TASC 42 - Reduced Gate Closure

November 2014

TRANSPOWER

Version	Date	Change
0.1	06/11/2014	draft
1.0	14/11/2014	Final

	Position	Date
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Reviewed By:	Various	13/11/2014

IMPORTANT

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1. EXECUTIVE SUMMARY

This report provides the information required from the System Operator (SO) to enable the Electricity Authority (The Authority) to consult with industry on a reduction of the gate closure period to 1 hour. The analysis has been undertaken in accordance with a request from the Authority under a Technical Advisory Services Contract (TASC).

In line with advice given previously to the Authority and industry the SO agrees that a reduction in gate closure to 1 hour is achievable and will benefit the industry. The SO has identified the changes to tools and processes that it must make in order to implement a reduction in gate closure to 1 hour whilst maintaining confidence in Principle Performance Objective (PPO) delivery.

The rough order of magnitude estimate for SO costs to implement a reduction in gate closure to 1 hour is $1,100,000. This is inclusive of investigation, system development and training costs. There is no expected impact on operational costs.

Pending approval, a delivery date of Q1 2016/2017 is currently scheduled as part of the system operator and the Electricity Authority Joint Development Plan.

The SO recommended that the Offer and Dispatch: Bid and Offer Revisions project be delivered at the same time due to synergies with the reduction in gate closure project. The ROM for joint delivery is $1,224,000. The delivery date remains the same.

The SO recommends that the Authority proceed with the reduction in gate closure to 1 hour initiative.

The SO views a reduction in gate closure to less than 1 hour as currently unachievable whilst maintaining an acceptable level of security of the power system.

2. BACKGROUND

From market inception a gate closure period has existed within the NZ Electricity Market. The current gate closure period precludes most trades[1] from being revised within 2 hours of the trading period to which the trades apply. There are some exceptions to this rule but the vast majority of trades submitted are subject to the 2-hour gate closure rules. The gate closure provisions are defined within The Electricity Industry Participation Code 2010 (The Code).

Gate closure periods exist in electricity markets to enable analysis of forward looking scheduling with a relative degree of certainty. The need for certainty is true for both the SO and market participants (buyers and sellers). The SO is tasked with scheduling and dispatching a secure power system and it cannot do so if the trades upon which scheduling is derived are constantly changing. Equally in an ex-post market such as New Zealand's electricity market, participants desire a level of price and quantity certainty in forecast schedules. Locking down trades with a gate closure period allows trading periods to be analysed with the requisite certainty and decisions, both operational and commercial, to be made.

Notwithstanding the market participants' desire for certainty, participants within the NZ Electricity Market have questioned the continued need for a 2-hour gate closure period and in fact the need for a gate closure period at all. These questions were raised with both the Electricity Authority (the Authority) and the SO.

The Authority has detailed the benefits a reduction in gate closure will bring:

- overall more accurate offer and bid information input to the forecast schedules;
- more efficient use of generation resources, including:
    - more time for generators to manage wind firming capacity;
    - better management of generation resource consents;
- better offer/dispatch coordination and compliance by co-generation plant;
- more accurate dispatchable demand and interruptible load co-optimisation by dispatch-capable load stations;
- reduced compliance reporting burden on participants, the system operator and the Authority.

The Authority had requested two previous investigations of reduced gate closure be carried out under TASC requests by the SO. TASC003 provided operational advice on the capability of the system operator to reduce gate closure. The outcomes of the TASC003 investigation were;

- An initial reduction of gate closure to 1 hour could probably be achieved with the current tools and operational procedures;
- A gate closure of less than 1 hour would not be possible without substantial tool and operational change; and

[1] Generation and reserve offers, demand bids etc.

- A change to 1 hour gate closure should be tested to ensure it can be implemented without compromising the system operator's ability to manage its system security obligations[2].

