

System Operator Performance Review and Assessment

1 September 2009 to 31 August 2010

Prepared by the Electricity Authority

1 December 2010

Executive summary

The System Operator is a market operation service provider who performs a crucial role for the electricity industry in New Zealand. It must manage the processes required to coordinate generation at least cost to meet demand without overloading grid assets, while employing resources to mitigate specific threats of power supply interruptions. To emphasize the importance of this service provider role and the relationship between the Electricity Authority (Authority) and the System Operator, the Electricity Industry Participation Code 2010 (Code) includes a requirement for both parties to regularly review how well the System Operator is performing its role.

The transitional provisions of the Code deem the assessment of the System Operator's performance submitted to the Electricity Commission (Commission) under rule 14 of section II of part C of the Electricity Governance Rules 2003 (Rules) for the period ending 31 August 2010 to have been submitted to the Authority under clause 7.11 of the Code. Consequently, although the functions and obligations the System Operator was performing in the review period were contained in the Rules and the Electricity Governance Regulations 2003 (Regulations), the references in this report are Code references. Note that there are no material differences between the two sets of obligations referred to in this report.

As the System Operator's self-assessment is deemed to have been submitted to the Authority under clause 7.11 of the Code, the Authority must carry out its assessment of the System Operator's performance during the review period to which the self-assessment relates, having regard to the self-review and such other matters as the Authority considers relevant.

The Authority considers that Transpower, as System Operator, has satisfactorily performed its core functions, meeting both its principal performance obligations and the dispatch objective. Although the investigation of the under frequency event of 1 August 2009 identified some modelling shortcomings, the Authority commends the System Operator for its thorough investigation of this event and for the way it acted on the findings, especially the cooperative nature of its engagement with the industry and the generators concerned.

The System Operator also completed two other investigations in the review period, the credible event management review and the technical report on the automatic under frequency load shedding (AUFLS) review, the outputs of which were both finished to a high standard. The series of workshops it carried out following the investigation reports were well accomplished and received by the industry.

The manner and level of engagement between the System Operator and the industry has also been very good. It is noted that there has been more support from the System Operator on regulatory and industry development initiatives since the new market systems were commissioned. The Authority is looking forward to making further progress on these initiatives in the coming year.

Glossary of abbreviations and terms

Act	Electricity Industry Act 2010
AUFLS	Automatic Under-frequency Load Shedding
Authority	Electricity Authority
CDS	Central Data Set
Code	Electricity Industry Participation Code 2010
Commission	Electricity Commission
MSP	The System Operator's Market Systems Project
PPOs	Principal Performance Obligations
Regulations	Electricity Governance Regulations 2003
Rules	Electricity Governance Rules 2003
SOSPA	System Operator Service Provider Agreement
SSF	System Security Forecast

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1. Background

1.1 Introduction and purpose

- 1.1.1 The System Operator is a market operation service provider to the electricity market that performs a crucial role in the electricity industry in New Zealand. It must manage the processes required to coordinate generation at least cost to meet demand without overloading grid assets, while employing resources to mitigate specific threats of power supply interruptions. To emphasize the importance of this role and the relationship between the Authority and the System Operator, the Code includes a requirement for both parties to regularly review how well the System Operator is performing its role.
- 1.1.2 The System Operator submitted a review and assessment of its own performance to the Commission on 30 September 2010 for the review period from 1 September 2009 to 31 August 2010.
- 1.1.3 This report provides the Authority's own assessment of the System Operator's performance in the same review period.

