

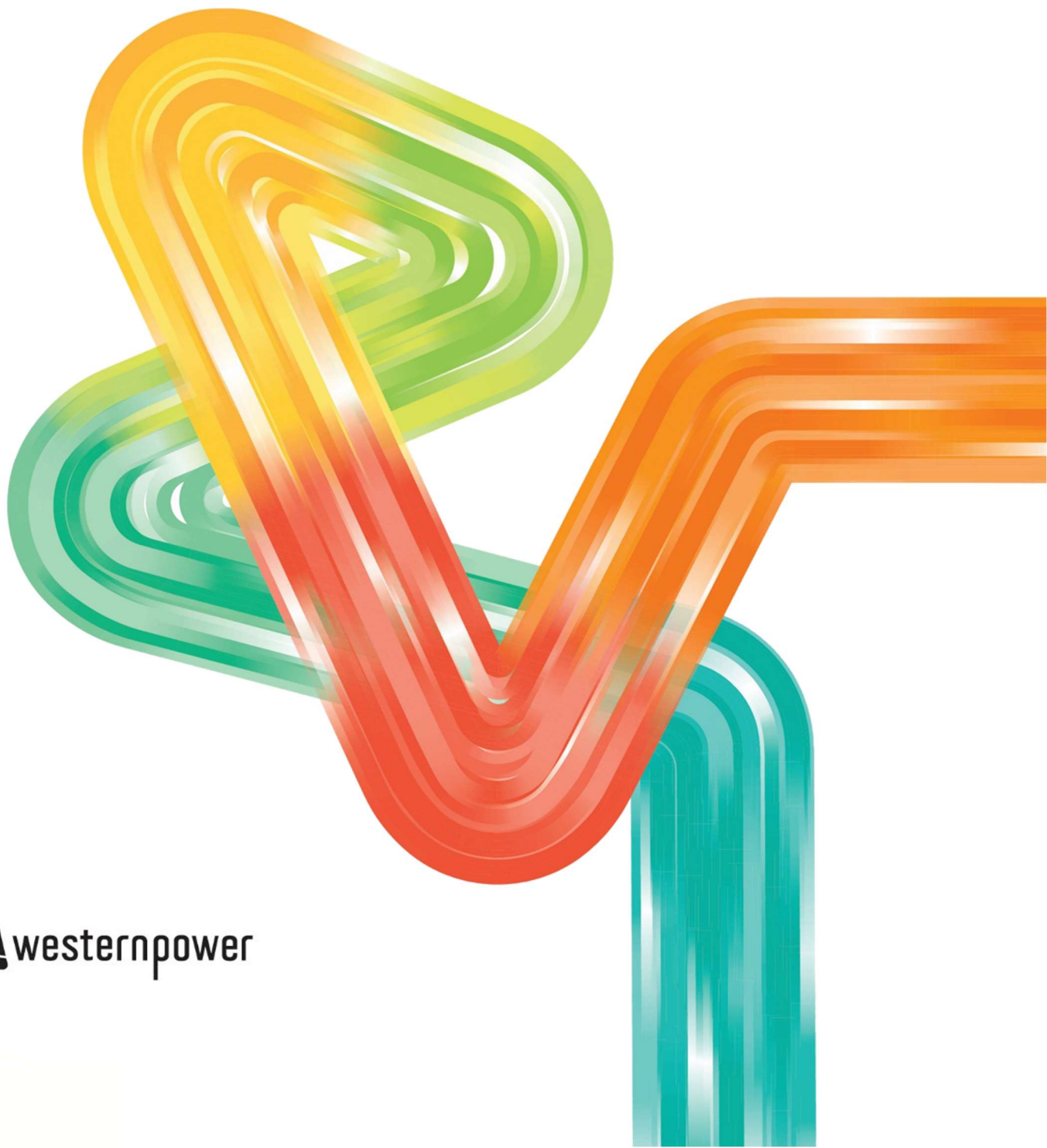
Limit Advice #4

Albany minimum post contingent voltage limit

Covering a prior outage of the KOJ-ALB 132kV line

Public

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VERSION CONTROL

Version	Release date	Changes
1.0	4 August 2021	Initial issue
1.1	18 November 2021	Added additional detail to clarify intent following feedback received from AEMO