Subsequently the Authority requested the SO undertake testing of a 1-hour gate closure in a simulated environment to highlight issues and crystallise the tools and roles changes required to implement 1 hour gate closure. This was performed under TASC024. The recommendations and findings from the TASC024 analysis are;

- 1-hour gate closure could be supported with minor to moderate tool changes and further training of support energy coordinators (due to changes in responsibilities);
- Implementing such changes will require changes to the Procurement Plan, ancillary service contracts and to the Code;
- Further work is required to scope and cost the tool and training changes;
- There are several matters making a move to 30-minute gate closure challenging, these being around the time needed to perform security assessments after the schedules are completed; and
- A further reduction in gate closure to 30 minutes should only be investigated once 1-hour gate closure is bedded in.

To enable the Authority to release a consultation paper on a reduction in gate closure the cost and timeframes for the tool changes and training required to implement a 1-hour gate closure period were requested under this TASC.

[2] Principal performance obligations (PPOs) contained within the Code.

3. DELIVERABLES

3.1 INITIAL ROM COSTING

The initial rough order of magnitude estimate (ROM) for the SO's costs to deliver a reduction in gate closure to 1 hour is $950,000. This cost is provided on a -25% +75% basis.

The separate cost for an investigation project to finalise the changes required to implement a reduction in gate closure is estimated at $150,000. This cost is provided on a -5% +10% basis.

3.2 DURATION OF DELIVERY PROJECT AND EARLIEST PROJECT DELIVERY DATE

The review of gate closure is included in the Joint Development Plan (JDP) as item number 8. The most recent JWP scheduling contains the following dates:

	Completion date	
Design market initiative:	Q3 2014/2015	(March 2015)
Develop solution approach	Q1 2015/2016	(September 2015)
Initiate, deliver and close	Q1 2016/2017	(September 2016)

3.3 COMBINED ROM

The ROM for the SO's costs to deliver both a reduction in gate closure to 1 hour and the changes required to deliver the Offer and Dispatch: Bid and Offer Revisions (TASC037 and JDP #22) project is $1,044.000. This cost is provided on a -25% +75% basis.

The separate cost of an investigation project to finalise the changes required to implement a reduction in gate closure and those required for the bid and offer revisions project is estimated at $180,000. This cost is provided on a -5% +10% basis.

3.4 WHY NOT LESS THAN 1 HOUR?

3.4.1 General comments

The investigations carried out under TASC003 and TASC024 found several significant reasons why gate closure could not easily be reduced to less than 1 hour. Primarily these reasons concern insufficient time post gate-closure and subsequent schedule completion to adequately security check schedule results prior to real time. In order to have confidence in the service that the SO is required to deliver to the electricity industry security checking is not negotiable.

A reduction in gate closure to less than an hour would result in either a 30-minute gate closure or no gate closure period at all. A reduction in gate closure to 30 minutes would give the SO approximately 20 minutes to security check the following trading period before dispatch of that trading period. This is insufficient time to perform a security check and mitigate security issues prior to real time. It should be noted many of the

mitigations require participant action too, i.e. revision of offers to alleviate shortfalls etc. A reduction in time for the SO to act to request such action is also a reduction in time participants have to respond. If issues are not mitigated prior to dispatch then the impacts will be present in settlement pricing. This is true irrespective of whether the market is settled on ex-ante or ex-post prices.

It is important to note that participants will be equally impacted by reduced gate closure, particularly demand-side participants (Purchasers). While the SO has reduced time in which to carry out security checks so too will the demand-side participant have reduced time in which to make commercial decisions concerning consumption of electricity.

If there is no gate closure period then, clearly, there is no security checking prior to the beginning of dispatch for the trading period. Consequently there is no ability to remedy, or correct, security situations prior to the initial conditions for ex-post final pricing being struck. This statement is equally true of an ex-ante market; prices could be calculated on data that could have been revised or alternatively may transpire to be unnecessary or bogus had a security check process existed. On the basis the complete removal of gate closure would be a fundamental industry change, rather than an incremental change, the SO believes it is unlikely to proceed within the current market structure. To implement no gate closure period at all would require significant supporting changes to the market structures, SO role, and SO tools.

