CONSTRAINT NAMING GUIDELINES

PREPARED BY: Systems Capability

DOCUMENT REF: SC_CM_04

VERSION: 8

DATE: 3 May 2013

FINAL

This document is current to version 55 of the National Electricity Rules

Approved for distribution and use

Mark Stedwell
Group Manager, Systems Capability

Date 3 / 5 / 2013

Version Release History

VERSION	DATE	AUTHOR	PEER REVIEW	APPROVED	COMMENTS
8	3 May 2013	Ben Blake	Edmund Hon, Andrew Groom, Terry Liu	Mark Stedwell	Full document review, converted to new AEMO template, corrections to a number of examples, updated substation abbreviations, updated URLs for new AEMO website, added Negative Residue Management and Constraint Automation Stage 3
7	6 July 2010	Ben Blake			Added AEMO disclaimer, minor fixes, update to abbreviations list, replace Generic Equation with new name Constraint Function, Outage Identifier section updated for clarity
6	30 December 2009	Ben Blake			AEMO rebranding, document review, minor corrections, change to orphaned generator IDs, updated abbreviations, minor rearrangement to section 9, updated definitions and references
5	6 April 2009	Ben Blake			Updated list of abbreviations
4	17 September 2008	Ben Blake			Removed CHIMERA
3	30 June 2008	Ben Blake			Modified for Snowy abolition, updated abbreviations, added constraint automation
2	6 July 2007	Ben Blake			Updated Abbreviations, added clarification to 6.3 on Multiple outages
1	5 March 2007	Ben Blake & Michael Lyons			Converted original Naming Guidelines to SOPP Constraint Guide, overall revision to guide, added Tasmania to Quick reference, added NSA constraints

This document has been created by the Systems Capability Division and will be reviewed from time to time.

Disclaimer

a) Purpose – This Guide has been produced by the Australian Energy Market Operator Limited (*AEMO*) to provide information about implementing constraint equations, as at the date of publication.

b) No substitute – This Guide is not a substitute for, and should not be read in lieu of, the National Electricity Law (NEL), the National Electricity Rules (NER) or any other relevant laws, codes, rules, procedures or policies. Further, the contents of this Guide do not constitute legal or business advice and should not be relied on as a substitute for obtaining detailed advice about the NEL, the NER, or any other relevant laws, codes, rules, procedures or policies, or any aspect of the national electricity market or the electricity industry.

c) No Warranty – While *AEMO* has used due care and skill in the production of this Guide, neither *AEMO*, nor any of its employees, agents and consultants make any representation or warranty as to the accuracy, reliability, completeness or suitability for particular purposes of the information in this Guide.

d) Limitation of liability - To the extent permitted by law, *AEMO* and its advisers, consultants and other contributors to this Guide (or their respective associated companies, businesses, partners, directors, officers or employees) shall not be liable for any errors, omissions, defects or misrepresentations in the information contained in this Guide, or for any loss or damage suffered by persons who use or rely on such information (including by reason of negligence, negligent misstatement or otherwise). If any law prohibits the exclusion of such liability, *AEMO*'s liability is limited, at *AEMO*'s option, to the re-supply of the information, provided that this limitation is permitted by law and is fair and reasonable.

Contents

GLOSSARY

(a) In this document, a word or phrase *in this style* has the same meaning as given to that term in the NER.

(b) In this document, capitalised words or phrases or acronyms have the meaning set out opposite those words, phrases, or acronyms in the table below.

(c) Unless the context otherwise requires, this document will be interpreted in accordance with Schedule 2 of the *National Electricity Law*.

TERM	MEANING
Constraint Equation	The mathematical representation that *AEMO* uses to manage power system limitations and FCAS requirements in NEMDE.
FCAS	Frequency Control Ancillary Service
LHS	Left Hand Side of a constraint equation. This consists of the variables that can be optimised by NEMDE. These terms include *Scheduled Generators*, *Semi-Scheduled Generators*, *scheduled loads*, regulated Interconnectors, *Market Network Service Providers* (MNSPs) or regional FCAS requirements.
Mainland	The NEM regions: Queensland, New South Wales, Victoria and South Australia
NEMDE	National Electricity Market Dispatch Engine
RHS	Right Hand Side of a constraint equation. The RHS is pre-calculated and presented to the solver as a constant; these terms cannot be optimised by NEMDE.
SCADA	Supervisory Control And Data Acquisition. Information such as line flows and generator outputs are delivered via SCADA.
System Normal	The configuration of the power system where: • All transmission elements are in service; or • The network is operating in its normal network configuration.

1 Introduction

a) This document provides an explanation/background as to how *AEMO* labels the constraint equations, constraint sets and constraint functions.
b) This document may be amended from time to time.
c) If there is any inconsistency between this document and the NER, the NER will prevail to the extent of that inconsistency.

2 Purpose

The purpose of this Guide is to provide both *AEMO* and *market participants* with guidelines on how constraint equations, constraint sets and constraint functions are labelled in *AEMO*'s market systems.The naming guidelines were originally developed in late 2001 to provide a unified standard across the constraint sets and constraint equations in the NEM. In some cases the naming guidelines do not produce the best result in terms of conveying information on what the constraint set or equation should be used for. As such, there remains some discretion with the constraint builder.

Constraint equations are created for power system limits (covering either system normal or plant outage conditions), discretionary, ramping, rate of change, non-conformance, network support agreements, negative residue management and FCAS.

Constraint equations that apply under the same set of system conditions – either system normal or plant outage conditions - may be grouped into constraint sets. These constraint sets can be quickly and efficiently invoked rather than having to go through the laborious task of invoking the constraint equations separately. Constraint sets may also be developed for special cases such as the ramping of interconnector flows at prescribed rates, or discretionary constraint sets for specific system conditions.

3 Related Policies and Procedures

- Constraint Formulation Guidelines: http://www.aemo.com.au/Electricity/Market-Operations/Congestion-Information-Resource/Constraint-Formulation-Guidelines
- Constraint Implementation Guidelines: http://www.aemo.com.au/Electricity/Market-Operations/Congestion-Information-Resource/Constraint-Implementation-Guidelines
- Congestion Information Resource: http://www.aemo.com.au/Electricity/Market-Operations/Congestion-Information-Resource

4 General Principles

Constraint Set, Constraint Equation and Constraint Function names can be up to 20 characters (prior to April 2003 it was limited to 10). The underscore "_" character is used, where possible, to separate each part of the constraint name to improve readability.

4.1 Forbidden and Reserved Characters

The following characters are forbidden and must not appear in any constraint set, constraint equation or constraint function ID.

