AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

# Monthly Constraint Report

## May 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 May 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 |
|---|---|---|---|
| N^^V_CTMN_1 | Out = Collector - Marulan (4) or Collector - Yass (3L) or Marulan - Yass (5), avoid voltage collapse at Southern NSW for loss of the largest Vic generating unit or Basslink | 1449 (120.75) | Voltage Stability |
| **N>NIL_94T** | Out= Nil, avoid O/L Molong to Orange North (94T) on trip of Nil, Feedback | 1366 (113.83) | Thermal |
| **N>>NIL_964_84_S** | Out= NIL, avoid O/L Port Macquarie to Herron Creek Tee (964/2) on trip of Tamworth to Liddell (84) line, Feedback | 756 (63.0) | Thermal |
| NSA_Q_GSTONE34_200 | Gladstone 3+4 >= 200 for Network Support Agreement | 666 (55.5) | Network Support |
| **N>NIL_9R6_9R5** | Out= Nil, avoid O/L Wagga North to Wagga132 (9R6) on trip of Wagga North to Wagga330 (9R5) line, Feedback | 532 (44.33) | Thermal |
| **S>NIL_MHNW1_MHNW2** | Out= Nil, avoid O/L Monash-North West Bend #2 132kV on trip of Monash-North West Bend #1 132kV line, Feedback | 517 (43.08) | Thermal |
| V^^N_MNYS_1 | Out = Marulan to Yass (4 or 5) 330kV line, avoid voltage collapse around Murray for loss of all APD potlines | 511 (42.58) | Voltage Stability |
| SVML_ZERO | SA to Vic on ML upper transfer limit of 0 MW | 409 (34.08) | Interconnector Zero |
| **V^^V_NIL_KGTS** | Out= Nil, avoid voltage collapse for loss of Horsham - Murra Warra - Kiamal 220kV line. Murraylink VFRB disabled. Swamp if Murraylink VFRB enabled. | 340 (28.33) | Voltage Stability |
| N::N_CTYS_2 | Out = Collector-Yass (3L), stability limit (Snowy-NSW) for loss of Yass-Marulan (5) or Crookwell to Bannaby (61) 330kV line | 333 (27.75) | Transient 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::N_CTYS_2 | Out = Collector-Yass (3L), stability limit (Snowy-NSW) for loss of Yass-Marulan (5) or Crookwell to Bannaby (61) 330kV line | 1,559,308 | Transient Stability |
| **N>NIL_94T** | Out= Nil, avoid O/L Molong to Orange North (94T) on trip of Nil, Feedback | 1,559,235 | Thermal |
| F_Q++86_L6 | Out = Armidale to Tamworth (86) line, Qld Lower 6 sec Requirement | 1,253,436 | FCAS |
| N>79_998_72 | Out= Wollar West to Wellington (79) 330kV line or Wollar 500/330kV TX or Wollar to Wollar West (75) 330kV line, avoid O/L on Cowra to Forbes North (998) on trip of Mt Piper to Wellington line (72), Feedback | 889,699 | Thermal |
| **N>NIL_9R6_9R5** | Out= Nil, avoid O/L Wagga North to Wagga132 (9R6) on trip of Wagga North to Wagga330 (9R5) line, Feedback | 503,656 | Thermal |
| N_WRWSF_066 | White Rock wind farm and White Rock solar farm upper limit of 66 MW | 440,161 | System Strength |
| S-DLBAT-G_0 | Discretionary upper limit for Dalrymple Battery (generation component) of 0 MW | 415,000 | Unit Zero |
| **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] | 280,932 | Thermal |
| **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 | 277,642 | Thermal |
| N_MOREESF1_21INV | Moree Solar Farm inverter limit of 21. Constraint to violate if Moree Solar Farm inverter availability greater than 21. Swamp out otherwise. DS only | 226,525 | 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>>79_944_72 | Out= Wollar West to Wellington (79) 330kV line or Wollar 500/330kV TX or Wollar to Wollar West (75) 330kV line, avoid O/L Wallerawang to Orange North (944) 132kV line on trip of Mt Piper to Wellington (72) 330kV line, Feedback | 101 (8.41) | Thermal |
| N>>79_94X_72 | Out= Wollar West to Wellington (79) 330kV line or Wollar 500/330kV TX or Wollar to Wollar West (75) 330kV line, avoid O/L Wallerawang to Panorama (94X) 132kV line on trip of Mt Piper to Wellington (72) 330kV line, Feedback | 89 (7.41) | Thermal |
| N_MOREESF1_21INV | Moree Solar Farm inverter limit of 21. Constraint to violate if Moree Solar Farm inverter availability greater than 21. Swamp out otherwise. DS only | 20 (1.66) | System Strength |
| **F_T+LREG_0050** | Tasmania Lower Regulation Requirement greater than 50 MW | 17 (1.41) | FCAS |
| **F_T+RREG_0050** | Tasmania Raise Regulation Requirement greater than 50 MW | 15 (1.25) | FCAS |
| N>>79_949_72 | Out= Wollar West to Wellington (79) 330kV line or Wollar 500/330kV TX or Wollar to Wollar West (75) 330kV line, avoid O/L Mt Piper to Orange North (949) 132kV line on trip of Mt Piper to Wellington (72) 330kV line, Feedback | 10 (0.83) | Thermal |
| N_NEWENSF1+2_110-INV | New England Solar inverter limit of 110. Constraint to violate if New England Solar inverter availability greater than 110. Swamp out otherwise. DS only | 10 (0.83) | System Strength |
| **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 | 8 (0.66) | Thermal |
| N_FINLEYSF_81INV | Finley Solar Farm inverter limit of 81. Constraint to violate if Finley Solar Farm inverter availability greater than 81. Swamp out otherwise. DS only | 6 (0.5) | System Strength |
| N>79_998_72 | Out= Wollar West to Wellington (79) 330kV line or Wollar 500/330kV TX or Wollar to Wollar West (75) 330kV line, avoid O/L on Cowra to Forbes North (998) on trip of Mt Piper to Wellington line (72), Feedback | 5 (0.41) | Thermal |

