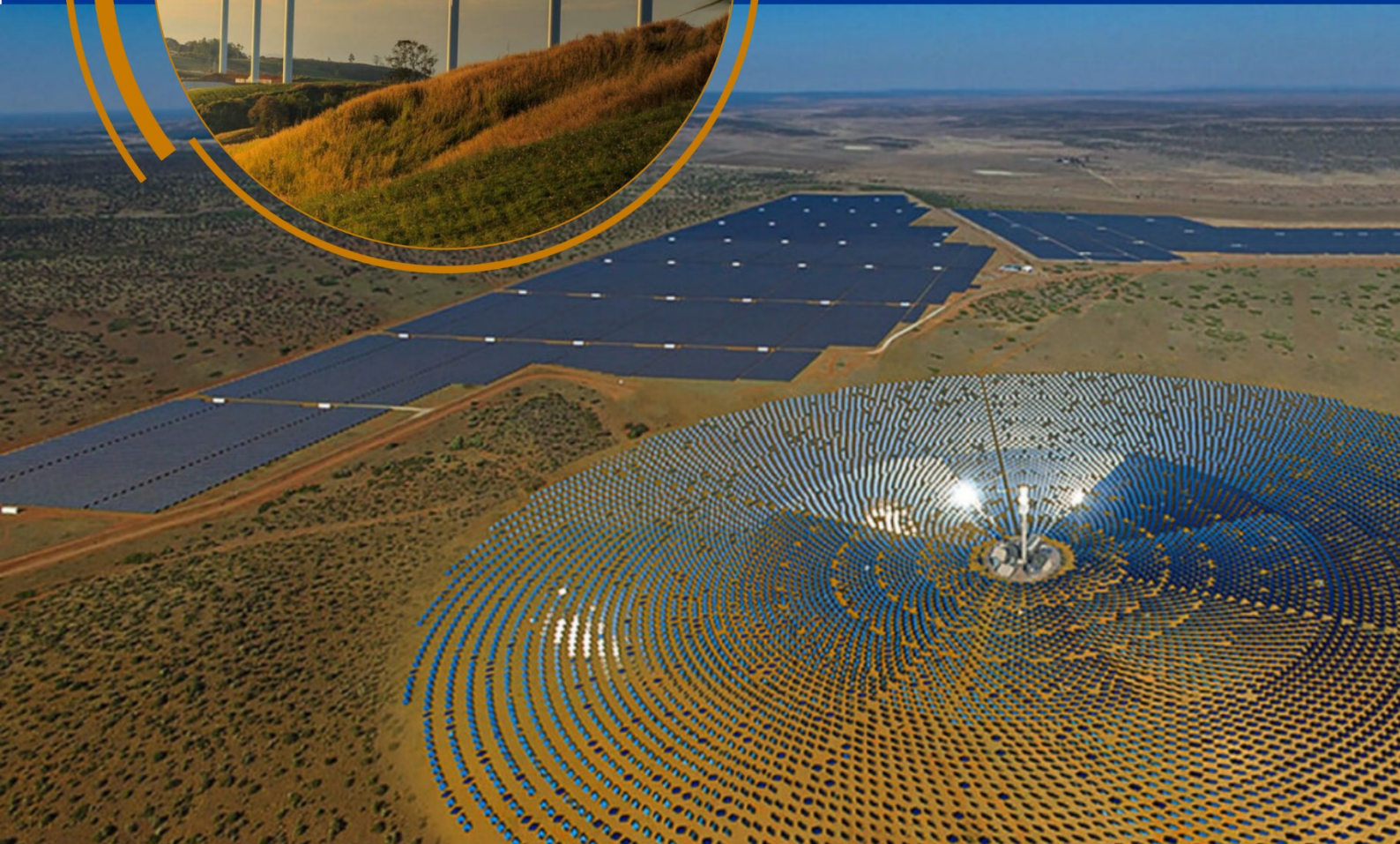


Addendum to the Generation Connection Capacity Assessment (GCCA)

2025

Transmission Grid Planning and Development

January 2024



GCCA 2025 Addendum

2025 Connection Capacity with Curtailment for Renewable Energy Generators

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This guide and interactive maps can be found on our website:

<https://www.eskom.co.za/eskom-divisions/tx/gcca/>

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Executive summary

As per the GCCA 2025 published in October 2023, parts of the transmission network located within the most favourable areas for wind generation such as the Eastern Cape and Western Cape have no capacity, as all of the capacity has been depleted from previous bid window rounds and private off-takers.

