Review of system operator performance

For the year 1 July 2022 to 30 June 2023

1 February 2024

ELECTRICITY AUTHORITY
TE MANA HIKO

Executive summary

Transpower, in its role as the system operator, is responsible for the secure and efficient operation of the power system in real time. The system operator's role is broad, complex, and critically important to New Zealand.

In our role as industry regulator, the Electricity Authority Te Mana Hiko (Authority) is responsible for defining the role of the system operator and assessing the system operator's performance.

Overall, the Authority is satisfied with the system operator's day-to-day business. The system operator operated well during events throughout the year, the most notable being Cyclone Gabrielle.

The Authority has also set an expectation for the system operator to work with the Authority to provide strategic thinking across short, medium, and long-term planning, and to educate and encourage solutions.

During the period of 1 July 2022 until 30 June 2023, we were satisfied with the system operator's:

- ✓ Collaboration and engagement with the Authority on the refresh of the system operator's performance metrics and strategic plan.
- ✓ Industry exercise in May 2023 (day 1), which was successful, professional, and collaborative.
- ✓ Collaboration, expertise, and engagement on day 2 of the industry exercise, which was run by the Authority.
- ✓ Collaboration and flexibility on designing and implementing the winter 2023 initiatives.
- ✓ Communication and development with the Authority and other stakeholders on the future security and resilience programme.
- ✓ Long term collaboration, coordination, and professionalism on implementing the real-time pricing changes. The smooth go-live of phase 3 and 4 with no adverse impacts on market operations was a credit to the implementation teams.
- ✓ Continued communication with stakeholders on a fortnightly basis with a focus on operations.
- ✓ Focus on investment in people and simulations.

The system operator has acted on the recommendations made in the 2021-22 financial year, in particular:

(a) Continuing to engage with participants from all sectors of the industry. This was particularly important during the severe weather events during the year, with the system operator communicating with participants over several different mediums. We look forward to the system operator looking for further opportunities to improve its communication and engagement.

(b) Reinstating the lessons learned section of the self-review, with a summary of the lessons learned in an appendix for easy reference.

The Authority has five recommendations for the financial year 2023-24:

(a) that the system operator does more to work with the Authority and provide strategic thinking across the short, medium, and long term planning. This is an opportunity for the system operator to educate and promote thinking on solutions.

(b) In collaboration with the Authority, the system operator considers running a simulation for its next pan-industry exercise in 2024, with more interactive elements for a wider range of participants (e.g. including direct grid connected consumers) and include injecting elements of surprise during the exercise. We consider including these elements in an industry exercise would ensure the industry continues to be engaged in the exercise and assist with preparedness for unexpected events. We also recommend that the system operator alongside the Authority starts preparation for the 2024 exercise early, to ensure that the exercise meets its objectives and is well planned and executed.

(c) When the system operator is performing a business assurance audit, the system operator includes an audit of the inputs, that the outputs of software used in the process are as expected, and that the software is functioning as in the functional specification. The Authority notes most software used is not “auditable software” under the SOSPA and is not suggesting a full audit of non-auditable software. However, including an assurance that software integral to a process is functioning as required and expected is critical to the robustness of a business assurance audit. This is especially so for software that is infrequently used. This check / assurance could be undertaken internally and does not need to be completed by an external auditor. The system operator should also regularly review its manual data update / input processes for market system tools and their fitness for purpose as part of the business assurance audit. This supports the finding from the recent business assurance audit for the voltage stability assessment tool (VSAT), where it is acknowledged that manual errors can impact on real time operations.

(d) The system operator should include a section in the self-review that acknowledges any adverse issues, events, or near-events that occurred or concluded in the year, for example Rulings Panel decisions. This is especially the case where issues span more than one review period, as they risk being missed by both reviews.

(e) We also recommend that the self-review better reflects on the things that did not go well and what the system operator learned from this. The Authority will provide feedback to the system operator about including more compliance material in future self-reviews to provide greater clarity about the system operator’s performance over the reporting period.