### 2.3.1 Reasons for constraint equation violations

**Table 4 Reasons for constraint equation violations**

| Constraint Equation ID (System Normal Bold) | Description |
|---|---|
| N>>79_944_72 | Constraint equation violated for 7 non-consecutive[2] DIs between 14/05/2024 1800 hrs and 15/05/2024 2155 hrs, 6 consecutive DIs between 21/05/2024 1740 hrs and 21/05/2024 1805 hrs, 54 consecutive DIs between 21/05/2024 1820 hrs and 21/05/2024 2245 hrs, 7 consecutive DIs between 22/05/2024 1715 hrs and 22/05/20241745 hrs and 27 non-consecutive DIs between 21/05/2024 2300 hrs and 31/05/2024 2130 hrs with a max violation degree of 32.87 MW on 21/05/2025 1955 hrs. Constraint equation violated due to post-contingency flows on the Wallerawang to Orange North 132 kV Line (944) exceeding its MVA limit. The network remained secure during these violating DIs as Transgrid had in place a post-contingency plan. |
| N>>79_94X_72 | Constraint equation violated for 9 non-consecutive DIs between 14/05/2024 1840 hrs and 15/05/2024 2150, 62 consecutive DIs between 21/05/2024 1745 hrs and 21/05/2024 2250 hrs and 18 non-consecutive DIs between 21/05/2024 2300 hrs and 31/05/2024 2145 hrs with a max violation degree of 55.71 MW on 21/05/2024 2020 hrs. Constraint equation violated due to post-contingency flows on the Wallerawang to Panorama 132 kV Line (94X) exceeding its MVA limit. The network remained secure during these violating DIs as Transgrid had in place a post-contingency plan. |
| N_MOREESF1_21INV | Constraint equation violated for 4 DIs between 07/05/2024 0735 hrs and 07/05/2024 0750 hrs and 16 consecutive DIs between 08/05/2024 0635 hrs and 08/05/2024 0750 hrs with a max violation degree of 0.001 MW. Constraint equation violated due to Moree Solar exceeding its inverter limit. |
| **F_T+LREG_0050** | Constraint equation violated for 17 non-consecutive DIs between 16/05/2024 0445 hrs and 31/05/2024 1510 hrs with a max violation degree of 50 MW on 16/05/2024 0445 hrs, 16/05/2024 0450 hrs and 31/05/2024 0200 hrs. Constraint equation violated due to Tasmania lower regulation service availability being less than the requirement. |
| **F_T+RREG_0050** | Constraint equation violated for 15 non-consecutive DIs between 01/05/2024 0135 hrs and 31/05/2024 1305 hrs with a max violation degree of 50 MW on 16/05/2024 0440 hrs and 16/05/2024 0445 hrs. Constraint equation violated due to the Tasmania raise regulation service availability being less than the requirement. |
| N>>79_949_72 | Constraint equation violated for 10 non-consecutive DIs between 23/05/2024 1740 hrs and 27/05/2024 1715 hrs with a max violation degree of 12.61 MW on 27/05/2024 1715 hrs. Constraint equation violated due to post-contingency flows on the Wallerawang to Panorama 132 kV Line (94X) exceeding its MVA limit. |
| N_NEWENSF1+2_110-INV | Constraint equation violated for 9 consecutive DIs between 09/05/2024 0945 hrs and 09/05/2024 1025 hrs and 1 DI on 16/05/2024 1425 hrs with a violation degree of 0.001 MW for all violated intervals. Constraint equation violated due to New England Solar Farm exceeding its inverter limit. |
| **N>NIL_9R5_9R6_N** | Constraint equation violated for 8 non-consecutive DIs between 20/05/2024 1720 hrs and 28/05/2024 0710 hrs with a max violation degree of 3.41 MW on 28/05/2025 0700 hrs. Constraint equation violated due to ramp rate limit of Uranquinty Units 1, 2, 3 and 4 for the DIs between 20/05/2024 1720 hrs and 28/05/2024 0700 hrs and due to non-conformance of Uranquinty Units 3 and 4 on 28/05/2024 0705 hrs and 28/05/2024 0710 hrs . |
| N_FINLEYSF_81INV | Constraint equation violated for 6 non-consecutive DIs between 06/05/2024 1700 hrs and 08/05/2024 1610 hrs with a max violation degree of 17.45 MW on 08/05/2024 1120 hrs. Constraint equation violated due to Finley Solar Farm exceeding its inverter limit. |
| N>79_998_72 | Constraint equation violated for 5 DIs between 16/05/2024 1805 hrs and 29/05/2024 1750 hrs with a max violation degree of 5.78 MW on 29/05/2024 1750 hrs. Constraint equation violated due to ramp rate limit of Uranquinty Units 2, 3 and 4. |

