Quarterly System Operator and system performance report

For the Electricity Authority

April to June 2022

Report Purpose

This report is Transpower's review of its performance as System Operator for Q4 2021/22 (April to June 2022), in accordance with clause 3.14 of the Electricity Industry Participation Code 2010 (the Code).

As this is the final self-review report of the quarter, additional information is included as per SOSPA clause 12.3. This includes performance against the performance metrics year to date, and actions taken in regard to the System Operator business plan, statutory objective work plan, participant survey responses, and any remedial plan agreed under clause 14.1(i). A summary of technical advisory services for the quarter is also provided.

A detailed system performance report (Code obligated) is provided for the information of the Electricity Authority (Authority).

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Commentary

This section provides a high-level update for this quarter. The remainder of the report provides supporting detail in two sections:

- System Operator performance
- System performance

Update (April to June 2022)

SOSPA deliverables

- We delivered the end-of-year SOSPA deliverables as agreed.
- The final set of performance metrics for 2022/23 will be provided in July.
- The published future thinking report this year was a series of three reports discussing the operational implications of Tiwai smelter closing in the future. The focus of these reports was on transient angular and oscillatory stability.

Security of Supply and market information

- Lakes are now comfortably within their main operating ranges. Our modelling shows that in order to cross the risk curves we would need an unprecedented dry sequence or infrastructure breakdown.
- A planned outage of the Maui gas production facility was successfully completed. Flex by Methanex meant gas generation was not heavily impacted by the outage.
- Shortfalls in generation have been signalled in NZGB for late-June through to mid-August. Improved generation margins were achieved when generators delayed outages for this period. Further shortfalls are forecast for July and August.
- With temperatures dropping, demand is increasing, and in June this resulted in four of the largest 10 peak demands on record.
- The Grid Emergency declared on 23 June resulted due to a risk of insufficient generation and reserve offers to meet demand; this was managed in real-time without customer disconnections through the use of controllable demand.
- We published a consultation on changes to the Security of Supply Forecasting and Information Policy (SOSFIP) and Emergency Management Policy (EMP) on 29 March. We have made recommendations to the Authority, based on feedback received, and anticipate the changes only having a small change on the Electricity Risk Curves.

Projects and TAS work

- Real Time Pricing (RTP): Phase 3 is on track to go live on 1 November. Timelines are being carefully managed as they come under pressure from an increased level of illness and resource turnover. The project is forecasting the need for additional budget - our current forecast to complete the project is $19.32 million (including risk allowances) compared to an approved budget of $17 million. This was approved by the Authority Board in May.
- Operational Excellence: This project is to develop a roadmap to address resource planning, training and support, continuous improvement, and assurance for critical processes. We have engaged external consultant support

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and will develop the roadmap to connect current and future state in the next quarter.

- Future Security and Resilience (FSR) programme: Two information sessions were held in April, and written feedback sought on these sessions. Themes were about opportunities needing to be brought forward, clarity on how FSR fits into the broader Authority work programme and ensuring Authority involvement/ownership is clear. These were tabled with the Authority at its 12 July Board meeting. The Authority has indicated TAS funding equivalent to 1 FTE for the next delivery phase in FY23 (Phase 3).
- Planned Outage Coordination Process (POCP): The new POCP application went live on the Customer Portal on 12 July. This is a very heavily used industry application and has involved coordinating with customers on testing, setting up API links and communicating changes.
- TAS work relating to Battery Offering Reserves (TAS 100): All testing with NZX has concluded and the TAS Report was submitted and approved. All deliverables have now been completed and the TAS has closed.

Risk and Assurance

- We continue to experience a rolling impact with individuals impacted over the quarter by COVID-19. A risk assessment has been undertaken regarding access to the control rooms, as we are experiencing a new peak in impact.
- On 26 May, we hosted an industry exercise designed to test improved procedures, tools, and communications put in place after the 9 August 2021 event last year. A debrief with participants, held on 9 June, regarded the exercise as highly successful and worthwhile. We appreciate the feedback from the Authority team and are acting on the recommendations.
- All business assurance audits for 2021/22 were completed and the 2022/23 audit plan has been agreed with the Authority.
- Following scoping this quarter, the annual System Operator independence audit, conducted by Deloitte, will be carried out in July and is expected to conclude in August with a final report to be delivered late August/early September.
- We closed two Conflict of Interest items this quarter, one related to the SO Compliance and Impartiality role. The Transpower legal team has implemented a Legal Protocol to manage the separate provision of legal advice to the System Operator and the Grid Owner.
- We reported two System Operator self-breaches this quarter. These were both modelling errors, which were not correlated, and no market impact was identified for either of these.

Generation commissioning

- We have obtained an interpretation of the Code around when distribution connected generation must support power system voltage for the System Operator. This interpretation differs from our present stance, we are therefore investigating the implications to develop a recommended way forward.

Incidents

- In April we managed regional voltage stability and thermal security issues in Southland as a result of extreme operating conditions in the region.

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System Operator performance

1 Customers and other relationships

KPI refresh

We worked with the Authority to develop performance metrics we will report against in 2022/23. These include three new metrics to cover the preparation, management and review of events. Our performance against these new metrics will contribute 30% towards the overall System Operator incentive payment.

During the quarter we have run two pilot trials to develop performance indicators for managing events and project delivery which are on track to start reporting information for the next financial year.

We are now working on the next stage of the KPI refresh programme – the full roll-out of performance metrics in 2023/24. The outcome of this will be a new set of internal reporting metrics and a new set of agreed external KPIs with the Authority.

2 Risk & Assurance

COVID-19

We continue to experience a rolling impact with individuals impacted over the quarter by COVID-19. We have been calling on operators who are close household contacts to positive cases but are RAT testing negative to work shifts under our exemption as a critical service. There is an MBIE process established for using positive asymptomatic operators as a last resort; we have not yet had to call on this process.

A risk assessment has been undertaken regarding access to the control rooms, as we are experiencing a new peak in impact. The new strain may require us to reinstate previous controls and we are closely monitoring the risk to business continuity. At this point we are not proposing changes to the settings but will increase vigilance to ensure the relevant rules are being adhered to.

9 August generation shortfall event

On 26 May, we hosted an industry exercise designed to test improved procedures, tools, and communications put in place after the 9 August 2021 event last year. The exercise was also useful to identify further opportunities to improve. More than 40 people participated from 20 lines companies and direct-connect customers, along with observers from the Authority, MBIE, and other interested stakeholders.

A debrief with participants, held on 9 June, regarded the exercise as highly successful and worthwhile. Feedback from participants expressed support for being able to practice operational and communications exercises which gave them a chance to test their internal processes. The Authority also provided feedback, which is appreciated. A number of actions have been identified and will be tracked.

Low residual and shortfalls

Coming into winter, generation margins have been tight with high peak demands. On 23 June, the System Operator declared a grid emergency (when two generators failed to start up effectively) advising a risk of insufficient generation and reserve offers to meet demand and provide N-1 security. For a period during the grid emergency the

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lack of reserve generation dropped the security level from N-1 to N, meaning the loss of a large generator could result in automatic load shedding. The grid emergency passed without any customer disconnections through the use of controllable demand. On 5 July we issued a Customer Advice Notice warning of a low residual going into the afternoon peak. The low residual passed without progressing to a grid emergency.

Looking ahead to the remaining winter period, our generation margin modelling tool NZGB is showing tight margins and we have published Customer Advice Notices highlighting these periods for both July and August

Southland low generation

During the last quarter, we managed regional voltage stability and thermal security issues in Southland during extreme operating conditions in the region. However, there is no longer a need to manage the situation as hydro storage levels in Southland are now back to their normal ranges, with consistent inflows replenishing generation.

Business assurance audits

Over the last quarter the following assurance audits were completed:

- Annual audit of Scheduling, Pricing, Dispatch (SPD) and the Reserve Management Tool (RMT). Completed by Robinson Bowmaker Paul and delivered to the Authority. No findings or recommendations were noted by Robinson Bowmaker Paul (a clean audit result).
- Managing conditional offers audit. Completed with an 'effective' outcome established by the auditor. The audit established two low risk findings for management action relating to developing a definition for a conditional offer and establishing an end-to-end procedure.
- Secondary risk audit. Completed with a 'partial effective' outcome established by the auditor. The audit established three medium risk findings and one low risk finding for management action relating to: establishing an end-to-end procedure including roles and responsibilities; training staff; establishing workflows and undertaking reviewing existing systems.
- Outage block mapping audit. Completed with a 'partial effective' outcome established by the auditor. The audit established two medium risk and one low risk findings for managing action relating to: establishing an end-to-end procedure and a standard operating procedure; investigating tool integration; and auditing outage blocks.
- Commissioning risk policy audit. Completed with a 'partial effective' outcome established by the auditor. The audit established four recommendations: three medium risk (priority 2) and one low risk (priority 3). These findings relate to developing an overarching process, training and improved workflows. These findings are staggered for completion up to 31 March 2023.

The 2022/23 audit plan has been agreed with the Authority. The five agreed audits are:

- Defects & enhancements audit
- System Operator load forecast
- Change management – voltage security assessment tool
- Ancillary services contract management
- Realtime management of simultaneous feasibility test constraints

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Control Self-Assessment

Risk control self-assessment was completed for our five lowest scoring critical controls from the November 2021 results. Two critical controls "change management" and "people management" moved from partially effective to fully effective. The remaining three controls "Connected asset & system monitoring", "Monitoring & evaluate future operating environment" and "Stakeholder management" remain partially effective. Operations senior leadership team have agreed improvement activities to lift their effectiveness.

3 Compliance

April

We did not report any System Operator self-breaches in April.

May

We submitted two system operator self-breaches in May.