Contents

1. Introduction

1.1. New Zealand electricity consumers rely on the system operator to ensure that electricity will be available when they need it.

1.2. The breadth and depth of the system operator's functions is large, which makes verifying its performance complicated. It provides a nationally critical infrastructure service, and the risks are often asymmetric and hard to estimate.

1.3. Given the inter-dependency of infrastructure industries upon one another, it is difficult to overstate how important it is that the system operator performs its role to a high standard.

1.4. On behalf of New Zealanders, we require Transpower to fulfil the system operator's function with skill, diligence, prudence, foresight, good economic management, and in accordance with recognised international good practice, considering:

(a) the circumstances in New Zealand; and

(b) the fact that real-time coordination of the power system involves complex judgements and inter-related events.[1]

2. Reviewing the system operator's performance

2.1. There are three entities with formal obligations to review the system operator's performance: Transpower itself, the Authority, and the Security and Reliability Council (SRC).

2.2. This report is the Authority's review of the system operator's performance, for the year ending 30 June 2023. The inputs to the review include the system operator's self-review for the same period, the Authority's own observations, and the SRC's advice on the topic.

2.3. This report assesses the system operator's performance in the following sections:

(a) long term planning

(b) medium-to-short-term planning

(c) real-time management

(d) security of supply forecasting and management

(e) other outcomes.

3. Long term planning

Strategic planning

3.1. The system operator's main instrument of strategic planning is its strategy for the system operator service delivered as part of the system operator service provider agreement (SOSPA).

3.2. This year, we asked the system operator to undertake a full refresh of its strategy, with a lens on the Authority's strategic objectives. The system operator engaged

[1] See Part 7 of the Electricity Industry Participation Code 2010

with us throughout the year and included the majority of our changes in its finalised strategy. We look forward to collaborating with the system operator on its next iteration of the strategic plan.

3.3. The system operator also delivers a series of documents which contribute to its planning, including its business plan and statutory objective workplan. During the review period, the statutory objective workplan assisted us in refreshing the system operator's performance metrics. The system operator's collaboration on the refresh of the performance metrics was appreciated by the Authority.

3.4. The system operator also continues to collaborate with the Authority on the future security and resilience (FSR) programme, supporting the Authority with an issues paper for the review of the common quality obligations in Part 8 of the Code, a set of FSR indicators, and taking part in the common quality technical group. The Authority is satisfied with the support it is receiving from the system operator for the FSR programme.

International engagement

3.5. The system operator's engagement with international counterparts is an important part of the system operator's function. Robust engagement is an indicator of organisational health, as it signals a willingness to devote resources to long term payoffs and the humility to learn from others.

3.6. The system operator recognises the environment it operates in is rapidly changing and seeks to understand how other organisations are developing during these challenges.

3.7. The system operator continues to engage in international conferences such as the Energy Systems Integration Group and the Association of Power Exchanges. The Authority supports the system operator's efforts to increase its knowledge sharing and welcomes its developments of insights into how lessons learnt overseas can be used in the New Zealand market. We have seen improvements in the way the system operator shares this information, and we encourage the continuation of this through working groups, forums, and in papers presented to the Authority and SRC.

3.8. International engagement is an important part of the system operator's assessment and continuous improvement but in the past it has been difficult to see how this has been used by the system operator. The Authority is pleased to see the system operator has included a specific section in its self-review that explicitly discusses the international engagements and how any lessons are applied. This was a specific recommendation made by the SRC.

4. Medium-to-short-term activities

Delivery of joint work

Joint work planning

4.1. The Authority works collaboratively with the system operator to promote well-prioritised project decisions across the programme of projects. The Joint Work Planning Team (JWPT) oversees the Joint Development Plan that sets out what the system operator will be working on.