## 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.

[2] In Table 4, 'non-consecutive' means that no more than 5 of the DIs occurred in successive intervals.

Table 5 Top 10 binding interconnector limit setters

| Constraint Equation ID (System Normal Bold) | Interconnector | Description | #DIs (Hours) | Average Limit (Max) |
|---|---|---|---|---|
| F_Q++86_L6 | NSW1-QLD1 Import | Out = Armidale to Tamworth (86) line, Qld Lower 6 sec Requirement | 2112 (176.0) | -335.91 (-621.71) |
| F_Q++86_L6 | N-Q-MNSP1 Import | Out = Armidale to Tamworth (86) line, Qld Lower 6 sec Requirement | 1904 (158.67) | -33.4 (-159.74) |
| **F_MAIN++APD_TL_L5** | T-V-MNSP1 Import | Out = Nil, Lower 5 min Service Requirement for a Mainland Network Event-loss of APD potlines due to undervoltage following a fault on MOPS-HYTS-APD 500 kV line, Basslink able to transfer FCAS | 1521 (126.75) | -389.24 (-439.0) |
| N^^V_CTMN_1 | VIC1-NSW1 Import | Out = Collector - Marulan (4) or Collector - Yass (3L) or Marulan - Yass (5), avoid voltage collapse at Southern NSW for loss of the largest Vic generating unit or Basslink | 1448 (120.67) | -282.15 (-1103.45) |
| N^^V_CTMN_1 | V-S-MNSP1 Import | Out = Collector - Marulan (4) or Collector - Yass (3L) or Marulan - Yass (5), avoid voltage collapse at Southern NSW for loss of the largest Vic generating unit or Basslink | 1335 (111.25) | 85.27 (-146.91) |
| **F_MAIN++LREG_0210** | T-V-MNSP1 Import | Mainland Lower Regulation Requirement greater than 210 MW, Basslink able transfer FCAS | 871 (72.58) | -402.86 (-439.0) |
| **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 | 727 (60.58) | 52.06 (-151.66) |
| **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 | 718 (59.83) | -921.2 (-1202.0) |
| F_MAIN++BIP_ML_L1 | T-V-MNSP1 Import | Out = Nil, Lower 1 sec requirement for a Mainland Load Event, for loss of the largest Boyne Island potline, Basslink able transfer FCAS. Requirement capped at 200 MW | 515 (42.92) | -433.95 (-439.0) |
| **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 | 513 (42.75) | 156.02 (198.06) |