3.4.2 Specific issues

If gate closure was reduced to less than 1 hour critical SO procedures associated with security checking could not be carried out post gate closure and pre-dispatch. Namely the identification and management of;

- periods of insufficient generation offers - the corrective actions to be taken to manage a situation where there is or may be insufficient generation offers to supply the load at n-1 security.
- changes in reserve conditions – the corrective actions taken to manage a situation where the reserve conditions have changed, or will change, significantly. This may be to reflect a generator trip, an AC network reconfiguration or a change in the operation of the HVDC. standby reserve shortfall situations - each island is monitored for sufficient standby generation to restore frequency reserve n-1 within 30 minutes of a contingent event (CE) occurring, and participants are notified when a standby reserve shortfall exists.
- oscillations between RMT and SPD – detailed in footnote 3 on page 9.

A means of dealing with each of these situations within 20 minutes would need to be identified and developed before gate closure could be reduced to 30 minutes.

The frequency keeper (described in more detail in Section 5.2) must be locked down a minimum of 1 trading period ahead of dispatch to allow at least one SPD/RMT iteration prior to real-time. That iteration is necessary because some frequency keepers can also be a risk setter. Whilst the potential impact of this issue may have been reduced because of Frequency Keeping Control (FKC) operation of the HVDC and the associated reduced frequency keeping band sizes, frequency keeping will revert to previous band sizes on an island basis when either FKC mode or the HVDC is unavailable.

While the lockdown of the frequency keeper is not a direct issue per se for a reduction in gate closure to less than an hour it is an issue for economic efficiency and robustness of both the frequency keeper selection process and subsequently dispatch. If the frequency

keeper is selected on offers that then change there is potential for inefficiency and possibly gaming.

The SO's scheduling time automated n-1 constraint builder, SFT, may build and apply constraints to the schedules that are not seen until real-time if gate closure is reduced to less than 1 hour. Conceptually that is the case now, however the current 2-hour gate closure period means that this is extremely unlikely to eventuate; constraints would most likely be built 1½ hours ahead of real-time because the offers driving the transmission flows behind the constraint were fixed 2 hours out.

The Authority's Improved Market Modelling of Losses initiative (JDP #7) may increase schedule solve times. Any increase in solve times corresponds to a reduction in the time available for security checking.

3.4.3 Recommendations concerning further reductions in gate closure

The SO recommends that gate closure is reduced from 2 hours to 1 hour and that benefits are assessed prior to any investigations into a further reduction in gate closure.

If and when gate closure is proposed to be reduced to less than an hour the SO would support the implementation of the previously suggested initiative of Electronic Re-offer Within the Current Period. Doing so may release coordinator time at an often critical time; they would no longer have to manually update generator and ancillary service provider capabilities for the current trading period. The released coordinator time could be utilised by the coordinators for security checking the following trading periods. It should be noted revisions of offers for the current trading period often apply to future trading periods too and those changes may themselves need to be security checked.

It is also likely that as a result of the event triggering the re-offering in the current trading period, re-offers for the immediately following trading period will be submitted by participants; if allowed under a further reduced gate closure regime. The efficiency gain from facilitating this re-offering is one of the justifications for the proposed reduction in gate closure; facilitating an increased ability for participants to react via updated trades.

These offer changes will need to be security checked. The less time coordinators spend on updating offers for the current period manually the more time they will have to security check future trading periods.

It should be noted, however, implementing Electronic Reoffer in the Current Trading Period is not a complete solution for introducing gate closure of less than 1 hour. It is required to facilitate such a change but would be part of a suite of changes to the market systems needed to enable gate closure of less than 1 hour.

4. SCOPE OF WORK TO IMPLEMENT 1-HOUR GATE CLOSURE

4.1 TOOL CHANGES

To implement a reduction in gate closure while maintaining confidence in PPO delivery the SO has identified changes are required within its market systems. These changes will include, but may not be limited to;

- Enhancements to the visibility of offer changes within the market system, particularly those submitted between 2 hours and 1 hour ahead of real time; required for enhanced situational awareness and short-term security assessments.
- A new display within the market system to allow the comparison of the Reserve Management Tool (RMT) results; required to monitor instances of oscillation between RMT and schedule outcomes.[3]
- Various changes to align log entries and alarms with an altered gate closure period.