CHARACTER	DESCRIPTION
‘	Single quote
“	Double quote
&	Ampersand

CHARACTER	DESCRIPTION
%	Percentage
	Space (single or multiple)

The following characters are reserved for use as the first character of quick, bid and other AEMO control room built constraint sets and/or equations;

CHARACTER	DESCRIPTION
#	Quick constraints
$	Bid constraints - these are automatically created when a generating unit submits a fixed bid.
@	All other constraints prepared by AEMO control room
~	Mandatory Restrictions constraint – these are automatically generated based on a Mandatory Restrictions bid.

4.2 Regional and Special Condition Identifiers

Regions are identified through the use of a single character identifier (or Region ID):

CHARACTER	DESCRIPTION
Q	Queensland
N	New South Wales
V	Victoria
S	South Australia
T	Tasmania
I	Interconnector

“I” is only used if the network condition involves the elements that cross the region boundary (e.g. the Dumaresq – Bulli Creek 330 kV lines). All other plant is treated as being inside the region and should use one of the region identifiers.

For special conditions the following characters are used:

CHARACTER	DESCRIPTION
CA	Constraint Automation
F	FCAS constraints
NC	Non-conformance constraints
NSA	Network Support Agreement constraints

4.3 Outage Identifier

The Outage Identifier is used in the constraint name to identify the particular system condition the constraint set or equation is used for.

NIL is used for no transmission outages, i.e. System Normal condition. There may be variations of System Normal that require an extra unique identifier such as radial or parallel mode in Victoria, or Queensland intra-regional limits, or different line ratings used.

For transmission lines the “Outage Identifier” is created by combining the 2 or 3 character substation ID (see 8.4, 8.5, 8.6, 8.7, 8.8) from the substations at each end of the line. The order of the substations should be alphabetical, but in some cases it is better to reflect the physical nature of the plant (say to indicate a Tee point).

For other types of equipment the substation ID is combined with the 2-character equipment types (see 8.1).

If it is impractical to try to identify multiple outage items the letter “X” and a unique identifier should be used to identify multiple outage constraint equations. The unique identifier should be numerical rather than alphabetical.

Examples

ID	DESCRIPTION
BUDP	Buronga - Darlington Pt 220 kV line
SMTXF2	South Morang 500/330 kV F2 transformer
X_DDMB	both Dederang - Mt Beauty 220 kV lines

5 Constraint Sets

Constraint Sets are a group of constraint equations required for a particular network condition. As such the Constraint set name will not identify the cause of the constraint (thermal overload, transient or voltage stability). The second character of the Constraint set name is used as a separator and is normally a dash “-“ (preferred), however, some older constraint sets use an underscore “_”. A plus”+” character is currently used for Victorian constraints based on 5 minute ratings.

The first character identifies the region where the network condition is located.

5.1 System Normal

Region ID / “-NIL_” / unique identifier

System Normal constraint sets are for no transmission outages in a region. There may be variations of the System Normal conditions for each region so an extra unique identifier may be required such as radial or parallel mode in Victoria, or Queensland intra-regional limits.

Examples

ID	DESCRIPTION
S-NIL	South Australia region: System Normal
V-NIL_RADIAL	Victoria region: 15 minute line ratings (Latrobe Valley buses configured to Radial mode)
V+NIL_PAR_3-5	Victoria region: 5 minute line ratings (Latrobe Valley buses configured to Parallel 3-5 mode)
N-NIL	NSW region: System Normal
Q-NIL_TR	Queensland region: Tarong limit constraints
T-NIL_BL	Tasmania region: System Normal with Basslink in service

5.2 Single plant outage

Region ID / “-“ / Outage Identifier / “_” / unique identifier

If a single element of plant results in several other items of plant also being out-of-service (such as a bus outage) then this is classed as a single plant outage.

The Outage Identifier (see 4.3) for plant outage constraint sets can also include the line number or the voltage level. This is either for clarity or there are multiple parallel lines at different voltages.

Examples

ID	DESCRIPTION
I-HYSE_R	Outage of one Heywood to South East 275 kV line (Latrobe Valley buses configured to Radial mode)
I-BCDM_ONE	Outage of one Bulli Creek – Dumaresq (8L or 8M) 330 kV line
N-BWSW_32	Outage of Bayswater - Sydney West (32) 330 kV line in the NSW region
S-PA_EAST_BUS	Outage of Para 275 kV "East" bus in SA region
S-BNMT	Outage of the Blanche – Mt Gambier 132 kV line in the SA region
Q-BR_VC	Outage of Braemar SVC in the Queensland region
V-SMTXF2_R	Outage of the South Morang 500/330 kV F2 transformer in the Victoria region (Latrobe Valley buses configured to Radial mode)
T-HAPM_110	Outage of one Hadspen – Palmerston 110 kV line in the Tasmania region

5.3 Multiple Plant outage

Region ID / "-X_" / Outage Identifier(s) / "_" / unique identifier

Multiple plant outage constraint sets are for combinations of outages that require special constraints for that combination. For example, multiple outages can consist of lines sharing the same towers, parallel cables (such as the Directlink cables), multiple lines in different easements, or lines and other plant such as capacitor banks or transformers. Ideally the outage identifier (see 4.3) for multiple plant outages should include details of each item of plant. However, this might be impractical for some outages. In these cases the outage identifier for transmission lines can be replaced with the line numbers or a unique identifier (preferably numerical) can be used.

Examples

ID	DESCRIPTION
V-X_DDMB_P	Outage of both Dederang – Mt Beauty lines in Victoria region (Latrobe Valley buses configured in Parallel mode)
I-X_JNWO_BURC	Outage of Jindera – Wodonga (060) 330 kV and Buronga – Red Cliffs 220 kV lines
N-X_84_85	Outage of Liddell – Tamworth (84) and Armidale – Tamworth (85) 330 kV lines in NSW region
S-X_DVRB_CGRB	Outage of Davenport – Robertstown and Cherry Gardens – Robertstown 275 kV lines in SA region
N-X_MBTE_3	Outage of all 3 Directlink cables

5.4 Discretionary

Interconnector:

"I-" / From Region to Region / "_" / Limit MW

Intra-Regional / Generator(s):

Region ID / "-" / Generator(s) or Cut-set / "_" / Limit MW

1 – When there are 2 Interconnectors between regions these need to be uniquely identified. In general the DC interconnector is identified explicitly (see 8.3). For all Interconnectors between regions an "S" is used.

2 – "ZERO" should be used when the flow is equal to zero instead a number. For a limit of zero in one direction the number should be used.