1.2 Regulatory requirements

- 1.2.1 Clause 17.27 in the transitional provisions of the Code deems the assessment of the System Operator's performance submitted to the Commission under rule 14 of section II of part C of the Rules for the period ending 31 August 2010 to have been submitted to the Authority under clause 7.11 of the Code. Consequently, although the functions and obligations the System Operator was performing in the review period were contained in the Rules and Regulations, the references in this report are Code references. Note that there are no material differences between the two sets of obligations referred to in this report.
- 1.2.2 Having deemed the System Operator's assessment to have been submitted to the Authority under clause 7.11, the Code requires the Authority to carry out its own assessment of the System Operator's performance during the review period to which the self-assessment relates, having regard to the self-review and such other matters as the Authority considers relevant.
- 1.2.3 Clauses 7.8 and 7.9 of the Code outline the matters that the Authority must consider in its review. Clause 7.8 requires the Authority to concentrate on the System Operator's compliance with:
- (a) its obligations under the Code and the Electricity Industry Act 2010 (Act);
 - (b) the operation of the Code and the Act;
 - (c) any performance standards agreed between the System Operator and the Authority; and

- (d) the provisions of the System Operator's service provider agreement (SOSPA) with the Authority.

1.2.4 Clause 7.9 requires the Authority to take into account the following matters when conducting the review:

- (a) the terms of the SOSPA;
- (b) the reports from the System Operator to the Authority;
- (c) the performance of the System Operator over time in relation to part 7 and 8 of the Code;
- (d) the extent to which acts or omissions of other parties have impacted on the System Operator's performance and the nature of the task being monitored;
- (e) reports or complaints from any person;
- (f) the fact that real time co-ordination of the power system involves a number of complex judgments and inter-related incidents;
- (g) any disparity of information between the Authority and the System Operator; and
- (h) any other matter the Authority considers relevant.

1.2.5 Clause 7.11(4) requires the Authority to publish its review and assessment of the System Operator within 10 business days after the meeting at which the Authority completes its review and assessment.

1.3 Review framework

1.3.1 This review and assessment of the System Operator's performance has been arranged under the following headings:

- (a) operation of the Code and Act;
- (b) obligations under the Code and Act;
- (c) performance under the provisions of the SOSPA;
- (d) performance standards agreed between the System Operator and the Commission;
- (e) contribution to regulatory and industry development work; and
- (f) other activities.

1.3.2 The review process aims to cover all aspects, both positive and negative, of the System Operator's performance and provide constructive feedback, wherever possible, for the purpose of continuous improvement in performance.

- 1.3.3 In gathering input to the review, Authority staff preparing this report sought feedback from the different Authority groups who regularly work with the System Operator.

2. Assessment

2.1 Operation of the Code and Act

Reasonable and Prudent System Operator

- 2.1.1 Although it is important that the System Operator complies with all its regulatory requirements, it is especially concerned with fulfilling its core functions and obligations. The System Operator is primarily required to be a “reasonable and prudent system operator”, a term which is defined in clause 1.1 of the Code as:

“...exercising that degree of skill, diligence, prudence, foresight and economic management, as determined by good international practice and that would reasonably and ordinarily be expected from a skilled and experienced system operator engaged in the co-ordination of an integrated transmission network under the same or similar circumstances as applied in New Zealand at the time.”

Principal Performance Obligations

- 2.1.2 To provide more direction in this overarching duty, clause 7.2 of the Code contains a set of obligations called the principal performance obligations (PPOs). The PPOs require the System Operator to:
- (a) act as a “reasonable and prudent system operator” in dispatching assets made available to avoid cascade failure of generation which results in power blackouts; and
 - (b) ensure frequency remains within prescribed upper and lower limits and number and duration of frequency fluctuations (outside the normal band) stay within specified limits.
- 2.1.3 There were neither blackouts nor any frequency or voltage excursions large enough to cause the AUFLS relays to disconnect demand during the review period or to exceed the limits prescribed. The Authority is satisfied with this outcome but notes the near miss on 1 August 2009 identified some shortcomings in the System Operator’s systems that manage the procurement of reserve in the South Island. Although the event occurred and was noted in the last review, the findings were published in this review period. Accordingly, it is appropriate to comment on them in this report.
- 2.1.4 At 4:30am on 1 August 2009, the HVDC between the North and South Islands tripped while carrying power south, causing the sudden loss of 270 MW to the South Island. The event was significant because the frequency:

- (a) fell below the level expected for a contingent event (48 Hz) and within 0.2 Hz of the trip setting for the first block of AUFLS; and
- (b) subsequently increased beyond 50 Hz to 52.05 Hz, a level where it is expected that some generating units automatically disconnect.