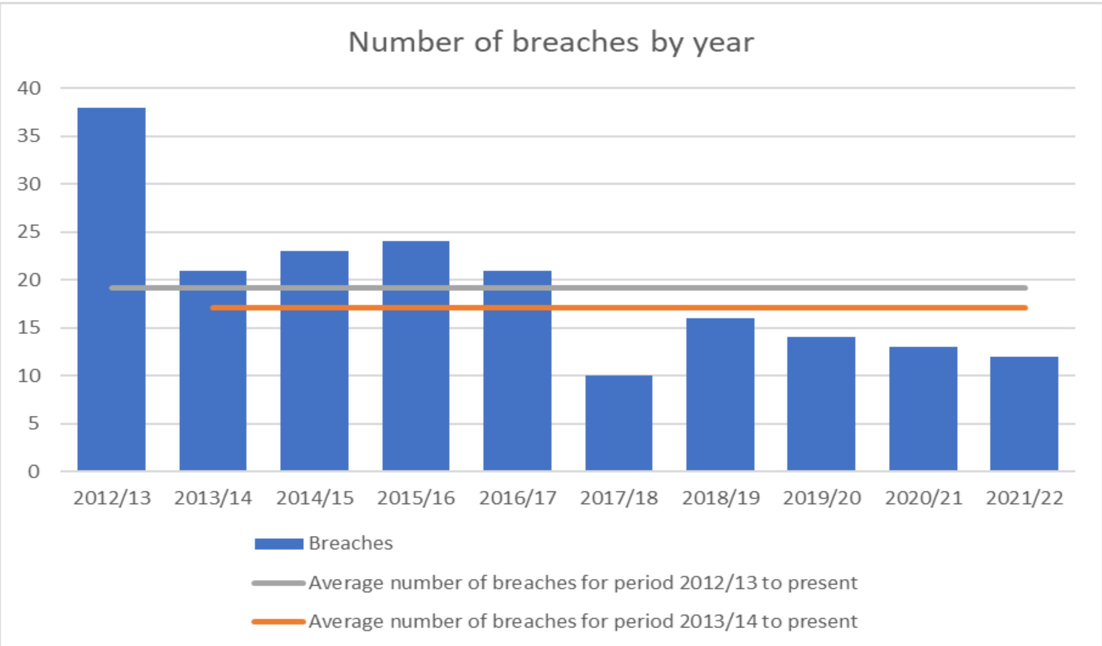
The first related to the incorrect modelling of the NSY_ROX circuit for one trading period in the forward schedules on 14 December 2021. The System Operator had not completed change activities to model the increased rating of the circuit. The error was corrected in real time and there was no market impact.

The second related to the incorrect modelling of circuit breaker LTN CB 212 during the model change process on 3 November 2021 when we incorrectly modelled the circuit breaker as normally open when it should have been modelled as normally closed. The issue was corrected in real time and it only affected two forward schedules with no identified market impact.

There was no correlation between the separate modelling errors.

June

We did not report any System Operator self-breaches in June.



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The Authority closed two System Operator breaches in June. We have fifteen outstanding breaches with the Authority compliance team.

9 August 2021 Grid Emergency

The System Operator and the Authority sought and obtained directions from the Rulings Panel during May as follows:

- A directions conference will be set for a date after 15 August 2022.
- In the interests of the efficient and appropriate determination of the proceeding, the System Operator and Authority will continue discussions to streamline the issues for determination.

Appendix A shows instances where the System Operator has applied discretion under 13.70 of the Code.

4 Impartiality of Transpower roles

The entries in the table below are the open issues in the conflict of interest register (Register). These issues are being actively managed in accordance with our policy for managing conflicts of interest.

We closed two items this quarter:

- Item 31 related to a System Operator employee participating in a Transpower demand response working group. The employee's participation in this working group has now ended.
- Item 39 related to the SO Compliance and Impartiality role. The Transpower legal team has implemented a Legal Protocol to manage the separate provision of legal advice to the System Operator and the Grid Owner.

We have four open items in the Register (below). These are being actively managed in accordance with our Conflict of Interest Procedure. In this context, we recently implemented mitigation measures consistent with Item 40 to manage the secondment of a Grid Owner engineer to work on the System Security Forecast between July and September 2022.

System Operator Open Conflict of Interest Issues		
ID	Title	Managed by
29	**Preparing the Net Benefit test – System Operator involvement:** The System Operator is reviewing how it can provide information for use by the grid owner undertaking a Net Benefit Test.	Operations Planning Manager
40	**General System Operator/Grid Owner dual roles:** This is a general item that will remain permanently open to cover all employees with a dual System Operator/grid owner role. The item documents the actions necessary to ensure impartiality in these circumstances; these items will be monitored to ensure their continue effectiveness.	SO Compliance & Impartiality Manager
41	**General relationship situation:** This is a general item that will remain permanently open to cover all potential conflicts of interest arising under a relationship situation. This item documents the actions necessary to prevent an actual conflict arising and will be monitored by the SO Compliance & Impartiality Manager to ensure their continued effectiveness.	SO Compliance & Impartiality Manager

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System Operator Open Conflict of Interest Issues		
ID	Title	Managed by
42	**Mercury KPO upgrade:** The Power Systems Engineer assigned to manage the KPO upgrade previously worked at Mercury. The employee will provide input into the commissioning/testing documentation and will prepare the final compliance documentation for SO sign-off. Controls have been implemented, including management oversight and sign-off of all commissioning/testing documentation.	Power Systems Engineering Assurance Manager

4.1 System Operator independence audit

The System Operator has engaged Deloitte to conduct the 2022 System Operator independence audit. The scope of the audit is outage planning and Deloitte began the audit in early July. The audit is expected to conclude in August with a final report to be delivered late August/early September.

5 Project updates

5.1 Market design and service enhancement project updates

Progress against high-value, in-flight market design and service enhancement projects is included below along with details of any variances from the current capex plan.

Real Time Pricing (RTP)
Phase 2 was successfully deployed in March with no defects identified.

Following re-forecasting activity, the Real Time Pricing project is forecasting the need for additional budget and the requirement for an extension to some milestones. Change request RTP CR007 was submitted to the Electricity Authority in April, however, it was declined, with the Authority wanting to defer the approval escalation of additional budget to their Board once the actual project expenditure exceeds a threshold closer to the currently agreed budget. The Authority requested a subsequent change request be provided for approval of changes to project milestones and scope phasing in the interim. RTP CR008 was subsequently submitted to the Authority and was approved in May.

Our current forecast to complete the project is $19.32 million (including risk allowances) compared to an approved budget of $17 million.

Phase 3 go live date of 1 November remains intact; however, it is coming under pressure due to development completion being delayed by two weeks as a result of an increased level of illness during June. Stand Alone Dispatch is scheduled for completion at the end of July. Testing is progressing but again due to illness and resource turnover we now have a backlog of test cases to work through which is putting pressure on our timeline. Steps to mitigate this are underway including applying additional resource to support testing. Impacts from this approach will be felt in the phase 4 work which was scheduled to start in July; this will now be delayed until August

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while the team focuses on phase 3 delivery. Planning for technical deployment and business change is progressing and on track.

Operational Excellence
Transpower has engaged an external consultant to support the development of an Operational Excellence roadmap. Recommendations arising from investigations into the 9 August generation shortfall event, have been included in the scope along with resource planning, training and support, continuous improvement, and assurance for critical processes.

Deliverables include:

1. Identification and review of our critical processes and training, including global best practice consideration.
2. Recommendation of a governance framework to govern critical processes. training processes, assurance processes and resource planning processes.
3. Development of a prioritised operational excellence roadmap to address opportunities identified.
4. Identification and documentation of recommended approaches to change management and any other risks that may represent barriers to a successful implementation of the operational excellence roadmap.

The first phase to investigate current state was completed in May. Phase 2, to determine desired current state, kicked off in June and is set to complete in July 2022. Early findings which suggest areas of focus for improvements are being reviewed by the team.

Between July and August 2022, the project will develop the roadmap to connect current and future state.

5.2 Other projects and initiatives

Industry consultation on the Security of Supply Forecasting and Information Policy (SOSFIP)
We published a consultation on changes to the SOSFIP and Emergency Management Policy (EMP) on 29 March 2022. These are System Operator policy documents incorporated by reference into the Code. They set out how the System Operator prepares for and publishes information regarding national hydro storage, including the Electricity Risk Curves (ERCs) which are the trigger for policy mechanisms such as Official Conservation Campaigns and the Customer Compensation Scheme. This consultation followed the MartinJenkins 2021 dry year review.

Feedback was received and a recommendation made to the Authority (who sign off on any changes). The System Operator recommended that electricity and gas demand response be split into types:

- Type 1: response that can respond to short term price signals
- Type 2: response that requires long lead times to stop and/or start

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The System Operator recommended that Type 1 response be included in the calculation of the risk curves at all times; while Type 2 is only included if there is a formal arrangement in place.

These changes would have small impact on the Electricity Risk Curves calculation this year as there is already substantial formal arrangements in place for Type 2 response. We expect Authority support for majority of the recommendations.

6 Technical advisory hours and services

Future Security and Resilience (FSR) Programme

On 13 April, we delivered two information sessions to industry on the draft phase 2 FSR roadmap. In parallel, via the Authority, we sought written feedback on these sessions, for which submissions closed 10 May 2022. Themes from industry feedback were about opportunities needing to be brought forward, clarity on how FSR fits into the broader Authority work programme and ensuring Authority involvement/ownership is clear (parties expressed concern that outcomes would be biased towards the System Operator). An overview of the feedback was provided by the Authority to the Security and Reliability Council on 1 June 2022. Responses to the feedback and updates to the roadmap have been developed and provided to the Authority. These will be tabled with the Authority at its 12 July Board meeting.

The Authority has indicated TAS funding equivalent to 1 FTE for phase 3 FSR delivery in FY23. The Authority and the System Operator have agreed at a high level what scope to cover with this level of funding and work is ongoing to finalise the detailed scope of works for FY23.

Other TAS work

TAS work relating to Battery Offering Reserves (TAS 100) - All testing with NZX has concluded and the TAS Report was submitted and approved. All deliverables have now been completed and the TAS has closed.

The following table provides the technical advisory hours for Q4 2021/22 and a summary of technical advisory services to which those hours related (SOSPA 12.3 (d) refers).