This document therefore serves as an addendum to the GCCA 2025 published in October 2023 for the purpose of indicating additional capacity that has been made available in the Eastern Cape and Western Cape under curtailment.

By accepting a reasonable share of no more than 10% of curtailment, 3 470 MW of additional wind generation can be connected to the grid almost immediately, with 2 680 MW in the Western Cape and 790 MW in the Eastern Cape.

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1. Introduction

The depletion of generation connection capacity in the Eastern Cape and Western Cape has resulted in many generation projects being denied connection. These areas remain in high demand due to their abundant energy resources for renewable generation. Unlocking capacity in these areas will require a significant amount of transmission network investment, which takes several years to develop and construct. The option of curtailment therefore provides developers with an alternative if they are still keen to connect in the constrained grid areas.

By accepting a reasonable share of curtailment, the generation connection capacity for constrained areas can be safely increased. Curtailment is defined as the controlled reduction of the output of renewable energy plants as a system operator response to transmission capacity constraints. When the grid limit is reached, any further increase of generation in the supply area leads to grid congestion. In such cases, and in order to remove the congestion, generation has to be reduced.

Curtailment therefore maximises use of the existing grid and increases generation connection capacity. The implementation of curtailment has passed through the governance process. Governance within Eskom has been approved to a large extent; and regulatory support was confirmed by NERSA in December 2023.

This document therefore serves as an addendum to the GCCA 2025 published in October 2023 for the purpose of indicating additional wind generation capacity that has been made available in the Eastern Cape and Western Cape under curtailment. The network used in the GCCA 2025 addendum study incorporates all the preferred bidders for the bid windows up to Round 6 (BW6) and all the budget quotations (BQs) that have been issued or are pending for private off-takers.

2. Western Cape

2.1. Assumptions

Table 1 shows rated capacities (Pmax) of the PV plants and wind farms that have been approved up to BW6 and private IPPs at BQ stage. The total RE generation of 3 500 MW comprises of 488 MW PV and 3 011 MW wind and excludes projects which have been cancelled.

Table 1: WC renewable energy generation assumptions

Substation	Approved		BQ	
	PV	Wind	PV	Wind
Agulhas				380
Aurora	89	159	10	109.8
Bacchus	36	59		243.9
Droërvier		75		
Kappa	353	108		
Komsberg		699		700
Muldersvlei		138		340
Nuweveld				
Grand Total	478	1238	10	1773.7

Local integration projects are in progress for connection of the above renewable energy generation.

Table 2: Projects for current generation integration

Type	Scheme	Project	Expected Year
Transformer	Komsberg 2 nd 400/132 kV transformer	<ul style="list-style-type: none"> Install 2nd 400/132 kV 500 MVA transformer. 	2024 (Self-build)
Transformer	Komsberg 3 rd 400/132 kV transformer	<ul style="list-style-type: none"> Install 3rd 400/132 kV 500 MVA transformer. 	Aug 2026
Transformer	Komsberg 4th 400/132 kV transformer	<ul style="list-style-type: none"> Install 4th 400/132 kV 500 MVA transformer. Loop-in Koring – Kappa 1 400 kV line into Komsberg. Decommission Komsberg series capacitors. 	TBD
Substation	Agulhas Substation	<ul style="list-style-type: none"> 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

2.2. Results

Table 3 indicates the approved and budget quote allocation per transmission substation including the amount of MW allocated for curtailment.

Table 3: Total generation MW allocation per substation

Substation	Approved		BQ		Curtailment	Total
	PV	Wind	PV	Wind	Wind	
Agulhas				380	140	520
Aurora	89	159	10	109.8	0	367.8
Bacchus	36	59		243.9	140	478.9
Droërivier		75			460	535
Kappa	353	108			1020	1481
Komsberg		699		700	0	1399
Muldersvlei		138		340	200	678
Nuweveld					720	720
Grand Total	478	1238	10	1773.7	2680	6179.7

- The total generation at Komsberg and Kappa is limited to ~1425 MW which is the firm limit with 4 x 500 MVA transformers.
- The additional generation allocation at Droërivier is limited to 475 MW which is the limit for the new 500 MVA transformer.
- The additional generation allocation at Agulhas and Bacchus is limited to 140 MW each i.e., which limits the total generation at these two substations to ~475 MW each which is the substation firm limit.
- Nuweveld is a planned new substation which will require 2 x 500 MVA transformers to accommodate 720 MW. The limit is imposed at Nuweveld to ensure a short circuit ratio (SCR) of 3 with a single 400 kV line from Droerivier.
- 200 MW is allocated to Muldersvlei to make up for the remaining capacity in the Western Cape.