- 2.1.5 The Authority is concerned at the modelling weaknesses found by the System Operator during its investigation.¹ However, it commends the System Operator for its thorough investigation of this event and for the way it acted on the findings, especially the cooperative nature of its engagement with the industry and the generators concerned.
- 2.1.6 The Authority is also concerned at deficiencies in delivery of contracted reserve from some industry participants. The identification of these deficiencies, and consequential improved performance modelling, is an important achievement of the System Operator.
- 2.1.7 Clause 7.2(1)(b)(v) of the Code also requires the System Operator to act as a reasonable and prudent system operator with the objective of ensuring frequency time error is no greater than five seconds of New Zealand Standard time. The Authority notes there were three instances when time error exceeded this objective. Two of these instances relate to a single day and followed the sudden and unplanned outages of both HVDC poles. The Authority agrees with the System Operator that the unexpected nature of the events and the efforts required to restore frequency within the normal band suggest it did not breach its rule requirements. The Authority notes that the System Operator has notified a breach of its requirements with respect to the third occasion, which occurred on 17 April 2010.
- 2.1.8 The System Operator declared a total of 37 grid emergencies during the review period (up from 30 last year), all of which it managed without major disruption to power users. The Authority acknowledges the major system frequency event that occurred on 30 October 2009, which has since caused the System Operator to make a change in its outage planning procedures. During an outage of two circuits in North Auckland (Hepburn Road to Mount Roskill) the remaining circuit feeding North Auckland and Northland was tripped by a forklift, resulting in the loss of approximately 600 MW of load and causing the frequency in both islands to spike above 51 Hz before recovering. In this case, the System Operator successfully performed a speedy and effective restoration of load lost as a result of the event.
- 2.1.9 As a result of this event, the System Operator has reviewed its procedures with respect to planned outages of transmission lines that leave a considerable amount of load on N security. It is now seeking to procure over frequency reserve (generation willing to trip) in the North Island (it is already procured in the South Island) to control the recovery of frequency in situations where, during a

¹ http://www.systemoperator.co.nz/f1688,28048637/aug-09-event-public-report-final-3_.pdf

transmission outage, a single line is left to carry load sufficient to cause an over frequency event if it trips.

Dispatch objective

- 2.1.10 Clause 13.57 of the Code also requires the System Operator to fulfil the dispatch objective, which is to take the offers from generators and maximise, for each half hour, the gross economic benefits to all purchasers of electricity at the grid exit points, less the cost of supplying the electricity at the grid injection points and the costs of ancillary services purchased by the System Operator.
- 2.1.11 The Authority is satisfied that the System Operator has performed its duty to meet the dispatch objective during the review period. The Authority continues to encourage the System Operator to seek innovative ways to increase the competitive pressure for the supply of ancillary services.

