

SFT FAQ Sheet

Introduction

This document answers some 'frequently asked questions' about the Simultaneous Feasibility Test (SFT) software currently being implemented by the System Operator. Together with the flowcharts published on the website, it also provides an explanation of the methodology and procedures the System operator intends to employ in formulating constraints using SFT. Participants are encouraged to contact the System Operator at systemoperator@transpower.co.nz, attn: Fiona Abbott, with any questions about the software or the project. The System Operator intends to add to this FAQ sheet as questions arise and are answered.

Frequently asked questions

1. ***What is the intended changeover date (being the date that the System Operator will start using SFT)***

At this stage, the System Operator intends to start developing constraints using the SFT software from 14 February 2011 for the trading periods from 28 March 2011. The earliest the SFT constraints will be published to participants will be the first WDS created in respect of 28 March 2011. The System Operator will confirm these dates in late January 2011.

2. ***Will the System Operator deactivate or change constraints? If so, under what circumstances?***

The System Operator will, under certain circumstances, deactivate SFT constraints that have been created or prevent the constraints from being created.

In summary we will be preventing SFT from creating constraints where:

- A binding constraint could not be satisfied (little or no generation / spur feeds / protecting supply transformers etc)
- Where modelling issues would not create a valid constraint; for example:
 - South Island West Coast given instability when no generation on
 - Runback scheme where operation of scheme results in a subsequent security violation
- SFT constraints are having an adverse effect on the schedule (e.g. SPD not solving).

Deactivating SFT constraints (or preventing the creation of SFT constraints) will be carried out in change management time, planning time, near real time, and real time. At times it will be outage related only.

There is very little difference from the current process, where the System Operator does not create constraints in circumstances where it believes they are not required and/or will not work as intended.

3. ***Will the System Operator create additional constraints where SFT has not created a constraint?***

The System Operator will, under certain circumstances, copy a SFT constraint to a time period when the constraint doesn't exist or alter the start and/or end time(s) of a SFT constraint. Such circumstances might include:

- Where a contingency is oscillating between trading periods (solved / unsolved), an adjacent trading period constraint will be applied for the periods where no constraint has been generated.
- Where a station offer schedules generation so that security violations are less than the near binding threshold, an adjacent trading period constraint can be applied for periods where the constraint was not automatically generated.

4. ***Will the System Operator change the constraint RHS once SFT has created a constraint?***

The System Operator will continue its existing process of optimising a constraint in real time by altering the RHS when:

- the schedule indicates a constraint to be binding (or near binding) but this violation is not apparent in real time
- the real time tools indicate a binding (or near binding) constraint. That is not indicated in the schedule. .

5. **Will manual constraints still be applied?**

Manual constraints (using the current manual process) will still be created and applied to SPD to manage:

- Voltage stability
- Power system stability
- Situations where SFT is unable to create a constraint but the System Operator reasonably believes a manual constraint is still required. Such situations might include circumstances where
 - a protection scheme cannot be accurately modelled
 - more than just a protected and contingent branch needs to be modelled (i.e. multiple branches are required)

6. **With regard to the number of iterations between SPD and SFT, how does the convergence check account for multiple solutions in SPD? When there are multiple solutions, how will you know when the solutions have converged?**

In case of SPD multiple solutions, SPD outputs only one of the multiple solutions at any given instant. SFT will work with the solution it gets from the SPD.

How does SFT deal with infeasible solutions?

In case of an SPD infeasible solution, SFT will take this solution and work through distributed slacks.

How does SFT deal with Spring Washers?

Spring Washers will not affect SFT's ability to solve. The System Operator intends to run a scenario of a high spring washer occurring during its testing with participants and publish the results (see the [Test Plan](#) with participants on this website)

7. **What is the process when SFT fails to solve?**

Achieving an AC solution consistently across multiple studies depends greatly on robust reactive and voltage profiles, and requires fine tuning of those reactive and voltage profiles. If the AC power flow solution cannot be achieved, a failure is reported, and, where time permits, the System Operator is expected to fine-tune reactive profiles and re-run the case.

