Constraints Overview

Constraints can be applied to branches, market nodes (to constrain generation and/or reserves), or a combination of both (mixed constraints). HVDC constraints are a special case of branch constraints.

The table below summarises the different constraint types that can be applied in the market system.

Constraint type	Sub type	Examples	Purpose	Applied manually or automatically?	Applied by...?	Used by which schedules? (WDS, NRSL, PRSL, NRSS, PRSS, RTD, RTP, FP, OPS, CAS)	Published on WITS?**
Market node	Frequency Keeping	These constraints have an FK prefix FK_WTO_CTRLMAX FK_WTO_CTRLMIN FK_WTO_MW+6 FK_WTO_MW+60	To ensure that the frequency keeper is dispatched within its offered limits	Auto	FK business logic	All - Schedules will use the most recent frequency keeping constraints for each trading period at the time of the solve*†.	No The frequency keeper is published to WITS, but not the FK constraints.
	Discretionary	These constraints have a DN prefix DN_PEN0331_6_Max DN_PEN0331_60_Max DN_OTA2202 OTC0_MW_Max DN_OTA2202 OTC0_MW_Min DN_OTA2202 OTC0_MW+60_Max DN_OTA2202 OTC0_MW+60_Min	To ensure any real time changes are applied until the participant can make a formal change to offer e.g. bona fides	Manual	Energy coordinator	RTD and RTP only	Yes - if 85% binding or greater
	General (manual)	ABY_TIM_Outage_6s ABY_TIM_Outage_Zero_60s COL0661 COL0 MW_Min	Typically to constrain generation at a particular site/unit for security purposes or for studies.	Manual	Market Analyst, Ops Planning Engineer or Security Coordinator	Can be used by any schedule as applied	Yes - if 85% binding or greater
Branch	SFT	Naming convention for SFT constraints depends on what element is being monitored (see SFT Constraints Naming Convention below). Examples of SFT constraints are: CYD_ROX2.1__CYD_ROX1.1__:S__CYD_ROX1__ROX__LN ARI_KIN1.1__ATI_TRK1.1__:S__ATI_TRK1__ARI__LN WIL__T8__220KV__HAY_WIL1.1__HAY_WIL1__XF BPE_WGN1.1__SFD__T10__SFD_T10__BPE__LN	Thermal constraints applied for security reasons.	Auto	SFT - constraint generation mode	When turned on, SFT will run off the WDS, NRSL, NRSS, PRSL and PRSS (CAS and OPS when run). WDS, NRSL, NRSS, PRSL, PRSS, CAS and OPS will use the SFT constraints generated from their own SFT solve. RTD, RTP and Final Pricing will use the SFT constraints generated from the latest NRSS or CAS*.	Yes - if 85% binding or greater
	Branch Group - Also referred to as equation constraints (temporary or permanent)	UPPER_NORTH_ISLAND_STABILITY_P_1J HOR_KBY_ISL_1_W_O RDF_T5_M_O_1	To limit branch flows for security reasons. Examples are permanent constraints, stability constraints, thermal (outage) constraints (when SFT switched off for a contingency or component)	Manual - either by constraint activation or override	Ops Planning Engineer, Security Coordinator	All* - but depending on how the override has been applied (if applied via an override)	Yes - if 85% binding or greater

