



Proposal for SFT testing: Customer interface

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1 Introduction

1.1 Background

Security Constraints are applied to the SPD market clearing engine to ensure the power system is securely dispatched.

The System Operator proposes to automate the way thermal security constraints are calculated using an application called Simultaneous Feasibility Testing (SFT), which was delivered by the System Operator's market systems replacement programme (MSP). When implemented, SFT will allow the System Operator to determine and implement thermal security constraints dynamically.

Constraints built through this process will:

- use up-to-date and accurate network and injection data for developing constraints, therefore providing optimal application of security constraints
- automatically consider possible contingencies
- remove a considerable manual process with attendant risks
- allow for efficient and more cost effective use of grid capabilities by market participants.

The application of SFT will therefore allow the System Operator to provide better management of constraints in real-time operation in a secure and efficient manner. To ensure maximum benefits from SFT – that is, the cost effective use of grid capabilities, it is important that generators/ retailers have an appropriate level of knowledge, understanding, and the tools to predict the outcomes of the SFT constraints software and make offers in consideration of the predicted SFT outcomes. The System Operator is working with a group of industry participants to facilitate this outcome.

1.2 Purpose

The purpose of this document is to permit and support the industry participants to conduct their own due diligence on the effects of enabling SFT automated constraint generation on the operation of the market.

This document sets out a proposed plan that will enable selected participants to:

- view the SFT outcomes from schedules and compare them with the existing production system outcomes
- select scenarios for the System Operator to run to test the SFT outcomes against previous outcomes
- test compatibility and integrate the SFT outcomes with their own tools

This document does not detail internal testing by Transpower.

2 Scope of Testing

2.1 In Scope

The testing proposes to meet the following objectives:

- 1) Ensure that the industry participants have sufficient opportunity to test the operation of their own software tools and processes (Objective 1).
- 2) Provide confidence to the industry participants that SFT generated constraints are stable over time (Objective 2), i.e.
 - a) The constraint value does not fluctuate unacceptably;
 - b) Binding nature of constraints does not change significantly unless it is absolutely necessary to respond to changed system conditions.
- 3) Provide confidence to the industry that any changes to constraints generated (once SFT is implemented) are understood and predictable (Objective 3).
- 4) Provide confidence to the industry participants that SFT will behave acceptably and predictably under extreme conditions within the power system (Objective 4).

2.2 Out of Scope

The following activities are out-of-scope as they are the subject of a separate test plan for internal Transpower testing:

- 1) Load, stress, volume and other performance related testing
- 2) All other non functional requirement testing
- 3) Process testing for dispatch and other System Operator processes
- 4) Interface testing to other Transpower systems
- 5) Functional testing for Market System components such as the Market Operator Interface
- 6) Interface testing with NZX/MCo

The following activities are also out-of-scope:

- 7) Transpower participation in testing any participant software system (except by way of providing standardised data feeds via COMIT)
- 8) Making wholesale changes to SFT code or changing the methodology from that which has been previously consulted on and communicated to the industry (although changes may be proposed and programmed if all participants and the System Operator agrees such changes are desirable).

3 Testing Approach

3.1 Approach

Testing is proposed to be phased to meet the four objectives separately.

Phase	Description / Objective
Phase 1 – Data Feed via COMIT	Provide a data feed from the test Market System to the participants via COMIT to allow the participants to test the operation of their software with new constraint naming standards. Meets objective 1.
Phase 2 – Limited Parallel Run	Run a test Market System in parallel with production for set periods to allow participants to view the stability of constraints under SFT and identify any differences between SFT and existing constraints. Meets objectives 2 and 3.
Phase 3 – Scenario Testing	Execute specific scenarios in the test Market System to allow the participants and Transpower to determine the behaviour of SFT during extreme events in the power system. Meets objective 4.

4 Communications

4.1 Regular Communications

At the start of Phase 2, a System Operator representative will contact each participant involved to ascertain the company contact details for their nominated representative.

Participating companies are:

- Genesis Energy Ltd
- Meridian Energy Ltd
- Mighty River Power Ltd
- Contact Energy Ltd
- TrustPower Ltd
- Todd Energy Ltd

Peter Monney, System Coordinator, will be the System Operator representative during the testing and will therefore be the first point of contact for any questions or issues that arise. Peter's contact details are as follows:

Email: Peter.monney@transpower.co.nz

Phone: (04) 496 9100

Cellphone 021 0202 4604

It is proposed that Peter will contact each company representative by phone at the start and end of each week during phase 2 of the testing to seek participant feedback and brief participants of any matters of interest related to the testing.