TAS Statement of Work (SOW)	Status	Hours worked during Q4
TAS SOW 99 – Future Security & Resilience	In progress	260.25
TAS SOW 100 – Battery ESS Offering Reserve	Closed	23.0
Total hours		**283.25**

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7 Outage planning and coordination

Outage Planning – near real time

Outage numbers were high in April, with dips covering public holiday periods.

We published two assessments covering a potential North Island generation shortfall (3 May) and voltage stability issues during an Islington-Livingstone outage (9 -13 May). However, sufficient margins were achieved to avoid an event on both dates.

We published three NZGB assessments covering a series of mainly South Island outages for the three months of June, July and August as we were seeing potential shortfalls. These potential shortfalls were driven by outages, but also partly by the record peak demands we saw last year in end June and August, which have been used in our assessments.

New Zealand Generation Balance (NZGB) analysis

In April there were several N-1-G shortfalls forecast across late-June to mid-August, and a N-1 shortfall on 26 July. However, in June the NZGB analysis showed improved generation margins for July and August with significant changes to the generation balance from generators deferring outages, with the most significant change being to Contact's Taranaki Combined Cycle outage which was scheduled for this period but will now take place in November 2022.

Although we have seen an improvement, the latest NZGB data, extracted from POCP on 4 July, shows a general decline in the generation balance from July until end of October, with an average of -49 MW N-1-G margin for the base case. The largest decrease is seen in early August, where the margin is -211 MW.

Planned Outage Coordination Process (POCP)

The new POCP application went live on the Customer Portal on 12 July. This is a very heavily used industry application and has involved coordinating with customers on testing, setting up API links and communicating changes. It has also involved integration with our Outage Management System IONS and the New Zealand Generation Balance (NZGB) application. We now start on developing the new NZGB application for release at the end of the year.

8 Power systems investigations and reporting

System Operator published three reports at the end of June discussing the operational implications of Tiwai smelter closing in the future. The focus of these reports was on transient angular and oscillatory stability. We are confident we can take steps to manage stability and maintain security in the South Island should Tiwai cease operations, but this could result in the need to constrain generation at times, especially during planned outage (N-1-1) conditions.

Growth in regional demand and implementing operational mitigations measures such as modifying existing inter-trip settings or enabling additional power system stabilisers can reduce the likelihood of constraining generation. Similarly enhancing our real-time tools to consider actual system conditions for determining stability limits to reduce conservatism associated with offline studies is something we have begun working on.

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We notified the Authority of three events under our Significant Event Reporting procedure during this reporting period:

- On 9 June, a severe weather event (multiple lightning strikes) resulted in multiple contingencies. We submitted a report to the Authority on 29 June. In the report we raised some broader considerations around event classification and noted we would review the assessment criteria within the procedure.
- On 20 June, we modelled the HVDC in a different state than reality during reclose blocks. We have notified the Authority of the event and are preparing a near-miss report.
- On 23 June, there was a loss of supply at Hangitiki (due to a Grid Owner asset outage) which lasted longer than one hour. We have notified the Authority of the event and are preparing an investigation report.

9 Performance metrics and monitoring

The following dashboard shows System Operator performance against the performance metrics for the financial year to date as required by SOSPA 12.3 (a).

Only those metrics with a weighting are used in the calculation of the System Operator score and incentive payment.

		Annual Target	Actual to date	Points
Smart about money				
Perception of added value by participants		80%	73%	
Customers are informed and satisfied				
Annual participant survey result		83%	95%	5
Annual participant survey result response rate - First tier stakeholders		80%	80%	
On-time special event preliminary reports		90% ≤ 10 business days	N/A	5
Future thinking and insights	Future thinking report	≥ 1	1	5
	Longer Market Insight reports	≥ 4	3	5
	Bite-sized Market Insights	≥ 45	49	
Quality of written reports		100% of standard	100%	
Role impartiality		80%	92%	5
Responding to requests for information from the Authority		100% by agreed deadline	N/A	
Code compliance maintained and SOSPA obligations met				
Market breaches remain below threshold		≤ 3 @ ≥ $40k	1	10
Breaches creating a security risk - below threshold/within acceptable range		≤2	0	10
On-time SOSPA deliverables		100% (40)	100% (40) *	10

* We have delivered the reports as agreed. At the Authority's request, the remaining nine SOSPA deliverables are to be finalised in July.

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		Annual Target	Actual to date	Points
Successful project delivery				
Project delivery	Service Maintenance projects	≥ 70% on time	43%	
		≥ 70% on budget	83%	
	Market Design and Service Enhancement projects	≥ 70% on time	0 completed	
		≥ 70% on budget	0 completed	
Accurate capital planning		≥ 50%	50%	10
Commitment to optimal real time operation				
Sustained infeasibility resolution		80% ≤ 10am or equiv	87%	5
High spring washer resolution		80% ≤ 10am or equiv	100%	
Fit-for-purpose tools				
Capability functional fit assessment score		76.00%	68.54%	
Technical quality assessment score		70.00%	71.85%	
Sustained SCADA availability		99.90%	99.99%	10
Maintained timeliness of schedule publication		99.00%	99.99%	10

9.1 Dispatch accuracy dashboard

Since 2019/20, we have been reporting the Dispatch Accuracy dashboard for energy dispatch as part of this report. This is a means of monitoring overall industry performance.

In addition, we also produce a Dispatch Accuracy dashboard for reserves to identify trends and patterns in reserve management.

For this financial year, both dashboards are contained in Appendix B, along with an explanation of the methodology we used to create the dashboards.

Both dashboards continue to evolve and provide a good mechanism to see how changes to the power system, such as how the introduction of more wind generation, affect performance.

We will continue to assess the value of these dashboards once we start to develop new measures as part of the KPI refresh project.

Below are instances of variations we have observed this quarter.

Energy

Overall industry performance this quarter – April to June 2022

- *Application of discretion under 13.70 (May)*
    - Half of the discretions applied in the month related to a planned outage of the ARG1101 BRR0 circuit which requires manual intervention.
- *HVDC modulation (general)*
    - We continue to see a rising trend in the % of minutes where maximum modulation exceeds 30 MW. As previously noted, we are keeping a close eye on this measure, as the new windfarms are added to the system, and will be revisiting the 30 MW band if this trend continues.

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- *Constrained on energy ($)*
  - The higher costs reflect periods of tight generation/low reserves on the system.

Optimal dispatch this quarter

The observations in the dashboard show a slight dip in the overall optimal dispatch percentage in June. We are exploring possible reasons for this and will report back on drivers.

Reserves

It should be noted, the variability in the way the system responds could be a result of many factors, not just the efficiency of the System Operator actions. These factors include:

- The amount of interruptible load armed, as opposed to that offered and used as an input into RMT (and then dispatched by SPD).
- The influence of the type of generation on the amount of net free reserves available.

Observations this quarter – April to June 2022

Observations are consistent with what we expect. There is no significant change.

- *Proportion of time ACCE is risk setter*
  - ACCE has been the risk setter 100% of the time this quarter with Huntly unit 5 the most common risk setter.

On 2 June, we made improvements to modelling Manapouri reserves in RMT which means net free reserves are more accurately modelled. We are monitoring changes and will report back in future months.

10 Cost of services reporting

The cost of services reporting for 2020/21 was delivered to the Authority on 22 December 2021. The next cost of services reporting, for 2021/22 will be delivered to the Authority before the end of 2022.

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11 Actions taken

The following table contains a full list of actions taken during Q4 2021/22 regarding the System Operator business plan, statutory objective work plan, participant survey responses and any remedial plan, as required by SOSPA 12.3 (b).

<table>
<tr><th>Item of interest</th><th>Actions taken</th></tr>
<tr><td>(i) To give effect to the System Operator business plan:</td><td>Lift industry capability to respond to operational events by holding at least two system restoration exercises (simulation and paper-based)
We hosted an industry exercise on 26 May designed to test improved procedures, tools, and communications put in place after the 9 August 2021 event last year
Develop a way to include carbon emission data in our market information
We included carbon emission tracking information in our weekly market insight report on 29 May.</td></tr>
<tr><td>(ii) To comply with the statutory objective work plan:</td><td>Evaluate and revise performance metrics, targets and incentive payment calculation
During quarter 4, we have:
worked with two pilot groups to develop internal and external metrics for the two focus areas:
Management of System Events
Project Delivery
worked with the Authority staff to agree performance measures for events, and how to include these within the incentive payment regime; these will be reported in FY 22/23..</td></tr>
<tr><td>(iii) In response to participant responses to any participant survey:</td><td>Feedback from the 2020-21 survey
In response to how we can increase the value of the system operator service?
Suggestions were: more engagement with GIC, Engage with the EA to re-write the Code to be more technology neutral
We continue to work across the energy sector with regular meetings with representatives from the gas industry, particularly during gas supply outage issues earlier in the year.
We have submitted a code change request on how intermittent generation can offer into the wholesale market.</td></tr>
<tr><td>(iv) To comply with any remedial plan agreed by the parties under SOSPA 14.1</td><td>N/A – No remedial plan in place.</td></tr>
</table>

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System performance

12 Security of supply

Lower South Island lakes have recovered from the low levels which resulted in reduced generation from both Manapōuri and Te Anau in early April 2022. Lake levels are now comfortably within their main operating ranges.

La Niña conditions continue to dominate weather patterns and are expected to continue through July; however, some commentators are indicating the trend is losing strength. National hydro storage is below average, at 89% of average for the time of year and continues to hover around the 90th percentile of historic ranges. While this is below average, we are now at a time of year where this level of storage would be sufficient to get through winter and into spring when the risk drops away. Our modelling shows that in order to cross the risk curves we would need an unprecedented dry sequence or infrastructure breakdown.

A planned outage of the Maui gas production facility (New Zealand's largest gas field) has successfully been completed. During the outage, Methanex responded by reducing its consumption by 100 TJ/day matching the drop in production from Maui. This meant gas generation was not heavily impacted by the outage. Over the next few months, we expect a material increase in gas production.

Contact Energy's Taranaki Combined Cycle Plant at Stratford (TCC) experienced an issue limiting its running hours in closed cycle mode. The 5-week outage, which was scheduled from 17 July to 21 August to fix the issue, has been pushed out to November. However, GE (manufacturers of the generator) have approved Contact to run TCC for an additional 700 hours. This will allow TCC to run through to the end of August, covering of the bulk of the winter periods.

