Eskom
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GCCA 2025 Update: Integrating Congestion Curtailment Capacity

Grid Planning and Development

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Curtailment-Adjusted Connection Capacity for Wind Generators in the Eastern Cape and Western Cape

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This document can be found on our website: *https://www.ntcsa.co.za/gcca/*

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Executive summary

The GCCA 2025, published in October 2023, confirmed that the most favourable regions for wind generation, Eastern Cape and Western Cape, have reached full connection capacity.

This update introduces congestion curtailment capacity as a mechanism to unlock additional hosting capacity. By allowing controlled curtailment of renewable energy output, more wind generation can be connected to the constrained grid while improving network utilisation.

In alignment with NERSA's approval, based on ***4% curtailment***, hosting capacity in these provinces can increase from ***5 625 MW*** **to** ***7 205 MW*** by 2028. This unlocks an additional ***1 580 MW*** **of wind energy**, distributed as follows:

- ***1 180 MW*** in the Western Cape
- ***400 MW*** in the Eastern Cape

This approach enables accelerated integration of renewable energy, optimises existing infrastructure, and supports national energy transition goals while remaining technically sound and compliant with the grid code.

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1. Introduction

The Eastern Cape and Western Cape remain South Africa's most favourable regions for wind generation. However, the GCCA 2025, published in October 2023, confirmed that available grid capacity in these provinces has been fully allocated, primarily through previous bid windows and private off-taker agreements. As a result, many renewable energy projects have been denied grid access.

Unlocking additional capacity in these constrained areas typically requires substantial transmission infrastructure investment, which involves long lead times for development and construction. To address this challenge, a strategic shift is underway where rather than waiting for grid expansion, congestion curtailment is being implemented to unlock hosting capacity and maximise utilisation of existing infrastructure.

Congestion curtailment refers to the controlled reduction of renewable energy output in response to transmission constraints. When grid limits are reached, further increases in generation lead to congestion, requiring output to be reduced. By enabling developers to connect in constrained areas, curtailment optimises existing grid assets and increases generation connection capacity.

This approach has passed through the necessary governance processes:

- Eskom internal approval.
- NERSA approval on 29 April 2025, confirmed in the *Reasons for Decision (RfD)* designates congestion curtailment as a constrained generation ancillary service, specifically to facilitate additional wind generation in the Eastern Cape and Western Cape.

This approval is valid from 1 April 2025 to 31 March 2028. It allows for affected generators to receive financial compensation for curtailed energy due to congestion, within the budget allocated to NTCSA in the MYPD6 determination based on a 4% curtailment level.

This document serves as an update to the GCCA 2025 addendum published in January 2024. While ensuring alignment with this previous release, adjustments ***had*** to be made to reflect:

1. Current projects in execution or with active budget quotes
2. Inclusion of significant rooftop PV
3. Reduction of curtailment levels from 10% to 4% in line with the NERSA approval

2. Western Cape

Table 1 shows the RE plants in the Western Cape that are in execution and those with active budget quotations (BQs), specifically those without any upstream dependencies beyond 2028. The projects below are already accommodated for in the current capacity allocations.

Table 1: Projects in execution or with active budget quotes in WC

Project No.	Substation	Technology	Capacity (MW)	Expected Year
1.	Agulhas	Wind	380	2028
2.	Aurora	Wind	2	2025
3.	Aurora	Wind	47	2027
4.	Bacchus	Wind	80	2026
5.	Bacchus	Wind	124	2026
6.	Bacchus	Wind	103	2025
7.	Droërivier	PV	250	2027
8.	Kappa	Hybrid	128	2025
9.	Komsberg	Wind	150	2027
10.	Komsberg	Wind	320	2028
11.	Muldersvlei	PV	3	2025
12.	Muldersvlei	Wind	100	2027
13.	Muldersvlei	Wind	100	2027

Local integration projects that are required for connection of some of the above renewable energy generation plants are shown in Table 2.