3 – If the constraint is a greater than or equal to type the last characters are "MN"

Discretionary constraint sets are used to limit an interconnector or generation to less than or equal to, equal to, or greater than or equal to a fixed value. These sets are invoked at the discretion of operating staff and are not necessarily associated with any specific outage or system condition.

Examples

ID	DESCRIPTION
I-VS_200	Vic to SA limited to 200 MW
I-NQTE_100	NSW to Queensland flow on Terranora is limited to 100 MW
I-QN_ZERO	Queensland to NSW flow on QNI is equal to zero
I-NQS_500	NSW to Queensland flow on QNI plus Terranora is limited to 500 MW
I-VS_050MN	Vic to SA flow must be greater than or equal to 50 MW
Q-RS_500	Flow across the Ross cut-set in Queensland limited to 500 MW
V-LY_2500	Generation at Loy Yang A plus Loy Yang B plus Loy Yang Gas limited to 2500 MW

5.5 Ramping

Region ID / "-" / Outage Identifier(s) / "_" / unique identifier / "_RAMP"

1 – If there is not enough space "RD" (for Ramp Down) or "RU" (Ramp Up) can be used

Constraints for prior outage ramp down should match the outage constraint set and are suffixed with "_RAMP".

Examples

ID	DESCRIPTION
T-FASH_1_A_RAMP	Ramp down generation prior to an outage of a Farrell to Sheffield No.1 220 kV line in Tasmania region
T-RC1_TI_300_RD	Ramp down Reece 1 and Tribute generation to 300 MW in Tasmania region

5.6 Rate of Change

"I-" / From Region to Region1 / "_ROC"

1 – see 5.4 for guidelines on identifying Interconnectors

Examples

ID	DESCRIPTION
I-TV_ROC	Tasmania to Victoria on Basslink rate of change limited to 200 MW / DI
I-NQTE_ROC	NSW to Queensland on Terranora, rate of change limited to 80 MW / DI

5.7 Post – Separation Island

Islanded Region(s) / "_ISLE"

The "Islanded Region(s)" Identifier should indicate what has been separated, including generators that are disconnected from their parent region but continue to supply into the adjacent region. If there are several break points with no generation then use one of the major substations to uniquely identify the constraint set.

Examples

ID	DESCRIPTION
QLD_STHN_ISLE	Queensland and Southern regions separation - between Armidale and Bulli Creek
QLD_STHN_MI_ISLE	Queensland and Southern regions separation - between Bulli Creek and Tarong, Millmerran connected to the Southern regions
QLD_AR_STHN_ISLE	Queensland and Southern regions separation - between Armidale and Muswellbrook, Armidale and/or Tamworth connected to the Queensland region
SA_ESTN_ISLE	South Australia / Eastern regions separation between Heywood and South East

5.8 FCAS

FCAS constraint sets follow the same guidelines as for network constraint sets except that:

- All FCAS constraint sets are prefixed with "F-"
- "I" is used to represent a requirement for all regions (global requirement)
- There are specific abbreviations for FCAS constraints covering event types, services and region combinations (see 8.2).

System Normal using dynamically calculated constraints:

"F-" / Region(s) / "_NIL_" / Event Type

Discretionary FCAS:

"F-" / Region(s) / "_" / Event Type / "_" / Requirement MW

Examples

ID	DESCRIPTION
F-I-BCDM_ONE	Outage of one Bulli Creek – Dumaresq 330 kV line, FCAS requirements
F-N-LDMU_83	Outage of Liddell – Muswellbrook (83) 330 kV line, FCAS requirements
F-I_NIL	Global FCAS for System Normal operation
F-ESTN_LREG_0150	Lower Regulation requirement for the Eastern regions of 150 MW
F-VS_TL_0600	FCAS requirements for Victoria and South Australia for a load loss of 600 MW

5.9 Non-Conformance

"NC-" / Region / "_" / DUID

Examples

ID	DESCRIPTION
NC-N_BW01	Non Conformance Constraint for Bayswater Unit 1
NC-T_TARRALEA	Non Conformance Constraint for Tarraleah
NC-Q_MPP_1	Non Conformance Constraint for Millmerran Unit 1

5.10 Network Support Agreements

"NSA-" / Region ID / "_" / DUID or ID for the station / "_" / MW Value

Examples

ID	DESCRIPTION
NSA-V_BDL01_40	Network Support Agreement constraint for Bairnsdale Unit 1 for 40 MW
NSA-V_BDL_40	Network Support Agreement constraint for all Bairnsdale units for 40 MW
NSA-Q_GSTONE34_200	Network Support Agreement constraint for Gladstone units 3 & 4 for 200 MW

5.11 Multiple Contingencies / Credible Contingency declared

For conditions where the loss of two or more plant elements have been declared a credible contingency (e.g. due to a bushfire under a dual circuit line, proximity of lightning or a bus is at risk due to the proximity of construction work) the constraint set should use the same naming guidelines as the existing constraint sets, suffixed with "**_N-2**". If there are several sets that are distinguished by different plant ratings (e.g. 30 min and 15 min ratings) a further suffix should be added to indicate this.

Examples

ID	DESCRIPTION
I-HYSE_N-2	Loss of both Heywood to South East 275 kV lines reclassified as a credible contingency
N-LDNC_LDTM_N-2_15M	Loss of 81 and 82 330 kV lines in NSW declared credible, 15 min ratings used
F-T-FASH_N-2	FCAS requirements for loss of both Farrell to Sheffield 220 kV lines declared a credible contingency in Tasmania region

5.12 Constraint Automation

5.12.1 Real-Time / Closed-Loop

The constraint set used for the constraint automation run in real time is:

"CA_AUTO"

5.12.2 Study / Offline

Constraint Automation constraint sets created from an EMS study case are prefixed with CA followed by a unique ID. The unique ID is generated by the Constraint Automation application and is also used for the constraint equations in the constraint set.

"CA_" / UniqueID

Examples

CA_BPS_373D7DA1

CA_BPS_374BECD7

6 Constraint Equations

Each Constraint Equation name needs to identify:

- the regional location or the main interconnector effected by the limit
- the cause of the limit

- whether it is fully co-optimised or not

The cause of the constraint (the “Cause ID”) is represented by the following characters:

CAUSE ID	DESCRIPTION
>	Thermal overload of a network element
:	Transient or oscillatory stability limit (the one that applies is specified in the descriptive text provided with the constraint equation)
^	Voltage stability limit
+	Frequency control requirement
_	An underscore should be used if the cause does not fit one of the above identifiers. For example if the constraint equation is restricting generator output to 0 MW.