2.2 Compliance with obligations in the Code and Act

- 2.2.1 As a key service provider to the electricity market, the Code and Act place many other obligations on the System Operator. This section presents the Authority's assessment of the System Operator's compliance with these obligations.
- 2.2.2 In its self-review, the System Operator reported a modest but significant decrease in the number of self-reported breaches of the Rules, from 50 breaches in 2008-09, to 43 in this reporting period.
- 2.2.3 The System Operator describes the performance in this review period as encouraging as it had anticipated more mistakes might be made by its operators while they familiarised themselves with the new market systems software, which was commissioned in July 2009. It has categorised seven of the 43 self breaches as being due to unfamiliarity with the new market systems. The Authority is hopeful that this performance will lead to the total in the next review period decreasing further, closer to the 24 breaches reported in 2007-08.
- 2.2.4 The Authority is encouraged by the increasing level of engagement shown by the System Operator and the willingness it has shown to thoroughly investigate the circumstances surrounding its own breaches, as transparency and openness are essential to maintain the present self-reporting approach to compliance.
- 2.2.5 The Authority is pleased that there were no instances where the voltage on 110 or 220 kV circuits exceeded their allowed +/-10% limits during the review period.² Although maintaining voltage levels within normal limits is not part of the PPOs, it is an important measure that ensures:
- (a) there is sufficient flexibility for the System Operator to operate the power system; and

² Clause 8.22(1) of the Code.

- (b) the grid operates at voltage levels within the design limits of equipment drawing power from and injecting power into the grid.

Policy statement and procurement plan

- 2.2.6 The System Operator is required to review two important schedules to the Code each year; the policy statement and the procurement plan.
- 2.2.7 A new policy statement comes into force on 1 September each year. It documents the policies and practices the System Operator will follow to meet the PPOs and the dispatch objective. It includes the means by which it plans to maintain the integrity of the power system following the sudden and unexpected loss of generation or transmission assets and the situations in which it might have to shed load.
- 2.2.8 The procurement plan comes into force on 1 December each year. It sets out the requirements, the method, and the means by which the System Operator intends to procure ancillary services, (instantaneous reserve, frequency keeping, voltage support, over frequency reserve, and black start). Once the new plan is finalised each year, the System Operator negotiates and manages contracts with ancillary service agents to provide ancillary services. It then coordinates the scheduling and dispatch of electricity and ancillary services to meet its PPOs. The costs of these services are allocated to participants according to the rules in the Code.
- 2.2.9 The annual review process for both schedules is largely mature as it has been a part of the Rules since they were introduced in 2004. Recent drafts have generally contained only relatively minor enhancements and amendments rather than substantial changes.
- 2.2.10 During this review period, the System Operator completed a review of credible events, a task the policy statement requires it to carry out once every five years. The review confirmed the measures it employs to mitigate the impact of under frequency events is in line with international practice. It also identified a number of new credible events and categorised some of them as contingent or extended contingent events.³ The System Operator submitted a draft policy statement on 31 March 2010 that contained these and more minor changes.
- 2.2.11 The depth and quality of its credible event review is to be commended as it was well received by the industry and eased the path of the new draft, which was adopted on 1 September 2010.
- 2.2.12 The Authority is also appreciative for the efforts the System Operator made to submit a new draft procurement plan earlier than it was obliged to ensure it could be approved by the Minister before the cut-off date for new Rules during the recent regulatory transition.

³ More details of the review can be found here: <http://www.systemoperator.co.nz/n2531.html>

System security planning

2.2.13 As part of its system security planning, the System Operator engages in several planning activities across different time frames, all of which are important in maintaining the integrity of the power system and achieving the PPOs. The Authority is satisfied with the efforts the System Operator makes in this area, especially on:

- (a) the System Security Forecast (SSF);
- (b) several national and regional planning forums; and
- (c) a review of AUFLS effectiveness.

System Security Forecast

2.2.14 For its long-term planning, the System Operator produces a SSF. The Code requires the System Operator to publish a new SSF once every two years and to review the need to revise the latest SSF every six months. It consists of demand and supply forecasts and power system modelling and provides the System Operator's view of its ability to meet its PPOs over the next three years or more.

2.2.15 The System Operator last published a SSF in December 2008 and a new one is due in December 2010. The Authority is satisfied with the way the System Operator conducts the SSF process and with the way it reports on its findings.