## 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

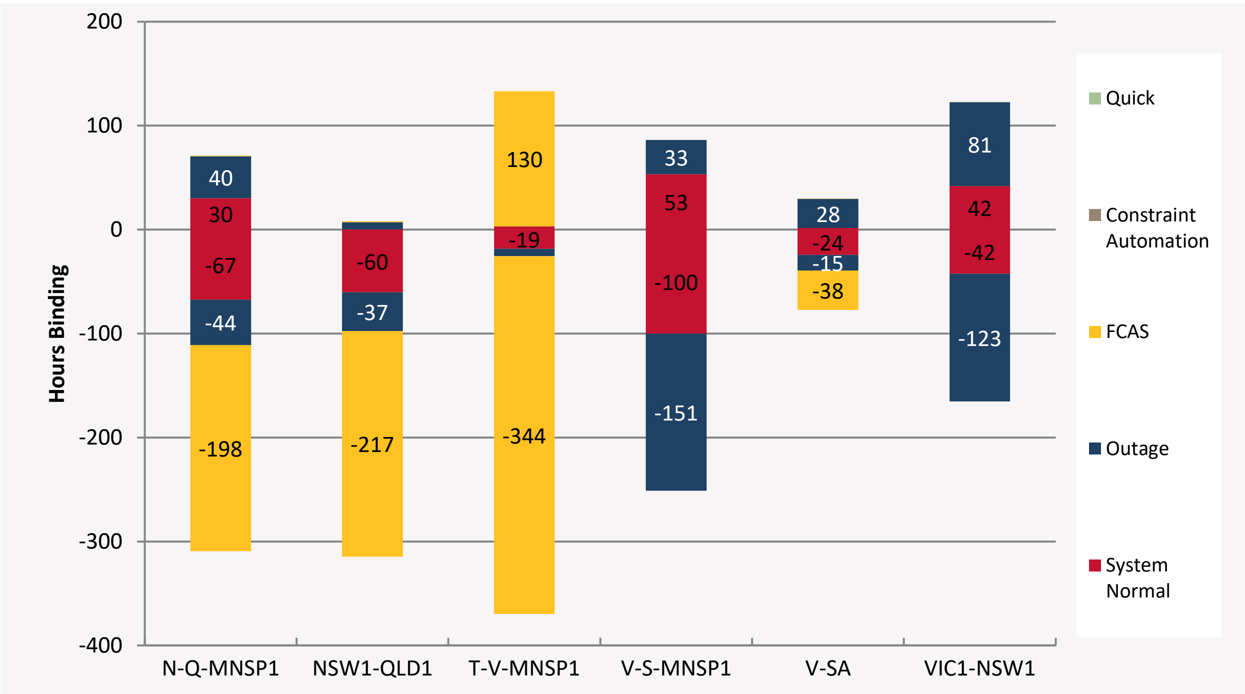
Non-real time constraint automation was not used.