A double Cause Identifier is used to indicate a constraint is fully co-optimised (i.e. it contains both Interconnectors and Generators on the LHS).

6.1 System Normal

Region ID / Cause ID(s) / Region ID / “_NIL_” / unique identifier

Region ID / Cause ID(s) / Cut-set ID / “_NIL_” / unique identifier

From Region ID / Cause ID(s) / To Region ID / “_NIL_” / unique identifier

1 - 2nd Region ID is optional

2 - see 5.4 for guidelines on identifying Interconnectors

Similar to Constraint Sets, there may be variations of the System Normal conditions for each region so an extra unique identifier may be required for Constraint Equations such as radial or parallel mode in Victoria, or Queensland intra-regional limits or different line ratings.

In general, Constraint Equations are one of the first 2 types above. The 3rd type, where the interconnector is included in the name, is only used where the constraint is for a limit that directly affects the Interconnector. Examples of this include: overloads on plant that makes up the Interconnector, stability limit (Voltage or transient) between regions.

Examples

ID	DESCRIPTION
N>>N_NIL_A_15M	Overload limit on Canberra – Lower Tumut (07) 330 kV line using a 15 minute rating
N^^V_NIL_1	NSW to Vic voltage stability limit for loss of the largest generator in Victoria region
N::V_NIL	NSW to Vic system normal transient stability limit
N>>N-NIL_28	Overload limit for Marulan – Dapto (8) 330 kV line
Q^NIL_GC	Gold Coast system normal voltage stability limit

6.2 Single Plant outage

Region ID / Cause ID(s) / Region ID / “_” / Outage Identifier / “_” / unique identifier

Region ID / Cause ID(s) / Cut-set ID / “_” / Outage Identifier / “_” / unique identifier

From Region ID / Cause ID(s) / To Region ID / “_” / Outage Identifier / “_” / unique identifier

1 - 2nd Region ID is optional

2 - see 5.4 for guidelines on identifying Interconnectors

Single plant outage constraint equations follow the same guidelines as for system normal except the NIL is replaced by an Outage Identifier (see 4.3). This Outage Identifier should match the one used in the Constraint Set for the outage (see 5.2).

Examples

ID	DESCRIPTION
V>SML_VFRB_7	Overload limit on Ararat - Ballarat North 66 kV line for an outage of the Murraylink Very Fast Runback scheme
Q:N_ARDM_A	Transient stability limit for trip of a Boyne Island potline or a Hunter Valley fault for an outage of one Armidale – Dumaresq (8C or 8E) 330 kV line
N>>N-BWSW_C	Avoid overloading Mt Piper to Wallerawang (71) 330 kV line for a trip of Mt Piper to Wallerawang (70) 330 kV line for an outage of Bayswater to Sydney West (32) 330 kV line in the NSW region
V::S_BNMT	Transient stability limit for trip of Northern PS for an outage of the Blanche – Mt Gambier 132 kV line in the SA region
N^^V_SMTXF2	Voltage stability limit for loss of the largest generator in the Victoria region for outage of the South Morang 500/330 kV F2 transformer in the Victoria region
T>>T_HAPM_110_2A	Overload limit on Sheffield – Palmerston 220 kV line for an outage of one Hadspen – Palmerston 110 kV line in the Tasmania region

6.3 Multiple Plant outage

Region ID / Cause ID(s) / Region ID / "_X_" / Outage Identifier(s) / "_" / unique identifier

Region ID / Cause ID(s) / Cut-set ID / "_X_" / Outage Identifier(s) / "_" / unique identifier

From Region ID / Cause ID(s) / To Region ID / "_X_" / Outage Identifier(s) / "_" / unique identifier

1 - 2nd Region ID is optional

2 - see 5.4 for guidelines on identifying Interconnectors

Multiple plant outage constraint names are similar to those for single plant outages except they use a '_X' after the Region, Cause and Cut-set IDs. In general to allow more space for the outage identifiers the 2nd Region ID is omitted. The Outage Identifier should match the one used in the Constraint Set for the outage (see 5.3).

Examples

ID	DESCRIPTION
V::N_X_DDMBQA_R	Transient stability limit for trip of a Hazelwood – South Morang 500 kV line for outage of both Dederang – Mt Beauty lines in Victoria region (Latrobe Valley buses configured in Radial mode)
N>>N-X_DTMN_WWSS_01	Avoid overloading Marulan to Yass (4) 330 kV line on trip of Marulan to Yass (5) 330 kV line for and outage of the Dapto to Marulan (8) and Sydney South to Wallerawang (76) 330 kV lines
Q:N_X_84_85_1	Transient stability limit for trip of a Boyne Island potline for an outage of Liddell – Tamworth (84) and Armidale – Tamworth (85) 330 kV lines in NSW region
S>X_DVRB_CGRB_BRDV	Overload limit for Davenport – Brinkworth 275 kV line for an outage of Davenport – Robertstown and Cherry Gardens – Robertstown 275 kV lines in SA region

6.4 Discretionary

Interconnector:

From Region to Region1 / "_" / Limit MW

Intra-Regional / Generator(s):

Region ID / "_" / Generator(s) or Cut-set / "_" / Limit MW

1 – see 5.4 for guidelines on identifying Interconnectors

2 – "ZERO" should be used when the flow is equal to zero instead a number. For a limit of zero in one direction the number should be used.

3 – If the constraint is a greater than or equal to type the last characters are "MIN"

Examples

ID	DESCRIPTION
VS_200	Vic to SA limited to 200 MW
NQTE_100	NSW to Queensland flow on Terranora is limited to 100 MW
QN_ZERO	Queensland to NSW flow on QNI is equal to zero
NQS_500	NSW to Queensland flow on QNI plus Terranora is limited to 500 MW
VS_050_MIN	Vic to SA flow must be greater than or equal to 50 MW
Q_RS_500	Flow across Ross cut-set in Queensland limited to 500 MW

6.5 Ramping

Region ID / "_" / Outage Identifier(s) / "_" / unique identifier / "_RAMP"

1 – If there is not enough space "RD" (for Ramp Down) or "RU" (Ramp Up) can be used

The outage identifier for the ramping constraint equations should be the same as for the prior outage equations.

Examples

ID	DESCRIPTION
T_FASH_1A_WC_RAMP	Ramp down west coast generation prior to an outage of a Farrell to Sheffield No.1 220 kV line in Tasmania region
T_RC1_TI_300_RD	Ramp down Reece 1 and Tribute generation to 300 MW in Tasmania region

6.6 Rate of Change

From Region to Region1 / "_ROC"

1 – see 5.4 for guidelines on identifying Interconnectors

Examples

ID	DESCRIPTION
TV_ROC	Tasmania to Victoria on Basslink rate of change limited to 200 MW / DI
NQTE_ROC	NSW to Queensland on Terranora, rate of change limited to 80 MW / DI

6.7 Post – Separation Island

Islanded Region(s) / "_ISLE"

The "Islanded Region(s)" Identifier should match that used for the Constraint Set (see 5.7).