A meeting between the System Operator and participants involved in the testing will be arranged on completion of testing to summarise test outcomes, matters outstanding for resolution, and seek any final participant feedback.

Near or at the end of Phase 3, but prior to go-live, the System Operator will arrange a presentation for participants to inform and update the industry on the SFT functionality and the test outcomes.

4.2 Issues Raised By Participants

When a participant has an issue that they wish to bring to the System Operator's attention then the following process will be followed:

1. The participant will email the information outlined in Appendix A to the Transpower email address sft.implementation@transpower.co.nz¹.
2. The System Operator will acknowledge the issue.
3. The System Operator will maintain a register of identified issues. Information on all issues, and their resolutions, will be available to all participants².

¹ This address does not currently exist and therefore may change if the format is not an acceptable one.

4. The System Operator will discuss the proposed resolution of the issue with the participant and, where possible, agree the action to be taken.
5. The System Operator will manage resolution of the issue including scheduling any defect for correction.

4.3 Defect Management

The process covered by this plan is intended to allow participants access to the data generated by SFT for their own due diligence. Detection of defects is not the primary purpose and the focus will be on managing issues raised by the participants.

Where the System Operator agrees that a defect has been detected, the defect will be processed as though it had been raised through the internal testing process.

However, depending on the nature of the defect, it may not be possible to correct every defect identified by this process before go live.

Defects raised by participants will be tracked in the same manner as issues, in the register.

² If a participant does not want an issue logged in a common register, they must state, at the time of raising the issue, that the matter is commercially sensitive and should not be viewed by participants.

5 Test Schedule

5.1 Test Schedule Overview

A summary of proposed milestones are listed in the following table.

Activity	Start	Finish	Duration
Internal Testing	01/03/2010	18/06/2010	16 weeks
Phase 1 – Data Feed to Participants	10/05/2010	18/06/2010	6 weeks
Phase 2 – Parallel Run	21/06/2010	13/08/2010	8 weeks
Phase 3 – Scenario Testing	16/08/2010	10/09/2010	4 weeks

The above timetable is based on the following principles and assumptions:

1. Phase 1 is assumed to start after the majority of internal testing has taken place to ensure the data feeds are working well enough to provide data out to the participants. This includes all of the interconnections between the SFT test market system and test COMIT, and between test COMIT and participants. This timing can be reconsidered if it causes participants significant issues.
2. There are some interface & COMIT display changes (related to SFT) scheduled for a release in mid April. If phase 1 is started before the scheduled market systems release, we will advise participants of the relevant changes
3. Phase 2 will be started once comparison tools have been built and the system is sufficiently free of defects to go live (in particular those that may affect outbound data and interfaces).
4. Phase 3 will require significant setup. The assumption is that at least some of this can be done during Phase 2 – but the 4 weeks of scenario testing assumes 2 weeks of setup, 1 week of testing and 1 week of post test analysis.
5. If the internal or participant testing identifies any material issues, the testing may be suspended or the testing may be extended beyond the above periods.

5.2 Daily Schedule (Phase 2)

During Phase 2 of this testing, the System Operator will run a fully parallel operation for two hours each week day during the evening peak.

The general outline of this is:

1. At the same time as the current Week-ahead Dispatch Schedule(WDS) is produced, a parallel schedule will also be produced with SFT generated constraints
2. By 4pm each day, the SFT Test environment will be aligned to the current state of the Market System production environment:
 - a. Outages will be correctly actioned;

- b. Any required manual constraints (i.e. those that will not be generated by SFT) will be entered;
 - c. Discretionary constraints and any other manual setting will be applied.
3. The following schedules will then be run in parallel:
 - a. SDPQ initiated at 16:10
 - b. SDS initiated at 16:00
 - c. SDPQ initiated at 16:40
 - d. SDPQ initiated at 17:10
 - e. PDS initiated at 17:00
 - f. SDPQ initiated at 17:40
 - g. SDPQ initiated at 18:10
 - h. SDS initiated at 18:00
 - i. SDPQ initiated at 18:40
4. During the period from 4pm to 7pm, all actions applied to the production system will be applied to the SFT Test environment.
5. The System Operator will then publish those aspects of the 'test' schedules that are currently published as well as the following comparison information:
 - a. Prices for the WDS, PDS, and SDPQ at all nodes
 - b. Aggregate quantities for the PDS
 - c. HVDC component flows for the PDS and the SDPQ
 - d. Outages and overrides as is currently published
6. The System Operator will notify participants of when SFT performs a dc solve (rather than an ac solve).

