AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Monthly Constraint Report

September 2024

A report for the National Electricity Market on Constraint results.

Important notice

Purpose

This publication has been prepared by AEMO to provide information about constraint equation performance and related issues, as at the date of publication.

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1 Introduction

This report details constraint equation performance and transmission congestion related issues for September 2024. Included are investigations of violating constraint equations, usage of the constraint automation and performance of Pre-dispatch constraint equations. Transmission and generation changes are also detailed along with the number of constraint equation changes.

2 Constraint Equation Performance

2.1 Top 10 binding constraint equations

A constraint equation is binding when the power system flows managed by it have reached the applicable thermal or stability limit or the constraint equation is setting a Frequency Control Ancillary Service (FCAS) requirement. Normally there is one constraint equation setting the FCAS requirement for each of the eight services at any time. This leads to many more hours of binding for FCAS constraint equations - as such these have been excluded from the following table.

Table 1 Top 10 binding network constraint equations

Constraint Equation ID (System Normal Bold)	Description	#DIs (Hours)	Limit Type
T::T_NIL_1	Out = NIL, prevent transient instability for fault and trip of a Farrell to Sheffield line, Swamp if less than 3 synchronous West Coast units generating or Farrell 220kV bus coupler open or Hampshire 110kV line is closed.	3000 (250.0)	Transient Stability
SVML_ZERO	SA to Vic on ML upper transfer limit of 0 MW	2652 (221.0)	Interconnector Zero
V_CWWF_FLT_0	Limit Crowlands Wind Farm upper limit to 0 MW to manage post contingent voltage oscillation	1791 (149.25)	System Strength
N>NIL_969	Out= Nil, avoid O/L Gunnedah to Tamworth (969) on trip of Nil, Feedback. Metering is used as specified in OM520 [Note: swamped with 96M or 9UJ or 9UH is O/S]	1767 (147.25)	Thermal
N>Q-NIL_757_758	Out= Nil, Avoid overloading 757 or 758 (T174 Terranora to H4 Mudgeeraba) 110kV line on trip of the other 758 or 757 (T174 Terranora to H4 Mudgeeraba line), Flow North, Feedback	1647 (137.25)	Thermal
V_T_NIL_FCSPS	Basslink limit from Vic to Tas for load enabled for FCSPS	1561 (130.08)	Other
Q_STR_7C0K_HASF_2	No limit to Haughton Solar Farm if Stan>=2+Stan+Cal>=3+Glad>=2+ (Stan+Cal+Glad) >=7, NQLD>250&270(AVG),Ross_FN>100&120(AVG),Haughton Syncon is ON, Zero otherwise.	1342 (111.83)	System Strength
N>NIL_94T	Out= Nil, avoid O/L Molong to Orange North (94T) on trip of Nil, Feedback	1197 (99.75)	Thermal
Q>NIL_YLMR	Out= Nil, avoid overload on 110kV feeders between Yarranlea and Middle Ridge(733/1 and 734/1), Feedback	1162 (96.83)	Thermal
V^^N_DPWG_1	Out = DarlingtonPt to Wagga(63), avoid voltage collapse around Murray for loss of all APD potlines	1057 (88.08)	Voltage Stability

2.2 Top 10 binding impact constraint equations

Binding constraint equations affect electricity market pricing. The binding impact is used to distinguish the severity of different binding constraint equations.

The binding impact of a constraint is derived by summarising the marginal value for each dispatch interval (DI) from the marginal constraint cost (MCC) re-run[1] over the period considered. The marginal value is a mathematical term for the binding impact arising from relaxing the RHS of a binding constraint by one MW. As the market clears each DI, the binding impact is measured in $/MW/DI.

The binding impact in $/MW/DI is a relative comparison and a helpful way to analyse congestion issues. It can be converted to $/MWh by dividing the binding impact by 12 (as there are 12 DIs per hour). This value of congestion is still only a proxy (and always an upper bound) of the value per MW of congestion over the period calculated; any change to the limits (RHS) may cause other constraints to bind almost immediately after.

Table 2 Top 10 binding impact network constraint equations

Constraint Equation ID (System Normal Bold)	Description	∑ Marginal Values	Limit Type
N>NIL_94T	Out= Nil, avoid O/L Molong to Orange North (94T) on trip of Nil, Feedback	1,906,944	Thermal
V_CWWF_FLT_0	Limit Crowlands Wind Farm upper limit to 0 MW to manage post contingent voltage oscillation	1,863,460	System Strength
N>NIL_969	Out= Nil, avoid O/L Gunnedah to Tamworth (969) on trip of Nil, Feedback. Metering is used as specified in OM520 [Note: swamped with 96M or 9UJ or 9UH is O/S]	1,701,213	Thermal
V_MURRAWRWF_FLT_100	Limit Murra Warra Wind Farm 1+2 upper limit to 100 MW to manage system stability on the next contingency due to voltage oscillation	1,385,607	System Strength
V_KIAMSF_FLT_50	Limit Kiamal solar farm upper limit to 50 MW to manage post contingent voltage oscillation	891,860	System Strength
S_PPT+SNPT+BLVR_220	SA Pelican Point + Snapper Point generation +Bolivar PS<= 220 MW (Note: Constraint swamps out if Bolivar PS is at 0MW)	818,968	Discretionary
V^^V_MLNK_KGTS	Out= Murraylink, avoid voltage collapse for loss of Horsham - Murra Warra - Kiamal 220kV line	765,953	Voltage Stability
N>NIL_9R5_9R6_N	Out= NIL, avoid O/L Wagga330 to Wagga North (9R5) 132kV line on trip of Wagga132 to Wagga North (9R6) 132kV line, Feedback	728,960	Thermal
Q>NIL_YLMR	Out= Nil, avoid overload on 110kV feeders between Yarranlea and Middle Ridge(733/1 and 734/1), Feedback	687,929	Thermal
V_BANNERTSF_FLT_45	Limit Bannerton Solar Farm upper limit to 45 MW to manage post contingent voltage oscillation	628,558	System Strength