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	Branch Limit	HAM_KPO_1_W_O_2A HAM_KPO_2_W_O_2A RDF_T4_O_1	To limit branch flows to ensure that total flow through the branch (MW and MVAR) does not exceed the component limit (Amp or MVA). Most commonly used to prevent steady-state SPS operation. It is not used to re-rate individual components; branches will be re-rated via overrides (not constraints).	Manual - via override	Ops Planning Engineer, Security Coordinator	All* - but depending on how the override has been applied.	Yes - if 85% binding or greater Note: SPD creates constraints for every branch to model the branch MW limit. If flow is within 85% of the limit, it will be published on WITS for all schedules **except** the WDS.
Mixed	N/A	There are no examples of mixed constraints currently active in the market system. SPD retains the capacity to use mixed constraints should any be added in the future.	To manage the interaction of different types of SPD variables. For example, a combined limit for a branch flow and cleared reserve at a generation site.	Manual	Applied only with associated Code change	All	No
HVDC **Note: HVDC constraints are special cases of branch constraints**	Pole min transfer limits	BEN_HAYP3min HAY_BENP3min BEN_HAYP2min HAY_BENP2min	Used during commissioning tests when specific pole transfers are required including round power.	Auto applied based on (manually entered) HVDC Configuration	HVDC Scheduling	All* - if the schedule was run for the timeframe that the constraint was applied.	Yes - if 85% binding or greater
	HVDC max pole transfer limits	BEN_HAYP3max HAY_BENP3max BEN_HAYP2max HAY_BENP2max	To model the HVDC max transfer limits - can change when HVDC in different modes (reduced voltage etc)	**Scheduling timeframe -** Auto applied based on (manually entered) HVDC Configuration **OPS cases -** Auto applied to OPS cases when run	HVDC Scheduling	All* Note: HVDC Scheduling runs automatically every time there is an HVDC configuration change (for the MTLF timeframe) or runs for the period of every OPS case.	Yes - if 85% binding or greater
	HVDC stability limits	BEN_HAYmax HAY_BENmax	To model the HVDC transfer voltage stability and runback limits. Please note, these constraints will never bind but can still limit HVDC transfer. HVDC transfer will be limited when equal to the right-hand side minus the modulation risk. This is because of how these constraints are referred to within the SPD formulation, where the sum of reserve shared from the sending island (either FIR or SIR), HVDC transfer, and the modulation risk must be less than or equal to the RHS of these constraints.	Auto	HVDC Scheduling	All* except RTD and RTP	Yes - if 85% binding or greater. Please note, these constraints will never be 100% binding, but HVDC transfer will be limited when the LHS is equal to the RHS minus the modulation risk (see purpose column for explanation)

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	HVDC manual stability limits	BEN_HAY_Transfer_Limit HAY_BEN_Transfer_Limit	To limit the flow on the HVDC bipole to manage AC security or AC stability Please note, these constraints will never bind but can still limit HVDC transfer. HVDC transfer will be limited when equal to the right-hand side minus the modulation risk. This is because of how these constraints are referred to within the SPD formulation, where the sum of reserve shared from the sending island (either FIR or SIR), HVDC transfer, and the modulation risk must be less than or equal to the RHS of these constraints.	Manual	Energy co-ordinator, Ops Planning Engineer	All*	Yes - if 85% binding or greater Please note, these constraints will never be 100% binding, but HVDC transfer will be limited when the LHS is equal to the RHS minus the modulation risk (see purpose column for explanation)
	HVDC real time pole minimum operating limits	DCP3Nmin DCP3Smin DCP2Nmin DCP2Smin	To apply HVDC min operating limits to the real time (5 min) schedules. Also for use during commissioning tests when specific pole transfers are required including round power.	Auto	HVDC Scheduling	RTD and RTP only	Yes - if 85% binding or greater
	HVDC ramp constraints	DCNMax DCNMin DCSMax DCSMin	To apply operational and HVDC ramp rate limits to the real time (5 min) schedules (half hour ramp rates on the HVDC are so large they effectively never bind). The ramp rate constraints applied are constrained by the operational limits of the HVDC.	Auto	HVDC Scheduling	RTD and RTP only	No
	HVDC Round Power pole max transfer limits	DCRP3Nmax DCRP3Smax DCRP2Nmax DCRP2Smax	To model the HVDC max transfer limits when in Round Power mode - can change when HVDC in different modes (reduced voltage etc) May also be used for commissioning tests to obtain specific pole transfers	Auto applied based on (manually entered) HVDC Configuration	HVDC Scheduling	RTD and RTP only when in round power mode. Replaces normal pole max constraints	Yes - if 85% binding or greater
	HVDC Round Power BiPole max transfer limits	DCRBPNmax DCRBPSmax	To model the net HVDC transfer voltage stability and runback limits when in round power mode	Auto	HVDC Scheduling	RTD and RTP only when in round power mode	Yes - if 85% binding or greater
	HVDC absolute stability limits	Roundpower_MaxBH Roundpower_MaxHB	To model the absolute HVDC transfer voltage stability limits when in round power mode	Manual (permanent constraints)	Security co-ordinator	All*	Yes - if 85% binding or greater
	HVDC round power ramp constraints	DCRMax DCRMin	To apply HVDC round power ramp rate limits to the real time (5min) schedules. The ramp rate constraints applied are constrained by the operational limits of the HVDC.	Auto	HVDC Scheduling	RTD and RTP only when in round power mode. Replaces normal HVDC ramp constraints	No
	HVDC_MANUAL Constraints	HAY_BENmax_MANUAL BEN_HAYmin_MANUAL BEN_HAYmax_MANUAL HAY_BENP2max_MANUAL BEN_HAYP2max_MANUAL BEN_HAYP2min_MANUAL HAY_BENP2min_MANUAL	Available for the application of discretion or temporary operating restrictions.	Manual	Energy Coordinator, Security Coordinator,Ops Planning Engineer	All*	Yes - if 85% binding or greater