A non-linear DC solution can help when there is not sufficient time to make changes and re-run the case. If SFT detects that an AC solution cannot be achieved, SFT will try to achieve a solution with non-linear DC analysis. A non-linear DC solution is achieved by ignoring the reactive power solution (Q-V solution) in full de-coupled powerflow i.e., the Mvar component of the branch flows is zeroed out

There may be times when SFT cannot solve with an AC or DC solution. If this occurs, the System Operator will have a procedure to ensure a secure system continues whilst trying to diagnose and rectify the problem. We hope to identify, in advance during our operational testing, the circumstances where such a situation could occur and the appropriate response.

8. **On what basis is the threshold for near binding constraints set? Has Transpower considered a lower threshold for near binding constraints, especially for schedules further out from real time (such as the WDS)?**

The near binding threshold (or 'constraint percentage threshold') for SFT constraints is set at 90%. Where manual constraints are required (see FAQ 5) the constraint percentage threshold will be 0% as all manual constraints will be created and applied to SPD regardless of the likelihood of them binding. .

The System Operator has done extensive studies to determine an appropriate threshold for SFT constraints and determined it should be between 85% and 100%. This is based on the logic that the lower bound should not be far away from 100% to avoid building unnecessary thermal constraints but at the same time the near binding threshold (NBT) should also account for potential differences in assumed and actual modelling and load forecasting.

The upper limit of the threshold ensures that differences between scheduling and dispatch conditions are reasonably accounted for. If the threshold is too high, it becomes more likely that the scheduling process will not generate a constraint that would be required by actual dispatch conditions (allowing for a margin of error in forecasting such conditions). The upper threshold limit is also a key part of the mechanism that ensures continuity of constraints across the various schedules leading up to dispatch time. Setting the value too high could result in important constraints being alternately dropped and re-created as the schedules progress towards real time. This would create uncertainty for both the System Operator and participants.

The lower limit of the threshold ensures that constraints, and particularly offload time constraints, are not

developed when there is little serious risk of the branch overloading post-contingency. While in principle this should have little impact on the SPD solution, it has been observed that some types of constraints can be generated by SFT under certain conditions and then bind in SPD, requiring manual intervention by the coordinator. Setting the near-binding threshold too low increases the likelihood of these constraints becoming a significant distraction and a source of confusion.

It may be possible to reduce the Constraint percentage threshold as schedules approach real time. However, the technical feasibility of such a change would need to be investigated before any commitment is made to make the change.

9. **What is the publication threshold and is it different from the NBT?**

Whereas the NBT is the limit at which SFT creates constraints, the publication threshold is the limit at which the constraints that have been created by SFT are published. At this stage, the limit is set at equal to or greater than 85% of binding. The System Operator has requested removal of this specific limit in the Policy Statement to enable this publication threshold to be increased or lowered without a rule change if participants determine it is desirable.

10. **What does the naming convention mean? How is the constraint name derived?**

SFT constraint names are derived from the components involved in the creation of the constraint and describe the constraint to enable independent constraints developed for the same branch to be distinguished from each other.

The name includes identification of the protected branch, the contingent branch, whether the constraint is developed to meet a static or offload time limit, the contingency that resulted in the violation, and at which end of the protected branch the violation was detected. The components are ordered like this in the constraint name:

Protected Branch	e.g. ARA_WTK.1
Contingent Branch	e.g. MTI_WKM1.1
Static Violation Flag (circuit only)	“:S”
Contingency Name	e.g. MTIWKM1\$
Violating End (circuit only)	e.g. ARA
Protected Branch Type	LN, XF, ZBR

It may appear that including the contingency name is redundant, as usually it reflects the contingent branch name. However, it is sometimes necessary to model the same contingent branch in multiple ways; for example, to account for an intertrip or runback scheme which may or may not be enabled¹. Including the contingency name in the constraint name helps distinguish constraints developed for the same branch under different conditions.

11. **Is the RHS of a constraint always going to be linked to the rating of a branch?**

For all constraints developed to protect a branch against static limits, the RHS of the constraint will be related to the static branch rating as expressed in MVA or Amps, with corrections for actual power factor and voltage as required to give dimensions of MW. It will not necessarily match the steady state SPD MW rating for the branch.

For circuit constraints developed to meet the offload time limit, the RHS is modified to a higher value to reflect the fact that the protected branch can be loaded above its nominal rating provided it stays within its design temperature for at least 15 minutes. Again, power factor and voltage corrections are applied to give the RHS in dimensions of MW

¹ in the above example MTIWKM1\$ is the contingency name for a MTI_WKM1 trip with the MTI runback scheme enabled