4.2. During the review period, the system operator successfully provided technical advisory services to the Authority as well as meeting its performance measures for delivery of capital projects.

4.3. In the previous review period, we recommended there be a review of the joint process of engagement between the Authority and system operator on large capex projects spanning multiple years. By agreement, this has yet to occur, but we will seek to undertake this as part of the next planning period.

Real-time pricing

4.4. The real-time pricing (RTP) project, which has been seven years in development, was completed on 1 November 2022, with some additional work finishing in April 2023. RTP has made wholesale electricity prices more certain and more efficient by determining the settlement price in real-time rather than up to three days afterwards.

4.5. During the review period, RTP was re-prioritised and further funding provided to preserve the 1 November 2022 start date. The project's governance team has worked well and been given suitable attention by the system operator.

Extended reserve (AUFLS)

4.6. In March 2023, the system operator provided the Authority with its first Automatic Under Frequency Load Shedding (AUFLS) security assessment report. This report was for the 2021 calendar year and was requested by the Authority under clause 7(9A) of Schedule 8.3, Technical Code B of the Code. The report raised several compliance matters that the Authority is considering.

4.7. AUFLS were not mentioned in the system operator self-review 2022-2023 report. The Authority would have welcomed a statement from the system operator on this in the review. The Authority notes Transpower's (as grid owner) responsibility for AUFLS in the South Island and reaffirms its expectation that the system operator treat all participants equally, and with rigour. In future annual reports the Authority would like to see a statement regarding the system operator's management of conflicts of interest and management of participants.

4.8. The system operator in conjunction with North Island connected asset owners have prepared a transition to a four block AUFLS system, beginning in January 2024.

Service maintenance

Maintaining tools

4.9. The system operator maintains a work programme specifically aimed at maintaining the service. This includes a wide variety of projects, such as deploying new versions of third-party software and augmenting in-house software. The system operator has autonomy to determine its service maintenance projects, and the Authority gets visibility on this through our JWPT that seeks to avoid clashes through the joint work programme.

4.10. The major change during the review period was the implementation of RTP. Several market events have occurred since the implementation of RTP, as discussed in section 4.4 - Real time management. The system operator has met its auditing

obligations with respect to its key market software (Scheduling Pricing Dispatch and the Reserve Management Tool). This entails an annual audit of all changes, and ad hoc audits before deployment of each individual change.

4.11. The system operator should consider regularly reviewing its manual data update / input processes for market system tools and their fitness for purpose. Where a software tool is integral / critical to a process, the system operator should also consider that the functional specification of these tools (acknowledging they are not formally considered 'auditable software' under the SOSPA) should also be regularly reviewed to ensure they are fit for purpose, particularly for any tools that are used infrequently. This supports the findings from the recent business assurance audit for the Voltage Stability Assessment Tool (VSAT), where it is acknowledged that manual errors can impact on real time operations.

Maintaining risk assessments

4.12. The system operator has continued to provide to the Authority 'deep dives' on its risks. This includes (during the review period) its key risk of not having power system assets available to manage the system. We consider these presentations valuable and encourage the system operator to continue to present its risks to us and the Authority Board's Market Operations Committee.

4.13. The system operator also continues to undertake its self-assessments of its critical controls and improve its effectiveness where the controls are not fully effective.

Maintaining procedures

4.14. The system operator policy statement sets out requirements for the system operator on topics such as power system security and conflicts of interest.

4.15. The ancillary services procurement plan documents how the system operator will procure ancillary services from the market. The system operator has not proposed any amendments after reviewing its existing procurement plan, as required under the Code. We agree with the system operator's assessment and their reasons for not amending the procurement plan. The current procurement plan will remain in force until the system operator conducts its next periodic review.

Review of the SOSFIP and EMP

4.16. The system operator delivered its reviews of the security of supply forecasting and information policy (SOSFIP) and the emergency management policy (EMP) in August 2022.