Notes:

- The System Operator will investigate whether it is possible to also publish the real-time EMS contingency results to compare with the SFT results. The System Operator understands this information is desirable but will need to work through the practical details of publishing this data. We will inform participants once we have investigated this further.
- 'SFT' Constraints ($\geq 85\%$ of binding) will be published for the test schedules in the same manner as constraints are published for production schedules.
- While we need to operate the test system from 4pm to ensure alignment during the test period, the actual parallel period is proposed, at this stage to be 5pm to 7pm each day. Participants may receive actual data from the System Operator SFT test system outside this time but the data will not be kept up to date.
- At this stage, participants will not be able to adjust the offers going into the test system, as they will be a copy of the real market offers. Instead participants will be able to observe the effects of their current offer strategies and determine what, if anything, they might do differently.
- There will be no data warehousing of the data beyond the existing 32 day retention period.

- As the SFT parallel system is operating on a test platform with lower capacity than the production Market System, Transpower is unable to guarantee exact delivery timing on data.

5.3 Scenarios (Phase 3)

The System Operator has been provided with the following scenarios in this phase:

- A multiple generation unit tripping (similar to 23 September 2009)
- Shortage of generation capacity in the North Island and reserves set to zero (similar to 5 October 2009 and 14 October 2009)
- An HVDC Pole 2 outage to ascertain what happens when the North island and South island markets are separated (similar to TP16-18 on 12 November 2009 when the average price separation was \$870)
- A spring washer (similar to TP16-21 at OTA on 2 February and TP26-29 at TRK on 3 February 2010) with emphasis on the final price outcomes³
- Reduced transmission capacity between Waitaki and Southland due to outages (similar to TP12 to TP23 on 19 August 2009 – CYD_CML_TWZ outage)
- A major transmission tripping causing loss of power to Auckland (TP 31 on 25 January – Auckland power outage)
- A situation where the NSY_ROX line is in constraint with no outages occurring to test how this constraint behaves with SFT (similar to TP23-26 on 5 January 2010)
- The operation of the West Coast split to ascertain how SFT manages the associated constraints (similar to TP23-26 on 1 February 2010 when the West Coast split caused high Upper South Island prices)

The System Operator will endeavour to create scenarios that are as close as possible to the original event to enable participants to view how SFT behaves during these types of events. Whilst the System Operator will try and replicate the circumstances that existed on the example dates to produce similar results, the re-run scenarios will not be exactly the same as those occurring on the above dates. Therefore, we will run the scenario with, and without SFT turned on to produce the necessary comparisons.

It is likely the System Operator will need to contact participants during the set up phase for the scenarios where additional questions about the scenario inputs arise or where there is difficulty in modelling the above situations (due to technical difficulties or where the scenario set up is unduly onerous in terms of time and workload). Where the System Operator believes it will not be able to model the above situations or similar, it will contact relevant participants to discuss.

5.4 Test Completion

The test programme will be completed once:

³ The final price outcomes will be tested if practicable given it is a pricing manager process and not a system operator process

1. The period agreed for testing with the participants expires and no additional time has been requested by a participant and agreed by Transpower for further testing.
2. There are no outstanding defects that would prevent operational use of SFT in the areas of software performance or data publication.
3. Outstanding issues or recommendations have been adequately documented and an action plan has been provided for addressing the actions arising.

5.5 Test Reports

At the end of each phase a report will be generated showing all issues raised by the participants and the resolution of these issues.

6 Appendix A: Raising issues by email

Information to be included in email to sft.implementation@transpower.co.nz when raising an issue:

- Date and time issue identified
- Participant details and preferred contact
- Schedule time and timestamp
- Priority⁴
- Issue
- Expectation and suggested resolution
- Any additional information
- If the issue can be logged in the common register or is commercially sensitive and therefore must remain confidential

⁴ 1 Critical, 2 Medium, 3 Low