Examples

ID	DESCRIPTION
QLD_STHN_ISLE_A	Queensland and Southern regions separation - between Armidale and Bulli Creek, equation A in a series of equations
QLD_AR_STHN_ISLE_C	Queensland and Southern regions separation - between Armidale and Muswellbrook, Armidale and/or Tamworth connected to the Queensland region, equation C in a series of equations
SA_ESTN_ISLE_B	South Australia / Eastern regions separation between Heywood and South East, equation B in a series of equations

6.8 FCAS

FCAS constraint equations follow the same guidelines as for network constraint equations except that:

- All FCAS constraint equations are prefixed with "F_"
- "I" is used to represent a requirement for all regions (global requirement)
- There are specific abbreviations for FCAS constraints covering event types, services and region combinations (see 8.2).

Dynamically calculated FCAS:

"F_" / Region(s) / "+" / Outage ID / "_" / Event Type

"F_" / Region(s) / "++" / Outage ID / "_" / Event Type

Discretionary FCAS:

"F_" / Region(s) / "+" / Outage ID / "_" / Event Type / "_" / Requirement MW

"F_" / Region(s) / "++"/ Outage ID / "_" / Event Type / "_" / Requirement MW

Orphaned Generator:

"F_" / Region ID / "+" / Unit ID or Outage ID / "_" / Event Type

There are several types of FCAS constraint equations. The first type is for a global or local requirement such as regulation, largest generator loss or largest load loss. The size of the event for these requirements can be either based on a static value (such as regulation) or a dynamically calculated value. The second type is for loss of the Interconnector (known as 'interconnector risk' constraints) and these include the interconnector on the LHS. In the case of Basslink both these types can be co-optimised with Basslink flow to allow FCAS transfers between Tasmania and the mainland. The last type is for a generator set to provide no FCAS as it will be removed from its parent region with the loss of the interconnector.

FCAS constraint equations are only classed as fully co-optimised (indicated by the double cause identifier '++') if all the required Interconnectors are on the LHS. This is important as separate constraint equations are required for Basslink able and unable to transfer FCAS. For these pair of constraints the one with Basslink on the LHS is classed as fully co-optimised. In cases where Tasmania does not contribute to the FCAS the constraint equation with Interconnectors on LHS is fully co-optimised.

Examples

ID	DESCRIPTION
F_I+NIL_MG_R5	Global Raise 5 min requirement for loss of the largest generator, dynamically calculated
F_MAIN++NIL_MG_R6	Mainland Raise 6 second requirement for loss of the largest generator in the Mainland, dynamically calculated, Basslink able to transfer FCAS
F_ESTN+LREG_0150	Lower Regulation requirement for the Eastern regions (NSW, Victoria, Queensland and Tasmania) of 150 MW
F_NVS++LDMU_L5	NSW, Vic and SA Lower 5 min requirement for an outage of Liddell - Muswellbrook (83) 330 kV line, Basslink able to transfer FCAS
F_NVS+LDMU_L5	NSW, Vic and SA Lower 5 min requirement for an outage of Liddell - Muswellbrook (83) 330 kV line, Basslink unable to transfer FCAS
F_Q++LDMU_L6	Queensland Lower 6 sec requirement for an outage of Liddell - Muswellbrook (83) 330 kV line
F_V_MURRAY_L5	Murray Lower 5 min limited to 0 MW.

6.9 Non–Conformance

"NC_" / Region ID / "_" / DUID

Examples

ID	DESCRIPTION
NC_N_BW01	Non Conformance Constraint for Bayswater Unit 1
NC_T_TARRALEA	Non Conformance Constraint for Tarraleah
NC_Q_MPP_1	Non Conformance Constraint for Millmerran Unit 1

6.10 Network Support Agreements

"NSA_" / Region ID / "_" / DUID or ID for the station / "_" / MW Value

Examples

ID	DESCRIPTION
NSA_V_BDL01_40	Network Support Agreement constraint for Bairnsdale Unit 1 for 40 MW
NSA_V_BDL_40	Network Support Agreement constraint for all Bairnsdale units for 40 MW
NSA_Q_GSTONE34_200	Network Support Agreement constraint for Gladstone units 3 & 4 for 200 MW

6.11 Negative Residue Management

"NRM_" / From Region / "_" / To Region

1 – From Region and To Region are the full region IDs not the single character ID

Examples

ID	DESCRIPTION
NRM_NSW1_QLD1	Negative Residue Management constraint for NSW to QLD flow.
NRM_QLD1_NSW1	Negative Residue Management constraint for QLD to NSW flow
NRM_VIC1_SA1	Negative Residue Management constraint for VIC to SA flow

6.12 Multiple Contingencies / Credible Contingency declared

For conditions where the loss of two or more plant elements have been declared a credible contingency (e.g. due to a bushfire under a dual circuit line, proximity of lightning or a bus is at risk due to the proximity of construction work) the constraint equation should use the same naming guidelines as the existing constraint equations, suffixed with "**_N-2**". If there are several sets that are distinguished by different plant ratings (e.g. 30 min and 15 min ratings) a further suffix should be added to indicate this.

Examples

ID	DESCRIPTION
N>>N-MNYS_N-2_2	Avoid overloading Capital to Canberra (6) 330 kV line for loss of both Marulan to Yass (4 & 5) 330 kV lines in NSW region declared credible
F_T++FASH_N-2_TG_R5	Raise 5 min requirement for loss of generation due to the trip of both Farrell to Sheffield 220 kV lines being declared a credible contingency in Tasmania region

6.13 Constraint Equations for a particular timeframe

Constraint equations may be required for a particular time frame: Dispatch, Predispatch, ST PASA or MT PASA. For the first two timeframes a descriptor is appended to the constraint equation name (**_DS** and **_PD** respectively). For constraint equations that are specific to the ST and MT PASA timeframe the constraint equation name will be prefixed with **ST_** and **MT_**.

Examples

ID	DESCRIPTION
T^T_NIL_BL_1_DS	System Normal constraint equation for voltage collapse in Tasmania region, Dispatch only
MT_V^S_NIL	Victoria to SA system normal voltage collapse limit for MT PASA
MT_N>N_NIL_5	NSW system normal overload limit, equation No.5 in a sequence for MT PASA

6.14 Constraint Automation

6.14.1 Real-Time

Automatically built and updated constraint equations IDs are based on identifiers for the tripped and managed elements. The IDs are then consistent across any number of network conditions. The ID only contains a single ">" character so that the ID can remain consistent even if the interconnectors and generators move on and off the LHS with changing network conditions.