Authorisation

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Acronyms and abbreviations

General

NRS	Network reinforcement scheme
SWIS	South West Interconnected System

Substations and terminals

ALB	Albany substation
KOJ	Kojonup substation
MBR	Mount Barker substation
MU	Muja Terminal

Transmission lines

KOJ-ALB 81	Kojonup-Albany 132kV line
KOJ-MBR 81	Kojonup-Mount Barker 132kV line

1. Purpose

This document is to provide AEMO with Limit Advice to prevent Albany windfarms (1 & 2) and Grassmere windfarm from being constrained off during high demand at ALB and MBR substations with a prior outage of the KOJ-ALB 81 line. Otherwise, it can breach the below Technical Rules requirement:

- Post contingent steady state voltage criteria (clause 2.2.2(a))

after a contingency loss of a 132kV capacitor bank at Albany substation under this system condition.

This is a new Limit Advice.

2. Scope

This Limit Advice is only valid when all of the following system conditions are met:

- KOJ-ALB 81 line is out of service;
- Both Albany 132kV capacitors banks - ALB CAP 81 and 82 - are switched in; and
- The MW flow¹ from KOJ substation on the KOJ-MBR 81 line (measured at MBR end) is $\geq +25\text{MW}$.

Therefore, the limit equation included in this Limit Advice will be disabled when either one of the above conditions is not met.

This Limit Advice includes only the existing generator facilities connected in the ALB and MBR substations as at September 2021, excluding any Non-Scheduled Facilities less than 5MW.

¹ + when the MW flow is from KOJ to MBR

3. Limit Advice

Table 3.1 shows the limit equation included in this Limit Advice.

Table 3.1: Limit equations and description of limits

Equation name	Description of limit
W_LE6^{KOJ-ALB81 off}ALB_132kV_CAP}ALB	This limit equation is required when the Albany load area under the system conditions stated in Section 2 to maintain the Albany 132kV bus voltage ≥ 0.9 pu following the loss of a 132kV capacitor bank at Albany substation

3.1 Limit equation “W_LE6^{KOJ-ALB81 off}ALB_132kV_CAP}ALB”

The limit equation is presented as:

$$\text{MBR MW Import} \leq \text{constant} + A1.X1 + A2.X2 + A3.X3 + \dots + An.Xn$$

Where:

- MBR MW import is the MW flow measured at MBR end of the KOJ-MBR 81 line, with a positive quantity being for the MW flow from KOJ to MBR.
- An is the coefficient and Xn is the variable.

Table 3-2 presents the variables and coefficients for this limit equation.

Table 3-2: Variables and coefficients of limit equation “W_LE6^{KOJ-ALB81 off}ALB_132kV_CAP}ALB”

Right-hand-side variables	Coefficient
Constant	-320
vMU132	319
psALB_WF1&2	0.018
psGWF	0.015
qALB22kVCAP	0.004
q-expMBR	1.47
Limit margin (1.645 * Standard error)	-2.920

Where:

Variable	Description
vMU132	The actual Muja 132 kV bus voltage in pu
psALB_WF1&2	The total MW sent out from Albany windfarms 1 & 2
psGWF	The MW sent out from Grasmere windfarm
q22kVCAP	<p>The total Mvar output (+ for export to the SWIS) from Albany 22kV reactive devices² measured at ALB502³ and ALB521 circuits. The following reactive devices (and their Mvar ratings) are connected to the ALB502 and ALB521 circuits:</p> <ul style="list-style-type: none">• ALB CAP51B (3Mvar)• ALB CAP52A (2Mvar)• ALB CAP52B (3Mvar)• ALB REA51 (15.4Mvar)
q-expMBR	The Mvar export measured at MBR end of the KOJ-MBR line with a positive quantity being for the Mvar flow from MBR to KOJ.
Limit margin	Limit margin (=1.645 * Standard error)

3.2 Network model & network reinforcement scheme (NRS) included

The SWIS PowerFactory Base Model Version 202004v2, uploaded to AEMO's portal on 27/7/2020, was used to derive the above limit equation.

No applicable NRS was included.

3.3 SCADA points availability

No unavailable SCADA points have been used in deriving the above limit equation.

² ALB CAP51A has not been available for switching in for some time

³ ALB 22kV reactor -REA51- shares the same circuit breaker (ALB502) with CAP51B. When REA51 and CAP51B are both in service, the Mvar output from ALB502 circuit is negative.