With temperatures dropping, demand is increasing. Demand peaks were consistently high from Monday 20 to Thursday 23 due to the cold snap, resulting in four of the largest 10 peak demands on record. This was covered in the Weekly market update – 26 June 2022. Since then a further demand peak in this range (6,764 MW) has been observed on Wednesday 29 June at 5:30pm, as the evening peak coincided with cold temperatures and low wind generation.

Prices continue to sit around $200/MWh underpinned by low hydrology, and upward pressure on thermal fuels and carbon.

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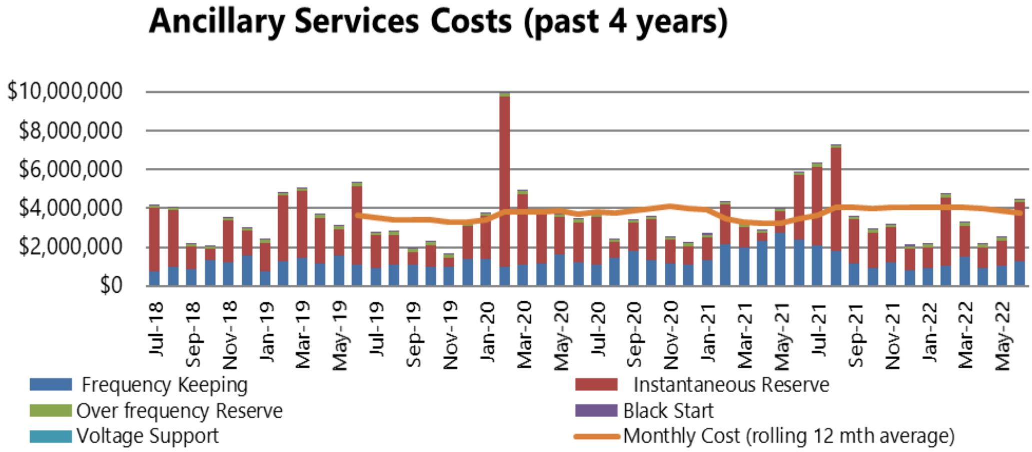
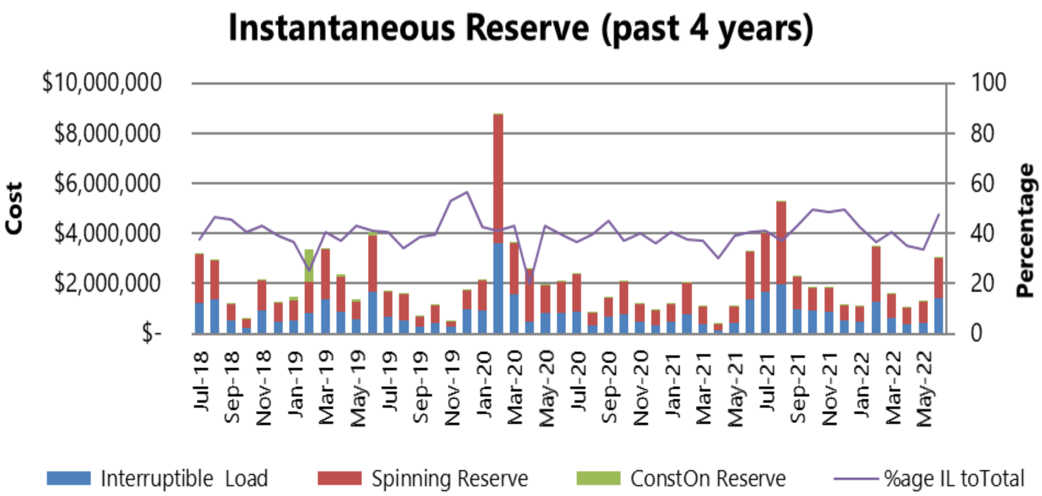
13 Ancillary services



This quarter's ancillary service costs were $9.3 million, which is a 10% decrease compared to the previous quarter's costs of $10.3 million. This reflects significantly lower costs for instantaneous reserves since last quarter, as well as lower frequency keeping costs and over frequency reserve costs. However, costs for instantaneous reserves increased in June driven by increases in interruptible load, spinning reserve and associated constrained on costs.

The significant increase in instantaneous reserve costs in June is the result of an increased instantaneous reserve requirement and lower reserve offers. Cold temperatures in June also saw an increased need for the quantity of instantaneous reserves.



This quarter, the instantaneous reserve costs were $5.3 million, which is a 13% decrease to the previous quarter ($6.2 million). Interruptible load costs were slightly lower than last quarter with a decrease of $160k (7% decrease), spinning reserves decreased by $665k (18% decrease), and constrained on costs increased by $5k (29% increase).

Procured quantities of South Island instantaneous reserves decreased steadily over the quarter while procured quantities of North Island reserves peaked in May. The price

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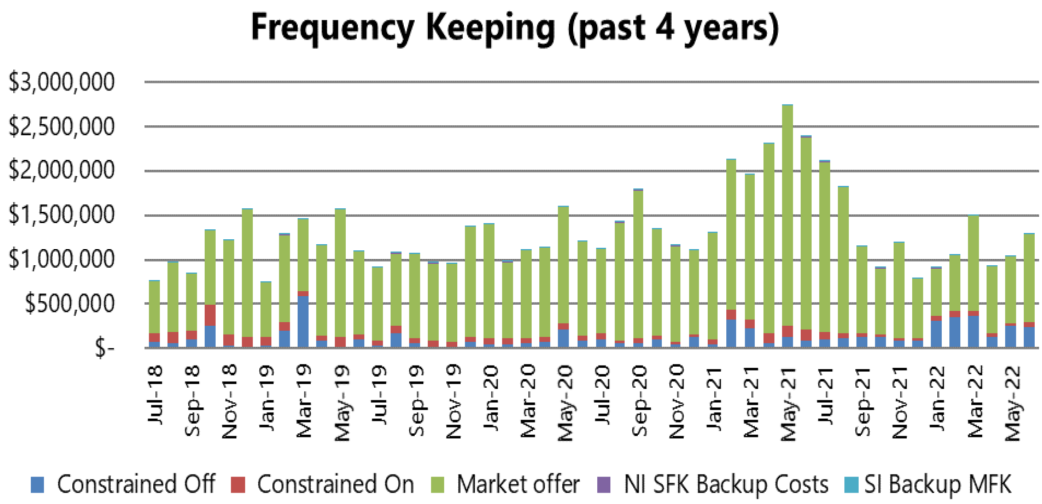
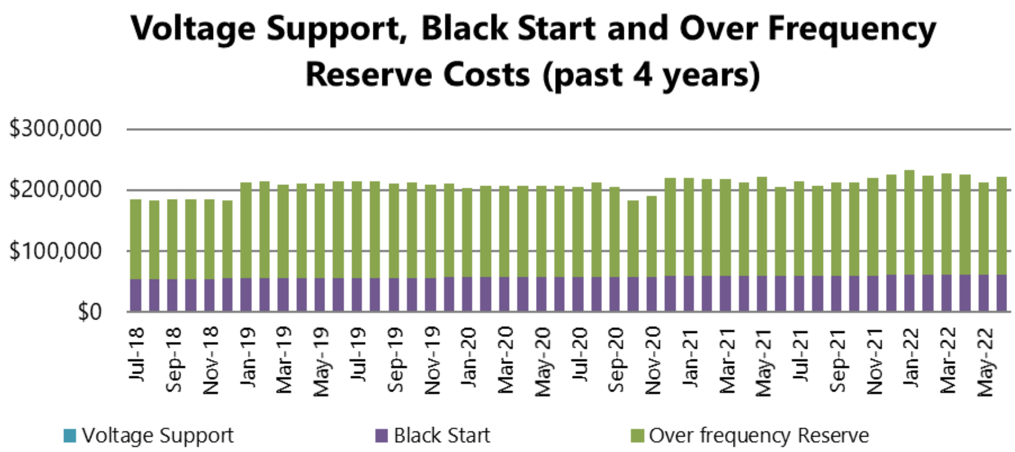
per MW of instantaneous reserves in the South Island increased steadily over the quarter, while North Island average instantaneous reserve prices increased significantly in June (500% increase) primarily because of generation and reserve shortfalls.



This quarter the frequency keeping costs were $3.2 million, which is a 6% decrease compared to the previous quarter's costs of $3.5 million. While both constrained on and constrained off costs decreased by $56k (31% decrease) and $399k (39% decrease) respectively, market offer values increased by $247k (11% increase).

Frequency keeping costs increased in May and June as there was only one frequency provider offering high prices over multiple trading periods during a period of limited competition.



This quarter the costs for over frequency decreased slightly to $474k (5% decrease) as some stations that provide over frequency reserves were unavailable during the quarter. Black start costs are unchanged since last quarter and were $62k in each month. There are no voltage support costs as there is no need to procure this ancillary service at this time.