Region ID > Tripped Element ID "_" Monitored Element ID

1) *The Region ID is a single character representing the regional location of the sending end of the monitored element*
2) *Each element ID is made up of 2 or 3 character identifier for each substation in the positive direction of flow (for example for flow from Murray to Upper Tumut is MSUT).*
3) *For no element trip the tripped element ID is "NIL"*
4) *Transformers include a TX after the substation ID followed by a single character indicating the receiving end winding. "H" is used for the high voltage winding and "L" for the low voltage winding.*
5) *Where there are 2 or more elements between substations these will include the element number after the element ID*
    a. *When the constraint equation ID has greater than 20 characters the element numbers will not be included*

6) *Tee'd lines are identified as if they were separate lines and the tee point having its own ID (for example Liapootah to Cluny tee section is LICL and the Cluny tee to Chapel St section is CLCS)*

Examples

ID	DESCRIPTION
N>LDNC_LDTM	Trip of Liddell to Newcastle (81) line, avoid overload of Liddell to Tomago (82) line
V>NIL_SMTXL	South Morang F2 transformer overload on no line trips
T>SHGT1_PMSH	Trip of Sheffield to Georgetown #1, avoid overloading Palmerston to Sheffield
Q>CLWU_CLST	Trip of Calvale to Wurdong (871), avoid overloading Calvale to Stanwell (855)
S>SETXH1_SETXH2	Trip of one South East transformer, avoid overloading on the remaining South East transformer
V>DDMS1_DDMS2	Trip of Dederang to Murray #1 line, avoid overloading Dederang to Murray #2 line

6.14.2 Study / Offline

Constraint Automation constraint equations created from an EMS study case are prefixed with CA and suffixed with a number. The other part is a unique ID generated by the Constraint Automation application. This is the same unique ID used for the constraint set.

"CA_" / Unique ID / "_" / Unique Number

Examples

CA_BPS_373D7DA1_01

CA_BPS_373D7DA1_02

7 Other Naming Guidelines

7.1 Constraint Functions

Constraint Functions (these have been referred to as base equations, shared expressions or generic equations) are groups of RHS terms that are shared between multiple constraint equations. They might be for complex stability limits or for calculations or sub-regional demand.

For complex equations used for system normal and outage constraint equations these should be prefixed with '**X**_' and suffixed with the timeframe (see 8.3). The remaining part should match up with the system normal equation showing the region(s), interconnector and cause identifier. For other equations it is preferred that these also start with '**X**_'. However, for clarity or space reasons this can be omitted.

Examples

ID	DESCRIPTION
X_N::V_BWSW_DS	NSW to Vic transient stability limit for trip of Bayswater to Sydney West (32) 330 kV line for Dispatch
X_N^^N_DS	NSW voltage stability limit across lines 01, 2,3 and 07 for trip of Canberra to Lower Tumut (07) line for Dispatch
X_MG_NSW	Calculation of the largest generator in NSW
ARMIDALE_AREA_LOAD	Terranora load calculation for Predispatch and PASA

7.2 Plant Ratings

Region ID / "RAT" / Rating Time / "_" / From Substation / To Substation / Line Number

Region ID / "RAT" / Rating Time / "_" / Transformer Substation / "_TX" / Transformer Number

1 – The Rating time is a 2 character ID which can be CN, SE (see 8.3) or:

- *4H – 4 Hour rating*
- *2H – 2 Hour rating*
- *30 – 30 minute rating*
- *20 – 20 minute rating*
- *15 – 15 minute rating*
- *10* – 10 minute rating

2 – The From and To substations are for the direction of flow on the line

Examples

ID	DESCRIPTION
NRATCN_CNUT01	Continuous rating of Canberra - Upper Tumut 330 kV line from Canberra
QRAT15_CLWU871	15 minute rating of Calvale - Wurdong 275 kV line from Calvale
TRAT4H_BU_TX2	4 Hour rating of Burnie No.2 220/110 kV transformer
NRATSE_DPBA_X5/1	Sustained Emergency rating of Darlington Pt - Balranald tee 220 kV line from Darlington Pt.

8 Abbreviations

8.1 Equipment

TYPE	ABBREVIATION
Capacitor	CP
Circuit Breaker	CB
Reactor	RX
SVC or Synchronous Condenser	VC
Transformer	TX

Each of these can be appended with a unique identifier for the item of plant. Some plant has a unique identifier and this is to be included where possible.

Examples

ID	DESCRIPTION
AR_CP_2	No.2 132 kV Cap Bank at Armidale
SMTXF2	South Morang 500/330 kV F2 transformer
SMTXH1	South Morang 330/220 kV H1 transformer
TV_CB4112	Townsville 132 kV CB 4112

8.2 FCAS

TYPE	ABBREVIATION
Generation Event	MG
Load Event	ML
Network Event – Load	TL
Network Event – Generation	TG
Loss of Basslink	BL
Raise Regulation	RREG
Lower Regulation	LREG
Raise 5 minutes	R5
Lower 5 minutes	L5
Raise 60 seconds	R60
Lower 60 seconds	L60
Raise 6 seconds	R6
Lower 6 seconds	L6
Mainland regions (SA, Vic, NSW & Qld)	MAIN
Eastern regions (Vic, NSW & Qld)	EST (or ESTN)
Southern regions (SA, Vic & NSW)	STH (or STHN)
Islanded or separated regions	ISLE (or ISL)

8.3 Miscellaneous

TYPE	ABBREVIATION
Dispatch	DS
Pre-Dispatch	PD
Short Term PASA	ST
Medium Term PASA	MT
Terranora Interconnector	TE
Murraylink	ML
Basslink	BL
Ramp Down	RD
Ramp Up	RU
Continuous Rating	CN
Sustained Emergency Rating or Post-Contingent Continuous	SE
Short Time Rating	SH