## 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.

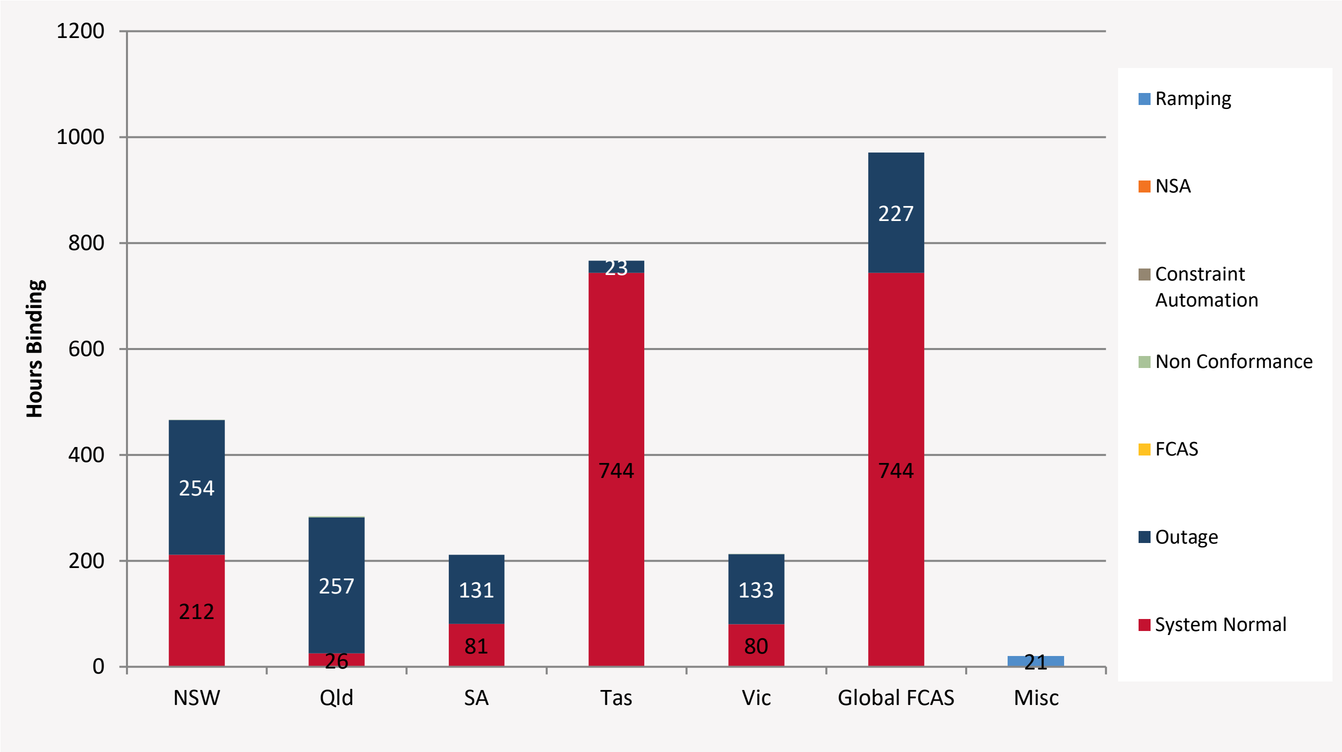
In the following graph the export binding hours are indicated as positive numbers