4.17. The reviewed EMP was approved by the Authority in October 2022 and came into effect 1 December 2022. The changes to the EMP align with the recommendations in the MartinJenkins report[2] on the 2021 dry year event. These changes work in conjunction with the changes to the SOSFIP that was declined.

4.18. The system operator made pragmatic suggestions to ensure the minor misalignments between the revised EMP and the SOSFIP were still workable while the SOSFIP went through the revision and approval process.

[2] The Authority commissioned an independent review into the 2021 'dry year event'. The report is available on our website – Final-Electricity-Authority-Dry-Year-Review-2021.pdf

4.19. The changes the system operator proposed for the SOSFIP were aligned with the recommendations made by the Authority and MartinJenkins in their 2021 report with two exceptions:

(a) the inclusion of a process for assessing electricity demand response that required participants to have formal contracts in place

(b) the omission of a requested clarification formalising the Authority's access to information held by the system operator.

4.20. With the first exception the system operator advised they had considered the Authority's suggestion that they use their judgement and experience in managing the power system to take into account demand response available without a formal contract. The system operator advised they believed alignment with the process for assessing gas demand response (that requires a formal contract to be in place) to be preferable.

4.21. The second exception was an accidental omission, and after discussion the system operator agreed it should be included.

4.22. The Authority consulted on the changes it wishes the system operator to make to the SOSFIP to deal with the two issues identified. After consultation, the Authority sent a letter to the system operator requesting the changes be made, and the system operator submitted a draft SOSFIP that included the changes. This revised SOSFIP was approved in April 2023 and came into effect 1 June 2023.

4.23. The Authority is disappointed the process and lessons learned from the process are not mentioned in the system operator's self-review given the Authority and system operator resources involved.

4.24. The Authority considers there are lessons for the system operator regarding collaboration with the Authority before any process documents with significant industry impact are reviewed or released for consultation. The Authority has spent additional resources amending the Code to prevent a recurrence.[3]

Assisting prospective market participants

4.25. During the review period, the system operator saw the highest level of commissioning activities in recent years. We are pleased with the system operator's continued engagement with prospective generators, demand-side participants and new technologies and recognise the increased resource required for this activity.

4.26. We appreciate the time and effort for the system operator in providing its technical and regulatory expertise in the market. We encourage the system operator to proactively engage with the Authority when there are issues around interpretation of the Code and the intent of the Code provisions. We look forward to working closely with the system operator when implementing new market designs.

Stakeholder engagement

4.27. The system operator has met the requirement of the education and engagement plan they agreed with the Authority for the review period. The system operator provides many engagement forums which are positively received. This engagement

[3] See the Authority's "System operation documents" project – System operation documents | Our projects | Electricity Authority (ea.govt.nz)

with industry covered industry-wide evolving situations such as severe Auckland and Hawkes Bay flooding and HVDC outages.

Industry exercise

4.28. The Authority and system operator held a two-day industry exercise in May 2023 to test industry preparedness for managing potential electricity supply shortfalls in winter. Day one of the exercise took place on 24 May, with day two taking place a week later on 31 May.

4.29. Day one of the exercise was led by the system operator, with most distributors in attendance, and focused on working with distributors to ensure alignment around the updated information being delivered by the Authority's winter 2023 work programme. The system operator also walked through the procedures that provide the system operator and market participants with visibility of controllable load when required.

4.30. Overall, we consider the exercise was successful, professional, and collaborative. The communications between the system operator and the Authority for the exercise (including the Authority-run day) were excellent and ensured all attendees received the same message from both organisations. The Authority appreciated the system operator's valuable input on (and attendance at) day two of the exercise.

4.31. The Authority looks forward to working with the system operator on the next exercise to ensure objectives are met, and the exercise continues to be a useful test of industry preparedness. Early engagement and review of material by the Authority will enable clarification of any issues such as interpretation of the Code and ambiguity around timing of required actions.