A final list of tool changes required will be undertaken as part of the investigation phase when the gate closure reduction initiative becomes an implementation project.

4.2 COORDINATOR ROLE CHANGES

With a reduction in gate closure the SO will need to need to review how security checking is carried out in the coordination centre to achieve a reasonable balance between security checking and achieving the market objectives of a reduced gate closure. This will be necessary to ensure changes to offers submitted between 2 hours and 1 hour ahead of real time are checked for implications to power system security. The current security checking is broadly aligned with the current gate closure period. However it is not possible to simply realign the current security checking procedure with a reduced gate closure; a detailed and involved security assessment of an NRSL schedule's results by a security coordinator can take longer than the current 2-hour gate closure period. The 2-hour gate closure period affords the SO a degree of leeway with

[3] RMT and schedule oscillations can occur when one outcome heavily influences the other's solution; RMT and the market schedules solve on an iterative basis. Most commonly it occurs when there is high HVDC south transfer. RMT will identify the increased risk posed to the South Island by an HVDC pole trip and require more reserves to be scheduled in the South Island. The next schedule then reduces the HVDC transfer due to the cost/availability of South Island reserves. These results pass to RMT which no longer requires increased South Island reserves due to the reduced HVDC transfer. The following schedule has high HVDC south transfer because the increased reserve requirements were removed. This oscillation continues until either the results converge or there is a manual intervention. The occurrence of RMT and schedule oscillations has reduced since the restoration of a bi-pole HVDC due to the reduced trip risk relative to mono-pole operation. For a contingent event only a single pole trip is considered.

security checking; not every schedule is security checked[4] but the 2-hour gate closure period gives sufficient time for most issues to become visible, checked and mitigated.

[4] Either the previous security check is not yet completed or a full security check has been deemed unnecessary.

5. OTHER ISSUES / INTERDEPENDENCIES

5.1 MARKET SYSTEM OUTAGES

The most pressing issue is the duration of planned market system outages. Planned market system outages are required to release upgrades to the market system. Market system releases occur regularly throughout the year. They are scheduled to be completed within the current 2-hour gate closure period. During market system outages no bid or offer processing is performed. Bids and offers remain queued at WITS. Queued bids and offers for future trading periods are processed once connectivity is restored following the market system outage.

The assessment of a reduced gate closure period has focussed on the security aspects of the change not on market system outages. Planned market system outages are approximately 1½ hours in duration; longer than the 1-hour gate closure proposed. This presents an issue as the effective gate closure period during a planned market system outage will be longer than that prescribed in the Code. This issue can be included within the investigations phase of a reduced gate closure project. A practical solution may be to facilitate the status quo (temporary 2-hour gate closure periods due to SO operational requirements) within the Code.

5.2 FREQUENCY KEEPER SELECTION LOCKDOWN

Currently the SO locks down the frequency keeper selection for the current plus two trading periods. If left unchanged the selection methodology and confidence in the economic efficiency of the selection process would be compromised. Changes outside of gate closure but within the period for which the frequency keeper is locked down could alter the efficiency of the frequency keeper selection process. Accordingly it is proposed to align the frequency keeper selection timeframes to the reduced gate closure period; ie current plus one trading period. Should this proceed commensurate changes would need to be made in the Procurement Plan and ancillary services contracts.

5.3 SYNERGIES

The SO has identified that there are significant synergies between the reduced gate closure proposal and the changes proposed under the Offer and Dispatch: Bid and Offer Revisions initiative (TASC037 and JDP #22). The SO alerted the Authority to those synergies and the likelihood that merging the two projects would deliver efficiency gains and potential cost savings relative to independent delivery. Accordingly the Authority requested a ROM for joint delivery of both the Reduced Gate Closure and Offer and Dispatch: Bid and Offer Revisions initiatives under this TASC.