Constraint type	Sub type	Examples	Purpose	Applied manually or automatically?	Applied by...?	Used by which schedules? (WDS, NRSL, PRSL, NRSS, PRSS, RTD, RTP, FP, OPS, CAS)	Published on WITS?**
		HAY_BENmin_MANUAL BEN_HAYP3max_MANUAL HAY_BENP3max_MANUAL BEN_HAYP3min_MANUAL HAY_BENP3min_MANUAL					

* Final Pricing uses the most recent constraints at the start of each trading period.
** Constraints applied to OPS and CAS schedules are not published
† FK constraints are typically not applied to OPS schedules due to the timeframe that OPS schedules are run (as the constraints are not available)

SFT Constraints Naming Convention

Constraint Naming Convention

SFT doesn't know about outages, so the SFT constraints naming convention has references to protected and contingent branches only.

Constraint Examples

SFT creates the constraint name by bringing the names of the monitored element and the contingent element together.

The following suffixes differentiate constraints created for different monitored elements:

- 'LN' for a line (and has :S if the limit is static)
- 'ZBR' for a zero impedance branch
- 'XF' for transformers
- 'INTRFC' for monitored interface.

The following table provides some examples of constraints.

ZBR, XF and INTRFC violations will always be static limit violations, hence the qualifier ":S" will not be added for these constraints.

Monitored Element	Naming Convention	Examples
Line	LN: ID_LINE (14 char) of the monitored element + "." + ID_LN (2 char) of the monitored element + "__" + ID_LINE (14 char) of the contingency element + "." + ID_LN (2 char) or ID_ZBR (2 char) of the contingency element + "___" + optional ":S__" for static limit constraints + ID_CTG (8 char) + "___" + ID_ST(8 char) of the end where the violation is detected + "__LN"	Static limit: ARA_WRK.1__MTI_WKM1.1__:S__MTIWKM1$__ARA__LN ARA_WRK.1__ALB__T4__:S__ALB_T4__ARA__LN Off-load limit: ARA_WRK.1__MTI_WKM1.1__MTIWKM1$__ARA__LN ARA_WRK.1__ALB__T4__ALB_T4_ARA_LN
Zero impedance branch	ZBR: ID_LINE (14 char) of the monitored element + "." + ID_ZBR (2 char) of the monitored element + "__" + ID_LINE (14 char) of the contingency element + "." + ID_LN (2 char) or ID_ZBR (2 char) of the contingency element + "___" + ID_CTG (8 char) + "___" + ID_ST(8 char) of the end where the violation is detected + "__ZBR"	KILN_COGEN.1__MTI_WKM1.1__MTIWKM1$__GLN__ZBR KILN_COGEN.1__ALB__T4__ALB_T4__GLN__ZBR
Transformer	XF: ID_ST(8 char) + "__" + ID_XF (14 char) of the monitored element + "__" + ID_KV (4 char) of the end where violation is detected + "KV__" + ID_LINE (14 char) of the contingency element + "." + ID_LN (2 char) or ID_ZBR (2 char) of the contingency element + "___" + ID_CTG (8 char) + "__XF"	ALB__T3__33KV__MTI_WKM1.1__MTIWKM1$__XF ALB__T3__33KV__ALB__T4__ALB_T4__XF
Monitored interface	INTRFC: ID_INTRFC (6 char) of the monitored element + "__" + ID_LINE (14 char) of the contingency element + "." + ID_LN (2 char) or ID_ZBR (2 char) of the contingency element + "___" + ID_CTG (8 char) + "__INTRFC"	ZONE1__MTI_WKM1.1__MTIWKM1$__HEN__INTRFC ZONE1__ALB__T4__ALB_T4__HEN__INTRFC