Industry forums

4.32. The system operator's fortnightly industry forums continue to be a successful system-wide engagement channel. The Authority encourages the system operator to continue engaging and to take a system-wide approach to security.

Engagement with Authority Board sub-committees

4.33. During the review period, one of our Board's sub-committees, the System Operations Committee, met three times to provide governance-level oversight of the system operator's performance. The system operator regularly attends and provides papers for the meetings. The Market Operations Committee has now been established and replaces the System Operations Committee. The first meeting was held in August 2023.

4.34. Overall, the system operator has made a positive contribution to our sub-committee's oversight. The quality of the system operator's papers has been high, the system operator is well prepared for meetings, and attendees are engaged and knowledgeable.

5. Real time management

Power system events

5.1. The system operator performed well through a series of significant events during the review period. The work for winter 2023 demonstrates the system operator's commitment to improve.

5.2. The system operator was proactive in its advance management and provided its expertise to the industry during Cyclone Gabrielle to ensure the grid returned to operation safely, securely, and as quickly as possible. The system operator communicated effectively with the industry and consumers.

5.3. The system operator communicates potential grid issues to electricity market participants through notices that are sent via email and published on its website. In cases when forecast residuals are low the system operator issues a customer advice notice (CAN) or if there is insufficient generation to cover demand the system operator can release warning notices (WRNs), or grid emergency notices (GENs).

5.4. Since the grid emergency of 9 August 2021, the system operator has improved its notification of potential power system issues. Notices have been issued earlier, giving participants more time to react. There was no escalation of events in 2022-23, except where there were extenuating circumstances such as equipment failures.

5.5. In addition to the earlier publication of the low-residual CANs in 2022 and 2023, the number of WRN notices issued reduced. Furthermore, in 2022 insufficient generation notices were only released due to extenuating circumstances, which was not always the case in 2021 (in five events WRNs or GENs were released even in the absence of such circumstances).

5.6. There was also a missed opportunity for the system operator to comment on the CANs and the industry response in its self-review.

5.7. In summary, the Authority found the management of potential low-residual and insufficient generation situations have improved due to several factors including earlier issuing of the tight situation notices by the system operator, and better wind and demand forecasting accuracy.

6. Security of supply forecasting and management

Security of supply

6.1. The system operator is required to produce a forecast of electricity supply and demand to assess the ability of the electricity system to meet New Zealand's needs over the decade ahead. The analysis looks at existing generation as well as planned generation at different stages of the development process to determine whether there is enough electricity generation in the system to meet total demand across the country under a range of supply and demand scenarios.

6.2. During the review period, the system operator consulted on reference case assumptions, including supply side and demand side sensitivities. These sensitivities are a pragmatic inclusion of the increasing penetration of intermittent

generation into the electricity system and show the effect of intermittency on the ability of the generation fleet to meet the forecast maximum demand. The system operator has continued the fortnightly industry forums. The Authority notes these are still well attended, and the system operator keeps the content relevant and timely.

Power system operations

6.3. The system operator's key function is to manage the power system to ensure a safe and stable supply through its principal performance obligations. This involves dispatching generation and demand, maintaining frequency, procuring reserves, and producing various power system analysis and forecasting to assist its real time operations. The system operator's functions are an integral part of the wholesale electricity market. It ensures the supply-demand balance is maintained in real time and provides scheduling and dispatch data for price discovery, market analytics and part of the clearing and settlement process.

6.4. The system operator completed its review of the system security forecast (SSF) in December 2022. The system operator is confident it will be able to meet its principal performance obligations over the next three years as it has committed asset changes, growth in demand, and operational practices.

7. Other outcomes

System operator self-review

7.1. The system operator's self-review of the 2022-23 period is also a deliverable. The system operator has increased its collaboration with the Authority and is actively engaging with us. We look forward to continuing in this manner and collaborating across a wide range of challenges and opportunities.