Table 2: Projects for integration of current generation projects in the WC

Type	Scheme	Project	Expected Year
Transformer	Droerivier 400/132 kV transformer 3	• Install 1st 400/132 kV 500 MVA transformer. • Establish new 132 kV busbar.	Aug 2027
Transformer	Komsberg 3rd 400/132 kV transformer	• Install 3rd 400/132 kV 500 MVA transformer.	Nov 2027
Transformer	Komsberg 4th 400/132 kV transformer	• Install 4th 400/132 kV 500 MVA transformer. • Loop-in Koring – Kappa 1 400 kV line into Komsberg. • Decommission Komsberg series capacitors. • Install 4 x 15 mH FCLRs	May 2028 (*self-build)*
Substation	Agulhas Substation	• Agulhas 400/132 kV Substation (1st and 2nd 500 MVA transformers). • Loop-in and out of Bacchus-Proteus 400 kV line. • Bypass Bacchus series capacitor.	Sep 2027 (*self-build*)

Table 3 shows all the RE plants assumed to be in operation in 2028. These comprise of those currently operational, those projects in execution and those with active BQs. The total RE generation is ***3 527 MW*** made up of ***128 MW hybrid***, ***608 MW PV***, and ***2 791 MW wind***.

Table 3: 2028 renewable energy generation assumptions for WC

Substation	Operational		Execution			BQ		Sub-
	PV	Wind	Hybrid	PV	Wind	PV	Wind	Total
Agulhas					380			380
Aurora	94	165			47		2	308
Bacchus	36	59			103		204	402
Droërivier		75				250		325
Kappa	225	108	128					461
Komsberg		700			140		470	1 310
Muldersvlei		138		3	200			341
Grand Total	**350**	**1 868**	**128**	**3**	**47**	**250**	**931**	**3 527**

Table 4 presents the curtailment-adjusted connection capacity for renewable energy generation in the Western Cape. The overall allowance for curtailment capacity is ***1 180 MW***, in line with the NERSA approval.

The ***1 180 MW*** is allocated to existing and new substations based on:

- Alignment, as far as practically possible, with previously communicated values in the GCCA 2025 addendum published in January 2024.
- Local transformation capacity available during the MYPD6 period, considering current projects in execution or with active budget quotes.

Table 4: WC total generation allocation per substation

Substation	Operational		Execution			BQ		Sub-	Curtail-ment	Total
	PV	Wind	Hybrid	PV	Wind	PV	Wind	Total	Wind	
Agulhas					380			380	100	480
Aurora	94	165			47		2	308	0	308
Bacchus	36	59			103		204	402	140	542
Droërivier		75				250		325	220	545
Kappa	225	108	128					461	0	461
Komsberg		700			140		470	1 310	0	1 310
Muldersvlei		138		3	200			341	0	341
Nuweveld / Galenia									720	720
Grand Total	**355**	**1 245**	**128**	**3**	**870**	**250**	**676**	**3 527**	**1 180**	**4 707**

- ***Agulhas***: The additional generation allocation is limited to ***100 MW*** based on the remaining firm capacity of the 2 x 500 MVA transformers after connecting the 380 MW wind project.
- ***Aurora***: No additional capacity is allocated to Aurora as it feeds the constrained Northern Cape.
- ***Bacchus***: Considering local load, additional allocation is capped at ***140 MW***, based on the remaining firm capacity of the 2 x 500 MVA transformers after connecting the 103 MW, 80 MW and 124 MW wind projects.
- ***Droërivier***: The additional generation allocation is limited to ***220 MW*** based on the remaining capacity of the new 500 MVA transformer after connecting the 250 MW solar PV project.
- ***Overberg corridor (Komsberg and Kappa)***: Excluded from curtailment allocation due to both voltage and system stability risks.
- ***Muldersvlei***: No capacity allocated due to limited wind interest.
- ***Nuweveld and/or Galenia***: To maintain voltage stability and overall wind generation diversity, a total of ***720 MW*** has been allocated to the planned Nuweveld and/or Galenia substations. To utilise this capacity within the MYPD6 period, these substations will need to be delivered as self-build projects. The maximum capacity at each substation may be restricted by local network constraints, which will be confirmed during the quotation process. Importantly, the combined generation connected to Nuweveld and Galenia must not exceed 720 MW.

