

SFT Constraint Publication Specification Paper – July 2006

This paper summarises the proposal for publishing security constraint information from late 2007 when the System Operator introduces a new application that automatically generate n-1 thermal security constraints. The application is called the “Simultaneous Feasibility Test” or “SFT”.

The paper has been updated to reflect industry discussions at the two “SFT” System Operator workshops in June 2006.

The paper will be used to further specify the design of the new system with Transpowers SFT vendor, Areva.

1: Background

N-1 Security Constraints are applied to the SPD market clearing engine to ensure the power system is dispatched in accordance with the EGRs and the security policy of the System Operator’s Policy Statement.

The System Operator will automate the way security constraints are calculated using an application called SFT. This automation will be delivered by the System Operator’s market systems replacement programme (MSP). This application will allow the System Operator to determine and implement thermal security constraints dynamically, providing better management of constraints in real time operation, enabling a more secure, efficient and cost effective use of grid capabilities.

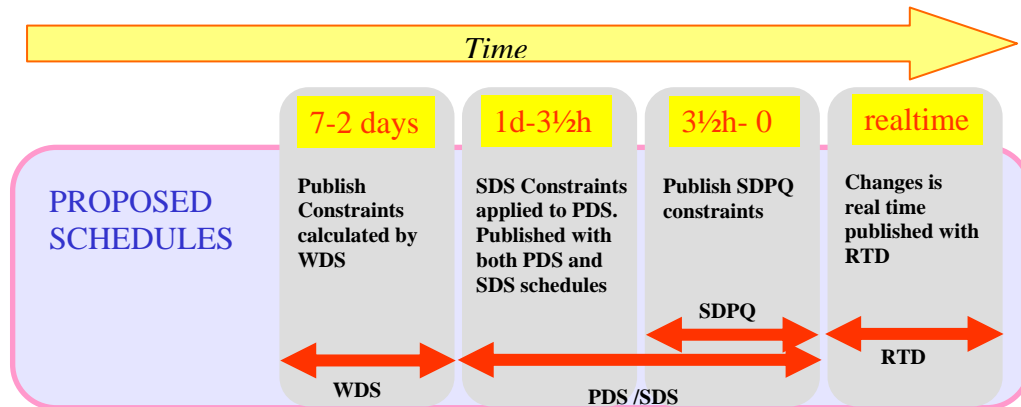
SFT will not increase the number of security constraints in real time or in final pricing because constraints only bind if they are needed to manage a real security issue. The number of constraints applying in final pricing is not a function of the type of tool used to calculate constraints.

The new SFT based method addresses drawbacks with our current system but also changes the way constraint information will need to be published to industry.

SFT will generate constraints for a particular grid configuration and dispatch pattern and so will only calculate constraints that are likely to bind or bind within a defined parameter – e.g. within a nominated percentage. The current process relies on a large number of permanent and outage constraints being applied to SPD with no indication of whether they will bind until the PDS and SDPQ schedules are produced.

2: Proposal

The System Operator’s proposal for calculating and publishing constraints is shown in the figure below.



The proposal is based on publishing constraints information with the existing RTD, PDS, SDS and PDS schedules and the new Weekly Dispatch Schedule (WDS).

The proposed constraint publication format is shown in tabular form below. All information is to be published in COMIT. The format of publication is to be discussed with industry. It is likely that constraints will be published as per current format. (ie: $1.34*TKU_WKM1.1+0.32*TKU_WKM2.1 \leq 240$)

On each occasion the schedules are run, the constraints will be recalculated and updated and will automatically account for any changes to offers.

Schedule	Description	Timing	Constraint 1		2	Outage 1	2	3
			Name	%				
WDS	The new WDS will run every day at 1am. The first period is T1 of the next day and it would run for a full 6 days. The WDS will use “rolled over” generation offers from the same day of the previous week. The offers to be used are at gate closure time for each trading period. For example the Wednesday 17 th April T7 forecast offers will be the offers for 10 th April T7 at gate closure, 1am on 10 th April.	Day 7	1.34*TKU_WKM1.1+ 0.32*TKU_WKM2.1 <120	90				
		Day 6...	1.36*TKU_WKM1.1+ 0.31*TKU_WKM2.1 <119	88				
		...Day 2	1.34*TKU_WKM1.1+ 0.32*TKU_WKM2.1 <120	85		BPE_TKU1.1		
SDS	Constraints that are within a fixed percentage of binding in the SDS schedules will be published (proposed to be 80%). The SDS has same duration as the PDS but uses the System Operator load forecast. Currently information from the SDS schedule is not published in COMIT.	1pm day before	1.38*TKU_WKM1.1+ 0.29*TKU_WKM2.1 <117	85		BPE_TKU1.1		
		3pm day before...	1.36*TKU_WKM1.1+ 0.31*TKU_WKM2.1 <119	84		BPE_TKU1.1		
		1/2 hour before constraint is required in real time	1.34*TKU_WKM1.1+ 0.32*TKU_WKM2.1 <120	82		BPE_TKU1.1		
PDS	The constraints calculated by the SDS schedule are applied to the PDS schedule. Those constraints that are within a fixed percentage of binding in the PDS schedules will be published.	1pm day before	1.38*TKU_WKM1.1+ 0.29*TKU_WKM2.1 <117	81				
		3pm day before...	1.36*TKU_WKM1.1+ 0.31*TKU_WKM2.1 <119	80				
		1/2 hour before constraint is required in real time	1.34*TKU_WKM1.1+ 0.32*TKU_WKM2.1 <120	82				
SDPQ	The System Operator will publish (in COMIT) a list of security constraints that are within a fixed percentage of binding in the SDPQ schedules.	3 hours in advance	Will be the same as the SDS results	83		BPE_TKU1.1		
		2 1/2 hours in advance		82		BPE_TKU1.1		
		1/2 hour before constraint is required in real time		RTD and Pricing use these constraints	82		BPE_TKU1.1	
RTD	Uses the constraints calculated from the last applicable SDPQ schedule. If constraints are modified after the last applicable SDPQ schedule then changes will be published with the RTD schedule.		1.34*TKU_WKM1.1+ 0.32*TKU_WKM2.1 <129	94		BPE_TKU1.1		
			RHS Changes normally or Ad hoc updates for major events					