7.2. For the 2023-24 period, we have five recommendations:

(a) that the system operator does more to work with the Authority and provide strategic thinking across the short, medium, and long term planning. This is an opportunity for the system operator to educate and promote thinking on solutions.

(b) In collaboration with the Authority, the system operator considers running a simulation for its next pan-industry exercise in 2024, with more interactive elements for a wider range of participants (e.g. including direct grid connected consumers) and include injecting elements of surprise during the exercise. We consider including these elements in an industry exercise would ensure the industry continues to be engaged in the exercise and assist with preparedness for unexpected events. We also recommend that the system operator alongside the Authority starts preparation for the 2024 exercise early, to ensure that the exercise meets its objectives and is well planned and executed.

(c) When the system operator is performing a business assurance audit, the system operator includes an audit of the inputs, that the outputs of software used in the process are as expected, and that the software is functioning as in the functional specification. The Authority notes most software used is not

"auditable software" under the SOSPA and is not suggesting a full audit of non-auditable software. However, including an assurance that software integral to a process is functioning as required and expected is critical to the robustness of a business assurance audit. This is especially so for software that is infrequently used. This check / assurance could be undertaken internally and does not need to be completed by an external auditor. The system operator should also regularly review its manual data update / input processes for market system tools and their fitness for purpose as part of the business assurance audit. This supports the finding from the recent business assurance audit for the voltage stability assessment tool (VSAT), where it is acknowledged that manual errors can impact on real time operations.

(d) The system operator should include a section in the self-review that acknowledges any adverse issues, events, or near-events that occurred or concluded in the year, for example Rulings Panel decisions. This is especially the case where issues span more than one review period, as they risk being missed by both reviews.

(e) We also recommend that the self-review better reflects on the things that did not go well and what the system operator learned from this. The Authority will provide feedback to the system operator about including more compliance material in future self-reviews to provide greater clarity about the system operator's performance over the reporting period.

7.3. The system operator has acted on the recommendations made in the 2021-22 financial year, in particular:

(a) Continuing to engage with participants from all sectors of the industry. This was particularly important during the severe weather events during the year, with the system operator communicating with participants over several different mediums. We encourage the system operator to look for further opportunities to improve its communication and engagement with the sector.

(b) Reinstating the lessons learned section of the self-review, with a summary of the lessons learned in the appendix for easy reference.

Performance metrics

System operator's performance for the 2022-23 period

7.4. Every year, the Authority agrees with the system operator a set of performance metrics and incentives that the system operator must strive to meet. The system operator provides a range of services, so the parties agreed on 25 performance metrics to measure the system operator's performance over the review period.

7.5. To ensure the incentive payment remains a meaningful incentive to improve or maintain high performance levels, 15 of the 25 performance metrics contribute to the incentive calculation and some metrics are weighted more heavily than others. Although the remaining measures do not contribute to a financial incentive, they cover areas of importance so are still measured. The performance metrics system allows the incentivised metrics to change if there needs to be increased focus or incentive on particular areas.

7.6. The system operator's performance against the contributing performance metrics contributes to the size of the incentive payment and determines whether it is made to the system operator or made by the system operator to the Authority.

7.7. For the financial year 2022-23, the system operator reported, and we agreed, it had achieved 97% of the incentive metrics. This resulted in the maximum incentive payment of $200,000 being paid to the system operator.