[1] The MCC re-run relaxes any violating constraint equations and constraint equations with a marginal value equal to the constraint equation's violation penalty factor (CVP) x market price cap (MPC). The calculation caps the marginal value in each DI at the MPC value valid on that date. MPC is increased annually on 1st July.

2.3 Top 10 violating constraint equations

A constraint equation is violating when NEMDE is unable to dispatch the entities on the left-hand side (LHS) so the summated LHS value is less than or equal to, or greater than or equal to, the right-hand side (RHS) value (depending on the mathematical operator selected for the constraint equation). The following table includes the FCAS constraint equations. Reasons for the violations are covered in 2.3.1.

Table 3 Top 10 violating constraint equations

Constraint Equation ID (System Normal Bold)	Description	#DIs (Hours)	Limit Type
N>NIL_9R5_9R6_N	Out= NIL, avoid O/L Wagga330 to Wagga North (9R5) 132kV line on trip of Wagga132 to Wagga North (9R6) 132kV line, Feedback	15 (1.25)	Thermal
N_BERYLSF1_27INV	Beryl Solar Farm inverter limit of 27. Constraint to violate if Beryl Solar Farm inverter availability greater than 27. Swamp out otherwise. DS Only	15 (1.25)	System Strength
N_PARSF1_10INV	Parkes Solar Farm inverter limit of 10. Constraint to violate if Parkes Solar Farm inverter availability greater than 10. Swamp out otherwise. DS only	12 (1.0)	System Strength
N_NYNGANSF_68INV	Nyngan Solar Farm inverter limit of 68. Constraint to violate if Nyngan Solar Farm inverter availability greater than 68. Swamp out otherwise. DS only	9 (0.75)	System Strength
N>NIL_9R6_9R5_N	Out= NIL, avoid O/L Wagga132 to Wagga North (9R6) 132kV line on trip of Wagga330 to Wagga North (9R5) 132kV line, Feedback	7 (0.58)	Thermal
NC_Q_KSP1	Non Conformance Constraint for Kidston solar farm	6 (0.5)	Non-Conformance
N_GNNDHSF1_82INV	Gunnedah Solar Farm inverter limit of 82. Constraint to violate if Gunnedah Solar Farm inverter availability greater than 82. Swamp out otherwise. DS only	6 (0.5)	System Strength
N_NEWENSF1+2_260-INV	New England Solar inverter limit of 260. Constraint to violate if New England Solar inverter availability greater than 260. Swamp out otherwise. DS only	6 (0.5)	System Strength
N_BERYLSF1_23INV	Beryl Solar Farm inverter limit of 23. Constraint to violate if Beryl Solar Farm inverter availability greater than 23. Swamp out otherwise. DS Only	5 (0.41)	System Strength
Q_STR_7C0K_HASF_2	No limit to Haughton Solar Farm if Stan>=2+Stan+Cal>=3+Glad>=2+ (Stan+Cal+Glad) >=7, NQLD>250&270(AVG),Ross_FN>100&120(AVG),Haughton Syncon is ON, Zero otherwise.	5 (0.41)	System Strength