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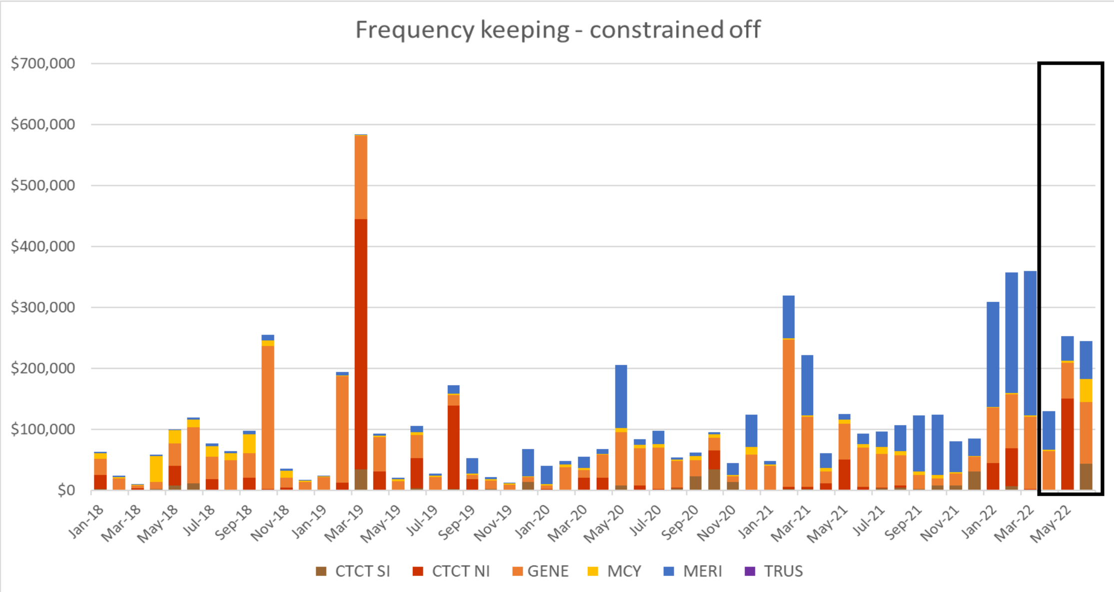
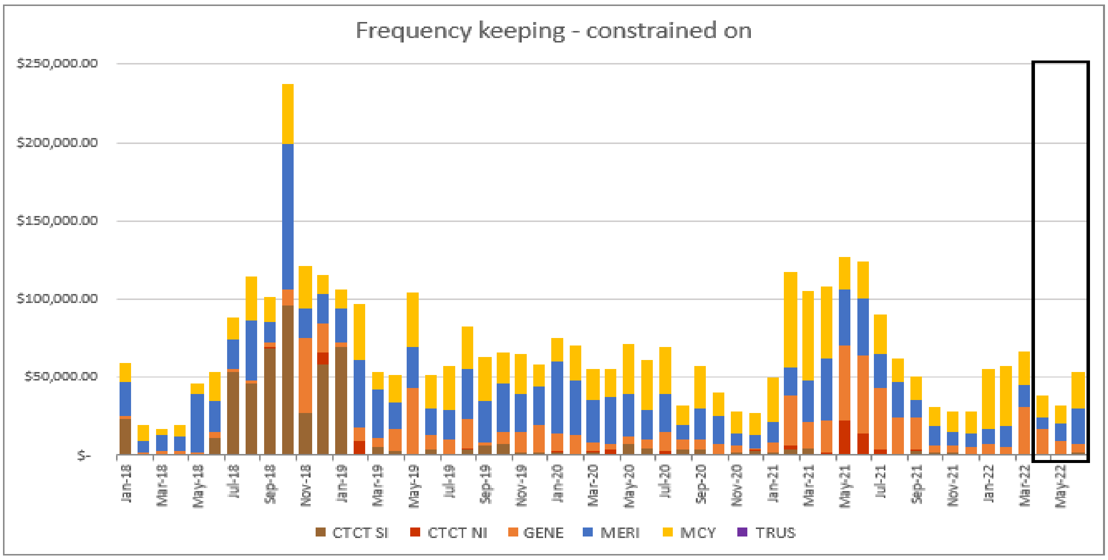
13.1 Constrained on/off costs

Note: Where there is a high payment, as opposed to in increasing/decreasing trend, it will often relate to payments over a small number of trading periods.

Frequency Keeping



For Q4 2021/22, the frequency keeping constrained off costs decreased by 39% on the previous quarter to $628k. The North Island constrained off costs increased by 2% over this period and the South Island's decreased by 66%.



For Q4 2021/22, the frequency keeping constrained on costs decreased by 31% on the previous quarter to $123k. The North Island frequency keeping constrained on costs decreased by 44% and South Island frequency keeping constrained on costs increased by 17% since the previous quarter.

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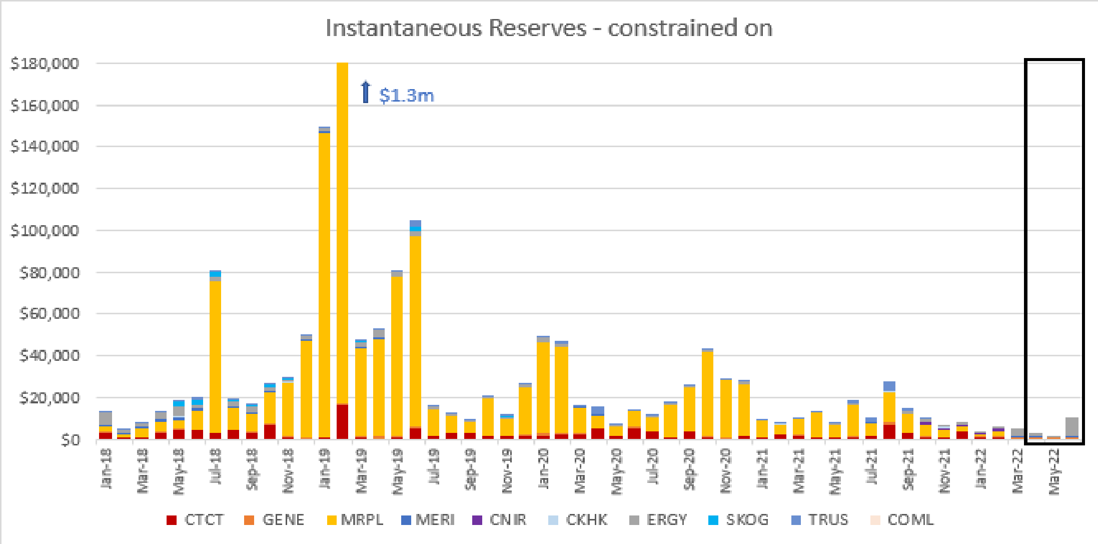
Instantaneous Reserves



For Q4 2021/22, the instantaneous reserves constrained on costs were roughly the same as the previous quarter ($19k), though there was an increase in June (to 13 k) compared to the previous two months ($6k and $4k respectively). This is the result of the generation shortfalls and reserve shortfalls in late June.

14 Commissioning and Testing

We have obtained an interpretation of the Code around when distribution connected generation must support power system voltage for the System Operator. This interpretation differs from our present stance, we are therefore investigating the implications to develop a recommended way forward.

We have also advised the Authority of challenges we are facing now that larger generation units who have previously supported frequency have the potential to be displaced by smaller units (looking to connect) who do not have the same obligations to assist with frequency.

15 Operational and system events

Southland Low Generation

In April, we managed regional voltage stability and thermal security issues in Southland as a result of extreme operating conditions in the region. This caused Lake Manapouri and Lake Te Anau to drop into their low operating ranges and resulted in unusually low generation from Manapouri – at times dropping to 0 MW in early April 2022. Resulting security issues required careful management by the coordination centre, forward assessments by planning teams and coordination with the Grid Owner and participants. They also required a request for an urgent grid reconfiguration, development of constraints, advice and coordination of outages, and communication with participants and stakeholders.

Conditions improved in the last week of April, following increased inflows. This enabled us to advise the Grid Owner that grid reconfiguration was no longer required, and to wind back assessment workloads.

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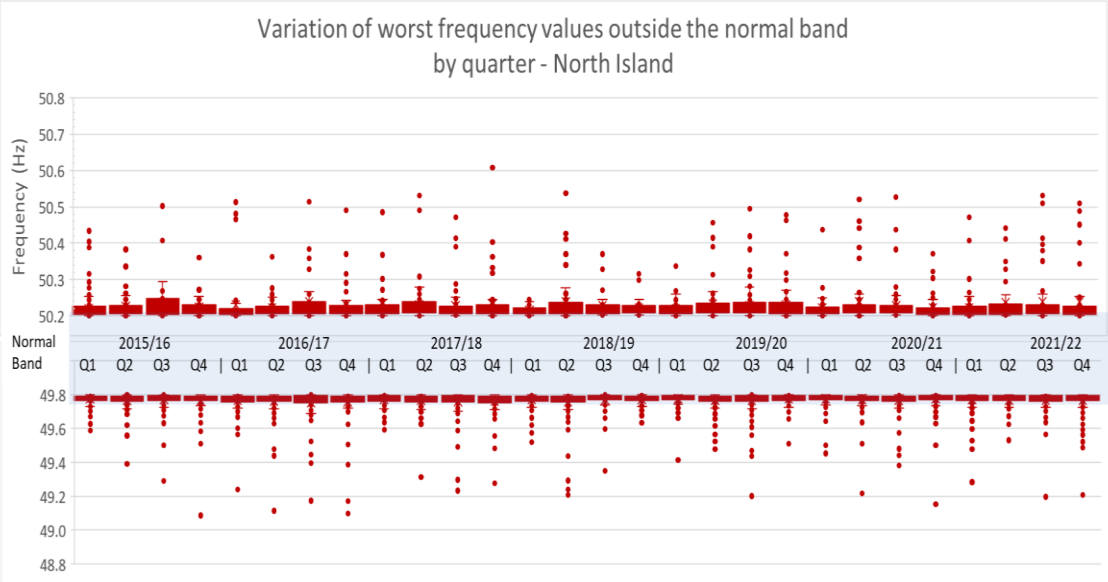
16 Frequency fluctuations

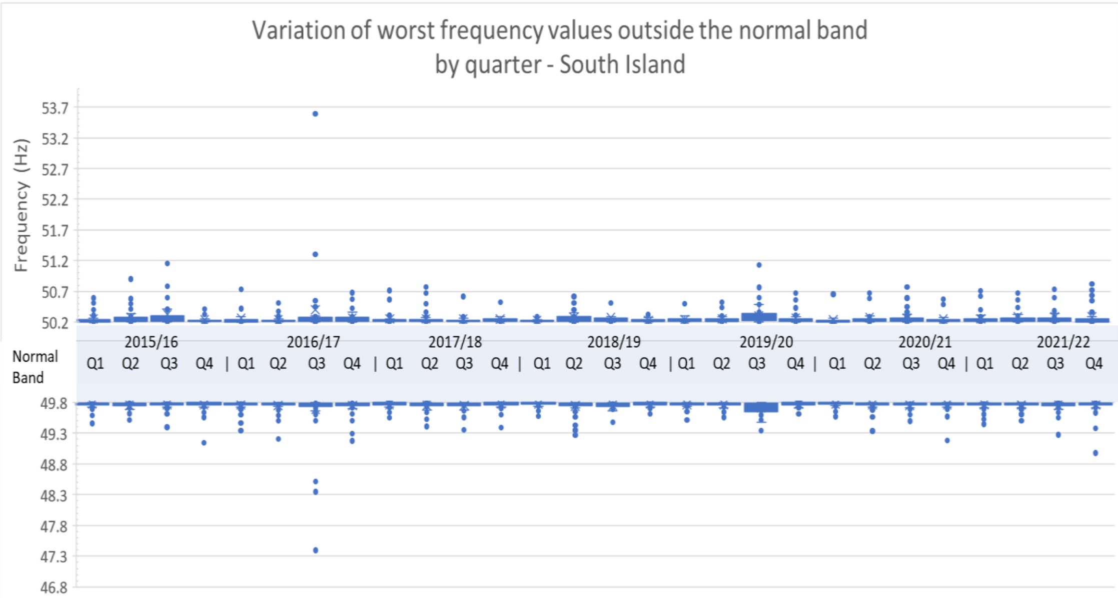
16.1 Maintain frequency in normal band (Frequency value)

The following charts show the distribution of the worst frequency excursion outside the normal band (49.8 to 50.2 Hz) by quarter since Q1 2015/16, including the reporting period.