Additional projects will also be required for integration of the additional renewable energy generation and also to avoid local network constraints.

Table 4: Additional projects under development required for the additional renewable energy generation

Type	Scheme	Project	Expected Year
Transformer	Droërivier 3 rd 400/132 kV transformer	<ul style="list-style-type: none"> Install 400/132 kV 500 MVA transformer. Establish new 132 kV busbar. 	Jan 2027
Transformer	Kappa 2 nd 400/132 kV transformer	<ul style="list-style-type: none"> Install 2nd 400/132 kV 500 MVA transformer. 	Jul 2026

Table 5: Additional projects that will be required for the additional renewable energy generation

Type	Scheme	Project
Transformer	Kappa 3 rd and 4th 400/132 kV transformers FCLRS	<ul style="list-style-type: none"> Install 3rd and 4th 400/132 kV 500 MVA transformers.
Substation	Nuweveld Substation	<ul style="list-style-type: none"> Nuweveld 400/132 kV Substation (1st and 2nd 500 MVA transformers). Construct Droërivier – Nuweveld 400 kV line. Install 100 Mvar 400 kV busbar reactor.

3. Eastern Cape

3.1. Assumptions

Table 6 shows rated capacities (Pmax) of the PV plants and wind farms that have been approved up to BW6 and private IPPs at BQ stage. The total RE generation of 1 942 MW comprises of 0 MW PV and 1 942 MW wind.

Table 6: EC generation assumptions

Substation	Approved		BQ	
	PV	Wind	PV	Wind
Dedisa				
Delphi		100		
Dorper				
Grassridge		808		333
Neptune				
Pembroke		53		
Poseidon		648		
Grand Total	0	1609	0	333

Local renewable energy integration projects are in progress for connection of the above renewable energy generation.

Table 7: Projects for current generation integration

Type	Scheme	Project	Expected Year
Transformer	Delphi 400/132 kV transformer	<ul style="list-style-type: none"> Install 1st 500 MVA 400/132 kV transformer. 	2027
Transformer	Grassridge third 500 MVA 400/132 kV transformer	<ul style="list-style-type: none"> Grassridge third 500 MVA 400/132 kV transformer 	2027

3.2. Results

Table 8 indicates the approved and budget quote allocation per transmission substation including the amount of MW allocated for curtailment.

Table 8: Total generation allocation per substation

Substation	Approved		BQ		Curtailment	Total
	PV	Wind	PV	Wind	Wind	
Dedisa						0
Delphi		100				100
Dorper					480	480
Grassridge		808		333		1141
Neptune					310	310
Pembroke		53				53
Poseidon		648				648
Grand Total	0	1609	0	333	790	2732

Due to internal congestion in the Eastern Cape supply area, additional wind generation can only be allocated on the eastern side of the supply area as indicated in the table above.

Additional projects will also be required for integration of the additional renewable energy generation and also to avoid local network constraints.

Table 9: Additional projects under development required for the additional renewable energy generation

TDP Scheme	Scheme	Project	Expected Year
Substation	Dorper 400/132 kV substation integration	<ul style="list-style-type: none"> Dorper new 400/132 kV substation and loop-in between Beta and Delphi 	2030

4. Conclusion

By accepting a reasonable share of no more than 10% of curtailment, 3 470 MW of additional wind generation can be connected to the grid almost immediately, with 2 680 MW in the Western Cape and 790 MW in the Eastern Cape.

To utilise the additional generation connection capacity by 2025, local renewable energy generation integration projects which are planned for around 2027 will have to be expedited as these will be required for connection of the renewable energy generation. Additional projects which are not in the current approved 10-year plan will also be required for integration of the renewable energy generation and also to avoid local network constraints.

It is cautioned that power procurement within the local municipalities will negatively impact the “new” generation connection capacity if the procurement is successful, is located within the Western Cape and Eastern Cape and if it is dispatched during times of congestion. Rooftop PV was also not specifically accounted for; however, some allowance has been made for it in the generation capacity for curtailment.

Any considerable load reduction or stagnation of the anticipated load growth will also result in an increase in the curtailment should all of the generation connection capacity be allocated to new renewable energy generation. On the contrary, bulk loads such as new data centres have been excluded due to lack of commitment from many of the applicants; these will however have a positive impact on reducing the curtailment should they happen within this timeframe and should therefore be encouraged to be located in these areas.