2.3.1 Reasons for constraint equation violations

Table 4 Reasons for constraint equation violations

Constraint Equation ID (System Normal Bold)	Description
N>NIL_9R5_9R6_N	Equation violated for 5 consecutive DIs on 15/09/2024 1745 hrs to 1805 hrs and 10 other non-consecutive DIs between 13/09/2024 1740 hrs and 15/09/2024 1955 hrs with a maximum violation degree of 14.91 MW occurring at 15/09/2024 1805 hrs. Constraint equation violated due to GT U3 and U4 being limited by its ramp down rate.
N_BERYLSF1_27INV	Constraint equation violated for 15 consecutive DIs between 10/09/2024 0805 hrs and 10/09/2024 0915 hrs with a violation degree of 0.001 MW. Constraint equation violated due to Beryl Solar Farm inverter availability exceeding its limit.
N_PARSF1_10INV	Constraint equation violated for 12 consecutive DIs between 10/09/2024 0805 hrs and 10/09/2024 0900 hrs with a violation degree of 0.001 MW. Constraint equation violated due to Parkes Solar Farm inverter availability exceeding its limit.
N_NYNGANSF_68INV	Constraint equation violated for 9 non-consecutive DIs between 10/09/2024 1730 hrs and 12/09/2024 1700 hrs with a violation degree of 0.001 MW. Constraint equation violated due to Nyngan Solar Farm inverter availability exceeding its limit.
N>NIL_9R6_9R5_N	Constraint equation violated for 2 consecutive DIs at 13/09/2024 1800 hrs and 13/09/2024 1805 hrs and for an additional 5 non-consecutive DIs between 15/09/2024 1755 hrs and 15/09/2024 1820 hrs with a max violation degree of 12.27 MW at 15/09/2024 1805 hrs. Constraint equation violated due to GT U3 and U4 being limited by its ramp down rate.
NC_Q_KSP1	Constraint equation violated for 6 consecutive DIs between 24/09/2024 0925 hrs and 24/09/2024 0950 with a maximum violation degree of 0.7 MW occurring on 24/09/2024 0935 hrs, 0940 hrs, 0945 hrs, and 0950 hrs. Constraint equation violated due to Kidston Solar Form non-conforming.
N_GNNDHSF1_82INV	Constraint equation violated for 3 consecutive DIs on 01/09/2024 0825 hrs, 0820 hr, and 0835 hrs and for 3 consecutive DIs on 11/09/2024 1615 hrs, 11/09/2024 1620 hrs and 11/09/2024 1625 hrs with a violation degree of 0.001 MW. Constraint equation violated due to Gunnedah Solar Farm inverter availability exceeding its limit.
N_NEWENSF1+2_260-INV	Constraint equation violated for 6 consecutive DIs between 11/09/2024 1615 hrs and 11/09/2024 1640 hrs with a violation degree of 0.001 MW. Constraint equation violated due to New England Solar Farm inverter availability exceeding its limit.
N_BERYLSF1_23INV	Constraint equation violated for 1 DI on 21/09/2024 0605 hrs and for 4 consecutive DIs between 23/09/2024 1055 hrs and 23/09/2024 1110 hrs with a violation degree of 0.001 MW. Constraint equation violated due to Beryl Solar Farm inverter availability exceeding its limit.
Q_STR_7C0K_HASF_2	Constraint equation violated for 1 DI on 11/09/2024 0845 hrs and for 4 consecutive DIs from 19/09/2024 1235 hrs to 19/09/2024 1250 hrs with a violation degree of 0.001 MW. Constraint equation violated due to Haughton Solar Farm exceeding its MVAr limit.

2.4 Top 10 binding interconnector limit setters

Binding constraint equations can set the interconnector limits for each of the interconnectors on the constraint equation left-hand side (LHS). Table 5 lists the top (by binding hours) interconnector limit setters for all the interconnectors in the NEM and for each direction on that interconnector.

Table 5 Top 10 binding interconnector limit setters

Constraint Equation ID (System Normal Bold)	Interconnector	Description	#DIs (Hours)	Average Limit (Max)
SVML_ZERO	V-S-MNSP1 Import	SA to Vic on ML upper transfer limit of 0 MW	2164 (180.33)	0.0 (0.0)
N>Q-NIL_757_758	N-Q-MNSP1 Export	Out= Nil, Avoid overloading 757 or 758 (T174 Terranora to H4 Mudgeeraba) 110kV line on trip of the other 758 or 757 (T174 Terranora to H4 Mudgeeraba line), Flow North, Feedback	1652 (137.67)	96.7 (97.0)
V_T_NIL_FCSPS	T-V-MNSP1 Import	Basslink limit from Vic to Tas for load enabled for FCSPS	1344 (112.0)	-343.77 (-477.87)
V^^N_DPWG_1	VIC1-NSW1 Export	Out = DarlingtonPt to Wagga(63), avoid voltage collapse around Murray for loss of all APD potlines	1020 (85.0)	716.48 (1107.79)
N>>NIL_964_84_S	NSW1-QLD1 Import	Out= NIL, avoid O/L Port Macquarie to Herron Creek Tee (964/2) on trip of Tamworth to Liddell (84) line, Feedback	923 (76.92)	-804.59 (-1248.94)
N>>NIL_964_84_S	N-Q-MNSP1 Import	Out= NIL, avoid O/L Port Macquarie to Herron Creek Tee (964/2) on trip of Tamworth to Liddell (84) line, Feedback	874 (72.83)	75.58 (-111.09)
V^SML_BUDP_3	V-S-MNSP1 Export	Out = Buronga to Balranald (X3) or Balranald to Darlington Pt (X5) 220 kV line, avoid voltage collapse for loss of Bendigo to Kerang 220kV line	870 (72.5)	37.54 (144.19)
V^^N_NIL_1	VIC1-NSW1 Export	Out = Nil, avoid voltage collapse around Murray for loss of all APD potlines	859 (71.58)	1129.51 (1381.28)
S>NIL_MHNW1_MHNW2	V-S-MNSP1 Export	Out= Nil, avoid O/L Monash-North West Bend #2 132kV on trip of Monash-North West Bend #1 132kV line, Feedback	830 (69.17)	162.78 (187.22)
F_Q++8E_L6	NSW1-QLD1 Import	Out = Sapphire to Armidale (8E) line, Qld Lower 6 sec Requirement	722 (60.17)	-38.76 (-210.22)

2.5 Constraint Automation Usage

The constraint automation is an application in AEMO's energy management system (EMS) which generates thermal overload constraint equations based on the current or planned state of the power system. It is currently used by on-line staff to create thermal overload constraint equations for power system conditions where there were no existing constraint equations or the existing constraint equations did not operate correctly.

