Report-August-2022-FINAL.pdf

annual-delivery-report-for-the-year-ending-31-march-2023.pdf

Aurora-Health-Safety-Environment.pdf

Development-Plan.pdf

Project-and-Programme-Delivery-Plan.pdf

Safety-Delivery-Plan-.pdf

1.\_Power\_Quality\_Aurora\_Energy\_Dev\_Plan\_Summary\_DS.pdf

2.\_Customer\_Charter\_Aurora\_Energy\_Dev\_Plan\_Summary\_DS.pdf

3.\_Planned\_Outages\_Aurora\_Energy\_Dev\_Plan\_Summary\_DS.pdf

4.\_Quality\_Data\_Aurora\_Energy\_Dev\_Plan\_Summary\_DS.pdf

5.\_Asset\_Mgmt\_Aurora\_Energy\_Dev\_Plan\_Summary\_DS.pdf

6.\_Cost\_Estimation\_Aurora\_Energy\_Dev\_Plan\_Summary\_DS-1.pdf

7.\_Quality\_Assurances\_Aurora\_Energy\_Dev\_Plan\_Summary\_DS.pdf

Aurora\_Energy\_Annual\_Delivery\_Customer\_Summary\_RY22-v2.pdf

Aurora\_Energy\_CPP\_Reporting\_Overview.pdf

Project\_Plan\_CentralOtagoSummary\_Aurora\_EnergyDS.pdf

Project\_Plan\_DunedinSummary\_Aurora\_EnergyDS.pdf

Project\_Plan\_QueenstownSummary\_Aurora\_EnergyDS.pdf

### Additional Information Disclosures information

Electricity-distributors-information-disclosure-data-2013-2023.xlsm

Information-Disclosure-for-the-year-ending-31-March-2022.pdf

Information-Disclosure-for-the-year-ending-31-March-2023.pdf

### Peer EDB AMPs

2023-AMP-Wellington-Electricity.pdf

Northpower-Asset-Management-Plan-2023.pdf

Orion-AMP-March-2023.pdf

Powerco 2023-electricity-asset-management-plan Version 1 (1).pdf



unison-2023-ramp-(final).pdf

vec246-vector-amp-2023-2033\_120523\_1.pdf

WEL networks 11111136-amp-web-version.pdf

### **Your Network, Your News newsletters**

Aurora-Energy\_Your-Network\_Your-News\_May-2022.pdf

Aurora-Energy-Your-Network-Your-News-November-2021-Web-version.pdf

AuroraEnergy\_YourNetworkYourNews\_May2023-v2.pdf

YourNetworkYourNews-October-2022-FINAL-version.pdf

### **Community update notices**

Aurora-Energy-Community-Advertorials-Aug-2023\_CentralOtagoWanaka.pdf

Aurora-Energy-Community-Advertorials-Aug-2023\_Dunedin.pdf

Aurora-Energy-Community-Advertorials-Aug-2023\_Queenstown.pdf

Aurora-Energy-Community-Advertorials-Jan-2023\_CentralWanaka.pdf

Aurora-Energy-Community-Advertorials-Jan-2023\_Dunedin.pdf

Aurora-Energy-Community-Advertorials-Jan-2023\_Queenstown.pdf

### **Regulations and other publications from the Commerce Commission**

2021-NZCC-3-Aurora-Energy-Limited-Electricity-Distribution-Customised-Price-Quality-Path-Determination-2021-w.pdf

Aurora-Energy-Limited-Additional-Information-Disclosure-Requirements-Final-reasons-paper-31-August-2021.pdf

Default-price-quality-paths-for-electricity-distribution-businesses-from-1-April-2020-Final-decision-Reasons-paper-27-November-2019.pdf

Electricity-Distribution-Information-Disclosure-Aurora-Energy-Limited-Amendment-Determination-31-August-2021.pdf

Electricity-Distribution-Information-Disclosure-Determination-2012-Consolidated-6-July-2023.pdf

Electricity-distribution-services-default-price-quality-path-determination-2020-consolidated-20-May-2020-20-May-2020.pdf

Electricity-distribution-services-input-methodologies-determination-2012-consolidated-20-May-2020-20-May-2020.pdf

Enhanced-information-disclosure-requirements-for-Aurora-Energy-Infographic-31-August-2021.pdf

CPP-Financial-Model-Aurora-Energys-CPP-Application-12-June-2020.pdf