8.4 Queensland Substations

SUBSTATION	POWERLINK ID	ABBREVIATION
Abermain	T136 & H62	AB

Alan Sherriff	T150	AS
Algester	T161	AL
Alligator Creek	T65	AC
Ashgrove West	T30	AW
Baralaba	T31	BAR
Barcaldine	T72	BD
Barron Gorge PS	T54	BG
Beenleigh	T108	BL
Belmont	H3	BM
Blackwall	H36	BK
Blackstone	H72	BLS
Bouldercombe	H10	BC
Boyne Island Smelter	H8	BI
Braemar	R2	BR
Braemar PS		BRA
Broadsound	H20	BS
Bulimba	T73	BUL
Bulli Creek	R3	BCK
Bundaberg	T20	BB
Bundamba	T162	BUN
Caboolture	T11	CE
Cades County	T81	CC
Cairns	T51	CI
Callide 'A' Power Station	T22	CA
Callide 'B' Power Station	H30	CB
Callide 'C' Power Project	H50	CAC
Callide 'B' (Station Transf.)	T103	CS
Calliope River	H67	CP
Calvale Switchyard	H24	CL
Cardwell	T134	CW
Chalumbin	H32	CH
Chinchilla	T13	CN
Clare South	T193	CR
Clayton	T121	CT
Clermont	T71	CM
Collinsville Power Station	T37	CV
Columboola	T194	CLB
Columboola East		CBE
Coomera	SSCMA	CMA
Condamine PS	T200	CON

Cooroy	T70	CY
Coppabella	T107	CO
Dalby	T2	DB
Dan Gleeson	T92	DG
Dysart	T35	DS
Edmonton	T129	ED
Garbutt	T46	GA
Gin Gin	H6	GG
Gladstone	H7	GL
Gladstone 1, 2, 5, 6 PS	H7	GD
Gladstone 3 & 4 PS	T5	GD
Gladstone South	T19	GS
Gregory	T97	GR
Greenbank	S3	GB
Goodna	H38	GO
Goonyella Riverside	T212	GYR
Gympie	T8	GY
Halys		HA
Image Flat	T40	IF
Ingham South	T157	IH
Innisfail	T50	IN
Invicta Mill	T36	IM
Kamerunga	T53	KM
Kareeya Power Station	T49	KA
Kemmis	T67	KE
Kidston	T77	KD
King Creek	T177	KCK
Kogan Creek PS		KC
Korenan	T120	KR
Lilyvale	H15	LV
Larcom Creek	H58	LC
Lockrose	T78	LR
Loganlea	T15	LL
Lytton	T114	LY
Mackay	T38	MAK
Maryborough	T59	MAR
Middle Ridge	H14	MR
Millmerran	R4	MI
Millmerran Power Station	R5	MPP
Molendinar	T91	MD

Moranbah	T34	MH
Moranbah South	T109	MHS
Mt England	H12	ME
Mt Stuart Power Station	T143	MSP
Mudgeeraba	H4	MU
Mungar	T123	MUN
Murarrie	H21	MUR
Nebo	H11	NE
Nerang	T75	NR
Newlands	T69	NL
Norwich Park	T111	NOR
Oakey Power Station	T146	OK
Palmwoods	H9	PW
Peak Downs	T110	PD
Postman's Ridge	T29	PR
Pioneer Valley	T141	PV
Proserpine	T39	PRO
Q.A.L.	T21	QA
Raglan	H73	RG
Redbank Plains	T80	RP
Richlands	T187	RI
Robina	T128	ROB
Rocklands	T100	RK
Rocklea	H16	RL
Roma	T83	RM
Ross	H13	RS
Runcorn	T24	RU
South Pine	H2	SP
South Port	SSSPO	SPT
South Toowoomba	T43	SO
Stanthorpe	T60	STA
Stanwell Power Station	H33	STN
Stanwell Switchyard	H29	ST
Stony Creek	T178	SC
Strathmore	H35	SM
Sumner	T160	SU
Swanbank ‘B’ PS	H1	SB
Swanbank ‘E’ PS	H55	SE
Tangkam	T147	TA
Tarong Power Station	H27	TRN

Tarong North Power Station	H54	TNT
Tarong Switchyard	H18	TR
Teebar Creek	H63	TC
Tennyson	T3	TY
Terranora	T174	TE
Townsville	T145	TV
Townsville Power Station	T144	TYP
Townsville South	T56	TVS
Tully	T48	TU
Turkinje	T55	TK
Upper Kedron	H23	UK
Wandoo	T106	WN
Warwick	T58	WWK
West Darra	T155	WE
Western Downs	S5	WD
Wivenhoe Power Station	H28	WV
Woolooga	H5	WO
Woree	H39	WR
Wurdong	H40	WU
Yabulu South	H56	YS

8.5 NSW Substations

TYPE	ABBREVIATION
Alstonville (66kV)	AL
ANM	AN
Armidale	AR
Avon	AV
Ballina (66kV)	BN
Balranald	BA
Bannaby	BY
Bayswater PS	BW
Beaconsfield West	BC
Bendeela PS	BD
Blowering PS	BL
Boambee South	BS
Broken Hill	BH
Brown Mt PS	BM
Buronga	BU
Burrinjuck	BJ

Canberra	CN
Capital	CW
Casino	CS
Coffs Harbour	CH
Colongra GT	CG
Dapto	DT
Darlington Point	DP
Deniliquin	DE
Dumaresq	DM
Dunoon	DU
Eraring PS	ER
Ewingsdale (66kV)	EW
Finley	FI
Forbes	FB
Glen Innes	GI
Guthega PS	GGA
Haymarket	HA
Hume PS	HM
Hunter Valley GT	HV
Ingleburn	IG
Jindera	JN
Kangaroo Valley	KV
Kempsey	KS
Kemps Creek	KC
Koolkhan	KK
Kurri	KU
Liddell PS	LD
Lismore	LS
Liverpool	LP
Lower Tumut SS	LT
Macarthur	MA
Macksville	MV
Marulan	MN
Mt Piper PS	MP
Mullumbimby	MB
Munmorah PS	MM
Munyang	MY
Murrumburrah	MR
Muswellbrook	MU
Nambucca	NB

Newcastle	NC
Raleigh	RL
Redbank PS	RB
Regentville	RG
Rothbury	RO
Port Macquarie	PM
Shoalhaven PS	SH
Sydney East	SE
Singleton	SI
Stroud	ST
Sydney North	SN
Sydney South	SS
Sydney West	SW
Tallawarra PS	TL
Tamworth	TW
Taree	TA
Tenterfield	TN
Tomago	TM
Tuggerah	TG
Tumut	TU
Uranquinty PS	UR
Upper Tumut SS	UT
Vales Pt B PS	VP
Vineyard	VY
Wagga	WG
Waratah West	WA
Wallerawang PS	WW
Wellington	WL
Williamsdale	WI
Wollar	WO
Yanco	YC
Yass	YS