The following section details the reason for each invocation of the non-real time constraint automation constraint sets and the results of AEMO's investigation into each case.

Non-real time constraint automation was not used.

2.5.1 Further Investigation

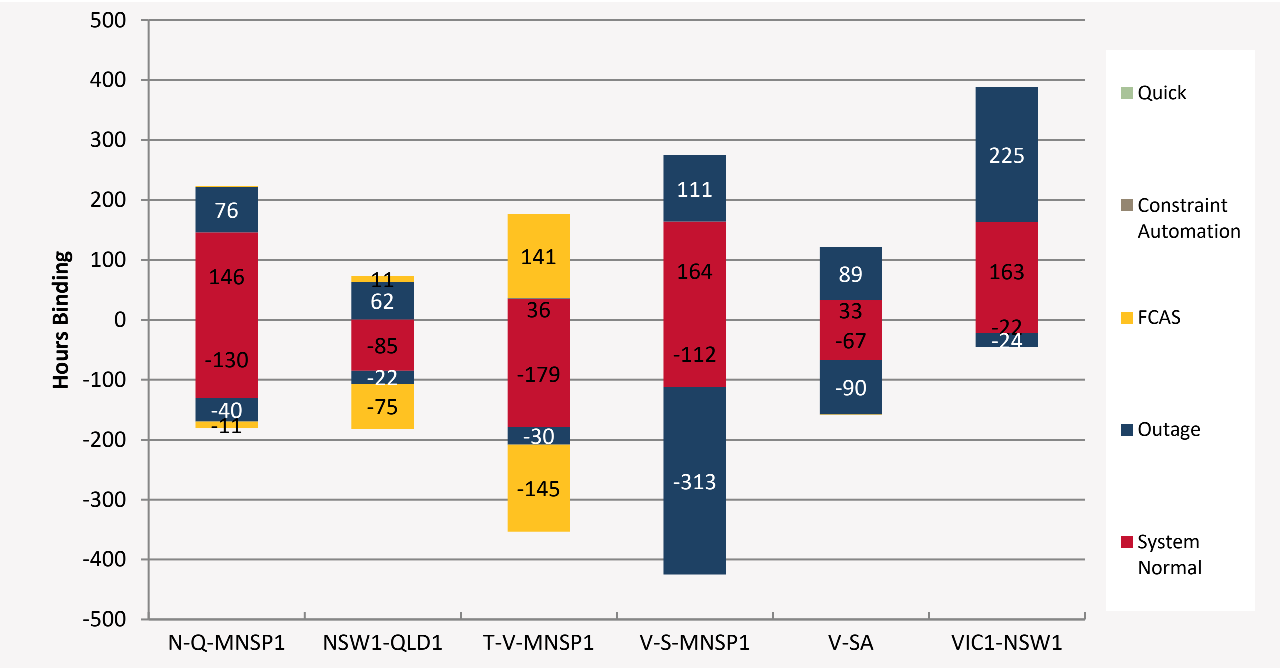
Non-real time constraint automation was not used.

2.6 Binding Dispatch Hours

This section examines the number of hours of binding constraint equations on each interconnector and by region. The results are further categorized into five types: system normal, outage, FCAS (both outage and system normal), constraint automation and quick constraints.