North Island



South Island



Note: These box and whisker charts show the distribution of data. The "box" represents the distribution of the middle 50% of the data, the "whiskers" indicate variability, and outliers are shown as single data points.

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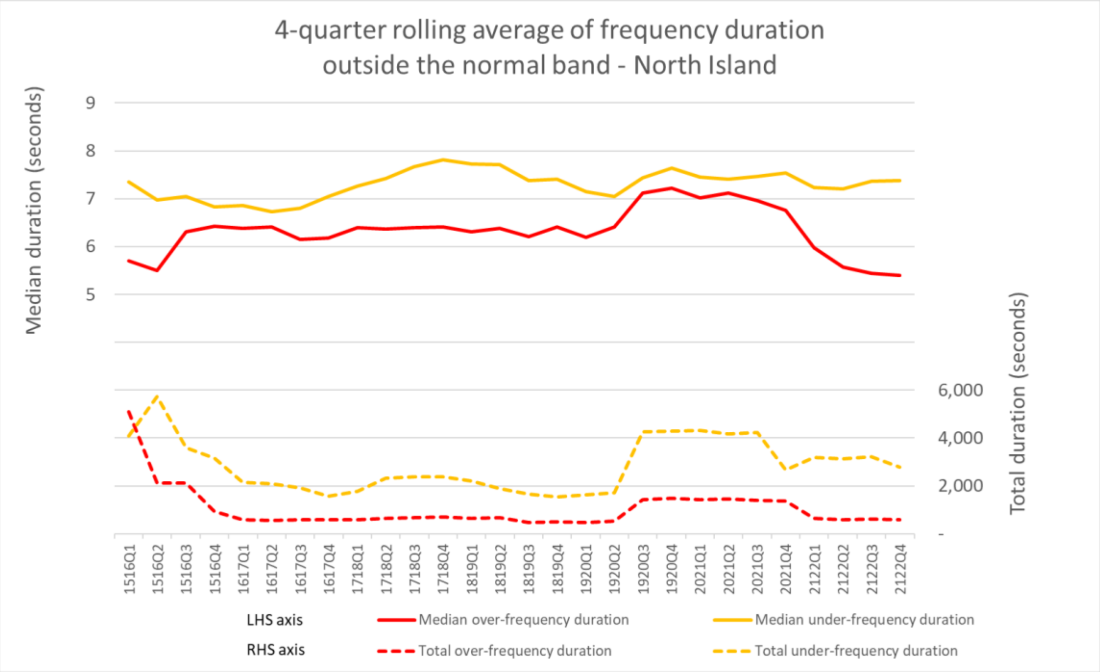
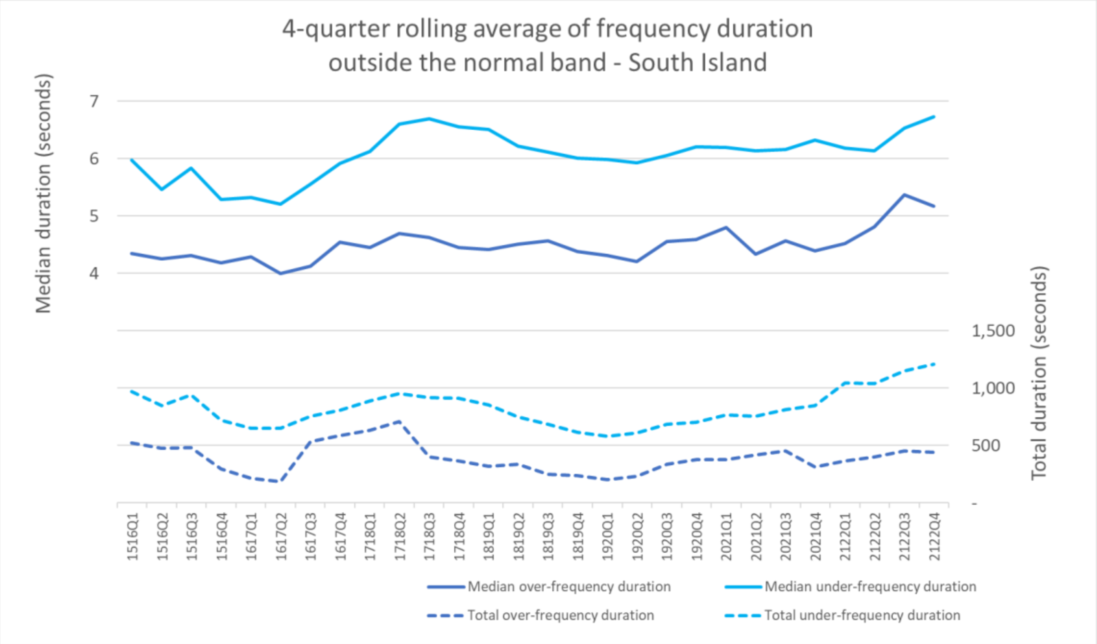
16.2 Recover quickly from a fluctuation (Time)

The following charts show the median and total duration of all the momentary fluctuations above and below the normal band for each island. The information is shown as a 4-quarter rolling average to illustrate trends in the data.

North Island



South Island



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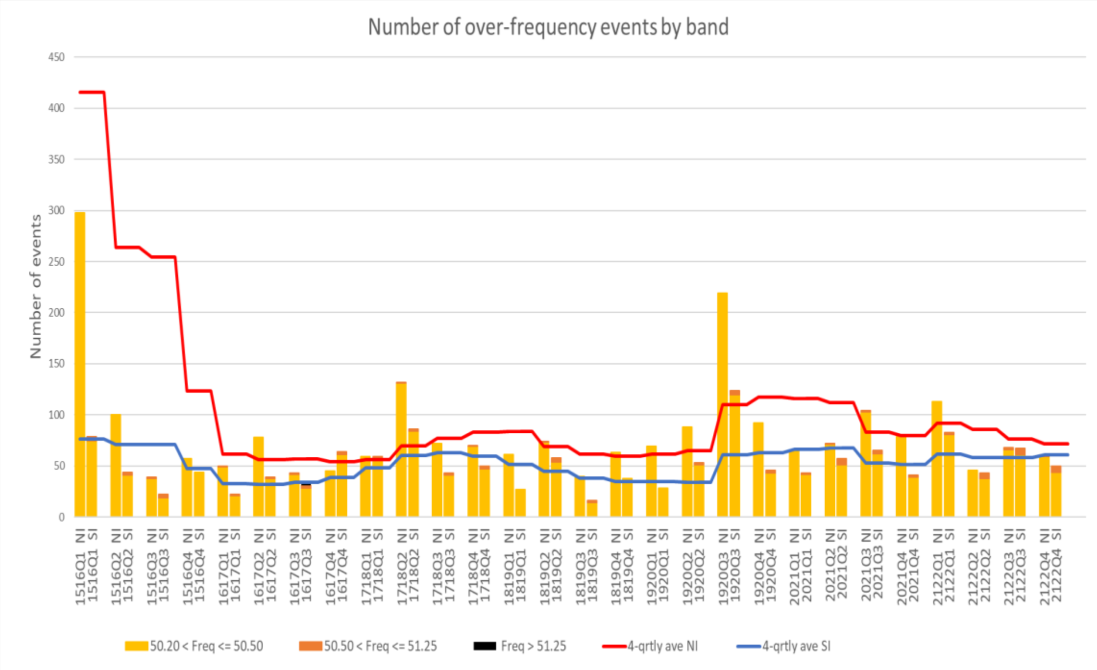
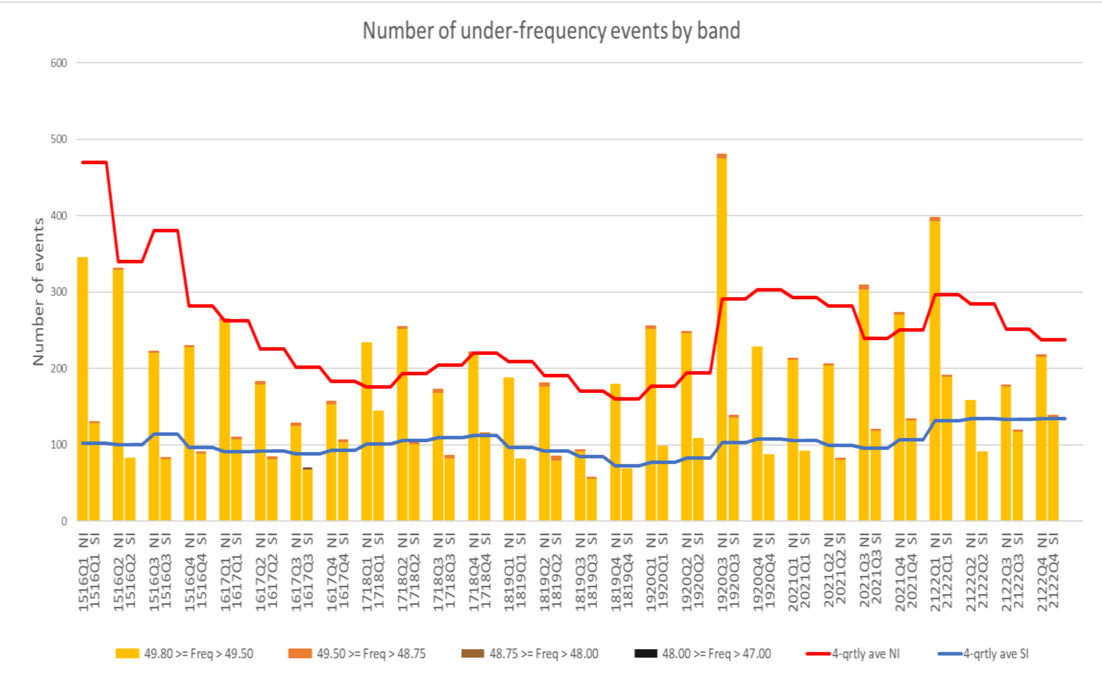
16.3 Manage frequency and limit rate of occurrences during momentary fluctuations (Number)