The new WDS schedule will be used internally by the System Operator for security analysis in the 2-7 day time horizon. The publication of the constraints generated from the WDS is considered the best indication of constraints likely to occur and is consistent with the Policy Statement objective to forecast constraints. The WDS is described in more detail in Appendix A.

To increase the usefulness of the WDS, the rolled over offers may be able to be modified by two processes. Firstly and where necessary, the System Operator will overwrite the rolled over offers to reflect up to date POCP information (using either a manual or automatic process). Secondly where participants provide offers overlapping the WDS time horizon, these offers may be used to update the WDS offers. The updating of WDS offers will be further discussed via industry discussions. It will be important that the WDS meets the Industry's needs and the System Operators security forecasting needs.

Outage Publication

Currently the System Operator manages grid outages in SPD by constraining branches to zero. SPD recognises branches constrained to zero and removes them from its internal model. In the future branches would no longer be constrained to zero but will be removed from the external model that is an input to SPD. Because constraints are currently published in TPIX, outage information is also currently published, as branches constrained to zero.

With the SFT solution, grid outages will be published in COMIT directly with the WDS, the PDS, and SDPQ schedules. The outage information published will be in the form of real grid component information e.g. BPE_TKU1.1 and BPE CB 62. The format of outage information will be further discussed via industry discussion. As a related issue, changes to the market model schematic (published on the System Operator web site) will also be discussed with industry.

Constraint History Database

A database of historical constraint information will be provided via COMIT or an alternative system and will be determined using industry discussion.

As a minimum, the database will have the following high level specification:

- Contain at least 1 years data
- Cover multiple schedules, but at least final pricing
- Have query functionality for searching for specific outage components and reporting:
 - the constraints that were required during all instances of the outage
 - the concurrent outages for each occurrence

The list of non SFT constraints, used to manage system stability, will continue to be published on the System Operator web site.

Summary of the Solution

The combination of the proposed publications will replace the current functionality for constraint publication. Instead of publishing a list of constraints

being applied to the SPD model, the System Operator will forecast the likelihood of the constraints being applied through the medium of various forward looking schedules.

3. Further Work Required

Further work can be categorized into two categories. The first category are items that will be considered in the initial implementation of SFT. The second category are items that require some operational experience with SFT and the forthcoming WDS before proceeding with consideration of these additional proposals. For this reason category two items are deferred for further SFT releases beyond 2007.

The items identified in the paper requiring additional industry discussion are in the first category and are summarised below. Transpower will undertake further discussions with the identified participant representatives directly to resolve these issues. Over the next 3 months we expect to have monthly meetings to finalise the issues. MCo will attend these meetings. The minutes of the meetings will be available on the System Operator website.

Category 1: Items to be resolved with industry discussion

- format of constraint publication (and the fixed percentage of binding that will trigger publication)
- replacement for WDS offers rules
- format of outage publication (and market model schematic)
- format of historical constraint database.

Category 2: Items to be resolved at a later date

- publication of Additional information with the SDS and WDS
- extending the WDS out beyond 1-4 weeks
- publishing Grid Owner assessment data
- additional WDS, SDS or SDPQ schedules to account for load changes.

Appendix A: New WDS Schedules

Publication	Constraints and outages only
Inputs	
Frequency regulating reserve requirements	Not applied to WDS.
HVDC Scheduling Application (creates DC constraints)	Applied to WDS
HVDC ramp rate constraints	Not applied to WDS.
HVDC running level requirements (DCSA constraints)	Not applied to WDS.
Other adjustments (bona fides/discretionary action)	Not applied to WDS.
Network Model (including outage information)	Network Model (including approved outage information from Outage Scheduler)
Conforming Load	Transpower Medium Term Load Forecast (MTLF)
Non Conforming Load	Use a fixed default value for each load
Generation (non-IG) information, including ramp rates	Generation Offer Rolled over
IG information, including ramp rates	Intermittent Generation Rolled over , Although needs further consideration
Initial Generation Value (for each generator market node)	Not required so override the Ramp rate for all offers to 9999
Reserve offers	Not required
Reserve requirements	RAF = 0, Although needs further consideration
Security Constraints (thermal/voltage/stability)	SFT created constraints + Manual Constraints
Voltage Profile	Voltage profile at controlled busses
Mixed constraints	Standard
Constraint Violation Penalties	Standard