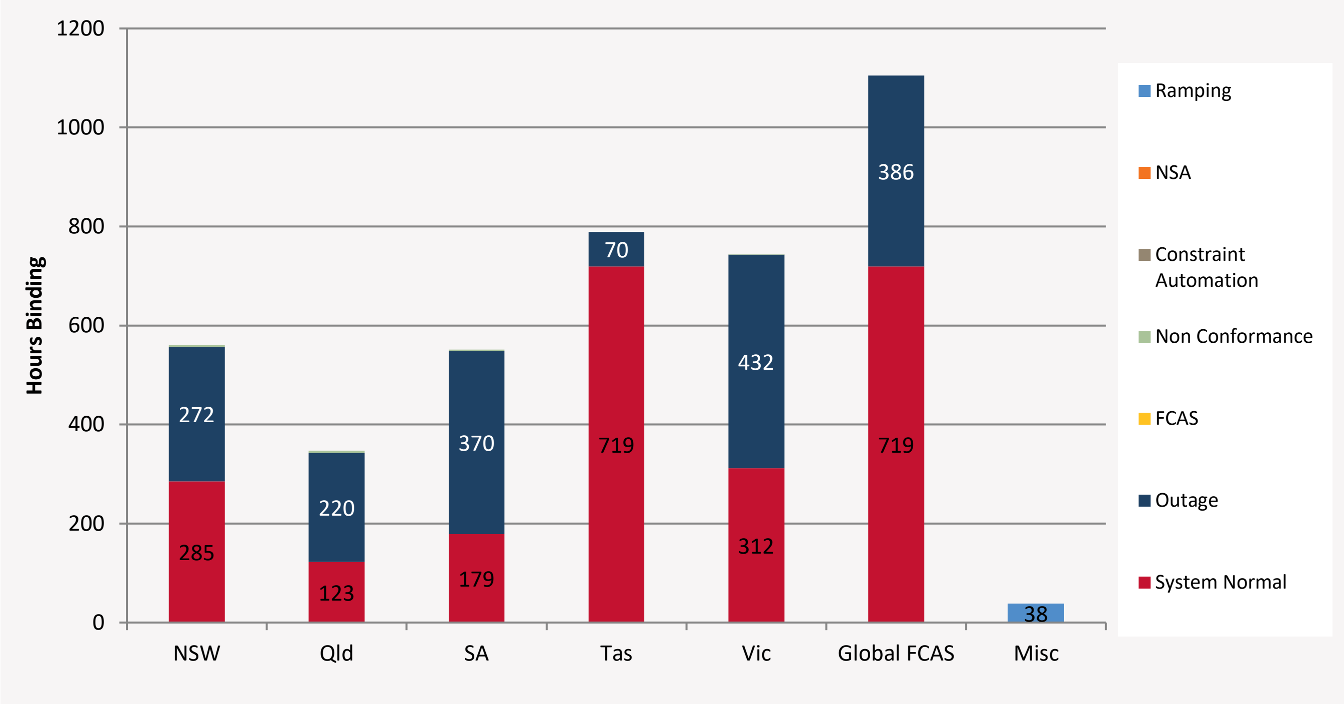
In the following graph the export binding hours are indicated as positive numbers and import with negative values.

Figure 1 Interconnector binding dispatch hours



The regional comparison graph below uses the same categories as in Figure 1 as well as non-conformance, network support agreement and ramping. Constraint equations that cross a region boundary are allocated to the sending end region. Global FCAS covers both global and mainland requirements.

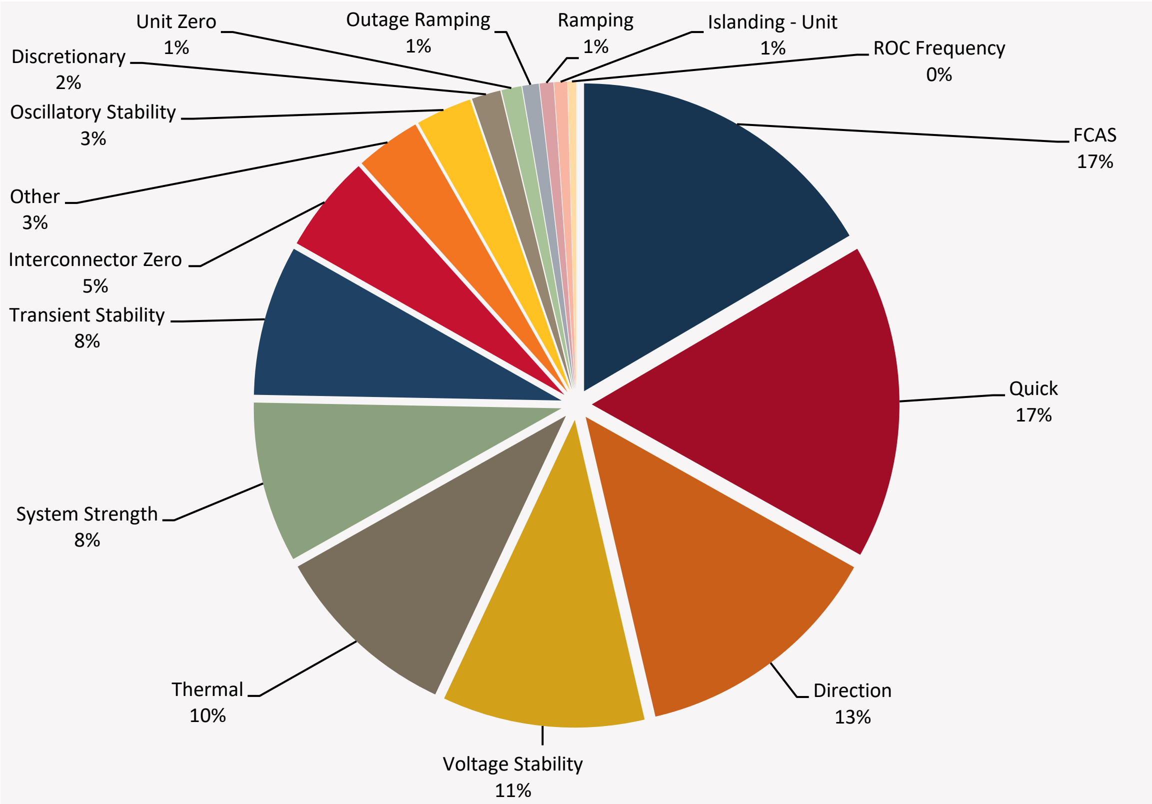
Figure 2 Regional binding dispatch hours



2.7 Binding Constraint Equations by Limit Type

The following pie charts show the percentage of dispatch intervals for September 2024 that the different types of constraint equations bound.