The following charts show the number of momentary fluctuations outside the frequency normal band, grouped by frequency band, for each quarter since Q1 2015/16. Information is shown by island, including a 4-quarter rolling average to show the prevailing trend.

Over-frequency events



Under-frequency events



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16.4 Manage time error and eliminate time error once per day

There were no time error violations in the reporting period.

17 Voltage management

Grid voltages did not exceed the Code voltage ranges during the reporting period.

18 Security notices

The following table shows the number of Warning Notices, Grid Emergency Notices and Customer Advice Notices issued over the last 12 months.

Notices issued	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22
Demand Allocation Notice	-	-	1	-	--	--	-	-	-	-	-	-	
Grid Emergency Notice	1	-	4	2	--	2	-	-	-	-	-	-	1
Warning Notice	-	1	4	-	--	--	-	-	-	-	-	1	
Customer Advice Notice	14	11	42	34	9	7	5	7	9	15	14	15	28

19 Grid emergencies

The following table shows grid emergencies declared by the System Operator April to June 2022.

Date	Time	Summary Details	Island
23/06/22	07:58	A grid emergency was declared due to there being insufficient generation offers available to meet projected national demand. A revision to this notice was published later correcting the start time of the grid emergency.	N + S

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Appendices

Appendix A: Discretion

April

Event Date and Time	Description
21/04/2022 11:42	MKE1101 MKE1: MKE generation tripped. Discretioned to zero MW to enable secure dispatch solution. Last Dispatched MW: 83.8

May

Event Date and Time	Description
1/05/2022 18:56	ARG1101 BRR0 Required for switching of planned outage - BLN_STK_1, ARG_KIK_1. BRR not currently clearing Last Dispatched MW: 0
4/05/2022 0:02	MAN2201 MAN0 Discretion added to bring MAN down by 180MW to allow for TWI Line 1 reduction line restoration Last Dispatched MW: 605
4/05/2022 0:06	ARG1101 BRR0 Added discretion to 0MW to allow for ARG_KIK_1 RTS - offers are priced high enough BRR not being dispatched or scheduled for this TP anyway Discretion extended to 13:00 as requested by SC - NGOC extended outage due to failover.
4/05/2022 23:47	MAN2201 MAN0 Last Dispatched MW: 605
13/05/2022 4:27	ARG1101 BRR0 ARG-KIK_1 RTS close ARG 174 Last Dispatched MW: 9
13/05/2022 4:47	SFD2201 SFD21 tripped Last Dispatched MW: 104
14/05/2022 0:43	MAN2201 MAN0 MCC SCADA Test. Last Dispatched MW: 576
15/05/2022 18:42	ARG1101 BRR0 Planned outage requires the generation off. Last Dispatched MW: 9
18/05/2022 5:42	ARG1101 BRR0 Last Dispatched MW: 10
21/05/2022 11:30	ROT1101 Last Dispatched MW: 6.5

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June

Event Date & Time	Event Description
1/06/2022 00:57	CYD2201 CYD0 After receiving dispatch of 61MW at CYD, CCC operator claimed Rule 13:82(a), as this put the unit into its rough running range. After discussion with SC, determination made this unit not required for security, so discretion applied for max. energy of 0MW. Last Dispatched MW: 60.99
7/06/2022 00:08	KOE1101 NGB0 NGB tripped Last Dispatched MW: 31.5
12/06/2022 23:20	HLY2201 HLY claim 13.82(a) rule exemption. Due to be dispatched off in next TP. Last Dispatched MW: 190
23/06/2022 07:48	WHI2201 WHI0 Required on over the AMPK. Total residual in NZ now <110MW. CCC advise minimum MW on one unit is 16MW. Last Dispatched MW: 25
28/06/2022 17:42	WHI2201 WHI0 Security of supply for evening peak. Last Dispatched MW: 0

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Appendix B: Dispatch Accuracy Dashboards

Energy

Same quarter in 2020/21

This quarter 2021/22

Measure	Description	Unit	2021 April	May	June	July	August	September	October	November	December	2022 January	February	March	April	May	June
Operator discretion applied	Total number of instances (5-minute dispatches) where operator interventions depart from the dispatch schedule to ensure the dispatch objective is met	100% binding	350	347	652	895	472	509	584	648	449	355	422	445	292	501	529
	Instances where the system operator has applied discretion under 13.70 of the Code to meet dispatch objective		-	1	15	9	12	32	11	16	24	2	9	5	1	10	5
Frequency keeper (MW)	Average absolute deviation (MW) from frequency keeper dispatch point. A movement of frequency keeping units away from their setpoint suggests greater variability in the system, but can also indicate the need for additional dispatches	NI	6.73	7.14	6.89	7.08	7.11	6.98	7.00	6.96	7.52	7.32	6.41	7.11	7.23	6.95	6.82
		SI	6.59	6.65	6.58	6.64	6.53	6.71	6.60	6.83	6.68	6.76	6.32	6.69	7.10	6.46	6.62
Time error (s)	Average absolute daily time error (s) indicates imbalance between generation and load, a reflection of imperfect dispatch	NI	0.2003	0.2113	0.2148	0.2379	0.2408	0.2317	0.1941	0.1862	0.2110	0.2087	0.2261	0.1901	0.2056	0.2071	0.2142
		SI	0.1898	0.2213	0.2072	0.2490	0.2332	0.2087	0.1879	0.2041	0.2095	0.1707	0.2258	0.1799	0.2120	0.1995	0.2142
Frequency excursions	Number of frequency excursions (>0.5Hz from 50Hz)		-	2	3	3	1	2	-	5	1	2	6	2	3	4	4
FK within 1% of band limit	% of time frequency keepers spend near to or exceeding their regulation limits indicates the need to redispatch.	NI	2.94%	3.59%	2.76%	3.28%	3.01%	2.66%	2.54%	2.64%	3.47%	2.68%	3.54%	2.58%	3.16%	2.58%	2.42%
		SI	3.87%	5.75%	2.78%	3.31%	2.92%	2.66%	2.55%	2.59%	3.48%	2.72%	3.55%	2.31%	3.13%	2.57%	2.44%
FK outside of band limit	% of time frequency keepers spend outside their regulation limits	NI	0.02%	0.09%	0.01%	0.01%	0.02%	0.04%	0.02%	0.02%	0.01%	0.01%	0.08%	0.05%	0.03%	0.04%	0.01%
		SI	0.00%	0.14%	0.00%	0.00%	0.02%	0.01%	0.00%	0.02%	0.00%	0.00%	0.03%	0.01%	0.01%	0.01%	0.00%
HVDC modulation beyond 30MW band	% of minutes where the maximum HVDC modulation exceeds 30MW away from its dispatch setpoint. This indicates greater variability in the system, but can also indicate the need for redispatch.		10.19%	10.60%	13.79%	15.05%	11.78%	10.93%	8.11%	10.05%	9.09%	9.09%	10.37%	7.38%	8.38%	9.13%	10.89%
Constrained on energy- Total	Total Monthly Generation	MWh	3,364,562	3,722,811	3,726,894	4,038,786	3,857,499	3,628,916	3,553,128	3,411,254	3,381,156	3,423,033	3,102,676	3,300,548	3,303,156	3,612,262	3,598,421
	Total constrained on - All sources	MWh	24,629	23,878	23,017	25,760	25,586	33,595	26,561	24,861	37,425	27,518	25,195	25,071	17,302	21,182	24,421
		% of all generation	0.73%	0.64%	0.62%	0.64%	0.66%	0.93%	0.75%	0.73%	1.11%	0.80%	0.81%	0.76%	0.52%	0.59%	0.68%
Constrained on energy ($) - Frequency keeping		$ Constrained On Energy	574,408	849,250	529,563	678,100	418,027	387,985	232,948	269,822	428,273	264,827	351,930	1,048,490	1,034,695	273,109	765,655
	Total constrained on $ due to frequency keeping (within band is attributable to SO)	$ Grid Constrained On Energy	108,176	126,538	123,621	90,143	61,541	50,707	31,140	28,176	28,196	41,297	57,475	66,726	38,151	31,680	53,162
Optimal Dispatch (%)	Compares the average impact of a perfect foresight case against dispatch solutions. Indicates impact of wind offer, load forecast and PSD accuracy.	%	94.790%	95.500%	95.310%	94.240%	93.790%	92.500%	91.500%	92.270%	92.480%	93.910%	92.050%	94.100%	95.730%	94.830%	91.160%
Dispatch load accuracy error (%)	Average absolute difference between forecast generation (load plus losses, including PSD) and actual generation relative to the average actual generation	%	99.610%	99.590%	99.550%	99.580%	99.620%	99.580%	99.620%	99.590%	99.570%	99.600%	99.570%	99.600%	99.610%	99.600%	99.620%
Wind offer accuracy (%)	Average absolute difference between persistence wind offer (based on 5mins prior) and the actual wind output relative to the average wind output	%	97.340%	97.600%	97.250%	97.360%	97.540%	97.730%	97.340%	97.710%	97.550%	97.410%	97.340%	97.260%	97.440%	97.420%	97.510%

Scale for measures: Variation of up to 0.25 std devs from standard ... up to 1 std dev from standard ... up to 2 std devs from standard ... over 2 std devs from standard

Scale for metric: 1 2 3

NOTE 1: Commentary on the current quarter's data is included in section 9.1 of this report

NOTE 2: Summary data for "FK outside of band limit" is not shown for the South Island in March 2020. The data collected for this month has missing values for a number of dates which meant the measure could not be calculated.