National and regional planning forums

2.2.16 The System Operator continues to lead and participate in forums on regional and national power security issues. The Authority notes that the summer and winter groups for the upper North Island and the upper South Island maintained a watching brief for the year as no new issues were identified. However, the System Operator expressed concern in 2009 that the incentives for thermal plants to make energy offers to cover peak demand were inadequate. Discussions with the Commission and industry resulted in a group of enhancements loosely described as the 'winter initiatives'. They included:

- (a) change to the energy offers for generation at Whirinaki power station;
- (b) various improvements to the information the System Operator provides to participants; and
- (c) changes to allow partial dispatch of reserves in situations where supply was tight.

2.2.17 The Authority notes that there was some disappointment expressed by a few participants that the System Operator had to seek two exemptions from complying with the rule changes associated with this project because of delays in implementation. The Authority acknowledges that the timeframe between this particular rule change coming into force and its implementation was tight.

AUFLS review

- 2.2.18 Following its credible event management review, the System Operator initiated a review of the AUFLS arrangements which examined how New Zealand's arrangements differ from load shedding arrangements in other countries and how effective it is under different scenarios. The work that was conducted and the recommendations in the System Operator's technical report were of a high standard. The Authority is looking forward to working with the System Operator on the implications of its findings.

2.3 Performance under Service Provider Agreement

- 2.3.1 The SOSPA sets out the terms under which Transpower will perform the role of System Operator. In addition to the requirement to meet its obligations under the Rules and Regulations, the SOSPA makes explicit a requirement for the System Operator to maintain a disaster recovery plan and to make certain warranties.
- 2.3.2 With regards to the disaster recovery plan, the System Operator has an obligation to comply with a number of arrangements and procedures relating to backups and disaster recovery. The System Operator noted a number of activities it was engaged in to improve its disaster preparedness, including:
- (a) updating its business continuity plan, including information relating to its new market systems software;
 - (b) 'fall back venue' transition from Pole 2 building at the Haywards substation to a new venue;
 - (c) completion of an IT business continuity simulation exercise; and
 - (d) a business continuity exercise planned for December 2010.
- 2.3.3 With regards to the warranties required of the System Operator in the SOSPA, it confirmed that it was unaware of anything within its reasonable control, which might or would adversely affect its ability to provide the contracted services under the SOSPA and that it had sufficient resources, skills and supervision to carry out those services.
- 2.3.4 The financial review provided in the System Operator's self-review stated that the base agreement fees charged to the Commission totalled just over \$25.8 million, for the period from 1 September 2009 to 31 August 2010, plus additional fees of \$141,461 for services in addition to those provided under the base contract.
- 2.3.5 The Authority notes that the System Operator's advice to the Commission, included in the fees for additional services, amounts to just over half of one percent of its total revenue. This statistic gives the impression that only a very small proportion of its resources are focussed on industry development initiatives when the Authority would like to have more System Operator engagement on them. However, the Authority has already noted that it is encouraged by the increase in the level of engagement it has received in the review period.

2.4 Performance standards

2.4.1 Although there were no formal performance standards agreed between the System Operator and the Commission to be assessed during the review period, the SOSPA provides for an 'at risk' component of the fee payable to the System Operator and based on performance criteria set each financial year. The amount at risk each year ending 30 June is set at \$250,000. The assessment of the System Operator's performance in the year to 30 June 2010 was based on its performance in two areas:

- (a) implementation of new capex and business planning arrangements (schedule 4 and clause 2.7 of the SOSPA); and
- (b) service delivery (in general across the contract, and particularly in relation to provision of data and the additional services under clause 14 of the SOSPA).

2.4.2 The outcome of the Commission's assessment of the System Operator's performance in these areas was at a level that justified it retaining 63% of the at risk amount.

2.5 Regulatory and industry development work

2.5.1 The System Operator has provided assistance to the Commission on the development of several rule changes and development initiatives over the review period. It is noted that there has been more support from the System Operator since the new market systems were commissioned. The Authority is looking forward to even greater levels of engagement by the System Operator on the Authority's work priorities in the coming year, as specified in s42(2) of the Act, as well as the backlog of important development work that is still to be completed.