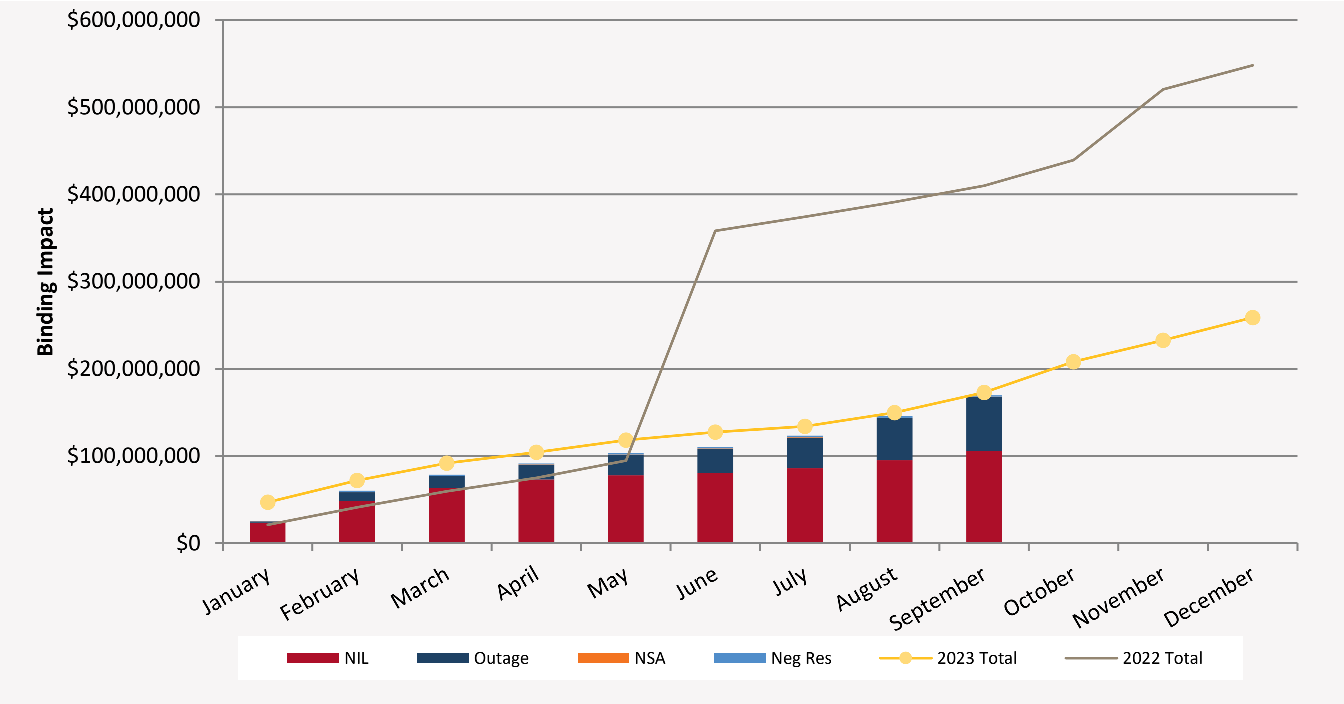
Figure 3 Binding by limit type



2.8 Binding Impact Comparison

The following graph compares the cumulative binding impact (calculated by summating the marginal values from the MCC re-run – the same as in section **Error! Reference source not found.**) for each month for the current year (indicated by type as a stacked bar chart) against the cumulative values from the previous two years (the line graphs). The current year is further categorised into system normal (NIL), outage, network support agreement (NSA) and negative residue constraint equation types.

Figure 4 Binding Impact comparison



2.9 Pre-dispatch RHS Accuracy

Pre-dispatch RHS accuracy is measured by the comparing the dispatch RHS value and the pre-dispatch RHS value forecast four hours in the future. The following table shows the pre-dispatch accuracy of the top ten largest differences for binding (in dispatch or pre-dispatch) constraint equations. This excludes FCAS constraint equations, constraint equations that violated in Dispatch, differences larger than ±9500 (this is to exclude constraint equations with swamping logic) and constraint equations that only bound for one or two Dispatch intervals. AEMO investigates constraint equations that have a Dispatch/Pre-dispatch RHS difference greater than 5% and ten absolute difference which have either bound for greater than 25 dispatch intervals or have a greater than $1,000 binding impact. The investigations are detailed in 2.9.1.