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Understanding the energy dashboard

The purpose of this dashboard is to identify trends and outliers for measures that represent overall industry performance in energy dispatch. The System Operator actions are only one of the influences in this performance. Three of the measures in which the System Operator has some influence in the performance are converted into a metric.

Measures selected

We have selected measures that cover the following key areas of dispatch performance:

- When operator discretion is required
- Variations in frequency
- When generators are required to be constrained on/off to meet the dispatch objective
- Variation in output and inputs to the Optimum dispatch tool, which compares what happened in real time to what would have happened if there had been perfect foresight

Colour scale

The dashboard uses coloured shading to make it easy to highlight interesting cells or ranges of cells and emphasise unusual values. In this case we have used a colour scale from green (good performance) through to orange (outliers). Each of the cells sits on a colour gradient within this scale.

The colour scales used in the dashboard reflect performance against a standard. A standard that represents good performance has been applied to each of the measures. Variance from this standard identifies outliers which we comment on in section 9.1 of the report. The current standard is the average of the data since January 2019.

Variation of up to 0.25 std devs from standard	... up to 1 std dev from standard	... up to 2 std devs from standard	... over 2 std devs from standard [1]

Metric[2]

The measures that contribute towards the metric are:

- FK outside of band limit [3]
- Constrained on energy- Total
- Optimal Dispatch (%)

There are three stages to calculating the metric

1. **Determine a standard**
   This is based on what represents good performance
2. **Rate the comparison on a scale of 1 to 3**
   The monthly performance is compared to the standard against a predefined scale. There are two scales used in this calculation - FK outside of the band limit and Constrained on energy - Total; and Optimal Dispatch (%). These are shown in the tables below: [4]

Score	Outcome	Measure is:
3	Good performance	Up to 0.25 std devs above the standard
2	OK performance	Between 0.25 and 1 std dev above the standard
1	Weak performance	Over 1 std devs above the standard

Score	Outcome	Optimal dispatch is:
3	Good performance	Up to 0.25 std devs below the standard
2	OK performance	Between 0.25 and 1 std dev below the standard
1	Weak performance	Over 1 std devs below the standard

3. **Calculate an overall metric score**
   The overall metric is the average of the three individual scores.

Example:

			Month	Standard
FK outside of band limit	% of time frequency keepers spend outside their regulation limits	NI	0.20%	0.08%
		SI	0.02%	0.01%
Constrained on energy- Total	Total constrained on - All sources	MWh	23,649	28,417
		% of all generation	0.59%	0.80%
Optimal Dispatch (%)	Compares the average impact of a perfect foresight case against dispatch solutions. Indicates impact of wind offer, load forecast and PSD accuracy.	%	93.2%	92.37%
	Metric calculation rows	FK outside band	2	
		Constrained on	3	
		Optimal Dispatch	3	
Dispatch accuracy %	Metric out of 3 (3 is best possible result)		2.7	

FK outside of band limit = (0.2+ 0.02)/2 = 1.1 -> 2 (as a result of the distribution for this measure)
Constrained on energy- Total = 0.59 -> 3 (as a result of the distribution for this measure)
Optimal Dispatch (%) = 93.20% -> 3 (as a result of the distribution for this measure)
Overall metric = (2+3+3)/3 = **2.7**

[1] Since last quarterly report we have changed the way in which we measure variation, to make it in terms of standard deviations (instead of percentage variations) for both the conditional formula shading and the metric calculation
[2] This metric is for analysis purposes and is not part of the performance metrics report to the Authority
[3] Last quarterly report used the measure FK within 5% of band limit, we have updated this as variation outside of band limit was felt to be more meaningful
[4] The score was changed during the year from a five point (1-5) to a three point (1-3) scale.

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Reserves

Same quarter in 2020/21

This quarter 2021/22

			2021									2022					
			April	May	June	July	August	September	October	November	December	January	February	March	April	May	June
FIR procured vs Risk	NI+SI Fast Instantanous Reserve (FIR) procured divided by the estimate of FIR risk. A greater proportion suggests over procurement of reserves in the relevant island. Monthly average per trading period.	ACCE	0.70	0.73	0.78	0.70	0.71	0.66	0.68	0.72	0.64	0.74	0.82	0.76	0.73	0.79	0.70
		DCCE	NIL	0.88	NIL	0.88	0.87	0.84	0.79	0.74	0.78	NIL	0.88	NIL	NIL	NIL	NIL
FIR procured (MW)	Average FIR MW procured per trading period		180	222	286	251	257	203	198	204	166	217	268	244	246	256	213
SIR procured (MW)	Average SIR MW procured per trading period		266	314	381	372	386	313	303	301	263	307	357	337	343	339	318
FIR procured ($)	Total monthly cost ($) of FIR procured		284,960	800,816	2,029,096	1,803,527	3,083,309	1,224,614	867,796	850,026	604,671	648,275	2,668,483	1,026,829	773,471	1,016,826	1,289,642
SIR procured ($)	Total monthly cost ($) of SIR procured		102,967	278,623	1,264,344	2,216,743	2,198,285	1,038,035	973,776	953,870	498,131	425,975	819,488	565,559	272,183	275,921	1,676,320
Net free reserves (NFRs)	Average national Net free reserves (NFRs) for a trading period where the risk type is binding, averaged over a month	AC	92	100	101	124	116	115	107	106	103	97	88	96	106	90	111
		DC	NIL	102.76	NIL	77	95	88	96	112	99	NIL	82	NIL	NIL	NIL	NIL
Reserve sharing	Average percentage of FIR procured that is shared between islands. FIR shared NI+SI / FIR MW Procured NI+SI (Average per trading period).		61%	45%	35%	36%	26%	37%	35%	52%	42%	51%	33%	42%	46%	43%	47%
IL vs Spinning Reserve	Percentage of IR procured as interuptable load.	FIR	29%	28%	40%	39%	33%	34%	36%	32%	32%	34%	35%	34%	28%	27%	34%
		SIR	30%	28%	41%	38%	36%	37%	38%	35%	35%	39%	36%	34%	27%	26%	36%
Risk setter	Most common risk setter (highest number of trading periods)	NI	HLY1CE	HLY5CE	HLY5CE	HLY5CE	HLY5CE	HLY5CE	HLY5CE	HLY5CE	HLY5CE	HLY5CE	HLY5CE	HLY5CE	HLY5CE	HLY5CE	HLY5CE
		SI	ManualCE;OtherIslandCE	OtherIslandCE	ManualCE;OtherIslandCE	ManualCE;OtherIslandCE	OtherIslandCE	ManualCE;OtherIslandCE	ManualCE;OtherIslandCE	OtherIslandCE	ManualCE;OtherIslandCE	ManualCE;OtherIslandCE	OtherIslandCE	ManualCE;OtherIslandCE	ManualCE;OtherIslandCE	ManualCE;OtherIslandCE	ManualCE;OtherIslandCE
Proportion of time risk setter	Proportion of time each type of risk was FIR risk setter	ACCE	99.93%	99.93%	100.00%	99.80%	78.18%	95.13%	87.77%	95.56%	94.83%	99.93%	89.43%	100.00%	100.00%	100.00%	100.00%
		DCCE	0.00%	0.07%	0.00%	0.20%	22.09%	2.50%	10.35%	2.78%	1.08%	0.00%	10.57%	0.00%	0.00%	0.00%	0.00%
		DCECE	0.07%	0.00%	0.00%	0.00%	0.14%	2.36%	1.88%	1.67%	4.10%	0.07%	0.07%	0.00%	0.00%	0.00%	0.00%
Average MW risk when risk setter	Average risk MW for each risk type when they are the FIR risk setter	ACCE	258	305	366	356	329	305	283	287	247	294	313	319	337	326	305
		DCCE	0	364	0	393	394	367	319	323	281	0	420	0	0	0	0
		DCECE	105	0	0	0	159	50	106	62	240	149	0	0	0	0	0

Understanding the reserves dashboard

The purpose of this dashboard is to provide greater visibility of statistics on fast instantaneous reserve (FIR) and sustained instantaneous reserves (SIR) which enable us to look at trends in reserve procurement.

Measures selected

We have selected a number of measures that identify trends in instantaneous reserves procurement. The one which we believe is the key one to focus on is:

> Monthly average of [FIR MW procured as a percentage of the FIR risk] per trading period (%)
> across the whole of New Zealand[5] for AC contingent events (ACCE)

This is because it reports on System Operator efficiency in procuring the lowest quantity of FIR to ensure system stability following an event. It also provides an insight into the output of the key System Operator tool – RMT. We consider this provides useful information and trends that can be analysed further. Note, this measure is focused on FIR quantities rather than costs which are largely a result of reserve offer prices than optimal procurement.

Colour scale

The dashboard uses coloured shading to highlight patterns in the data. In this case the shading identifies the variability of the results in the dashboard; it does not compare the results against a standard.

The variation in the shading should not be interpreted as good/bad – but used to identify where there is variation.

All results for a measure may be extremely good, but if there is any variation, the shading simply shows the most desirable values in darker green and the least desirable values in orange; colours from pale green, through pale orange illustrate the relative values between these two extreme points.

The blue shading is used for measures where the concept of least desirable and most desirable does not exist.

[5] The introduction of the national IR market has resulted in reserves being shared across the islands.

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