and import with negative values.

**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.

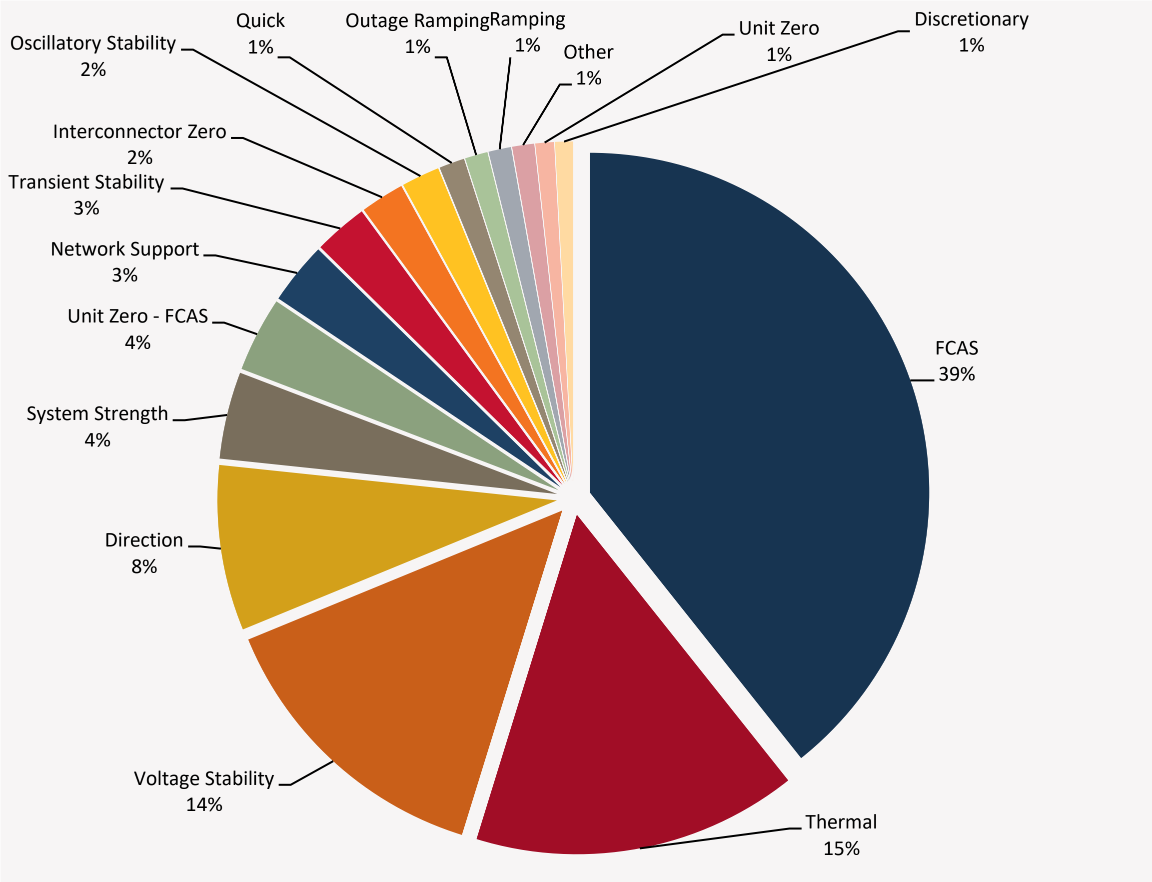
**Figure 2 Regional binding dispatch hours**