Table 6 Top 10 largest Dispatch / Pre-dispatch differences

Constraint Equation ID (System Normal Bold)	Description	#DIs	% + Max Diff	% + Avg Diff
V^SML_BUDP_3	Out = Buronga to Balranald (X3) or Balranald to Darlington Pt (X5) 220 kV line, avoid voltage collapse for loss of Bendigo to Kerang 220kV line	197	469,957% (76.86)	3,147% (23.36)
N::Q_ARSR_1	Out= Armidale - Saphhire (8E) 330kV line, NSW to QLD Transient Stability limit on loss of largest Qld unit	75	9,358% (264.58)	197% (47.25)
V^SML_KGRC_4	Out = Kerang to Wemen or Red Cliffs to Wemen 220kV line sections, or full Kerang to Wemen to Red Cliffs 220kV line, avoid voltage collapse for loss of Horsham to Ararat 220kV line	10	3,944% (52.23)	473% (32.42)
V_S_HEYWOOD_UFLS	Out= Nil, Limit Heywood flows when SA under frequency load shedding (UFLS) is insufficient (i.e. when UFLS blocks in SA <1000 MW) to manage for double-circuit loss of Heywood IC. Note: Constraint is swamped if UFLS blocks >= 1000 MW.	8	1,748% (9,459)	1,256% (7,083)
S::V_TBSE_TBSE	Out = one Tailembend-South East 275kV line (Note: with both Black Range series caps I/S); SA to VIC Transient Stability limit for loss of other Tailembend-South East 275kV lines.	16	1,563% (14.06)	160% (7.36)
V>>NIL_ARTSTL_ARCW	Out = Nil, avoid O/L Ararat to Stawell 66kV line for loss of the Ararat to Crowlands 220kV line, swamped if BATS-HOTS 66 kV tie opened, or with BGR tie splitting scheme in service, Feedback	8	1,217% (75.91)	444% (43.5)
V::N_NIL_V2	Out = NIL, prevent transient instability for fault and trip of a HWTS-SMTS 500 kV line, VIC accelerates. Yallourn W G1 on 500kV.	43	1,108% (242.42)	51.45% (49.23)
V::N_JNWG_S2	Out = Jindera to Wagga 330kV line, prevent transient instability for fault and trip of a HWTS-SMTS 500 kV line, SA accelerates, Yallourn W G1 on 500 kV.	15	468% (209.71)	116.55% (86.2)
Q_STR_7C0K_MEWF_7	Limit 80% to Mt Emerald WF if Stan>=2+Stan+Cal>=3+Glad>=2+(Stan+Cal+Glad) >=7,Kar >=2, NQLD>350&370(AVG),Ross_FN>150&170(AVG)(100% if Haughton Syncon ON), 40% if NQLD>250&270(AVG),Ross_FN>100&120(AVG)(25% if Syncon OFF or Kar<0),Zero otherwise.	37	220% (144.)	41.61% (77.1)

2.9.1 Further Investigation

The following constraint equation(s) have been investigated:

N::Q_ARSR_1: Investigated and no improvement can be made to the constraint equation at this stage.

V>>NIL_ARTSTL_ARCW: Investigated and no improvement can be made to the constraint equation at this stage.

V::N_JNWG_S2: Investigated and no improvement can be made to the constraint equation at this stage.

Q_STR_7C0K_MEWF_7: Investigated and no improvement can be made to the constraint equation at this stage.

V^SML_BUDP_3: Investigated and no improvement can be made to the constraint equation at this stage.

S::V_TBSE_TBSE: Investigated and no improvement can be made to the constraint equation at this stage.

V::N_NIL_V2: Investigated and no improvement can be made to the constraint equation at this stage

V::N_NIL_V1: Investigated and no improvement can be made to the constraint equation at this stage

3 Generator / Transmission Changes

One of the main drivers for changes to constraint equations is from power system change, whether this is the addition or removal of plant (either generation or transmission). The following table details changes that occurred in September 2024.