2.5.2 The Authority is also encouraged by the increase in the efforts by the System Operator on joint project planning and on combined workload management.

2.6 Other activities

2.6.1 The System Operator has a variety of other roles not already mentioned in this report. These roles are wide ranging and include activities such as commissioning of assets jointly with asset owners, processing of dispensation/equivalence arrangements, overseeing the initial completion and maintenance of asset capability statements and test programmes, and providing submissions and contributions to rule changes, systems development and investigation projects.

2.6.2 This section reviews the manner and form of some of the more significant interactions, including:

- (a) reporting;
- (b) generation commissioning; and

- (c) stakeholder relations.

Reporting and data provision

- 2.6.3 The System Operator prepares and publishes monthly reports on:
- (a) its performance in complying with its various obligations; and
 - (b) the performance of the power system.
- 2.6.4 The Authority is appreciative of the efforts made to prepare these reports but notes there has been an increase in the number of drafting errors in recent months.
- 2.6.5 The System Operator also provides regular data feeds for the Central Data Set (CDS) and prepares ad hoc reports for the Authority when requested. Regular CDS updates have been received without any issues. However, the preparation of ad-hoc reports has been of mixed quality and timeliness and this shows that there is some room for improvement.

Asset commissioning

- 2.6.6 Technical code A of schedule 8.3 of the Code requires that asset owners liaise closely with the System Operator when they want to commission new assets. The Authority acknowledges the significant workload that planning activities place on the System Operator and is satisfied with the relatively seamless manner in which most new generation is integrated within the power system.

Stakeholder Relations

- 2.6.7 The System Operator disseminates information via various means, emailing updates to subscribers, holding industry workshops, and posting information on its website. The Authority commends the System Operator for the design and maintenance of its website as it is an effective vehicle for disseminating information.
- 2.6.8 The Authority notes that the System Operator held several workshops during the review period. These workshops covered the findings of three investigations conducted by the System Operator:
- (a) investigation of an under frequency event of 1 August 2009;
 - (b) credible event management review; and
 - (c) review of AUFLS arrangements.
- 2.6.9 The Authority recognises the importance of workshops as they provide an important forum for the System Operator to exchange information with the industry. All three workshops were well accomplished and received.

2.7 Conclusions

- 2.7.1 The transitional provisions of the Code deem the self-review and assessment of the System Operator's performance, submitted to the Commission under rule 14 of section II of part C of the Rules for the period ending 31 August 2010, to have been submitted to the Authority under clause 7.11 of the Code. Therefore, although the functions and obligations the System Operator was performing in the review period were contained in the Rules and Regulations, the Authority is obliged under the Code to complete its own assessment of the System Operator's performance.
- 2.7.2 The review in this report covers the twelve months from 1 September 2009 to 31 August 2010. The System Operator's self-review report for the same period is a key input into the Authority's review and assessment.
- 2.7.3 The Authority considers that Transpower, as System Operator, has satisfactorily performed its core functions, meeting both its principal performance obligations and the dispatch objective. Although the under frequency event of 1 August 2009 identified some modelling shortcomings, the Authority commends the System Operator for its thorough investigation of this event and for the way it acted on the findings, especially the prompt and cooperative nature of its engagement with the industry and the generators concerned.
- 2.7.4 The System Operator also completed two other significant system security investigations in the review period, the credible event management review and the technical report of the AUFLS review, the outputs of which were both finished to a commendable standard. The series of related workshops it carried out were well accomplished and received by the industry.
- 2.7.5 The manner and level of engagement between the System Operator and the industry has also been very good.
- 2.7.6 It is noted that there has been more engagement from the System Operator on regulatory and industry development initiatives since the new market systems were commissioned. The Authority is looking forward to even greater levels of engagement by the System Operator on the Authority's work priorities in the coming year.