Figure 1 System operator performance metrics for 2022-23

Performance metrics 2022-23

		Annual Target	Actual	Pass/Not Achieved	Incentive payment weighting
We are smart about money					
Perception of added value by participants		80%	83%	Pass	
Our customers are informed and satisfied					
Annual participant survey result		83%	89%	Pass	5
Annual participant survey result response rate	First tier stakeholders	80%	75%	Not Achieved	
Reports	Future thinking report	≥ 1	1	Pass	5
	Longer Market Insight reports	≥ 4	4	Pass	5
	Bite-sized Market Insights	≥ 45	49	Pass	
Quality of written reports		100% of agreed standard	100%	Pass	
Role impartiality		80%	90%	Pass	5
Responding to requests for information from the Authority		100% by agreed deadline	0 to date	N/A	
We maintain Code compliance and meet our SOSPA obligations					
Market impact of breaches remain below threshold		≤ 3 @ ≥ $40k	1	Pass	10
Breaches creating a security risk remain below threshold/within acceptable range		≤2	0	Pass	10
On-time SOSPA deliverables		100%	100%	Pass	10
We deliver projects successfully					
Project delivery	Service Maintenance projects	≥ 70% achieved for approved time	82%	Pass	
		≥ 70% achieved for approved budget	73%	Pass	
	Market Design and Service Enhancement projects	≥ 70% achieved for approved time	100%	Pass	
		≥ 70% achieved for approved budget	100%	Pass	
Accurate capital planning		≥ 50%	55%	Pass	10
We are committed to optimal real time operation					
Sustained infeasibility resolution		80% ≤ 10am business day 1 or as required	87%	Pass	5
High spring washer resolution		80% ≤ 10am business day 1 or as required	0 to date	N/A	
Our tools are fit for purpose					
Capability functional fit assessment score		76.00%	69.10%	Not Achieved	
Technical quality assessment score		70.00%	71.60%	Pass	
Sustained SCADA availability		99.90%	99.99%	Pass	10
Maintained timeliness of schedule publication		99.00%	99.98%	Pass	10
We have the required skills for event management				Points achieved	Points available
Event preparedness		These are calculated via an agreed set of criteria with the Authority		10.4	12
Event management				11.0	13
Event review and improvements				12.0	12
				Available points	122

Number of points achieved = **118.4**
Level of performance = 118.4/122 = **97%**
Related incentive payment = **$200,000** paid by the Authority to Transpower as system operator

8. Financial results

8.1. Transpower, as a regulated entity, is required to publicly disclose financial information under the Transpower Information Disclosure Determination [2014] NZCC 5.

8.2. The system operator provided financial information, audited by Ernst and Young, as an addendum to its annual self-review of performance. The following tables and numbers were subject to an annual audit / review of results.

Changes in 2022-23

Financial measure	Changed by ($M)	Changed to ($M)	Percent change	Reasons for change
Revenue	$4.86 ↑	$46.45	11.69% ↑	The increase is primarily due to commissioning and recovery of the Market design real time systems project.
Operating expenditure	$2.57 ↑	$25.69	11.10% ↑	Increase attributable to CPI cost increases year on year and an increase in resourcing requirements.
Depreciation	$1.81 ↑	$14.06	14.75% ↑	Depreciation is driven by the Fixed asset register. The Asset base has increased during the year.
Fixed Assets (RAB)	$2.43 ↑	$52.56	4.85% ↑	Commissioning of several projects including Real Time Pricing, MS Simplification, Critical Corporate Fileshare and Situational Intelligence.
Regulatory profit (after tax)	$0.00 →	$5.03	0% →	Regulatory profit is consistent with the prior year. A function of an increase in revenue offset by higher operating costs and depreciation (above).

8.3. The system operator's 'vanilla' return on investment has reduced slightly from 10.96% to 10.30%. The 'vanilla' return on investment is the interest rate calculated such that the present value of the system operator's closing fixed assets and cashflows for the year are NPV equivalent to its opening fixed assets. It can be used as an indicator of overall profitability.

8.4. The system operator's OPEX revenue is adjusted annually by the consumer price index minus an adjustment factor (a 'CPI minus X' approach). This means that within each five-year period, the system operator's regulatory profit will tend to reduce if its operating costs rise faster than the consumer price index minus the adjustment factor.

8.5. If the system operator implements efficiencies beyond that needed to maintain its regulatory profit, the system operator retains the benefit of those reductions in operating expenditure during the then-current five-year period. Every five years

during the reset period, revenue is renegotiated with consideration of actual performance (such as enduring reductions or increases in operating expenditure).