Table 7 Generator and transmission changes

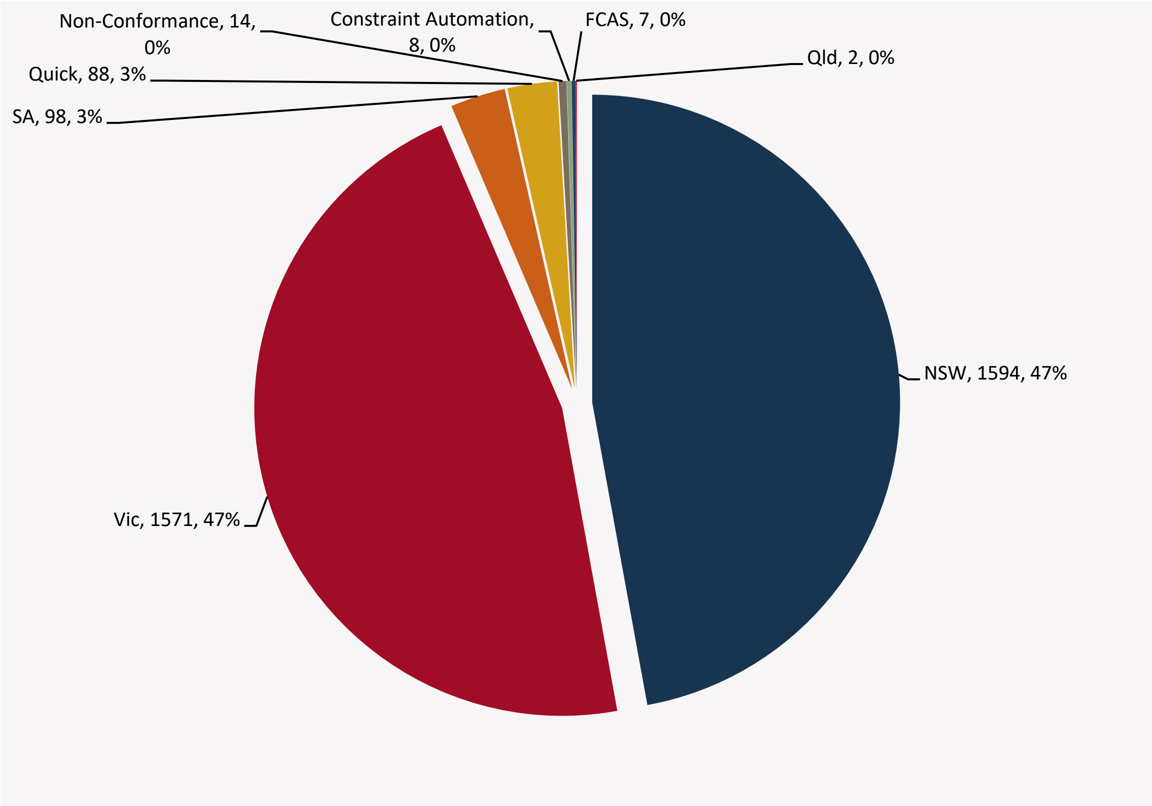
Project	Date	Region	Notes
Buronga – Red Cliffs X9 220 kV line	1 September 2024	NSW	Line commissioned
Buronga – Red Cliffs OX1 220 kV line	1 September 2024	NSW	Line decommissioned
Kingaroy Solar Farm	3 September 2024	Qld	New Generator
Waratah Battery	3 September 2024	NSW	New Battery
Hazelwood Battery (Load Component)	4 September 2024	Victoria	Deregistered Generator due to BDU cut-over
Hazelwood Battery (Generation Component)	4 September 2024	Victoria	Deregistered Generator due to BDU cut-over
Phillip Island Battery Load1	4 September 2024	Victoria	Deregistered generator due to BDU cut over.
Phillip Island Battery Gen1	4 September 2024	Victoria	Deregistered generator due to BDU cut over.
Happy Valley Battery BDU	6 September 2024	SA	Existing battery changed to BDU
Bolivar Waste Water Plant Battery BDU	6 September 2024	SA	Existing battery changed to BDU
Adelaide Desalination Plant Battery BDU	6 September 2024	SA	Existing battery changed to BDU
Christies Beach Wwtp Battery BDU	6 September 2024	SA	Existing battery changed to BDU
Project Energy Connect	10 September 2024	NSW	The following equipment at Buronga 330 kV substation has been commissioned: Buronga 330 kV A bus. Buronga 330 kV B bus. Buronga No 1 330 kV capacitor. Buronga No 2 330 kV capacitor. Buronga No 7 330/220 kV transformer.
Walla Walla Solar Farm #2	10 September 2024	NSW	New Generator
Walla Walla Solar Farm #1	10 September 2024	NSW	New Generator
Capital Battery BDU	12 September 2024	NSW	Existing battery changed to BDU
Hornsdale Power Reserve Battery BDU	12 September 2024	SA	Existing battery changed to BDU
Bulgana Battery BDU	13 September 2024	Victoria	Existing battery changed to BDU
Victorian Big Battery BDU	13 September 2024	Victoria	Existing battery changed to BDU

Project	Date	Region	Notes
Dr Viotaswdr S 1	17 September 2024	SA	New WDR unit
Wallgrove Battery BDU	26 September 2024	NSW	Existing battery changed to BDU
Lake Bonney Battery BDU	26 September 2024	SA	Existing battery changed to BDU
Walla Walla Substation cut-in	27 September 2024	NSW	Walla Walla substation has been cut into the existing Wagga - Jindera (62) 330 kV line to form the following circuits: Jindera - Walla Walla 62 330 kV Transmission Line Walla Walla - Wagga 6Y 330 kV Transmission Line

3.1 Constraint Equation Changes

The following pie chart indicates the regional location of constraint equation changes. For details on individual constraint equation changes refer to the Weekly Constraint Library Changes Report[2] or the constraint equations in the MMS Data Model[3].

Figure 5 Constraint equation changes



The following graph compares the constraint equation changes for the current year versus the previous two years. The current year is categorised by region.

[2] AEMO. *NEM Weekly Constraint Library Changes Report.* Available at: http://www.nemweb.com.au/REPORTS/CURRENT/Weekly_Constraint_Reports/

[3] AEMO. *MMS Data Model*. Available at: https://www.aemo.com.au/energy-systems/market-it-systems/nem-guides/wholesale-it-systems-software

Figure 6 Constraint equation changes per month compared to previous two years