3. Eastern Cape

Table 5 shows the RE plants in the Eastern Cape that are in execution and those with active budget quotations (BQs), specifically those without any upstream dependencies beyond 2028. The projects below are already accommodated for in the current capacity allocations.

Table 5: Projects in execution or with active budget quotes in EC

Project No.	Substation	Technology	Capacity (MW)	Expected Year
1.	Grassridge	Wind	75	2025
2.	Grassridge	Wind	111	2025
3.	Grassridge	Wind	111	2025
4.	Grassridge	Wind	111	2025
5.	Grassridge	Wind	84	2025
6.	Poseidon	Wind	86	2025

Table 6 shows all the RE plants assumed to be in operation in 2028. These comprise of those currently operational, those projects in execution and those with active BQs. The total RE generation is ***2 098 MW wind***.

Table 6: 2028 renewable energy generation assumptions for EC

Substation	Operational		Execution		BQ		Sub-
	PV	Wind	PV	Wind	PV	Wind	Total
Dedisa							0
Delphi		100					100
Grassridge		650		492			1 142
Neptune							0
Pembroke		54					54
Poseidon		716		86			802
Grand Total	**0**	**1 520**		**578**	**0**	**0**	**2 098**

Table 7 presents the curtailment-adjusted connection capacity for renewable energy generation in the Eastern Cape. The overall allowance for curtailment capacity is ***400 MW***, in line with the NERSA approval.

The ***400 MW*** is allocated to existing substations based on:

- Alignment, as far as practically possible, with previously communicated values in the GCCA 2025 addendum published in January 2024.
- Local transformation capacity available during the MYPD6 period.

Table 7: EC total generation allocation per substation

Substation	Operational		Execution		BQ		Sub-	Curtail-ment	Total
	PV	Wind	PV	Wind	PV	Wind	Total	Wind	
Dedisa							0	0	0
Delphi		100					100	0	100
Grassridge		650		492			1 142	0	1 142
Neptune							0	400	454
Pembroke		54					54		
Poseidon		716		86			802	0	802
Grand Total	**0**	**1 520**	**0**	**578**	**0**	**0**	**2 098**	**400**	**2 498**

- ***Dedisa, Delphi, Grassridge and Poseidon***: Excluded from curtailment allocation due to internal congestion which would require substantial curtailment, making them unsuitable for allocation at this stage.
- ***Neptune and/or Pembroke***: The maximum capacity at each substation may be limited by local network constraints, which will be confirmed during the quotation process. Importantly, the combined generation connected to Neptune and Pembroke must not exceed 400 MW. This is the remaining firm capacity with the planned Pembroke 400/132 kV 500 MVA transformer and the existing Neptune 400/132 kV 500 MVA transformer in service.

4. Conclusion

By adopting a controlled congestion curtailment level of approximately 4% in line with NERSA's approval conditions, the hosting capacity in the Eastern Cape and Western Cape can increase by nearly 30%, from ***5 625 MW*** to ***7 205 MW***. This approach enables the connection of an additional ***1 580 MW*** of ***wind generation*** by 2028.

The findings are supported by detailed network simulations and stability assessments, confirming that the proposed curtailment framework is technically sound and operationally feasible.

While the benefits are clear, certain risks must be managed:

- Local municipal generation procurement not accounted for in the study assumptions may result in curtailment levels exceeding 4%.
- Slower load growth, particularly in the Western Cape, may increase curtailment levels. Conversely, the inclusion of bulk loads such as data centres could improve curtailment outcomes provided they materialise within the projected timeframe.