8.6 Victorian Substations

TYPE	VICTORIAN ID	ABBREVIATION
Alcoa Portland Smelter	APD	APD
Altona	ATS	AT
Anglesea PS	APS	APS
Arrarat	ART	AR

Bairnsdale PS	BDPS	BD
Ballarat	BATS	BA
Ballarat North	BAN	BAN
Bendigo	BETS	BE
Bogong	BOPS	BG
Brooklyn	BLTS	BL
Brunswick	BTS	BT
Buangor	BGR	BR
Cranbourne	CBTS	CR
Dartmouth PS	DPS	DP
Dederang	DDTS	DD
East Rowville	ERTS	ER
Eildon PS	EPS	EP
Fishermans Bend	FBTS	FB
Fosterville	FVTS	FV
Frankston	FTS	FT
Geelong	GTS	GT
Glenrowan	GNTS	GN
Hazelwood TS	HWTS	HW
Hazelwood PS	HWPS	HW
Heatherton	HTS	HT
Heywood	HYTS	HY
Horsham	HOTS	HO
Jeeralang A PS	JLGS A	JLA
Jeeralang B PS	JLGS B	JLB
Jeeralang TS	JLTS	JL
Keilor	KTS	KT
Kerang	KGTS	KG
Laverton North	LNGS	LN
Loy Yang A PS	LY	LYA
Loy Yang B PS	LY	LYB
Loy Yang TS	LY	LY
McKay PS	MKPS	MK
Malvern	MTS	MT
Moorabool TS	MLTS	ML
Mortlake PS	MOPS	MO
Mortons Lane (wind farm)	MLWF	ML
Morwell PS	MPS	MP
Morwell TS	MWTS	MW

Morwell Tee		MWT
Mount Beauty	MBTS	MB
Murray	MSS	MS
Newport PS	NPSD	NP
Oaklands Hill (wind farm)	OWF	OW
Point Henry	PTH	PT
Portland (wind farm)	PTWF	PW
Red Cliffs	RCTS	RC
Richmond	RTS	RT
Ringwood	RWTS	RW
Rowville	ROTS	RO
Shepparton	SHTS	SH
Southern Hydro	SHYD	SHYD
South Morang	SMTS	SM
Somerton PS	SPS	SOM
Springvale	SVTS	SV
Stawell	STL	ST
Sydenham	SYTS	SY
Tarrong	TRTS	TA
Templestowe	TSTS	TS
Terang	TGTS	TG
Thomastown	TTS	TT
Tyabb	TBTS	TBT
Valley Power	VPGS	VPG
Waubra PS	WBTS	WA
Wemen	WETS	WT
West Kiewa PS	WKPS	WK
West Melbourne	WMTS	WM
Wodonga	WOTS	WO
Yallourn PS	YPS	YP
Yambuk (wind farm)	YWF	YW

8.7 South Australian Substations

TYPE	ABBREVIATION
Androssan West	AW
Angas Creek	AC
Baroota	BA
Belalie	BL
Berri	BE

Blanche	BN
Brinkworth	BR
Bungama	BG
Canowi	CN
Canunda (wind farm)	CA
Cathedral Rocks (wind farm)	CR
Cherry Gardens	CG
City West	CW
Clare North	CLN
Clements Gap (wind farm)	CM
Cultana	CL
Dalrymple	DL
Davenport	DV
Dry Creek	DC
Dorrien	DR
East Terrace	ET
Hallett PS	HL
Happy Valley	HV
Hummocks	HU
Keith	KH
Kilburn	KB
Kincraig	KN
Ladbroke Grove PS	LG
Lake Bonney (wind farm)	LB
LeFevre	LF
Magill	MG
Mannum	MA
Mannum - Adelaide Pump 2	MAP2
Mannum - Adelaide Pump 3	MAP3
Mayura	MY
Middleback	MD
Millbrook	MI
Mintaro PS	MN
Mobilong	MO
Monash	MH
Morgan - Whyalla Pump 1	MWP1
Morgan - Whyalla Pump 2	MWP2
Morgan - Whyalla Pump 3	MWP3
Morgan - Whyalla Pump 4	MWP4
Morphett Vale East	MV

Mt Barker	MB
Mt Barker South	MS
Mt Gambier	MT
Mokota	MK
Mt Millar (windfarm)	MM
Murray Bridge – Handorf Pump 2	MHP2
Murray Bridge – Handorf Pump 3	MHP3
New Osborne	NO
Northern PS	NP
North Brown Hill (wind farm)	NBH
North West Bend	NW
Northfield	NF
Osborne PS	OSB
Para	PA
Parafield Gardens	PS
Parafield Gardens West	PG
Pelican Point PS	PP
Penola West	PW
Playford PS	PF
Port Lincoln PS	POR
Quarantine PS	QP
Red Hill (tee point)	RH
Robertstown	RB
Roseworthy	RS
Salisbury	SB
Snowtown (tee point)	ST
Snowtown (wind farm)	SN
Snuggery	SG
South East	SE
Tailem Bend	TB
Torrens Island	TI
Torrens North	TN
Templers	TP
Templers West	TW
The Bluff (wind farm)	BLUFF1
Tungkillo	TU
Waterloo	WT
Waterloo (wind farm)	WW
Waterloo East	WE
Wattle Point (wind farm)	WP

Whyalla Terminal	WY
Yadnarie	YD

8.8 Tasmanian substations

TYPE	ABBREVIATION
Bastyan	BA
Bell Bay	BB
Bridgewater	BW
Boyer	BY
Butlers Gorge	BG
Burnie	BU
Catagunya	CA
Cethana	CE
Chapel Street	CS
Cluny	CL
Comalco	CO
Creek Road	CR
Devils Gate	DG
Emu Bay	EB
Farrell	FA
Fisher	FI
George Town	GT
Gordon	GO
Hadspen	HA
Hampshire	HM
John Butters	JB
Lake Echo	LE
Lake Margaret	LM
Lemonthyme	LT
Liapootah	LI
Lindisfarne	LF
Mackintosh	MC
Meadowbank	MB
Mowbray	MO
Musselroe	MU
New Norfolk	NN
Palmerston	PM
Paloona	PA
Poatina	PO

Port Latta	PL
Que	QU
Reece	RC
Repulse	RE
Risdon	RI
Rowallan	RO
Scottsdale	SD
Sheffield	SH
Smithton	ST
St Leonards	SL
Tamar Valley PS	TV
Tarraleah	TA
Temco	TE
Tods Corner	TC
Trevallyn	TR
Tribute	TI
Tungatinah	TU
Ulverstone	UL
Waddamana	WA
Waratah Tee	WT
Wayatinah	WY
Wilmot	WI
Woolnorth	WN