## 2.7 Binding Constraint Equations by Limit Type

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

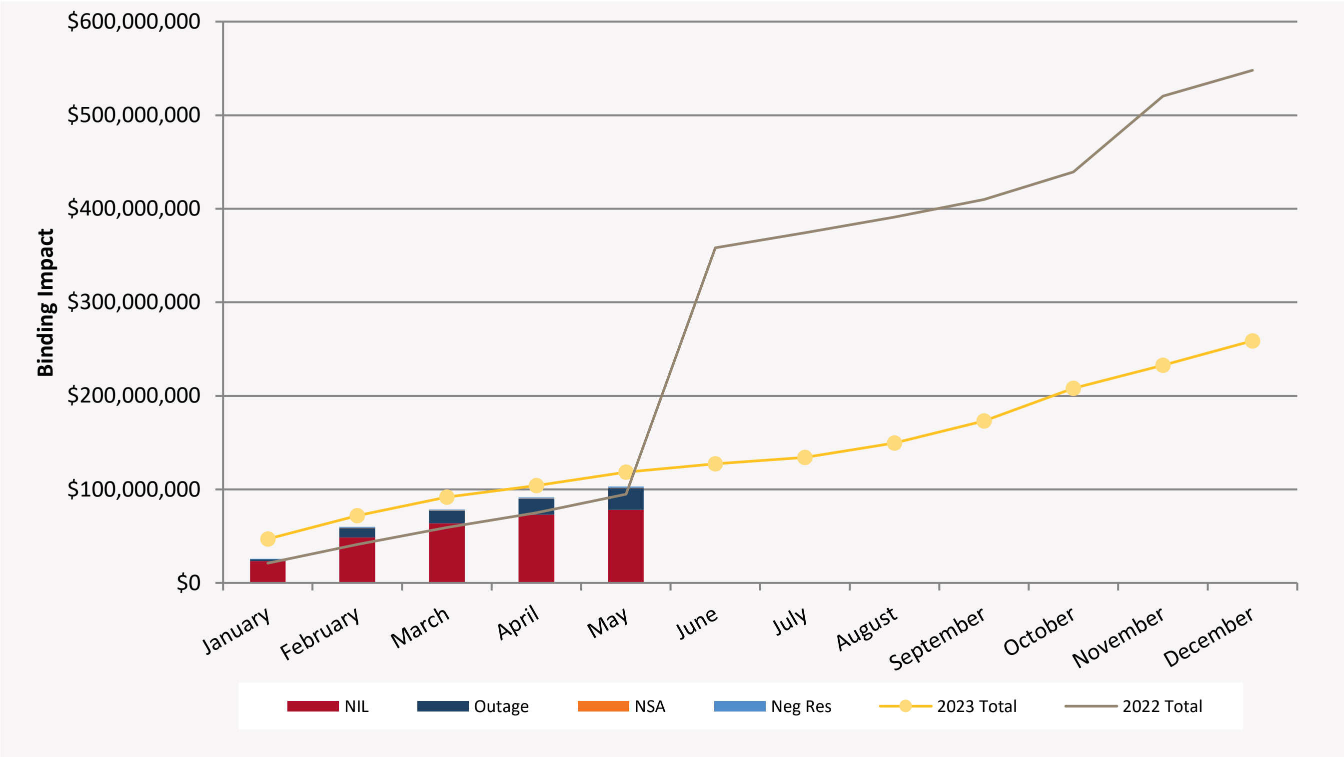
**Figure 3 Binding by limit type**



## 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 2.2) 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 0.

**Table 6 Top 10 largest Dispatch / Pre-dispatch differences**

| Constraint Equation ID (System Normal Bold) | Description | #DIs | % + Max Diff | % + Avg Diff |
|---|---|---|---|---|
| N_X_MBTE_3B | Out= all three Directlink cables, Terranora_I/C_import <= Terranora_Load | 18 | 700% (7.8) | 141.63% (3.8) |
| N>WLTX_998_WLTX | Out= one of the Wellington 132/330kV Transformers, avoid O/L Cowra to Forbes (998) 132kV line on trip of other Wellington 330/132kV TX, Feedback | 4 | 412% (101.36) | 268% (76.92) |
| N>79_998_72 | Out= Wollar West to Wellington (79) 330kV line or Wollar 500/330kV TX or Wollar to Wollar West (75) 330kV line, avoid O/L on Cowra to Forbes North (998) on trip of Mt Piper to Wellington line (72), Feedback | 39 | 257% (98.03) | 66.95% (55.18) |
| N>N_LSDU_9U6_1 | Out= one of Lismore 132 to Dunoon 132kV line (9U6 or 9U7), avoid O/L the remaining 132kV line, NSW to Qld limit | 139 | 250% (75.12) | 82.98% (39.79) |
| N_X_MBTE_3A | Out= all three Directlink cables, Terranora_I/C_import <= Terranora_Load | 3 | 233% (7.) | 82.1% (3.3) |
| **V::N_NIL_O2** | Out = NIL, prevent transient instability for fault and trip of a HWTS-SMTS 500 kV line, Other than VIC accelerates. Yallourn W G1 on 500kV. | 5 | 178% (161.69) | 82.76% (82.59) |
| N^^V_CTMN_1 | Out = Collector - Marulan (4) or Collector - Yass (3L) or Marulan - Yass (5), avoid voltage collapse at Southern NSW for loss of the largest Vic generating unit or Basslink | 303 | 169% (446.38) | 27.29% (104.08) |
| **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. | 193 | 102.83% (255.23) | 57.04% (171.67) |
| **V::N_NIL_O1** | Out = NIL, prevent transient instability for fault and trip of a HWTS-SMTS 500 kV line, Other than VIC accelerates. Yallourn W G1 on 220kV. | 10 | 89.33% (152.28) | 36.36% (63.2) |

### 2.9.1 Further Investigation

The following constraint equation(s) have been investigated:

**N>WLTX_998_WLTX:** Investigated and no improvement can be made to the constraint equation at this stage.

**N>79_998_72:** Investigated and no improvement can be made to the constraint equation at this stage.

**N>N_LSDU_9U6_1:** Under investigation and will be improved if possible.

**N^^V_CTMN_1:** Investigated and no improvement can be made to the constraint equation at this stage.

**T::T_NIL_1:** Investigated and no improvement can be made to the constraint equation at this stage.

**NRM_NSW1_VIC1:** Investigated and no improvement can be made to the constraint equation at this stage.

**N^^N_NIL_X5_BEKG:** Investigated and no improvement can be made to the constraint equation at this stage.

**S>LFTI_PPPW_LFTX4:** Investigated and no improvement can be made to the constraint equation at this stage.

**N>>NIL_33_34:** Investigated and no improvement can be made to the constraint equation at this stage.

**N>NIL_99U:** Under investigation and will be improved if possible.

**Q_STR_7C0K_MEWF_8:** Investigated and no improvement can be made to the constraint equation at this stage.

**V::S_MOTB_MAXG_2:** Investigated and no improvement can be made to the constraint equation at this stage.

**N>NIL_94T:** Under investigation and will be improved if possible.

**N>NIL_901:** Investigated and no improvement can be made to the constraint equation at this stage.

**N>NIL_969:** Investigated and no improvement can be made to the constraint equation at this stage.

**N>>LDTM_964_81_OPEN:** Investigated and no improvement can be made to the constraint equation at this stage.

**N>>NIL_964_84_S:** 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 May 2024.

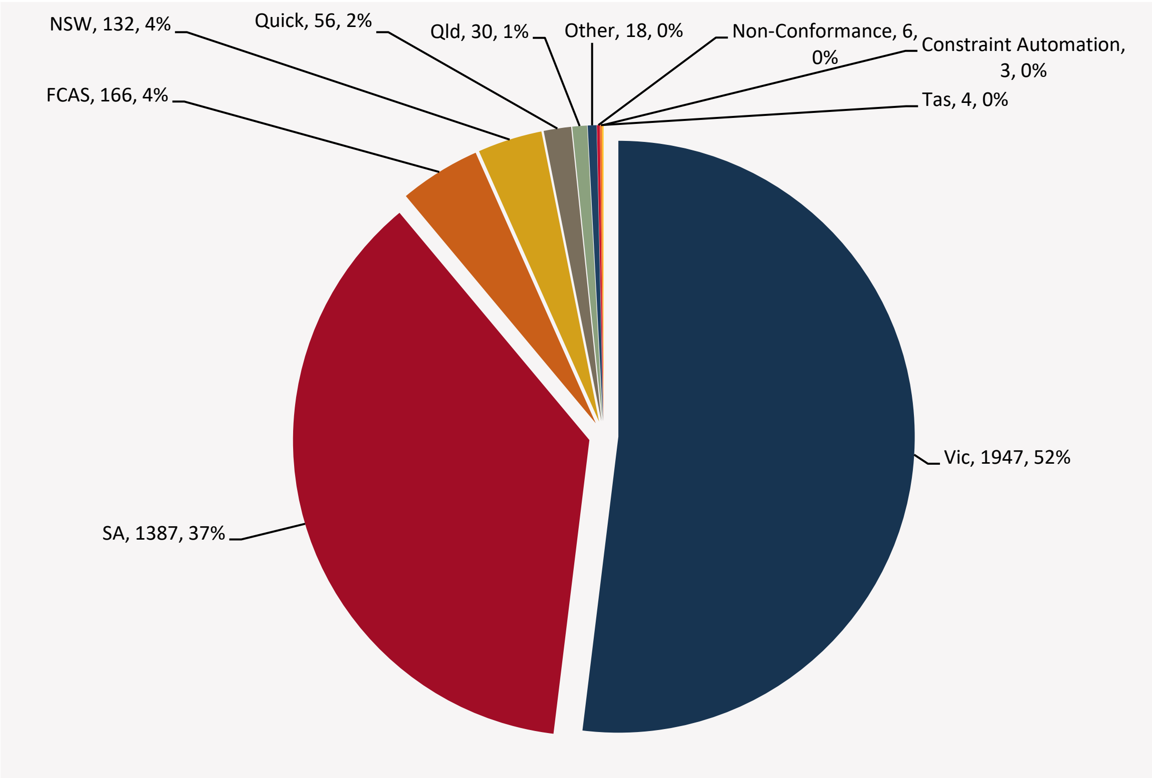
**Table 7 Generator and transmission changes**

| Project | Date | Region | Notes |
|---|---|---|---|
| H13 Ross - H93 Guybal Munjan No. 8917 275 kV line | 2 May 2024 | QLD | Line Commissioned |
| Guybal Munjan 275 kV Switching Station | 15 May 2024 | QLD | Network Augmentation Commissioned<br><br>The former Ross - Chalumbin No. 857 and Ross - Chalumbin No. 858 275 kV Lines have been replaced with the following lines:<br>• H13 Ross - H93 Guybal Munjan No. 8916 275 kV line.<br>• H13 Ross - H93 Guybal Munjan No. 8917 275 kV line.<br>• H93 Guybal Munjan - H32 Chalumbin No. 857 275 kV line.<br>• H93 Guybal Munjan - H32 Chalumbin No. 858 275 kV line. |
| Crookwell 3 Wind Farm | 21 May 2024 | NSW | New Generator |
| Wellington North Solar Farm (330 Mw) | 21 May 2024 | NSW | New Generator |
| Hawkesdale Wind Farm | 31 May 2024 | Victoria | New Generator |

## 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[3] or the constraint equations in the MMS Data Model[4].

**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.

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

[4] 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**