Financial performance

SCHEDULE SO1: SYSTEM OPERATOR

Transpower	Disclosure Date	30 June 2023
	Disclosure Year (year ended)	30 June 2023

SO1(i): Return on Investment

		CY ($000)	CY ($000)
	Operating surplus/(deficit)	20,763.9	
less	Assets purchased or commissioned	16,493.2	
less	Tax payable	1,671.6	
	Notional cash flows for the year		2,599.1
	Opening fixed assets		(50,129.2)
	Closing fixed assets	52,561.6	
plus	Lost assets	-	
less	Found assets	-	
	Adjusted closing fixed assets		52,561.6

	CY-4	CY-3	CY-2	CY-1	CY
Vanilla ROI	26.69%	31.48%	23.52%	10.96%	10.30%
Leverage (%)	42.00%	42.00%	42.00%	42.00%	42.00%
Cost of debt (%)	4.29%	3.29%	2.23%	2.79%	5.31%
Corporate tax rate (%)	28.00%	28.00%	28.00%	28.00%	28.00%
Post-tax ROI	26.19%	31.10%	23.26%	10.63%	9.67%

SO1(ii): Regulatory Profit

		CY-4 ($000)	CY-3 ($000)	CY-2 ($000)	CY-1 ($000)	CY ($000)
	Total revenue	41,099.4	41,891.7	42,528.9	41,591.0	46,454.1
less	Operating expenditure	22,526.1	21,377.5	20,710.5	23,122.4	25,690.2
	Operating surplus/(deficit)	18,573.3	20,514.2	21,818.5	18,468.6	20,763.9
less	Total depreciation	8,804.0	9,105.5	10,590.8	12,253.9	14,060.8
	Regulatory profit/(loss) before tax	9,769.3	11,408.7	11,227.7	6,214.7	6,703.1
less	Tax payable	3,391.5	3,382.7	2,812.0	1,182.8	1,671.6
	Regulatory profit/(loss) after tax	6,377.9	8,026.1	8,415.7	5,031.8	5,031.5

SO1(iii): Revenue

	CY-4 ($000)	CY-3 ($000)	CY-2 ($000)	CY-1 ($000)	CY ($000)
Revenue					
System operator service provider agreement revenue - operating	25,915.9	26,224.6	26,641.7	27,162.6	28,884.6
System operator service provider agreement revenue - capital	14,450.5	15,250.6	15,561.1	13,735.2	16,797.1
Technical services advisory revenue	733.1	416.5	326.1	693.1	772.4
Other gains /(losses) (provide details)	-	-	-	-	-
Total revenue	41,099.4	41,891.7	42,528.9	41,591.0	46,454.1

	CY+1 ($000)	CY+2 ($000)	CY+3 ($000)	CY+4 ($000)	CY+5 ($000)
Revenue forecast					
System operator service provider agreement revenue - operating	30,284.5	31,354.1	32,084.5	32,747.8	33,419.1
System operator service provider agreement revenue - capital	18,010.2	17,767.9	17,665.3	17,599.9	14,671.7
Technical services advisory revenue	712.7	731.2	741.7	740.0	750.6
Other gains /(losses) (provide details)					
Total forecast revenue	49,007.4	49,853.2	50,491.5	51,087.7	48,841.5

	CY-4 ($000)	CY-3 ($000)	CY-2 ($000)	CY-1 ($000)	CY ($000)
Actual vs. forecast					
Historical forecast revenue	40,706.7	41,732.8	41,966.5	41,605.3	45,725.7
Actual revenue	41,099.4	41,891.7	42,528.9	41,591.0	46,454.1
Variance ($)	(392.8)	(158.9)	(562.5)	14.4	(728.4)
Variance (%)	(1%)	(0%)	(1%)	0%	(2%)